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Strategic Shifts and Technological Transformations in Modern Warfare

**ARTIFICIAL INTELLIGENCE LED LETHAL AUTONOMOUS
WEAPON SYSTEMS (LAWS) AND TERRORISM: RISK
ASSESSMENT AND SOLUTIONS**

Ahmad Ibrahim, Syeda Fizzah Shuja

Abstract

Artificial Intelligence (AI) is undertaking a paradigm shift in contemporary world and has emerged as a transformative force with significant military applications. As scale of AI integration in military systems is advancing, concerns about the potential risks associated with autonomous weapons have increased, raising apprehensions about national security in the face of potential terrorist threats. The article examines the evolution of AI in military contexts, various levels of autonomy, and will discuss conceptual understanding regarding Lethal Autonomous Weapon Systems. The lack of coherence in defining autonomous systems by international community have created legislative complications regarding arms control efforts of these weapons. Similarly, the likelihood of non-state actors exploiting AI-driven weapon technologies raises profound challenges for national security. In response to these challenges, the article explores potential counters and solutions. It addresses the ethical, legal, and strategic dimensions of managing AI in military applications to ensure responsible use and prevent unauthorized access by non-state actors. Ultimately, it contributes to the ongoing discourse on regulating AI in warfare, offering insights into potential safeguards and countermeasures to navigate the evolving landscape of lethal autonomous technologies in the context of global security challenges.

Key Words: Artificial Intelligence (AI), Drones, Lethal Autonomous Weapon Systems (LAWS), Terrorism, National Security.

Introduction to Artificial Intelligence (AI)

In 1956, during a conference at Dartmouth College, the initial understanding of artificial intelligence (AI) was expressed: “Every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it.”¹ Or it can be referred to as the ability of a machine to learn from experience, adjust to new inputs and perform human-like tasks.”² In brief, AI refers to the ability of computer systems to perform tasks often associated with human intelligence (HI). It leverages rapid, iterative, and intelligent algorithms to process substantial amounts of data, automatically discerning new patterns. The machine learns by processing large volumes of data, studying the successes and failures, and generating algorithms that help classify objects or predictions of behavior.³

This capacity holds significant potential across various facets of the contemporary world, including military applications. The incorporation of AI in the military is producing new and smart systems that are redefining how the combat force is projected on a battlefield. These weapon systems are increasingly getting smaller, more flexible, more precise, more intelligent, and more robust. An Autonomous Weapon System (AWS) has the ability to choose and attack targets without needing additional input from a human operator once activated.⁴ The incorporation of lethal fire power with AWS results in creation of the Lethal Autonomous Weapon Systems (LAWS). As the technology is evolving, the battlefield is proliferating with more and more AWS – many of which have been weaponized already.

¹ Jorgan Veisdal, “The Birthplace of AI – The 1956 Dartmouth Workshop,” *Cantor’s Paradise*, September 12, 2019, <https://www.cantorsparadise.com/the-birthplace-of-ai-9ab7d4e5fb00?gi=95ea7d231c63> .

² Yanqing Duan, John Edwards, and Yogesh Dwivedi, “Artificial Intelligence for Decision Making in the Era of Big Data – Evolution, Challenges and Research Agenda,” *International Journal of Information Management*, no. 48 (October 2019): 63-71, <https://www.sciencedirect.com/science/article/abs/pii/S0268401219300581> .

³ “What is Artificial Intelligence (AI)?” IBM - United States, June 3, 2020, <https://www.ibm.com/cloud/learn/what-is-artificial-intelligence> .

⁴ Gregory C. Allen, “DOD is Updating its Decade-Old Autonomous Weapons Policy but Confusion Remains Widespread,” *Centre for International and Strategic Studies*, June 06, 2022, <https://www.csis.org/analysis/dod-updating-its-decade-old-autonomous-weapons-policy-confusion-remains-widespread> .

Levels of Autonomy And OODA Loop

Intelligent machines capable of performing tasks by themselves without explicit human control are autonomous machines. The difference between automatic and autonomous weapon systems is often debated. Automatic systems follow pre-programmed instructions to carry out specific tasks, relying on static directives that necessitate human interaction for any adjustments in response to a changing environment. In contrast, autonomous systems possess the ability to dynamically adapt to their surroundings, making crucial decisions without the need for human intervention.⁵

The OODA loop, a decision-making model devised by Colonel John Boyd, encompasses four steps: Observe, Orient, Decide, and Act. In human-operated weapon systems, a human operator is responsible for executing these actions. However, in autonomous weapon systems, the human relinquishes control over certain aspects of the OODA loop. Depending on the nature of interaction with human controls in the Observe, Orient, Decide, and Act (OODA) loop, autonomy can be categorized into three levels: human-in-the-loop (semi-autonomy), human-on-the-loop (supervised autonomy), and human-out-of-the-loop (full autonomy). The extent of human participation in the OODA loop dictates the level of control humans exert over an AI-based system.

Human-in-the-Loop is the semi-autonomous level in which machine conduct supplementary actions while command & control lies with human. Human has the sole authority to make decision depending upon the input provided by machine.⁶ Human-on-the-Loop is the supervised autonomous level in which supplementary actions as well as decision making is undertaken by machine without human input. However entire process takes place under the supervision of human operator who can allow the machine to conduct operation autonomously, or he can override the entire operation depending upon the situation.⁷ Human-out-of-the-Loop is the full autonomous level

⁵ Stacy J. Taylor, "Autonomy," Encyclopedia Britannica, June 20, 2017, <https://www.britannica.com/topic/autonomy>.

⁶ Jack Beard, "Autonomous Weapons and Human Responsibilities," *George Town journal of International Law*, no 617 (2014): 14-56, <https://www.academia.edu/67515752/Autonomous>.

⁷ Kelly M. Saylor, *Defense Primer: U.S. Policy on Lethal Autonomous Weapon Systems* (U.S. Congressional Research Service, 2022), <https://crsreports.congress.gov/product/pdf/IF/IF11150>

where machines execute operation independently without intervention of human operator in any capacity.⁸

The capability and correspondingly the risks, increases with the level of autonomy in the weapon system. In general, full-autonomous weapon systems are perceived as most risky system due to the lack of human control and the threat of AI acting in an irresponsible and out-of-control manner. Malfunctioning, bugs, system failures, hacking, and unanticipated interaction with the environment can yield unintended consequences. Greater human control is widely believed to be the solution for the mitigation of the aforementioned risks.

However, this generalization is valid when professional security forces are taken into account. The human operator in such cases is bound by legal framework and is trained to act in accordance with standard operating procedures (SOPs) to attain maximum benefit with minimum risks. But the situation changes drastically when a human operator belonging to a terrorist organization is put into the equation. Such hostile actors rely on all means possible to inflict the utmost damage to civilian as well as military targets without bothering about ethical or legal obligations. This makes integration of lethal weapons with all levels of autonomy, no matter in what capacity human is involved, extremely dangerous and hard to counter.

Understanding Lethal Autonomous Weapon Systems (LAWS)

Contemporarily, there is no mutually agreed and globally recognized definition of an autonomous weapon system.⁹ China's People's Liberation Army perceives LAWS as "a weapon that utilizes AI to automatically pursue, distinguish, and destroy enemy targets; often composed of information collection and management systems, knowledge base systems, assistance to decision systems, mission implementation systems, etc."¹⁰ Russian Ministry of Defense has defined these systems as "an unmanned piece of technical equipment that is not a munition and is designed to perform military and

⁸ Saylor, "Defense Primer".

⁹ Sono Motoyama, "Inside the United Nations effort to Regulate Autonomous Killer Drones," *The Verge*, August 27, 2018, <https://www.theverge.com/2018/8/27/17786080/united-nations-un-autonomous-killer-robots-regulation-conference> .

¹⁰ Elsa B. Kania, "China Embrace of AI Enthusiasm and Challenges," *European Council on Foreign Relations*, November 06, 2018, https://ecfr.eu/article/commentary_chinas_embrace_of_ai_enthusiasm_and_challenges/ .

support tasks under remote control by an operator, autonomously or using the combination of these methods.”¹¹

According to NATO, an autonomous system is “a system that decides and acts to accomplish desired goals, within defined parameters, based on acquired knowledge and an evolving situational awareness, following an optimal but potentially unpredictable course of action.”¹² NATO has yet to craft a standardized definition of the lethal autonomous weapon system.

From the UK Ministry of Defence’s perspective, “An autonomous system is capable of understanding higher-level intent and direction. From this understanding and its perception of its environment, such a system is able to take appropriate action to bring about a desired state. It is capable of deciding a course of action, from a number of alternatives, without depending on human oversight and control, although these may still be present. Although the overall activity of an autonomous unmanned aircraft will be predictable, individual actions may not.”¹³

The U.S. Department of Defense (U.S. DoD) refers to LAWS as “a weapon system that, once activated, can select and engage targets without further intervention by a human operator. This includes human-supervised autonomous weapon systems that are designed to allow human operators to override operation of the weapon system, but can select and engage targets without further human input after activation.”¹⁴

Crafting mutual consensus regarding the definition of LAWS is a major challenge due vast disparity in comprehending their technical functionalities and subsequent military applications. In brief, three different groups of thoughts exist: pessimists, optimists, and realists. Pessimists perceive LAWS as weapons of mass destruction (WMD) which are destabilizing in nature, and contradict ethical and legal values. Optimists

¹¹ Raine Sagarmsingh, “Lethal Autonomous Weapon Systems: Artificial Intelligence and Autonomy,” *Journal of IEEE*, no. 12 (2019): 12 http://sixhalfdev.com/projects/wp-wise/wp-content/uploads/2019/04/Raine_S_-FinalPaper.pdf .

¹² AAP-06 Edition 2020: NATO Glossary of Terms and Definitions, NATO Standardization Office, 2020.

¹³ Ministry of Defence-Gov UK, *Unmanned Aircraft Systems (JDP 0–30.2)*, 2018, <https://www.gov.uk/government/publications/unmanned-aircraft-systems-jdp-0-302> .

¹⁴ US Department of Defense, *DoD directive 3000.09 on Autonomy in Weapon Systems*, January 25, 2023, <https://www.esd.whs.mil/portals/54/documents/dd/issuances/dodd/300009p.pdf> .

appreciate the capabilities provided by LAWS and support their further development. Realists have a more balanced point of view related to LAWS as they believe that technological developments of LAWS cannot be capped, and a complete ban is not possible. Therefore it is necessary to craft a regulatory mechanism to keep the development and deployment of such systems in check.¹⁵ These three different groups of thoughts are the representations of different nations' stances at the international level and are yet to find common grounds for defining and legislating LAWS.

Evolution of Autonomy in Unmanned Weapon Systems

Human-operated unmanned systems have been in use in varying capacities since the WW-I.¹⁶ The work for the incorporation of autonomy in military systems began during the Cold War. In 1963, US\$2 million in funds were granted to MIT by Defense Advanced Research Projects Agency (DARPA) to undertake research on “machine-added cognition” to develop new military applications for achieving technological advantage against the Soviet Union.¹⁷ The evolution of autonomy in unmanned systems can be split into three phases.

The first phase is characterized by remote-controlled systems which relied on human input to execute every task. During the Cold War several such unmanned aerial systems were developed, even employed, primarily for reconnaissance purpose. But these systems were completely void of autonomy of their own. For example, the United States MQ-1 Predator Drone, developed in the late 20th century, was remotely piloted and used chiefly for surveillance and reconnaissance roles. Later versions of these drones were capable of following pre-programmed flight paths, executing basic maneuvers, and conducting sustained surveillance independent of human control. In this

¹⁵ Sitara Noor, “Laws on LAWS: Regulating the Lethal Autonomous Weapon Systems,” *Journal of Indo-Pacific Affairs*, September 21, 2023, <https://www.airuniversity.af.edu/JIPA/Display/Article/3533453/laws-on-laws-regulating-the-lethal-autonomous-weapon-systems/> .

¹⁶ James W. Canan, “On the Horizon: Unmanned Aerial Vehicles,” *Air & Space Force Magazine*, October 01, 1988, <https://www.airandspaceforces.com/article/1088uav/> .

¹⁷ Richard H. Van Atta, “DARPA Technical Accomplishments. An Historical Overview of Selected DAPRA Projects,” *Internet Archives*, no.2 (1991): 83, <https://archive.org/details/DARPATechnicalAccomplishmentsandHistoricalReviewofSelectedDARPAProjectsVolume1> .

phase, unmanned systems began to weaponize with precision munitions. However, humans were still in control of making final decisions and completing complex tasks according to evolving situations.¹⁸

Post 2010 marks the second phase of autonomy integration in unmanned systems. Integration of higher grade of semi-autonomy allowed unmanned systems to adapt according to dynamic combat environment by identifying the changing conditions, crafting feasible solutions and making rapid decisions with minimum human input. Drones acquired more autonomy in navigation, target recognition, and flight operations. The engagement capability, however, remained under human control. Northrop Grumman X-47B, an unmanned combat aerial vehicle (UCAV), took-off and landed on an aircraft carrier after executing in-flight maneuvers on May 14, 2013.¹⁹ Similarly, the Boeing MQ-25 Stingray became the first carrier-based tanker drone which could perform the complex task of inflight-refueling autonomously.²⁰

The third and most contemporary phase involves the development and employment of military systems with supervised autonomy. Many such systems have been equipped with weapons, or have been integrated with warheads - like in the case of loitering munitions or kamikaze drone boats, essentially transforming them into LAWS. Loitering munitions, also called kamikaze or suicide drones, represent a unique weapon category that combines the characteristics of both drones and missiles.²¹ These munitions possess the capability to detect and track targets over an extended duration before initiating engagement. Although human input during operational use varies depending on the threat environment and type of weapon being used, but loitering munitions have a high degree of autonomy in comparison to traditional combat drones. In some instances these munitions can

¹⁸ John R. Hoehn, Kelley M. Sayler, Michael E. DeVine, *Unmanned Aerial Systems: Role, Missions, and Future Concepts* (U.S. Congressional Research Service, July 18, 2022), <https://crsreports.congress.gov/product/pdf/R/R47188> .

¹⁹ Nidhi Subbharaman, "X-47B Drone Completes First Ever Carrier Takeoff and Landing," *NBC News*, May 15, 2013, <https://www.nbcnews.com/tech/tech-news/navys-x-47b-drone-completes-first-carrier-takeoff-flna1c9922371>

²⁰ Thomas Newdick, "Navy's MQ-25 Stingray Tanker Drone Goes Abroad a Carrier for the First Time," *The War Zone*, December 02, 2021, <https://www.thedrive.com/the-war-zone/43361/navys-mq-25-stingray-tanker-drone-goes-aboard-a-carrier-for-the-first-time>

²¹ Paul Scharre, *Army of None: Autonomous Weapons and the Future of War* ed. 01 (New York: W.W. Norton & Company, 2018), 53.

autonomously search, identify, decide, and engage targets without any human intervention.²² Examples include Israel's Harpy, the United States' Switch Blade, Turkey's Kargu-II, Russia's Aero-Kub and even Iran's Shahed-136.

In full-scale conflict, kamikaze drones were first used by Azerbaijan in the Nagorno-Karabakh conflict. Azerbaijan's military effectively used loitering munitions to precisely engage the Armenian military, particularly air defence systems, from stand-off ranges.²³ Similarly, during the Russia-Ukraine conflict, both sides have extensively used weapons with great effect. These suicidal drones have proved their efficacy against military as well as civilian targets. The traditional air defence systems have repeatedly been overwhelmed by these munitions particularly during saturated strikes.²⁴

In the maritime domain, Ukraine has successfully employed kamikaze drone boats to attack the Russian Navy Black Sea Fleet. Despite overwhelming naval superiority, the Russian Navy has been unable to impose complete a blockade of the Ukrainian coast. Ukraine has been using suicidal boats with high-grade autonomy as a sea-denial weapon against the Russian surface fleet. These pilotless explosive-laden boats have been used to target warships at sea as well as harbor.²⁵ Allegedly, the well-protected Crimean Bridge was also attacked by an unmanned suicidal boat which managed to breach multiple layers of Russian defences.²⁶ These cheap suicide drone boats have degraded the Russian Navy's ability to operate independently in the Black Sea.

²² Ahmad Ibrahim, "Loitering Munitions as a New-Age Weapon Systems," *CSCR*, December 05, 2022. <https://cscr.pk/explore/themes/defense-security/loitering-munitions-as-a-new-age-weapon-system/>.

²³ Ibrahim, "Loitering Munitions".

²⁴ Lauren Kahn, "Can Iranian Drones Turn Russia's Fortunes in the Ukraine War?," *Council on Foreign Relations*, October 26, 2022. <https://www.cfr.org/in-brief/can-iranian-drones-turn-russias-fortunes-ukraine-war>.

²⁵ Mariano Zafra, and Jon McClue, "Sea Drones and Counteroffensive in Crimea," *Reuters*, July 17, 2023. <https://www.reuters.com/graphics/UKRAINE-CRISIS/CRIMEA/gdvzwrmlpw/>

²⁶ Nick P. Walsh, "The moment Ukraine used experimental sea drone to target Russian Bridge," *CNN*, August 15, 2023, <https://edition.cnn.com/2023/08/15/europe/ukraine-crimea-bridge-drone-strike-video-intl/index.html>

Besides the proliferation of loitering munitions and kamikaze drone boats, many nations are also in the advance stages of developing drone-swarm technology with an enhanced level of autonomy. These autonomous swarms of drones, once weaponized, will offer vast military applications along with equivalent levels of risks.²⁷ As the level of autonomy will evolve, the next generations of AWS will eventually enter into the battlefields of the future.

LAWS as Weapons of Terror

The likelihood of terrorists using LAWS depends on the motivation and realistic accessibility of such technology. Three factors contribute to the attractiveness of LAWS for terrorists. First, AI-enabled weapons could minimize, if not eliminate, the physical risks associated with terrorist action. Second, fully AWS hold the potential to be invulnerable to countermeasures such as jamming or interception thus increasing the rate of success. Thirdly, LAWS offer force multiplication as unlike manual systems that require continuous intervention, those deploying AWS can potentially operate multiple LAWS simultaneously. In sum, AI can potentially act as an enabling technology for terrorism.²⁸

When accessibility of such high-end technology to terrorist factions is taken into account, there are three primary obstacles. First, the availability of unmanned systems that can act as carriers; second, the incorporation of sufficiently advanced AI so that the weapon system could undertake tasks autonomously without failure; and thirdly, the ability to integrate a warhead with an unmanned system that can detonate as intended and deliver desired damage. Non-state actors now possess the capability to deploy homemade, remotely piloted drones and weapons capable of autonomously navigating to designated targets and delivering explosive payloads.

Militant organizations have been using manually controlled suicide drones for past several years. According to an open-source study, 440 terror

²⁷ David Hambling, "Israel Rolls Out Legion-X Drone Swarm for The Urban Battlefield," *Forbes*, October 24, 2022, <https://www.forbes.com/sites/davidhambling/2022/10/24/israel-rolls-out-legion-x-drone-swarm>.

²⁸ Michael Horowitz, "Artificial Intelligence, International Competition, and the Balance of Power," *Texas National Security Review*, no. 3(May 2018): 37, <https://tnsr.org/2018/05/artificial-intelligence-international-competition-and-the-balance-of-power/>

incidents involving weaponized drones have been recorded between August 2016 and March 2020.²⁹ Almost the entirety of these attacks (433 out of 440) took place in the Middle East and North Africa.³⁰ Use of commercial-grade quad-copters for dropping mortars and grenades was first popularized by the Islamic State of Iraq and Syria (ISIS) in 2017 during the war against Iraqi security forces.³¹ These drones caught Iraqi and the U.S. forces by surprise and inflicted losses to infantry, artillery and even armored forces. According to a U.S. special ops commander, the usage of “killer bees” in Mosul degraded morale and gave the enemy tactical advantage through commercial grade drones.³² On Jan 2018, ISIS attacked Russian forces in Hmeimim Airbase with several suicide drones. These drones were wrapped with home-made mines and were thwarted by Russian defences.³³ This was the first instance when an attack of this magnitude was launched by a terrorist outfit against a military.

Fully autonomous suicidal drones represent the next logical step in drones’ evolution. These drones can also be armed with weapon and will be able to effectively evade traditional defensive systems. Moreover, such systems will be able to identify and strike targets based on visual cues - or track individuals using facial or gait recognition. Commercial UAVs, including First Person View (FPV) drones, with their ability to navigate through complex obstacles and target specific individuals, already exhibit this capability thanks to integrated high-grade autonomy. Besides suicidal attacks for inflicting high losses, AI can also transform specialized tasks, such as

²⁹ Håvard Haugstved and Jan Otto Jacobsen, “Taking Fourth-Generation Warfare to the Skies? An Empirical Exploration of Non-State Actors’ Use of Weaponized Unmanned Aerial Vehicles (UAVs — ‘Drones’),” *Perspectives on Terrorism* 14, no. 5 (October 2020): 30, <https://www.jstor.org/stable/26940037>

³⁰ Haugstved and Jacobsen, “Taking Fourth-Generation Warfare to the Skies?”

³¹ Joby Warrick, “Use of Weaponized Drones by ISIS spurs Terrorism Fears,” *Washington Post*, February 21, 2017, https://www.washingtonpost.com/world/national-security/use-of-weaponized-drones-by-isis-spurs-terrorism-fears/2017/02/21/9d83d51e-f382-11e6-8d72-263470bf0401_story.html

³² Peter Layton, “Commercial drones: Privatising Air Power,” *The Lowy Institute*, September 27, 2017, <https://www.loyyinstitute.org/the-interpreter/commercial-drones-privatising-air-power>.

³³ “Russia Thwarts Drone Attack on Hmeimim Airbase,” *BBC News*, January 07, 2018, <https://www.bbc.com/news/world-europe-42595184>

sniping, into more routine and less specialized activities.³⁴ AI-powered suicidal drones can be used to target-kill specific individuals in crowds by terrorist factions.³⁵ For example, the assassination attempt on Iraqi Prime Minister Mustafa al-Kadhimi's residence in November 2021 was made by a booby-trapped drone.³⁶

According to a UN report, the first instance of an AI-powered suicidal drone was recorded in March 2020 in Libya when a Turkish-origin Kargu-II suicidal quad-copter was used to target the Libyan National Army (LNA).³⁷ The report further stated that "The lethal autonomous weapon systems were programmed to attack targets without requiring data connectivity between the operator and the munition: in effect, a true 'fire, forget and find' capability."³⁸ The proliferation of loitering munitions and their wide-spread use in the Russia-Ukraine war indicates that these highly capable munitions will eventually fall into the hands of non-state actors. Once employed, these suicidal autonomous munitions, due to their ability to exploit vulnerabilities in defenses, will pose a major challenge to the security of civilian as well as military infrastructure. Similarly, terrorist organizations might also explore the repurposing of commercially available drones, modifying them to carry improvised lethal payloads. While not true autonomous weapons, these modified drones could be used in autonomous or semi-autonomous modes for carrying out attacks.

Besides the use of AI-powered suicidal quad-copters or even loitering mentions, there are a few more potential forms of LAWS that can be exploited for terrorist purposes. Vehicle-Borne Improvised Explosive Device (VBIED), or simple car bomb, has been a weapon of choice for terror outfits for large-scale destruction. In concept, an explosive-laden vehicle is driven by a suicide-driver who detonates the vehicle after reaching the destined target. But

³⁴ Miles Brundage, *The Malicious Use of Artificial Intelligence: Forecasting, Prevention, and Mitigation*, (Oxford, U.K.: Future of Humanity Institute, University of Oxford, February 2018), 27.

³⁵ Brundage, *The Malicious Use of Artificial Intelligence*, 21.

³⁶ Ghassan Adnan, and Jared Malsin, "Iraq's Prime Minister Targeted in Assassination Attempt," *The Wall Street Journal*, November 07, 2021. <https://www.wsj.com/articles/iraqs-prime-minister-survives-assassination-attempt-government-says-11636248485>.

³⁷ UNSC Final Report of the Panel of Experts on Libya Established Pursuant to Security Council Resolution 1973 (2011) (Relief Web, 2021), <https://reliefweb.int/report/libya/final-report-panel-experts-libya-established-pursuant-resolution-1973-2011-s2017466>

³⁸ UNSC Final Report of the Panel of Experts on Libya, 17.

the convergence of AI with VBIED can potentially create an unmanned suicide vehicle that can operate semi-autonomously or even autonomously, and wreak havoc against congested or high-value targets.³⁹ Although this level of technology is currently beyond the grasp of non-state actors - but considering the wide adaptation of commercial technology of driver-less vehicles (Tesla cars for example), the risk of militarization and eventually terrorization of this technology is very real.

In the maritime domain, militant factions have used man-driven explosive-boats for suicide attacks against surface ships. On October 12, 2000, an explosive laden boat driven by two Al-Qaeda's suicide bombers hit United States Navy (USN) destroyer USS Cole, killing 17 sailors and injuring 39 others.⁴⁰ Similarly, in 2016, Royal Saudi Navy Frigate Al-Madinah was struck by a Yemeni Houthi's remotely controlled suicide boat killing two sailors and wounding three more. The attack took place in the Southern Red Sea and was the first incident in modern history involving a successful attack of a remote-operate suicide boat against a warship.

In the Russia-Ukraine war, kamikaze boats with a higher degree of autonomy are being used extensively to target Russian Warships and naval infrastructure in the Black Sea.⁴¹ The potential risk of employing kamikaze drone boats incorporated with AI by terrorists poses a major threat to maritime security. These boats would be a grave threat near shores or at choke points. Not only merchant vessels, but even warships will be vulnerable to this new potential threat, thus necessitating countermeasures.⁴² Likewise, underwater

³⁹ Jeffery W. Lewis, "Smart Bomb in Every Garage – Driverless cars and Future Terrorist Attacks," *National Consortium for the Study of Terrorism and Responses to Terrorism*, September 18, 2015, <https://www.start.umd.edu/news/smart-bomb-every-garage-driverless-cars-and-future-terrorist-attacks>

⁴⁰ "USS Cole Bombing Fast Facts," *CNN*, November 22, 2022, <https://edition.cnn.com/2013/09/18/world/meast/uss-cole-bombing-fast-facts/index.html>

⁴¹ "Unmanned Kamikaze Boats have become a real Ukrainian Weapon of Deterrence," *Defence Express*, August 24, 2023, https://en.defence-ua.com/news/unmanned_kamikaze_boats_have_become_a_real_ukrainian_weapon_of_deterrence-7731.html

⁴² Ahmad Ibrahim, "Feasibility of Kamikaze Drone Boats in Modern Warfare," *CSCR*, July 27, 2023, <https://cscr.pk/explore/themes/defense-security/feasibility-of-kamikaze-drone-boats-in-modern-warfare/#:~:text=First%2C%20these%20boats%20can%20be,d denial%20envelop%20in%20territorial%20waters.>

drones equipped with GPS and armed with explosives have been used by Hamas to target Israel's maritime infrastructure. Although the Israeli Navy countered these underwater suicide drones, but Israel was forced to deactivate a natural gas rig chiefly due to the threat of these drones.⁴³ Recently, the Houthi militia in Yemen has employed rudimentary unmanned suicide boats to target merchant vessels in the Red Sea. The U.S. Navy warships, deployed in the Red Sea under the aegis of Operation Prosperity Guardian, have intercepted numerous suicide drone boats launched by Houthis.⁴⁴ Besides surface drones, Houthis have also introduced unmanned underwater vehicles equipped with explosive payloads, to target merchant ships and naval vessels in the Red Sea.⁴⁵ The growing complexity scale of drone systems deployed by a non-state actor in the maritime domain suggests that as newer technologies will become wide spread, more capable systems with superior autonomy will also be used by such factions for hostile ambitions.

Perhaps the most concerning form of AI-driven weapon systems are drone swarms, where multiple drones adapt and learn to perform tasks with mutual collaboration.⁴⁶ The real peril lies in large swarms of weaponized drones potentially capable of inflicting tens of thousands of casualties.⁴⁷ Machine learning algorithms enable swarms of drones to navigate confined spaces by providing each other with information about their surroundings thus enabling them to learn not only their own presence but also the movements of

⁴³ Judah Ari. Gross "IDF says it Thwarted Underwater Drone Attack by Hamas from Northern Gaza," *Times of Israel*, May 18, 2021, <https://www.timesofisrael.com/idf-says-it-thwarted-underwater-drone-attack-by-hamas-from-northern-gaza/>.

⁴⁴ "U.S. Forces Destroy two Houthi suicide drone boats," *The Maritime Executive*, February 02, 2024, <https://maritime-executive.com/article/u-s-forces-destroy-two-more-houthi-suicide-drone-boats>

⁴⁵ David Millward, "Houthis Deploy Drone Submarine for first time," *The Telegraph*, February 18, 2024, [https://www.telegraph.co.uk/world-news/2024/02/18/red-sea-houthis-deploy-drone-submarine-shipping-middle-east/#:~:text=Houthi%20rebels%20have%20deployed%20a,CENTCOM\)%20said%20in%20a%20statement.](https://www.telegraph.co.uk/world-news/2024/02/18/red-sea-houthis-deploy-drone-submarine-shipping-middle-east/#:~:text=Houthi%20rebels%20have%20deployed%20a,CENTCOM)%20said%20in%20a%20statement.)

⁴⁶ David Humbling, "What are Drone Swarms and Why Does Everyone Suddenly want one?," *Frobes*, March 01, 2021, <https://www.forbes.com/sites/davidhumbling/2021/03/01/what-are-drone-swarms-and-why-does-everyone-suddenly-want-one/?sh=7ab4cef52f5c>

⁴⁷ Zachary Kallenborn and Philipp C. Bleek, "Drones of Mass Destruction," *War on Rocks*, February 14, 2019, <https://warontherocks.com/2019/02/drones-of-mass-destruction-drone-swarms-and-the-future-of-nuclear-chemical-and-biological-weapons/>

other drones within the swarm.⁴⁸ Aerobic displays featuring over hundreds of centrally controlled UAVs are becoming commonplace, and advancements in technology might enable fully autonomous UAVs in compact sizes. Consequently, terror entities assembling vast numbers of small autonomous weapons could create WMD. However, the technical complexities of creating a successful autonomous swarm currently limit their development to military actors.

In recent years, non-state actors have demonstrated a propensity for innovative adoption of new technologies including AI. The wide-spread use of loitering munitions by the Wagner group in the Russia-Ukraine war indicates that several states in the future would be prone to providing or leaking sensitive LAWS tech to non-state actors. Iran for example is actively working on improving the autonomy of domestic loitering munitions. But in parallel, Tehran also has close relations with several extra-regional militant organizations which have relied on Tehran for supplies and weapons.

As technology commercializes and dual-use technologies become commonly available, the prospects of terrorization of AI in general and LAWS in particular increase substantially. There is a growing need to craft legislation to cap the proliferation of such technologies so that its easy access to hostile actors may be denied. Given the formidable technical challenges associated with developing a functional autonomous weapons system, however, immediate apprehension about terrorist utilization of AWS may be unwarranted.

Legislation Issues Regarding LAWS

International Humanitarian Law (IHL), also known as the Law of Armed Conflict (LOAC), is designed to oversee armed conflicts and offers mechanisms to safeguard fundamental human rights during violence.⁴⁹ The key feature of IHL is the principle of distinction, which requires parties involved in armed conflict to distinguish between combatants and

⁴⁸ J. Fingas, "AI helps Drone Swarms Navigate through Crowded, Unfamiliar Spaces," *Engadget*, July 18, 2020, <https://www.engadget.com/caltech-drone-swarm-ai-174642584.html>.

⁴⁹ "What is International Humanitarian Law," *ICRC*, July 27, 2004, https://www.icrc.org/en/doc/assets/files/other/what_is_ihl.pdf

noncombatants and ensures the latter's immunity from being targeted. LAWS, being “human-less” in nature, have questionable credibility in this regard.

Legislations about LAWS are inherently difficult. The challenges stem from the fundamental complications in defining, predicting, and controlling the effects of these weapons. Majority of international agreements that exist to prohibit or regulate certain weapons were established before the emergence of the technology associated with AWS and LAWS.⁵⁰ Consequently, the rapid advancement of technology is outpacing the boundaries set by IHL, creating a situation where IHL struggles to keep pace with the evolving landscape of the militarization of AI.

Two expert meetings have been hosted by the International Committee for the Red Cross (ICRC), while the United Nations, operating under the Convention on Certain Conventional Weapons (CCW), has arranged three informal expert meetings to evaluate the technological, military, ethical, and legal aspects of LAWS.⁵¹ As a result of these meetings, the Convention on Certain Conventional Weapons (CCW) established a Group of Governmental Experts (GGE) in 2016. The inaugural meeting of this group, held in November 2017, saw participation from 86 countries, over 60 civil society organizations, UNIDIR, and ICRC.⁵² The primary objective was to explore legal arguments opposing the development, production, and employment of AWS. However, the summit faced a road-block in the very initial phase due to disagreement on precise a definition of AWS. This obstacle, emanating primarily due to objections from major powers, undermined the prospects of making further progress on the issue.

Since 2018, António Guterres, the Secretary-General of the United Nations, has consistently declared his stance that LAWS are both politically unacceptable and morally repugnant and should be prohibited under international law. In his 2023 New Agenda for Peace, Guterres reiterated this position, urging States to establish a legally binding instrument by 2026 to prohibit lethal systems that operate without human control and cannot adhere to international humanitarian law. He emphasized the absence of specific

⁵⁰ U. C. Jha, *Killer Robots: Legal Autonomous Weapons Systems, Legal, Ethical and Moral Challenges* (Delhi: Vij Publishers 2016): 59.

⁵¹ Noor, “Laws on LAWS.”

⁵² “Campaign to Stop Killer Robots, Support Grows for New International Law on Killer Robots,” *Stop Killer Robots*, November 17, 2017, <https://www.stopkillerrobots.org/?p=6579>.

multilateral regulations, highlighting that the design, development, and use of such systems raise serious humanitarian, legal, security, and ethical concerns. These concerns, he noted, constitute a direct threat to human rights and fundamental freedoms.⁵³

Several arms control advocates have persuaded the international community to impose a complete ban on the development and deployment of LAWS through an UN-sanctioned international treaty. Human rights organizations like Campaign to Stop Killer Robots call for banning all types of autonomous weapons. Human Rights Watch also advocates for a pre-emptive ban on the development, production, and use of fully autonomous weapon systems.⁵⁴ International Committee of Red Cross (ICRC) has recommended banning unpredictable autonomous weapons because of their indiscriminate effects.⁵⁵ Since 2013, 30 nations have endorsed a complete ban on LAWS.⁵⁶ Even prominent tech figures, including Elon Musk and Bill Gates, have also suggested banning “killer robots.”⁵⁷

However, it has been observed that nations at the forefront of development of AI-based weapons, including LAWS, resist calls for their prohibition.⁵⁸ According to them, a complete ban on LAWS is near-impossible primarily due to: difficulty in the categorization of LAWS; the military advantages associated with LAWS; and the prospect of using

⁵³ UNODA, “Lethal Autonomous Weapon Systems (LAWS),” United Nations Office for Disarmament Affairs, 2023 <https://disarmament.unoda.org/the-convention-on-certain-conventional-weapons/background-on-laws-in-the-ccw/>

⁵⁴ “Killer Robots,” *Human Rights Watch*, 2010, <https://www.hrw.org/topic/arms/killer-robots#:~:text=Human%20Rights%20Watch%20calls%20for,Campaign%20to%20Stop%20Killer%20Robots>.

⁵⁵ “ICRC Position on Autonomous Weapon Systems,” *ICRC*, May 11, 2021, <https://www.icrc.org/en/document/icrc-position-autonomous-weapon-systems>

⁵⁶ Brian Stauffer, “Stopping Killer Robots: Country Positions on Banning Fully Autonomous Weapons and Retaining Human Control,” *Human Rights Watch*, August 10, 2022, https://www.hrw.org/report/2020/08/10/stopping-killer-robots/country-positions-banning-fully-autonomous-weapons-and#_ftn12

⁵⁷ Catherine Clifford, “Hundreds of A.I. Experts Echo Elon Musk, Stephen Hawking in Call for a Ban on Killer Robots,” *CNBC*, November 8, 2017, <https://www.cnn.com/2017/11/08/ai-experts-join-elon-musk-stephen-hawking-call-for-killer-robot-ban.html>.

⁵⁸ Robert F. Trager, “Killer Robots are here – And We Need to Regulate Them,” *Foreign Policy*, May 11, 2022, <https://foreignpolicy.com/2022/05/11/killer-robots-lethal-autonomous-weapons-systems-ukraine-libya-reg>.

commercial grade technology for developing LAWS. Great powers oppose banning initiatives being counter-productive and potentially outlawing positive applications of militarized AI.⁵⁹ These powers have also resisted new arms control regime by arguing that existing international law is sufficient to cover autonomous weapons.⁶⁰ Furthermore, a complete ban will potentially undermine the efforts for developing counter systems against LAWS.

The United States asserts that existing international humanitarian laws are adequate, with its policy allowing for human intervention in the use of force decisions.⁶¹ China's stance is ambiguous, supporting research and development in LAWS but opposing their deployment in combat. China also insists on defining LAWS more precisely.⁶² Russia has also opposed moves to ban killer robots.⁶³ The United Kingdom initially endorsed the importance of human control over weapons but later opposed a pre-emptive ban, emphasizing the importance of technological advancements.⁶⁴ Germany advocates for maintaining meaningful human control over the decision to kill other humans and has called for banning these weapons. However, Berlin has not supported proposals to launch treaty negotiations.⁶⁵ France neither possesses nor intends to acquire AWS, but believes that it's legitimate and vital to continue research in the area of autonomy in weapon systems.⁶⁶ Israel asks for an open-minded approach regarding the capabilities of LAWS and even believes that these weapons even ensure better compliance with the IHL in future.⁶⁷ The variability in argumentation suggests that technologically advanced nations pre-dominantly view these weapons as effective tools of

⁵⁹ Alexandra Brzozowski, "No Progress in UN talks on Regulating Lethal Autonomous Weapons," *Euractiv*, November 22, 2019, <https://www.euractiv.com/section/global-europe/news/no-progress-in-un-talks-on-regulating-lethal-autonomous-weapons>.

⁶⁰ "U.S. Statement at the GGE on LAWS during the discussion on Agenda Item 5(D)," U.S. Mission Geneva, August 05, 2021, <https://geneva.usmission.gov/2021/08/05/u-s-statement-at-the-gge-on-laws-during-the-discussion-of-agenda-item-5d/>

⁶¹ Defense Primer: U.S. Policy on Lethal Autonomous Weapon Systems (U.S. Congressional Research Services, 2023) <https://crsreports.congress.gov/product/pdf/IF/IF11150>

⁶² Elsa Kania, "China's Strategic Ambiguity and Shifting Approach to Lethal Autonomous Weapons Systems," *Lawfare*, April 17, 2018, <https://www.lawfaremedia.org/article/chinas-strategic-ambiguity-and-shifting-approach-lethal-autonomous-weapons-systems>

⁶³ "Russia Blocks move on ban of Killer Robots," *Arms Control Association*, <https://www.armscontrol.org/act/2019-01/news-briefs/russia-blocks-move-killer-robots-ban>

⁶⁴ Brian, "Stopping Killer Robots."

⁶⁵ Brian, "Stopping Killer Robots."

⁶⁶ Brian, "Stopping Killer Robots."

⁶⁷ Brian, "Stopping Killer Robots."

warfare and means to achieve military superiority over their adversaries while undermining the risks associated with the misuse of these weapons.

A more targeted approach, as suggested by the European Union Commission, would be to ban the unacceptable use of AI. The unacceptable uses of AI are those which are “considered a clear threat to the safety, livelihoods and rights of people.” This approach, despite being more focused in nature, is still vague and thus unlikely to succeed.⁶⁸

A further complication arises from the competitive nature of global politics. The intensifying security dilemma between global powers, particularly the U.S. and China has triggered an arms race to develop and weaponize emerging technologies. Additionally, the nonproliferation regimes are being bypassed and previously agreed-upon treaties are gradually collapsing. Establishing an environment conducive to constructive dialogue among states for discussions on the prohibition, control, or regulation of the development of LAWS proves to be a formidable task.

A middle-ground suggestion may seek to find a balance between acknowledging the potential risks posed by autonomous systems and recognizing their capacity to mitigate the limitations of traditional weapon systems. Absolute prohibitions are not only impractical but may also inadvertently eliminate technological advancements that have the potential to reduce collateral damage in military operations. To nullify this risk, it would be prudent for governments to undertake tiered based arms-control and anti-proliferation measures⁶⁹ to prevent non-state actors from directly or indirectly accessing weaponized AI technology.

Use of LAWS for Terrorism: Legal Perspective

Regulatory and disarmament frameworks related to LAWS face a major challenge when the potential use of LAWS by terrorist organizations is taken into account. The International Committee of the Red Cross (ICRC) has identified “a need for a genuinely human-centered approach to any use of these technologies in armed conflict. It will be essential to preserve human

⁶⁸ “EU Artificial Intelligence Rules will Ban ‘Unacceptable’ Use,” *BBC News*, April 21, 2021, <https://www.bbc.com/news/technology-56830779>

⁶⁹ Zachary Kallenborn, “Applying Arms Control Framework to Autonomous Weapons,” *Brookings*, October 05, 2021 <https://www.brookings.edu/articles/applying-arms-control-frameworks-to-autonomous-weapons/>

control and judgment in applications of AI... especially where they pose risks to life.” The ICRC concludes that “AI and machine-learning systems remain tools that must be used to serve human actors, and augment human decision-makers, not replace them.”⁷⁰ The focus of these interstate deliberations is primarily on states' utilization of AI within the framework of international law, especially IHL.

United Nations General Assembly (UNGA) has recently passed global resolution on artificial intelligence to promote “safe, secure and trustworthy artificial intelligence that will also benefit sustainable development for all.” The text of the unanimously adopted resolution was co-sponsored by 120 states and endorsed by all UN member states. The resolution deals with development of AI in accordance with ethical design, data privacy and protection, transparency and trust, and to facilitate sustainable development. The resolution adaptation has marked “historic step forward” for the safe use of AI. However, considering the scale and momentum of developments taking place in AI, particularly in the military field, dedicated conventions specifically covering AI militarization is promptly required.

States are obligated to assess and comprehend the capabilities of the weapons they deploy, and they can be held accountable for violations of IHL. However, these frameworks will not be able to undermine the potential hostile use of AI as terrorist organizations neither abide by international legal regulations nor can they be coerced to do so.

In general, terrorism legislation is rooted in human intent and purposes, focusing on actions that seek to influence the government, intimidate a population, or advance religious, political, or ideological goals. While programming AI to carry out attacks for ideological purposes is prosecutable under existing terrorism legal framework, the challenge arises when addressing precursor behaviors. Terrorism laws traditionally enable legal actions against individuals engaged in activities that precede an attack, such as the possession of information useful to terrorists. However, AI's involvement may eliminate the need for individuals to possess operational

⁷⁰“Artificial intelligence and Machine Learning in Armed Conflict: A Human-Centred Approach,” *International Committee of the Red Cross (ICRC)*, June 06, 2019, <https://www.icrc.org/en/document/artificial-intelligence-and-machine-learning-armed-conflict-human-centred-approach>.

material, as instructions to AI components can be given to source information from the internet, making intervention based on possession difficult.

Furthermore, as machine decision-making plays a more significant role, establishing the necessary mental element for criminal liability becomes even more complex. The potential for AI-driven attacks, where machines act autonomously in kinetic scenarios, involving LAWS, poses unexplored challenges for terrorism legislation.

Counter-Terror Solutions for LAWS

The proliferation of autonomous systems in battlefields and the high-probability of militarization of commercial autonomous technologies suggest that the threat of LAWS falling into the hands of terrorist groups is a highly probable scenario. Terrorist organizations are already deploying drones for suicide attacks. Their temptation to procure autonomous technologies for employing LAWS for terrorism cannot be ruled out at all. Countering such a level of threat will be a challenging undertaking. Therefore, prompt measures must be taken to address this threat by advancing defensive solutions and supporting practical international collaboration to stigmatize military applications of artificial intelligence. In brief, there are two primary approaches: denial and defense. These approaches, if implemented with collaborative efforts at a global scale, can potentially deny and counter the use of LAWS by terror outfits.

Denial of LAWS' Technology to Terrorists

There is a need to develop consensus regarding the formulation and implementation of legislation against LAWS at the global scale. Yes, terrorists and non-state outfits do not care about legalities and often pursue their objectives outside the realm of law. However, a mutually agreed legal framework will help in supporting all tangible and intangible measures necessary for countering the production and usage of LAWS by hostile actors.

The fundamental problem is the lack of mutual consensus, particularly among developed and developing nations. Every nation aims to develop and retain control over these technologies - while preventing their access by others. Although all countries could gain from prohibiting the destructive uses of autonomy, the absence of universal agreement may create motivations for some nations, including non-state actors, to advance and deploy the

technology independently. Denial of technology to hostile actors by exercising strong control over the regulation of AI-based technology is also often presented as a solution to secure benefits of AI while undermining the risks in parallel.

For denying access to weaponized autonomy to terrorist outfits, three key measures can be taken. First, strict regulations that govern the entire lifecycle of LAWS can be established at national and international levels. These agreements should outline guidelines for the development, deployment, and employment of these weapons, with specific provisions designed to prevent the acquisition of autonomous weapons by non-state actors. Moreover, a comprehensive framework is required to identify and regulate dual-use and commercial-grade technologies, which can potentially be militarized for hostile purposes.

Second, security measures must be integrated throughout the development and manufacturing phases to prevent unauthorized access and potential sabotage. This involves securing supply chains, facilities, and any other points vulnerable to infiltration. To prevent LAWs from hacking attempts by malicious actors, continuous safeguard measures should be applied to address vulnerabilities in the programming systems.

Third, intelligence sharing and mutual collaboration are vital to prevent terrorists or similar hostile actors from acquiring LAWs. This involves close cooperation between governments, intelligence agencies, and relevant international organizations to detect and counter attempts at illicit acquisition. Transparency and accountability at all levels should also be exercised through a mutually agreed legislative framework to ensure adherence to established regulations.

The timely conduct of these measures will be crucial as control over the spread of technology is relatively in early stages. Once the technology will standardize at a societal level, imposing any pre-emptive control will no longer be feasible. Therefore, it is necessary that above mentioned measures must applied in synergy at all tiers, from grass root level, to effectively deny the risks of falling LAWs into the wrong hands.⁷¹

⁷¹ Jonathan Kwik, “Mitigating the Risks of Autonomous Weapon Misuse by Insurgent Groups,” *Laws*, 2023, 12 (1): 05, <https://www.mdpi.com/2075-471X/12/1/5>

Defensive Solutions against LAWS

The challenge posed by drones and AI in counter-terrorism is especially formidable due to the absence of effective counter-drone or anti-AI expertise. Targeting autonomously controlled drone swarms is particularly challenging due to their dispersion and numbers. It can be argued that the development of new defensive technologies to neutralize the threat of terror-centric LAWS is perhaps the most feasible solution which can be formulated rather quickly – even with the current level of technology. Security forces could bolster defenses against AI-driven drones by undertaking technological advancements in defensive technologies. AI technology can play a vital role, contributing to the development of defensive applications and strategies. This entails enhancing existing counter-drone systems, providing improved personnel training for capacity building of security forces, and formulating tactics to address drone or autonomous weapon threats. However, implementing anti-AI defenses on a large scale poses a considerable and costly challenge.

Currently, many state-of-art air defense systems like the U.S. Terminal High Altitude Area Defense (THAAD), Israel's Iron Dome, and Russia's S-400 Triumph air defense systems employ AI for computing and intercepting aerial threats autonomously. Warships have been using Close in Weapon Systems (CIWS) like the U.S. Phalanx for point defense against a wide spectrum of air-borne threats for the past several years. The land-based version of this system called C-RAM, has been used successfully by the U.S. Army for defending Forward Operating Bases (FOBs) against enemy rockets, mortars, and drones in Iraq and Afghanistan.⁷² Further evolution of these systems, with superior sensor suites and higher levels of autonomy can detect and intercept rudimentary AI-powered weaponized drones which can be potentially used by terrorists. Moreover, in the future, High-Energy Lasers, intercept-drones, etc. can serve as potent defensive solutions against terrorist autonomous weapons. But eventually, being on the defensive end will always keep vulnerability against terror outfits.

Another approach is to utilize LAWS proactively for counter-terror operations (COIN). Combat drones, operated by humans, were also

⁷² Kris Osborn, "Army C-RAM Base Defense will Destroy Drones," *Warrior Maven*, November 28, 2018, <https://warriormaven.com/land/army-c-ram-base-defense-will-destroy-drones>

popularized during War on Terror. LAWS can find similar applications. Autonomous systems can potentially respond more rapidly to imminent threats, making split-second decisions that may be challenging for human operators.

Lethal autonomous weapons, equipped with advanced sensors, could be used for Intelligence, Surveillance, and Reconnaissance (ISR) missions to detect, identify and track known terrorists or high-value targets. Besides ISR, these weapons will be able to conduct precise and targeted strikes against terrorist cells, infrastructure, or individuals – acting as sensors and weapons simultaneously. These weapons could operate independently or in coordination with other military or intelligence assets. In sum, these systems would offer a more objective perspective, potentially averting human errors in judgment and thus avoiding collateral losses during COIN operations.

Proponents argue that in specific conditions, LAWS can outperform humans and could minimize collateral damage. They posit that autonomous systems might demonstrate more humane conduct in military settings, acting cautiously and free from the psychological pressure that can result in emotionally driven decisions. As a result, in theory at least, these systems have the potential to reduce the number of noncombatant casualties and minimize collateral damage. In concept, autonomous weapon systems can adhere to an inherent ethical code, thus aligning with the framework of the existing Law of Armed Conflicts (LOAC). Moreover, to achieve the capacity to differentiate between civilian and hostile individuals, LAWS can incorporate mechanisms such as technological sophistication, integrated restrictions, system updates, and human involvement to make such distinctions, thus ensuring compliance with international humanitarian law (IHL). However, despite the promises made by technology, the ability of AI to positively distinguish a civilian, and terrorist, will remain a subject of extensive debate.

Conclusion

The evolution of autonomy in weapon systems, ranging from semi-autonomous to fully autonomous, is transforming the conduct of warfare. The intersection of Lethal Autonomous Weapon Systems (LAWS) and the potential for their acquisition by terrorist factions presents a formidable challenge to international security. The current landscape of warfare reflects a paradigm shift, where the deployment of LAWS is not only a concern for

conventional military forces but also a potential tool for asymmetric warfare employed by hostile non-state actors. The proliferation of AI-based technology in military domain, militarization of commercial grade AI-technology, and potential of leaking or inadvertently transferring this tech to terrorist factions has raised the likelihood of atrocities against humanity.

Addressing these risks demands a comprehensive and collaborative response at the multi-tier level. The legal and ethical concerns, repeatedly expressed by human rights organizations and developing states, highlight the urgent need for international agreements and regulations. However, major powers have repeatedly undermined such initiatives citing the potential operational advantages offered by LAWS in future battlefield. Nevertheless, the risk of falling these weapons in hands of terrorist organizations necessitate proactive measures for denying the availability weaponized autonomy to terror outfits as well as countering the rudimentary LAWS which can be potentially employed by hostile actors in future. In sum, achieving a balance between technological advancement and responsible governance is imperative to mitigate the risks.

CHANGING DYNAMICS OF DETERRENCE IN SOUTH ASIA: IMPLICATIONS FOR STRATEGIC STABILITY

Ehsan Ahmed Khan

Abstract

Deterrence involves increasing the cost of aggression for the adversary, such that retaliation surpasses the perceived benefits of aggression. The nuclearisation of Pakistan and India constricted the space of conventional war; however, India's progressive enhancement in its nuclear force posture towards a counterforce targeting strategy undermines the credibility of Pakistan's nuclear deterrent forces. The introduction of offensive military doctrines and destabilising weapons systems seek to dominate escalation and destabilise deterrence equilibrium. This research paper aims to analyse how changing force postures and doctrinal positions define the dynamics of deterrence and then explore its correlation with strategic stability. To construct it, this study emphasises the episodic crisis that characterises the transitional dynamics of deterrence, viewed through the lens of strategic stability. The study is holistic in nature; it employs a process-tracing methodology to investigate India and Pakistan's nuclear doctrinal positions, which intrinsically elucidate the dynamics of deterrence in South Asia.

Keywords: South Asia, Strategic Stability, Deterrence, Security Dilemma, Offensive Military Doctrines

Introduction

Nuclear deterrence is a psychological phenomenon based on states' perceptions of strategic competition. Deterrence is about raising the cost of aggression that the adversary may contemplate, compelling it to retaliate in a way that would outweigh the presumed benefits of aggression.¹ In South Asian strategic environment, the stable relationship between Pakistan and India also depends on deterrence stability. Particularly after the nuclearisation of South Asia in May 1998, nuclear deterrence, along with the fear of Mutually Assured Destruction (MAD), has prevented the two states from engaging in any all-out military conflict. However, frequent changes in doctrinal positions, nuclear force postures, and the acquisition and development of advanced weapons have exposed this relationship to transformations in the South Asian strategic environment.

These transformations have a direct bearing on regional peace and stability. This research paper analyses how changing force postures and doctrinal positions define dynamics of deterrence and then explores its correlation with strategic stability. For this purpose, it focuses on how deterrence equilibrium between Pakistan and India is implicated by changing doctrines, ambitious strategies pursued through offensive force postures, and technological modernization of nuclear weapons and their delivery systems. It proceeds with discussing the evolving concept of strategic stability, current state of security dilemma and deterrence equilibrium in South Asia, evaluating India's strategic interests in the region by taking into account its changing doctrines and evolving nuclear posture, Pakistan's response options, and implications for strategic stability.

Evolving Concept of Strategic Stability

Despite its wide usage in strategic analysis, stability is a contested intellectual construct with no consensus on its precise meaning and its surrounding condition.² Mearsheimer defined stability as "absence of war and major crisis"³ However, it entails a broader meaning that goes just beyond the absence of war. Strategic stability generally refers to a state in which major powers or actors in international system perceive that risks of conflict escalating into a large-scale, possibly nuclear war is minimized. It involves a condition where the strategic environment is predictable, and there is a mutual understanding and confidence among nations that discourages actions that could lead to dangerous and uncontrollable escalation of hostilities.

The use of Atomic weapons by US in World War II and subsequent emergence of Russia, UK, France and China as nuclear weapons states should have created a nuclear multi polarity. However, UK and France intertwined their policies with US, while China maintained a low key yet independent profile. Despite severe hostility, both Washington and Moscow committed to implementation of Article VI of NPT—"pursuit of nuclear disarmament in good faith"—and had a verbal attachment to what they called strategic stability.⁴ The catch phrase between both powers

¹ Shams uz Zaman, "Dynamics of Deterrence & Strategic Equilibrium in South Asia," *Journal of Security and Strategic Analyses*, Vol.2, No.1, (Summer 2016):52.

² Dr. Syed Riffat Hussain, "Analyzing Strategic Stability in South Asia," *Margalla Papers* 9, No.1 (2005)

³ Frank C. Zagare and D. Mare Kilgour, *Perfect Deterrence* (Cambridge: Cambridge University Press, 2000),

⁴ Mikhail Troitskiy, "What strategic stability? How to fix the concept for US-Russia relations," *Bulletin of the Atomic Scientists*, 21 October 2021, <https://thebulletin.org/2021/10/what-strategic-stability-how-to-fix-the-concept-for-us-russia-relations/>

was generally understood as a promise not to engage in nuclear brinksmanship and defined strategic stability as absence of incentives for any country to launch a first nuclear strike.

Since then, the geopolitical, technological, and psychological landscape that helped prevent war between the world's nuclear powers has significantly changed. More recently, James Acton identifies three connotations to understanding the concept of strategic stability. These include: strategic stability as a function of arms race stability and crisis stability; secondly, it relates to absence of armed conflict between the rival states; and thirdly, it refers to harmonious and peaceful relations between two adversaries.⁵ The concept and conditions for strategic stability have fundamentally changed as well, including the instruments for Changing Dynamics of Deterrence in South Asia preventing a nuclear conflict.⁶ US believes that the return of geopolitics whereby revisionist states like China and Russia intend to alter the status-quo is destabilizing for stability.⁷ Russia believes that strategic stability is undermined due to US development and deployment of conventional precision guided munition and Ballistic Missile Defence (BMD) systems and withdrawal from Anti-Ballistic-Missile Treaty.⁸ China, on the other hand, believes that unilateralism and hegemonic designs of US along with its development of prompt global strike capabilities and BMD constrain strategic stability.⁹

Beijing proposes that strategic stability can only be enhanced if genuine security concerns of all stakeholders are taken into account.¹⁰ These divergent views regarding the challenges to stability signify growing differences regarding the mutual understanding of this concept, hence leading to opposing strategies and force postures. The fallout of this worrying trend is also felt in South Asia where Pakistan and India, despite several threats to regional stability, have not engaged in meaningful dialogue to identify the mutual threats to stability and take remedial measures. The succeeding paras give a detailed account of current outlook of deterrence equilibrium between the two nuclear adversaries in South Asia.

Current State of Deterrence Equilibrium in South Asia

The anarchic strategic environment of South Asia, marred by several unresolved disputes and divergent strategies of competing states, represents a case of classical security dilemma. While explaining the security dilemma, Robert Jervis stated that: “Many of the means by which a

⁵ James M. Acton, “Reclaiming Strategic Stability,” *Carnegie Endowment for International Peace*, 5 February 2013, <https://carnegieendowment.org/2013/02/05/reclaiming-strategic-stability-pub-51032>.

⁶ Dmitri Trenin, “Strategic Stability in the Changing World,” *Carnegie Endowment for International Peace*, 21 March 2019, <https://carnegiemoscow.org/2019/03/21/strategic-stability-in-changing-world-pub-78650>.

⁷ Zeeshan Hayat and Tanzeela Khalil, “Great Power Competition and Global Strategic Stability,” *CISS Insight* 8, No.1 (2020)

⁸ Andrey Pavlov and Anastasia Malygina, “The Russian Approach to Strategic Stability: Preserving a Classic Formula in a Turbulent World,” in Lawrence Rubin and Adam N. Stulberg, eds., *The End of Strategic Stability? Nuclear Weapons and the Challenges of Regional Rivalries* (Washington DC: Georgetown University Press, 2018), 48

⁹ Zhong Jing & Pan Zhenqiang, “Redefining Strategic Stability in a Changing World: A Chinese View,” *Contemporary Security Policy* 25, No.1 (2004):123-135.

¹⁰ Ibid.

state tries to increase its security decrease the security of others...One state's gain in security often inadvertently threatens others."¹¹

The persistent security dilemma in South Asia leads to complex challenges to deterrence stability. By dragging the two nuclear adversaries in a vicious action-reaction circle, the mutual mistrust and uncertainty traps them in arms competition.¹² Therefore, the prevailing security dilemma in South Asia not only undermines the prospects of cooperation between the two states, but also exacerbates the risks of conflict escalation to a nuclear level. Experts observe that India is progressively enhancing its nuclear force posture towards a counterforce targeting strategy for pre-emptive counterforce strikes against Pakistan.¹³

Such a scenario directly undermines the credibility of Pakistan's nuclear deterrent forces, and therefore requires the latter to respond, as dictated by the concept of security dilemma. As Pakistan's nuclear capability diluted India's conventional advantage against Pakistan, India has consistently pursued an escalation dominance strategy that increases nuclear risk in South Asia.¹⁴ Differing political motivations, dynamism in force postures and incongruent threat perceptions also drive deterrence instability between Pakistan and India. In recent years, India has introduced offensive military doctrines and destabilizing weapons systems to seek escalation dominance, compelling Pakistan to regain balance. This classic security dilemma of action-reaction cycle consequently leads to destabilize deterrence equilibrium. India's quest for nuclear weapons was driven by gaining international prestige¹⁵ and revision of global order. George Perkovich notes that the decision to develop nuclear weapons was apparently a "shortcut to great power status."¹⁶ Indian Prime Minister I.K. Gujral reportedly stated that: "I told President Clinton that when my third eye looks at the door of the Security Council Chamber it sees a little sign that says only those with economic power or nuclear weapons are allowed. I said to him it is very difficult to achieve economic wealth."¹⁷

This motivation is prevalent even today and is evident from how India aspires to use nuclear and other military capabilities not only to dominate its immediate neighbourhood but also to exert influence beyond South Asia. Conversely, Pakistan's nuclear program has been security driven as it felt threatened by the Indian nuclear capability¹⁸ and was forced to

¹¹ Robert Jervis, *Perception and Misperception in International Politics* (Princeton, NJ: Princeton University Press, 1976), 66.

¹² Rizwana Abbasi and Zafar Khan, *Nuclear Deterrence in South Asia: New Technologies and Challenges to Sustainable Peace* (New York: Routledge, 2020), 3.

¹³ Mubeen Ashraf and Syed Saiful Haq, "Strategic Transformations: India's Pursuit of Counterforce Targeting and Regional Stability," *Margalla Papers* 27, No.2 (2023): 14-26.

¹⁴ *Ibid*, 139.

¹⁵ PR Chari, "India, Pakistan and the Nuclear Race: The Strategic Entanglement," *Nuclear Asia* 4, no.3 (July-September 2013): 4.

¹⁶ George Perkovich, *India's Nuclear Bomb: Impact on Global Proliferation* (Berkeley: University of California Press, 2001), 400.

¹⁷ *Ibid*.

¹⁸ PR Chari, "India, Pakistan and the Nuclear Race: The Strategic Entanglement," *Nuclear Asia* 4, no.3 (July-September 2013): 4.

develop its own nuclear deterrent.¹⁹ Since then, both states have quantitatively and qualitatively enhanced nuclear force postures, which is one of the sources of deterrence instability.

The historical animosity of more than seven decades between the two adversaries has a profound impact on their bilateral strategic relationship. Unsettled disputes, like that of Jammu and Kashmir, along with the legacy of wars and frequent military skirmishes haunt prospects of achieving durable peace in the region. Post-independence Pakistan and India have remained intensely embroiled in frequent application of violence across spectrum from military instrument to sub conventional warfare. India's so called peaceful nuclear explosion in 1974 enticed Pakistan in pursuing a similar capability.

Nuclearisation of India and Pakistan shook the foundation of strategic stability at global level in general and in South Asian region in particular. Notwithstanding, the beleaguered and disenfranchised relationship between Pakistan and India has relied on the deterrence stability. Dr. Zulfiqar Khan observes that the power asymmetries between Pakistan and India and the security culture based on their historical experiences compel them to heavily rely on nuclear deterrence.²⁰

The mutual nuclear deterrence and the fear of mutually assured destruction (MAD) have prevented both states from engaging in any all-out military conflict and has withstood the test of escalations in Kargil, Mumbai attack and Balakot Strike. Thus, even in an unstable nuclear environment spanning more than two decades, deterrence has prevented the breakout of an all-out military conflict.²¹ Nuclear deterrence has been a factor of stability, and both Pakistan and India recognized it in a joint statement in 2004.²² However, in this unstable environment, both parties do not fully recognize mutual threats confronting deterrence equilibrium between them. The sections below explain how India's ambitious military strategies along with increasing offensive force posturing dilutes mutual vulnerability and undermines deterrence equilibrium between the two nuclear adversaries.

India's Quest for Strategic Supremacy

Ideally, nuclear deterrence in South Asia should have effectively restrained the chances of any conventional misadventure and further minimize the bilateral strategic rivalry, however, that did not happen in the regional strategic scenario with Indian persistent attempts to exploit space for conventional war.²³ While such strategic thinking is largely driven by domestic political interests, the Indian attempt to engage in a limited conflict with nuclear armed adversary would be dangerously problematic.

¹⁹ Scott D.Sagan, "Why do States Build Weapons? Three Models in Search of a Bomb," *International Security* 21, No.3 (Winter 1996-1997):59.

²⁰ Dr. Zulfiqar Khan, "Geostrategic Transformation; Pakistan's Options for Deterrence and Strategic Posturing," *IPRI Journal* XVII, No.1 (Winter 2017):72-94

²¹ Sumit Ganguly and S.Paul Kapoor, India, Pakistan, and the Bomb: Debating Nuclear Stability in South Asia (New York: Columbia University Press, 2012), 34.

²² Rajesh Kumar Mishra, "India-Pakistan: Nuclear Stability and Diplomacy", *Strategic Analysis* 29, No.1 (Jan-Mar 2005):121

²³ Zafar Nawaz Jaspal, India's Surgical Strike' Stratagem: Brinkmanship and Response (Islamabad: Khursheed Printers Pvt Ltd, 2019).

Limited War below the Nuclear Threshold

Since nuclearisation, Pakistan and India have experienced an era of relative peace in terms of absence of all-out war between the two. As propagated by the theory of nuclear revolution the concept of MAD prevented both states from engaging into an all-out conflict.²⁴ Soon after realizing that the nuclear capability had established a stable environment at higher strategic level that diluted India's conventional superiority over Islamabad, gave way for idea of launching deeper strikes within Pakistani territory on the lines of Sundar Ji Doctrine.²⁵

This is reflected through contemplation of concepts like Cold Start Doctrine (CSD) or Pro-Active Operation Strategy and now Dynamic Response Strategy (DRS) with an aim to carry out limited conventional strikes against Pakistan without triggering a nuclear response.²⁶ Air Cdre Dr. Adil Sultan (Retd) asserts that India's aspiration to fight a limited war under nuclear overhang is also a reflection of stability-instability paradox.²⁷ Introduction of CSD created a dent in deterrence stability of South Asia by enhancing Pakistan's vulnerability against Indian conventional attack.

This compelled Pakistan to introduce the concept of Full Spectrum Deterrence (FSD) in line with the dictates of Credible Minimum Deterrence (CMD). This response option fine-tuned the nuclear deterrence of Pakistan against any possible Indian military aggression.²⁸ Critics argue that Pakistan has deviated from its traditional policy of CMD and to support its first-use posture, it intends to develop new category of weapons including miniaturized nuclear warheads.²⁹ However, contrary to this belief, FSD does not oppose the dictates of CMD and remains in line with it. On the other hand, Islamabad's adoption of this doctrinal posture should be seen as a consequence of New Delhi's offensive military strategies.

The possible deployment of CSD signifies that limited war constitutes one of the key features of India's escalation dominance strategy. Though the Indian leadership continued to deny the existence of this doctrine, the recent acknowledgement of CSD by New Delhi's military command and several military exercises in this regard are the dangerous indicators. The belief that an aggressor could potentially control a crisis to a limited level without provoking the nuclear armed adversary to deploy nuclear weapons is inherently destabilizing and subjected to strategic miscalculation.

This mindset prevails in the backdrop of Indian military's plans to integrate theatre commands with a view to integrate three services under a single unified command structure. in

²⁴ Keir A. Lieber and Daryl G. Press, *The Myth of the Nuclear Revolution: Power Politics in the Atomic Age* (New York: Cornell University Press, 2020).

²⁵ Kokab Al-Saba and Dr. Noor Fatima, "Doctrinal Shift in the Indian Army after 2018: Implications for Pakistan," *NDU Journal* 37 (2023): 17.

²⁶ Harsh V. Pant, ed., *Handbook of Indian Defence Policy: Themes, Structures and Doctrines* (New York: Routledge, 2016), 7.

²⁷ Sultan, *South Asian Stability-Instability Paradox*, pp. 35.

²⁸ Zafar Khan, *Pakistan's Nuclear Policy: A Minimum Credible Deterrence* (New York: Routledge, 2015), 138.

²⁹ Susan Turner Hayness, *Chinese Nuclear Proliferation: How Global How is Transforming China's Weapons Buildup and Modernization* (London: Nebraska Press, 2016), 54.

which a single commander, having control over all resources is responsible for the military operations.³⁰ This idea is similar to contemporary structures followed by leading military powers including the US and China to ensure seamless coordination among the three services. The adoption of integrated theatre commands in India has been propelled by two primary factors.³¹ First, the Indian armed forces have prioritized interoperability, particularly after becoming part of Quad and establishing foundational agreements with the US, including BECA, COMCASA, and LEMOA.³²

These arrangements necessitate collaboration in intelligence-sharing, cyberspace defence, logistics cooperation, and joint operations as required. Secondly, India's desire to find space for conventional warfare is another motivating factor behind this development as the theatre commands would confer the advantage of operationalizing Cold Start Doctrine.

The concept of theatre commands was proposed in 2016 to overcome lack of jointness within Indian military. India has planned to setup three theatre level commands in West, North, and South. The first integrated theatre command will be established in Jaipur in Northern India to address security challenges along the Pakistan border. The second integrated command will be based in Lucknow to counter China along the borders of IIOJK, LOC with Pakistan, and LAC with China. The third integrated theatre command will be the Maritime command based in Karwar to protect India's economic and security interests in the Indian Ocean.³³

Integration of theatre commands serves several advantages for Indian military. First, it enables the three services to improve coordination and integration for smooth exchange of information and resources. It also provides for efficient resource utilization without any limitations of service boundaries. Secondly, it is a way to remove bureaucratic hurdles by enabling swift response to dynamic situation, thus leading to flexibility in decision-making processes.³⁴ Further, having resources from three services at their disposal, it enables the operational commanders to execute prompt actions in dynamic situations. This is to be ensured through effective command and control in which theatre commanders will directly report to Chief of Defence Staff, instead of respective services chiefs.

Lastly, it offers rapidly deployable, survivable and maneuverable joint forces with sufficient combat effectiveness particularly stand-off strike capabilities and precision-guided munitions. By representing a cohesive force, theaterisation of commands strengthens deterrence and warfighting capabilities. Lately India under Modi has been trying to add a new dimension to warfighting strategies in South Asia. Through the so-called 'surgical strikes,' BJP intends to appease the electorate by launching limited conventional operations inside Pakistan. Dr. Zafar

³⁰ Gunjan Singh, "India's Military Modernization in the Shadow of the China Threat," *Journal of Asian Security and International Affairs* 10, No.3 (2023):280.

³¹ A.B.Shivane, "Restructuring for India's Disputed Borders: An Appraisal," *CLAWS Journal* 14, No.2 (2021):46-61.

³² Rear Admiral Raja Menon, "Reorienting Indian Military Grand Strategy: Defensive Territoriality to Offensive Oceanic in the Indo-Pacific," *Journal of Indo-Pacific Affairs* 5, No.2 (2022):54.

³³ Usman Haider, "India's Military Turns Toward Integrated Theater Commands: A Rising Challenge for Pakistan," *The Diplomat*, 08 August 2023, <https://thediplomat.com/2023/08/indias-military-turns-toward-integrated-theater-commands-a-rising-challenge-for-pakistan/>.

³⁴ Amit Gupta, "Preparing for a Two-Front Conflict: The Role of the Indian Air Force and the Indian Navy," in Anit Mukherji, Rajeswari P.Rajagopalan, and Nishat Rajeev, eds., *Momentous Changes: Defence Reforms, Military Transformation, and India's New Strategic Posture* (New Delhi: Observer Research Foundation, 2023), 65.

Nawaz Jaspal argues that India uses surgical strikes as an offensive and preventive measure to meet political objectives. Experts argue that India does not have the capability or the will to launch such an attack and it must realize that it neither possesses adequate capability to materialize this nor such an action would go un-responded by Pakistan.³⁵

While Pakistan's restrained conventional response in Operation Swift Retort ensured that an all-out war did not occur, such a risky manoeuvre by India may severely implicate crisis stability and contribute to escalation of conflict to a nuclear level. Keeping in view the fragile deterrence stability between Pakistan and India, the continuous pursuit of escalation dominance strategy by India, either in the form of CSD or a phantom surgical strike, may not necessarily be met with de-escalatory response by Pakistan and thus have serious ramifications for deterrence.

Indian experts believe that New Delhi's surgical strikes in 2016 and 2019 signify that Pakistan's nuclear threshold is not as low as it has been traditionally seen and it allows India to carry out limited offensive under the nuclear shadow. This belief implies that there is a space for limited action at operational and tactical level and India needed not follow "military restraint" just out of fear of a conventional military crisis escalating into a nuclear one. India's declared nuclear doctrine calls that any nuclear attack on India and its forces shall result in punitive retaliation with nuclear weapons to inflict unacceptable damage.

Pakistan's nuclear deterrent capability has denied any space for all-out war in South Asia leading to strategic frustration in New Delhi. Consequently, India has moved away from this position of punitive response and adopted the posture of engaging in limited warfare against Pakistan. Indian analysts assert that "India's single most probable military contingency remains a limited war with Pakistan." The surgical strikes in Uri and Balakot in 2016 and 2019 respectively diluted India's strategic limits of engaging in a conflict.³⁶ The provocative statements of Indian officials like taking AJK and Gilgit Baltistan further signified New Delhi's frustration with the status-quo. Given such threats, India may consider launching aerial strikes against Pakistan's posts across the LoC, capture some part of its territory across LoC and then declare unilateral cease-fire just short of Pakistan responding with its retaliatory options.

India's Ambiguous Nuclear Doctrine and Offensive Posture

Another trend affecting deterrence stability in South Asia is possible shifts in the Indian nuclear doctrine. While New Delhi has been fast developing destabilizing weapons, the political and strategic leadership has hinted at revision of significant features of its nuclear doctrine. One of those issues is the commitment on No-First-Use (NFU) of nuclear weapons. While Pakistan seemingly has never believed in the credibility of India's NFU commitment, recently signaling by Indian officials about possible revision of this policy holds significant implications for the deterrence stability.

This type of signaling is a direct indication of New Delhi's frustration with the status-quo whereby Pakistan's CMD denies it any space to engage in misadventures. However, through

³⁵ Jaspal, India's Surgical Strike' Stratagem, 124.

³⁶ Masood Ur Rehman Khattak, "The Indian Army's Land Warfare Doctrine 2018: A Critical Analysis," *IPRI Journal* XX, No. I (2020): 124.

the revision of NFU commitment, India may justify its burgeoning nuclear capabilities that only aim to seek hegemony at least at the regional level. Dr.Zafar Nawaz Jaspal notes that within India, the debate on NFU policy has three different streams.³⁷ The first stream belongs to the Indian officials in favour of upholding the NFU commitment.

The NFU commitment has seemingly helped India portray itself as a responsible nuclear power for more than last two decades. The second group is frustrated with this stance and presses for altering this policy. This group has put Indian aggressive mindset at full display. For instance, Defence Minister George Fernandes argued in a media talk that India can survive a nuclear attack, but Pakistan cannot.³⁸ Defence Secretary Yogindra Narain also made threatening remarks while talking to Outlook Magazine. He argued that if surgical strike fails to resolve things, we must be ready for mutual destruction.³⁹ Brahma Chellaney went to an even further extent by arguing that India should call Pakistan's nuclear bluff and Indian military has the capability to target every nook and corner of Pakistan.⁴⁰

These statements indicate growing calls within India to publicly give-up its NFU policy. Third group advocates two-fold policy, i.e. continue following NFU policy for diplomatic consumption while simultaneously develop pre-emptive nuclear strike capability. Indian strategic community frequently accuses Pakistan of nuclear brinkmanship and points out China's military capabilities as being the drivers behind India's growing nuclear arsenal.⁴¹ Using these notions as cover, India attempts to justify its burgeoning nuclear as well as conventional capabilities that exceed the requirements to ensure security against claimed rival states including Pakistan and China and have grave global implications.

This strategic behaviour puts a direct constraint on the South Asian deterrence stability and has been one of the defining elements of the changing dynamics of deterrence in the region. Over the years, New Delhi has actively pursued the development of capabilities based on triad of nuclear forces, complimented by BMDs and Inter-Continental Ballistic Missiles (ICBMs), that contribute to offensive posturing. India's growing military buildup also includes procurement of advanced missile technologies and related systems. Given the ongoing trends in non-proliferation regime, such collaboration is carried out under the garb of peaceful uses of technology.

—The membership of India into Missile Technology Control Regime (MTCR) has helped it to get access to most advanced weapons in the global market. These weapons not only provide it with a competitive edge in the battlefield, but may also entice India into using nuclear weapons first in a pre-emptive strike against Pakistan. Along with the development of MIRVs and ABMs, developing precision strike missiles like Agni-V, nuclear-capable guided cruise missiles like BrahMos and Dhanush, and rapidly advancing technologies used for remote sensing reflect India's enhancing capability to specifically target retaliatory capabilities of rival state. In addition to this, technological improvements in intelligence, surveillance, and reconnaissance (ISR) challenge the ability of adversarial state to ensure survivability of nuclear deterrent.

³⁷ Jaspal, India's Surgical Strike Strategy.

³⁸ Quoted in Dr Suresh Chandra, China-Pakistan Relations: Implications for India (New Delhi: Vij Books Pvt Limited, 2016).

³⁹ Ibid

⁴⁰ Ibid

⁴¹ Ibid

These trends give a confidence to aggressive power to initiate in conflict with impunity due to perceived invulnerability against the adversary and consequently increases the temptation to attempt launching first strike in pre-emptive role. Salient among these technologies include latest satellites that provide high resolution imagery and advanced antisubmarine warfare capabilities.⁴² Likewise, India's short-range ballistic missile that may also be used in materializing the CSD could also support the first strike. Rizwana Abbasi and Zafar Khan observe that India's short-range delivery systems including Nirbhay, Prahaar, Nirbhay and BrahMos may be employed in tactical role if and when Defence Research and Development Organization (DRDO) decides to develop miniaturized version of its warheads.⁴³

Acquisition of these technologies raise concerns that New Delhi may be seriously considering counterforce targeting as a viable strategy, thus having serious ramifications for defender's ability to preserve deterrence. Such changes in nuclear force posture that go contrary to declared commitments in official nuclear doctrine only lead to ambiguity and further exacerbate security dilemma. Pakistan, in such a situation, feels compelled to take counter measures to augment the credibility of its nuclear deterrent. There is a need to realize that even if there is a possibility of a limited conventional war between two nuclear adversaries, there will always be the risks of conflict escalating into an all-out war that may involve the exchange of nuclear weapons. In its attempt to shift strategic equilibrium in its own favor, there have been visible indications of aggression in India's force posture.

The recent military acquisitions and development of sophisticated weapons prior to formal abrogation or revision of its nuclear doctrine demonstrate that India has already started preparing itself for aggressive designs, as frequently projected by the Indian strategic leadership. The prevailing trends in New Delhi's evolving force posture signify the evolving dynamics of nuclear deterrence in the region. The evolving force posture hint at India's contemplation of counter-force targeting and employing nuclear capability in a pre-emptive role with a possible motive to disarm Pakistan's nuclear deterrent capability.

In an attempt to search a way-out of its perceived strategic paralysis with Islamabad, as argued by Christopher Clary and Vipin Narang, India has recently acquired or developed several capabilities that make counterforce targeting possible.⁴⁴ This flirtation with preemptive counterforce targeting strategy would have serious ramifications for the South Asian deterrence stability. Experts argue that the prevailing belief among high-profile commentators in India that it could initiate a conflict with a confidence to assert 'escalation control' while preventing escalation from going out of hand is misleading.⁴⁵ In addition to this, the extra-regional powers and ongoing power play at international level also impinge upon the deterrence dynamics in South Asia.

⁴² Sufian Ullah, "SAV Review: The New Era of Counterforce in South Asia," *South Asian Voices*, 4 September 2018, retrieved from <https://southasianvoices.org/review-the-new-era-of-counterforce-in-south-asia/>, accessed on 4 December 2019.

⁴³ Rizwana Abbasi and Zafar Khan, Nuclear Deterrence in South Asia, 11.

⁴⁴ Christopher Clary and Vipin Narang, "India's Counterforce Temptations Strategic Dilemmas, Doctrine, and Capabilities," *International Security*, Vol. 43, No. 3 (Winter 2018/19): 7-52.

⁴⁵ Ryan French, "Deterrence Adrift? Mapping Conflict and Escalation in South Asia," *Strategic Studies Quarterly* 10, No. (2016): 108.

The exceptional NSG waiver accorded to India by the Western powers after Washington signed civil nuclear cooperation agreement with New Delhi in 2008, has been proving detrimental to strategic stability in the region. Pakistan believes that India's discriminatory access to global nuclear market would allow it to fulfil requirements for peaceful uses of nuclear technology, while freeing up the domestic reserves to be used for the production of weapons. This only adds to military imbalance in the region, reduces Pakistan's reliance on external players as being the mediators in any conflict situation, and further enhances its reliance on nuclear deterrence for the security and survival of the country.⁴⁶ While India continues to pursue escalation dominance by retaining strategic advantage either in the form of technological edge or through operational manoeuvres, Pakistan is likely to keep developing its response options to cater for newly emerging threats to its security.⁴⁷

Given the nature of inter-state relationships in South Asia, the changing trends in the revision of nuclear doctrines and development of counterforce capabilities have profound implications for deterrence in the region. These changes indicate that the concept of deterrence, just like the nature of threats, is not static. Rather, it is a dynamic process that is correlated with doctrinal positions, force postures, and strategic behaviours. Thus, any changes in any of these aspects would have a direct bearing on adversary's threat perception and would continue to implicate deterrence stability.

Pakistan's Nuclear Threshold in the Wake of India's Escalation Dominance Strategy

Volatile relationship between Pakistan and India regularly brings the subject of Pakistan's nuclear threshold under discussion. Considering the fragility of deterrence equilibrium, any risky approach in military domain carrying risks of escalation can potentially lead to nuclear Armageddon in South Asia.⁴⁸ In a situation where Pakistan and India does not enjoy a nuclear relationship based on perfect stalemate, one state continues to explore the space for limited misadventure under the shadow of deterrence stability at higher level. This constant pursuit of an escalation dominance strategy paves way to an exacerbated security dilemma between the two rivals that consequently fuels not only arms race but also directly implicates the deterrence equilibrium. At the same time, this has direct implications for Pakistan's perceived nuclear threshold as it does not officially subscribe to NFU policy. Given the asymmetric nature of nuclear deterrence and conventional imbalance, Pakistan may feel better-off to continue with ambiguous nuclear threshold.

Ambiguous nuclear threshold allows weaker military powers to compensate for conventional asymmetries and deter relatively stronger adversaries. In a strategic situation between adversaries with disproportionate conventional military capabilities, ambiguous nuclear threshold contributes to strategic stability. The conventional military superiority of one state can be as destabilizing as an ambiguous first-use policy. Pakistan's ambiguous nuclear threshold contributes to crisis stability because of nuclear weapons' inherent deterrent value that keeps the

⁴⁶ Madhur Singh, "US-India Nuclear Deal goes through," *Time World*, October 2, 2008, accessed December 4, 2019, <http://content.time.com/time/world/article/0,8599,1846460,00.html>

⁴⁷ Sultan, "Pakistan's Emerging Nuclear Posture" (2011).

⁴⁸ French, "Deterrence A Drift?: 110.

adversary guessing and thus prevents it from any potential aggression. Hence, ambiguity is a product of military asymmetries.

The calculated ambiguity is a rational policy choice to enhance deterrent value of weaker state's nuclear capability. Pakistan's ambiguous nuclear threshold constrains India's operational plans to pursue strategic supremacy. This approach does not bind Pakistan to selected or limited response options like massive retaliation and flexible or proportionate response strategies. Hence, it adds to deterrent value of Pakistan's nuclear capability and thus strengthens deterrence stability vis-a-vis India. Such environment also leads to lesser distinction between offensive and defensive capabilities. It encourages aggressive state to equip and strengthen border forces and defensive corps to conduct offensive operations or engage in limited skirmishes to achieve limited political objectives.

The growing ambiguity in India's doctrinal thinking and offensive nuclear signaling, accentuates Pakistan's doubts on New Delhi's NFU policy and Pakistan also remains cognizant of the threat posed in the domain of limited warfare.⁴⁹ Hence, it feels compelled to forcefully project its policy of 'Quid Pro Quo Plus'(QPQ-Plus) as a manifestation of its FSD to thwart potential aggression at all levels of conflict. The manifestation of this policy in the aftermath of February 2019 crisis showed Pakistan's strong resolve to shrug off surgical strikes as a new normal in the region.⁵⁰

While the advantage of initiating a conflict remains with India, due to being a relatively stronger state with revisionist ambitions, it may not be allowed to dominate the escalation ladder with the belief that it could control to achieve desired objectives. The 'notion of victory' no more lies in decisive battles and rather focuses more in the domain of narratives. This situation has altered the character of warfare in South Asia by making Grey-Zone warfare more probable in the region. Given India's frustration to establish strategic supremacy over Pakistan solely through kinetic means, the former has resolved to employ hybrid tools to subdue Pakistan, hence opening new theatres of warfare in domains like cyber, information operations and so on.

Conclusion

The adversarial relationship between Pakistan and India is based on historic animosity and mutual mistrust. In last one decade, this relationship has only worsened. The lingering unresolved political disputes, legacy of three all-out wars, and absence of any concrete mechanism to initiate result oriented comprehensive dialogue mar the prospect of durable peace and stability. The nuclear deterrence stability has somehow ensured a stable relationship between Pakistan and India by preventing the two states from engaging into an all-out war. The fear of MAD, owing to destructive consequence of nuclear weapons, as ensured by the credible nuclear deterrents of both states has encouraged them to observe restraint at least at the higher strategic level. However, the deterrence stability has been confronted by multiple challenges and is constantly being tested by Indian actions based on hegemonic aspirations. This research work postulates that despite recognizing deterrence stability as a factor of overall stability in South

⁴⁹ Sufian Ullah, "Conceptual Assessment of NFU-Case Study of India," *JSSA* 6, No.1 (2020):2.

⁵⁰ Al-Saba and Fatima, "Doctrinal Shift in the Indian Army after 2018," 22.

Asia, why Pakistan and India continue to engage in military competition that consequently leads to an instable deterrent relationship. The evolving nuclear doctrines and force postures are indicative of prevalent security dilemma and reliance on military means to pursue vested strategic interests are the principal factors that drive Indian aspirations to pursue escalation dominance strategy.

While Pakistan strives to retain strategic balance, India is determined to achieve regional hegemony, eventually leading to global ambitions of becoming a major power. In this pursuit, India has exhibited its frustration on multiple occasions whereby its inability to strategically dominate Pakistan compels it to explore new means of dominance. The two most glaring examples of this approach are India's CSD and the conducted surgical strikes as new normal. While there is a need to augment deterrence stability in South Asia by resorting to peaceful means of conflict resolution and arms control agreement, Indian dismissive attitude signifies lack of interest in peace with Pakistan. Any Indian attempt to strategically dominate Pakistan is logically expected to be met with remedial measures.

GREAT POWER RIVALRY IN INDIAN OCEAN: IMPLICATIONS AND OPTIONS FOR PAKISTAN

Ahmad Ibrahim, Muhammad Azam Khan

Abstract

The Indian Ocean region holds immense significance due to its vital maritime trade routes and abundant natural resources. With intensifying China – U.S. competition for power in Indo-Pacific region, the geopolitical landscape in Indian Ocean is getting increasingly volatile. This research article delves into the geopolitical and strategic significance of the Indian Ocean and its evolving dynamics, primarily focusing on the perspectives of major global players: the USA, China, and India, and its impact on Pakistan. The study explores major developments currently taking place in Indian Ocean including China's Belt and Road Initiative (BRI), the China-Pakistan Economic Corridor (CPEC), Quad alliance, AUKUS agreement, Indo-U.S. strategic cooperation, India's assertive naval buildup, and emergence of new form of asymmetric threats in maritime domain. In the backdrop of neorealist “balance of power theory”, the research elaborates how the hegemonic power competition is upsetting the balance of power, intensifying security dilemma, and igniting arms race in Indian Ocean region. These developments potentially undermine strategic stability in Indian Ocean which could eventually lead to conflicts. The research specifically examines the economic, political, and strategic implications of intensifying power rivalry in Indian Ocean on Pakistan. In addition the study also proposes feasible options for Pakistan to counter the destabilizing consequences of power politics in Indian Ocean.

Key Words: Belt and Road Initiative (BRI), China Pakistan Economic Corridor (CPEC), Quad, AUKUS, Strategic Stability, Balance of Power, Security Dilemma, Arms Race

1. Introduction

In contemporary world, Indian Ocean has gradually become staging ground for the geopolitical competition and strategic maneuvering among major global powers, like United States and China, and regional powers. The U.S. has traditionally maintained a strong naval presence in the Indian Ocean, asserting its influence and ensuring the security of sea lanes critical for global trade. In contrast, China has been expanding its naval capabilities and infrastructure, aiming to secure its economic interests, particularly through the Belt and Road Initiative (BRI). India, with its political ambitions of being regional hegemon (regional policeman), is pushing to become a net-security provider in Indian Ocean. In this push, India is fiercely backed by the United States as both see a common enemy in China. Both the United States as well as India are using all available means to deny access to China in the region of Indian Ocean. The evolving geopolitical dynamics in the Indian Ocean reflect a complex power struggle involving economic, nuclear, military, technological and political dimensions. As these power dynamics unfold, understanding and managing the geopolitical tensions in the Indian Ocean become crucial for the stability and balance of power in the broader international system.

2. Theoretical Framework

Balance of Power (BoP) is one of the key subset of Realist school of thought and has been defined in various ways. Classical or traditional realist scholars such as Hans J. Morgenthau defines it as actual state of affairs signifying the distribution of power among various states having approximate power and capabilities. Other historians define balance of power as power equilibrium among states that inhibits one state from becoming colossally powerful to dictate its will upon other states. As per Palmer and Perkins, BoP underlies countervailing pressures and shifting alliances impeding the growth of either one power or combination of power from becoming strong to an extent that will disrupt security of other states.

Morgenthau while taking a traditional realist perspective and its emphasis on human being dictating the drive for domination and power argues that balance of power can mitigate this behavior and will subsequently ensure order and stability of international system. According to him, the balance of power and its resultant policies aimed at establishment and maintenance of order are deemed quintessential for international political stability. However, his core argument is that balance of power is consequent of struggle for power in which states primarily intend to acquire superiority rather than explicit establishment of balance of power.

On other hand Neo-realists such as Kenneth Waltz has developed balance of power as a refined theoretical approach in a scientific and consistent manner. As per him, international political structure causes states to fend for themselves given the prevalence of anarchy in the system. Resultantly, small states engage in act of balancing against more powerful threatening actor. This implies that balance of power as per Waltz focuses on anarchical international system which in turn characterize self-help puts limits on the states' behavior (Anderson, 2018).

As per neorealism, there are two key ways of balancing: Internal balancing and external balancing. The former implies channelization of resources of states for increasing armaments, resource extraction, prevention of infiltration and revolts, and adequate organization of state in order to strengthen and guard oneself for competing in an effective manner. As far as external balancing goes, it underscores formulation of alliances with the purpose to stop a rising power.

Waltz argues, despite the difficulty with respect to state's collaboration, the emergence of existential or common threat led states to put aside their confliction and band together against a threatening-cum-dominating state (Anderson, 2016).

With respect to Indian Ocean Region, balance of power rightly explains the current interplay of geopolitics between states and convergence as well as divergence of states interests. According to BoP, key regional littorals (India, Pakistan) and extra-regional powers (U.S., China, Japan, Australia) have forged coalitions and alliances in order to address security, military and economic concerns emanating from the volatile and ever-changing strategic environment in Indian Ocean. The balancing is evident from the U.S.-led Quad wherein U.S., India, Japan, and Australia have shown a strong commitment for rule-based Free and Open Indo-Pacific (FOIP) region characterized by democratic values, resolution of military disputes, freedom of navigation and over flight, political integrity, and most importantly rule of law. AUKUS is another manifestation of such alliance formation which although is directed broadly at Indo-Pacific; nonetheless has ramifications for Indian Ocean given the key objective of both Quad and AUKUS as Balancing of Power against the China. The receding influence of U.S. as sole global arbiter alongside the ever-enhancing military and economic might of China manifested through mega Belt and Road Initiative-BRI implies the significance of balancing China through forging allies and forming coalitions (Mohan, 2022). Not only that, to offset China's unhindered economic growth and ever increasing footprint in Indian Ocean, the United States and India have inked various agreements to facilitate ease of operations by their militaries especially navies; improve interoperability between both navies and to provide geospatial intelligence. Bilateral agreements like LEMOA, COMCASA, BECA are strategic in essence and aim to expand Balance of Power in favour of U.S and India against China.

3. Significance of Indian Ocean

Covering over 68,536,000 sq-km, the Indian Ocean constitutes approximately 27 percent of the Earth's water surface. It's surrounded by Asia, Africa, Australia, and Antarctic Ocean, and connects Pacific Ocean to the Mediterranean Sea. The trade routes transiting through Indian Ocean are vital for commercial shipping and carry significant political and strategic importance. Chokepoints such as the Strait of Hormuz, Bab-el-Mandeb, Horn of Africa, Suez Canal, and Malacca Strait serve as crucial transit nodes for global trade. Each year, around 80 percent of the world oil and a staggering 9.84 billion tons of cargo is traded through the international se alanes of the Indian Ocean. Littoral states along the Indian Ocean account for 65 percent of the world's oil reserves, and 35 percent of the world's gas resources. In 2020, the total trade reported by the Indian Ocean rim amounted to \$6.17 trillion. Any disruption along these strategically significant routes can have profound implications for the world's energy and economic security (Baruah, 2021).

For the United States, the Indian Ocean is of paramount importance within its Indo-Pacific strategic framework. The network of crucial shipping lanes in Indian Ocean holds pivotal importance for U.S, its strategic interests in the region as well as beyond. The region's energy security and safety and security of sea lanes is a key concern, given the significant portion of the world's oil and gas passing through the chokepoints of Indian Ocean. The U.S. maintains a robust naval presence in Indian Ocean. The U.S. Navy's Fifth Fleet, headquartered in Bahrain alongside the U.S. Naval Forces Central Command, maintains active presence in Indian Ocean.

Additionally, the United States military base at Diego Garcia provides it strategic pivot for power projection in entire region. Additionally, US-Navy plays important role in thwarting non-traditional security challenges in Indian Ocean. (Nilanthi, 2023).

China views the Indian Ocean as a key component of its global interests. Almost 80 percent of China's imported crude oil transit through the Strait of Malacca. The Belt and Road Initiative (BRI), a cornerstone of China's foreign policy, emphasizes infrastructure development and connectivity with the Indian Ocean. In terms of trade relationships, China stands as the leading import partner for twenty-four countries in the Indian Ocean and the primary export partner for thirteen nations. China has gradually expanded its naval presence to safeguard its sea borne trade. People's Liberation Army Navy (PLAN) has established first ever overseas base in Djibouti in proximity of strategically important Bab-ul-Mandab strait. A newly constructed pier (berth) is large enough to accommodate aircraft carrier. It is hence obvious that China intends to station and operate its new modern aircraft carriers in the Indian Ocean from here in future. An aircraft carrier is a formidable instrument of power projection and sustained operations in blue water. China's increasing naval presence in the region reflects its growing interest in securing sea lanes, protecting overseas interests besides nationals (diaspora) abroad. This fits well with Beijing's expanding economic footprint, ensuring energy security and towards geopolitical aspirations. For Beijing, the Indian Ocean serves as a platform to counterbalance U.S. influence in the Asia-Pacific region. (Khalid, 2021)

With over 7,500 km of coastline and some 1200 Islands along with offshore oil infrastructure, India is directly influenced by geopolitical developments in Indian Ocean. India is amongst some of the fastest-growing economies in the region, if not beyond. More than 90 percent of India's international trade by volume and over 70 percent by value is carried over the seas. Nearly 80 percent of the country's crude oil requirement is imported by sea using the international sea lanes across the Indian Ocean. Offshore gas fields also contribute to 80 percent of India's domestic natural gas production. (Indian Maritime Security Strategy, 2014) While oil shipments from Persian Gulf are crucial for India's economic growth, the country aspires greater connectivity with trade markets in Africa, the Middle East, and Southeast Asia. Beyond economic considerations, Indian Ocean is integral to India's security paradigm, allowing New Delhi to assert its influence and project itself as a net-security provider. As China expands its presence in the region, India seeks to preserve and enhance its strategic position, making the Indian Ocean a linchpin for economic growth, security, and regional influence. (Dhruva, 2016)

4. Contemporary Developments in Indian Ocean

The Sino-U.S. competition for power is gradually transforming the geopolitical dynamics of Indian Ocean region. China has enhanced its maritime presence in Indian Ocean through Belt and Road Initiative (BRI) and is periodically increasing its naval footprint to safeguard these projects. United States and India view these developments with major concern and perceive growing Chinese influence as threat to their national interest. To counter China's growing footprint, U.S. has ramped up its naval expansion, developed new regional alliances and has undertaken several strategic agreements with regional powers. In sum, security dynamics, economic interests, and geopolitical competition have created security dilemmas, spurred naval arms race, and have threatened the strategic stability in the Indian Ocean. Short details of major developments underway in the Indian Ocean are stated below.

4.1. China's Belt and Road Initiative (BRI)

In 2013, Chinese President Xi Jinping launched “One Belt One Road (OBOR)” in 2013 which was re-named as “Belt and Road Initiative (BRI)” in 2017. BRI comprises of Maritime Silk Road (MSR) and Silk Road Economic Belt. As far as the Silk Road Economic Belt is concerned, it entails overland infrastructure that in turn include existing and proposed networks joining Central Asian states to South Asia, oil-rich Middle East, and beyond to Africa and even Europe. The route of MSR itself implies its strategic significance as it conjoins coastal cities of China with Pacific alongside Indian Ocean. The route extends to volatile South China Sea, Malacca Strait, and Bay of Bengal. It further goes to Arabian Sea, Gulf of Aden and to strategically significant Persian Gulf. (Odhiambo, 2020)

4.2. China Pakistan Economic Corridor (CPEC) and Gwadar Port

China-Pakistan Economic Corridor (CPEC) is the flag ship project of China's Belt and Road Initiative (BRI). Initially valued at \$46 billion, the investment volume of CPEC has increased to \$65 billion as of 2022. (Asif, 2022). CPEC is a vast network of infrastructure projects that includes highways, railways, and energy projects spread throughout country. The most important aspect of CPEC is the connectivity of Gwadar Port in southwestern Pakistan to China's northwestern region of Xinjiang. The port of Gwadar is strategically located in close proximity to the Strait of Hormuz from where nearly 21 million barrels of oil, equivalent of 21 percent of global oil consumption transits on daily basis (Abdullah, 2023).

While most maritime chokepoints can be bypassed by using other shipping routes, the Strait of Hormuz has no feasible alternative. Therefore, the port holds immense economic and strategic importance, particularly in terms of expanding geopolitical footprint through the maritime domain. (Caliskan, 2022).

With its full functional capability, Gwadar port will provide direct connectivity to China with Persian Gulf, Africa, Middle East and other regions circumventing Strait of Malacca and much talked about infamous “Malacca dilemma”. This will enhance China's strategic resilience and improve security of energy and trade flows. Additionally, it will provide shortest feasible connectivity between land-locked resource rich Central Asian Republics (CARs) and Arabian Sea (James, 2019). In simple words, Gwadar port project of Pakistan is one of major economic growth project reshaping global economy. It is a perfect hub for the region drawing trade from China, Central Asia, and Afghanistan, and transporting it to other regions via Arabian Sea.

4.3. String of Pearl and Diamond of Necklace Strategies

The United States has always viewed China's BRI project with great concern. From economic perspective, Washington perceives BRI as manifestation of Beijing's debt trap diplomacy. This policy, according to Western analysts, may lead to unsustainable levels of debt for participating countries, potentially creating economic dependencies that could compromise their sovereignty. The U.S. government has also raised transparency issues, expressing doubts about the lack of clarity in BRI agreements. From a strategic perspective, the U.S. views China's expanding influence through the BRI as a challenge to its own waning global leadership, raising concerns about the geopolitical implications of China's increased presence in strategically important regions (Daniel, 2022).

India has also repeatedly expressed reservations about China's BRI project. According to New Delhi, China is periodically encircling India by developing infrastructure at key trade routes under the pretext of BRI, and gradually enhancing naval presence. As discussed in the preceding discourse, this strategy is often termed as "String of Pearls Strategy". Djibouti is the first state from where strings' western half starts and China has built its military base in Obock region here. This would allow China to conduct surveillance over Bab-el- Mandeb and other parts of the Western Indian Ocean. Gwadar port is considered by India as the most potent and most concerning point in this string particularly when China-Pakistan collaboration in naval domain is taken into account. Maldives' Feydhoo Finolhu Island is the home to third base in the western string. As far as eastern half is concerned, it comprises of Bangladesh's Chittagong port, Myanmar's Kyaukpyu port, Malaysia's Kuantan base and Maura base in Brunei. (Nawaz, 2023)

As alluded to earlier, to counter string of pearl strategy of China, India has also been working on similar strategy unofficially dubbed as 'Necklace of Diamonds'. This necklace comprise of Chabahar port in Iran, Oman's Duqm base, naval air-base in Seychelles' Assumption island, tri-service command in Andaman & Nicobar islands, Indonesia's Sabang base, and Singapore's Changi base. Alongside the Necklace of Diamonds, there is another speculated double fish hook strategy which entails amalgamation of military alliance in region with key actors such as U.S., France, Australia, and island states for securing Indian Ocean as well as containing China's maritime endeavors in region. (Nawaz, 2023)

4.4. Quad, AUKUS, and Indian Ocean

The Quadrilateral Security Dialogue, commonly known as the Quad, is a strategic forum comprising the United States, Japan, India, and Australia. Initially established in 2007, the Quad has gained renewed momentum in recent years as a response to growing China's influence in the Indo-Pacific region. While Quad officially focuses on a range of issues, including economic development, infrastructure, and climate change, but its underlying security dimension has drawn particular attention. This security dimension is underpinned by navies of Quad countries.

Malabar Naval Exercises, although a separate initiative originally conceived during Cold War between navies of the U.S. and India, have now become physical manifestation of the Quad's co-operation in naval domain. The inclusion of Australia in the Malabar Exercises in 2020 expanded Quad's footprint, showcasing a growing regional collaboration within the framework. The joint naval drills contribute to the Quad's efforts to enhance interoperability among its members, fostering better coordination and response capabilities in the maritime domain (Shahid, 2021).

China has termed Quad as Asian NATO, and has characterized Quad as a containment alliance to counter China influence in the region. Chinese officials have repeatedly criticized Quad, arguing that it may disrupt the regional Balance of Power, and can have destabilizing impact on global scale.

Unlike Quad, AUKUS is a purely military agreement. It's the trilateral security partnership between Australia, United Kingdom and United States announced in September 2021. It is perceived as the groundbreaking agreement that aims to enhance defense and security cooperation among the three nations. The centerpiece of AUKUS is the provision of nuclear-powered attack submarines (SSN) to the Royal Australian Navy (RAN) in a deal worth \$368

billion. These submarines will be configured on Royal Navy's next generation SSN-R project and will be called SSN-AUKUS.

The provision of nuclear propulsion technology for submarines marks first instance in history of sea based strategic deterrence. Australian submarines, as a consequence, will have extended staying time while on operational deployments. In parallel, RAN will be acquiring long-range cruise missiles and F-35 stealth aircrafts from United States which will significantly enhance the combat outreach of Australian forces. The delivery of cutting-edge technology to the Australian armed forces implies that the Washington is leveraging Australia as a frontline ally in its efforts to counter China. As part of AUKUS, Australia will eventually attain offensive posture instead of traditional defensive posture in Indo-Pacific. This transformation is expected to create new set of strategic complications in entire region. It will intensify arms race and will threaten the strategic stability. In parallel, transfer of submarine related nuclear propulsion tech under the ambit of AUKUS is poised to undermine non-proliferation regimes, encouraging other nations to seek similar capabilities. In sum, AUKUS substantiates the fact that increasing military might of China has reshaped the balance of power, compelling U.S. to undertake extraordinary decisions in order to maintain its global ascendancy.

4.5. Indo-U.S. Strategic Partnership

India and the United States have signed several strategic agreements to enhance bilateral cooperation and safeguard their increasingly overlapping interests in Indo-Pacific. There are three foundational defence agreements between the U.S. and India. These are, Logistic Exchange Memorandum of Agreement (LEMOA); Communication Compatibility and Security Agreement (COMCASA) and the Basic Exchange and Cooperation Agreement for Geospatial Intelligence (BECA).

LEMOA, signed in 2016, allows the armed forces of two countries to use each other's facilities for replenishment of supplies and services on a reciprocal basis. This agreement streamlines logistical support, facilitating a more efficient response to regional and global contingencies. Signed in 2018, COMCASA enables the secure exchange of communication and military grade data-sharing capabilities between India and the United States. This agreement facilitates the use of advanced defense systems, including encrypted communication equipment. By allowing for secure communication during joint military exercises and operations, COMCASA strengthens the strategic coordination between India and the U.S. It also supports India's efforts to modernize its defense capabilities and promotes the integration of advanced technologies into its military infrastructure. BECA was signed in 2020 and is a critical agreement that enhances the geospatial intelligence-sharing capabilities between both countries. BECA enables the exchange of geospatial information, topographical, nautical, and aeronautical data, allowing military forces of both nations to enhance their situational awareness and improve the accuracy of missile systems, targeting, and navigation. (Philip, 2020)

On one axis, these strategic agreements represent depth of Indo-U.S. strategic partnership, but on another they showcase the shared dilemmas of both nations against China. These agreements are destabilizing in nature as they are compromising the Balance of Power in Indian Ocean, particularly between India and Pakistan. The intensification of security dilemmas in maritime domain has triggered naval arms race which threatens the strategic stability in Indian Ocean.

4.6. India Aggressive Naval Build-Up

Indian Navy is in phase of rapid naval force expansion since last decade with emphasis toward indigenization. This fleet modernization includes commissioning of more warships and submarines. In parallel, the naval aviation and nuclear arm will also be modernized and expanded by incorporating more and superior systems.

India Navy surface combat fleet currently consists of ten destroyers, sixteen frigates, several corvettes, amphibious warships, patrol crafts and support vessels. By 2035, Indian Navy is eyeing to commission 175 warships by adding new vessels and replacing its obsolete surface fleet with additional modern warships. Obsolete Rajput class destroyers are in phase of replacement by four Visakhapatnam class destroyers. Seven new Nilgiri class frigates and four Talwar-III class frigates are in different phases of construction. In parallel, IN will be inducting dozens of new corvettes for surface and sub-surface warfare at regional scale.

IN has recently commissioned its first ever domestically produced air craft carrier named INS Vikrant. (Lendon, 2022) With INS Vikramaditya already in service, INS Vikrant is the second aircraft carrier in IN disposal. There are plans to construct a bigger and more capable aircraft carrier, tentatively called INS Vishal (IAC-02). But till date, no concrete decision has been made due to conflicting debates regarding its feasibility and limitations of resources (Bedi, 2022). Similarly India is expanding its surface-warship fleet by adding more warships with more sophisticated weapons and sensor suite. These warships are of varying tonnage. On higher axis, India is developing destroyers and frigates, while on lower axis it is producing corvettes and patrol vessels. It's worth noting, that India has gradually attained high level of autonomy as far as designing and construction of warships is concerned. (Atri, 2023)

The sub-surface modernization of Indian navy has conventional as well as nuclear dimension. IN is in process of commissioning six Kalveri class diesel electric submarines – a version based on French Scorpene submarine (Vavasseur, 2022). As a follow on project, called Project 75-I, IN is planning to acquire six more submarines with improved capabilities. These submarines will be built after collaboration with domestic and foreign shipyards. Various shipyards in Europe and Asia have submitted their bids for the tender. However, the final submarine design is yet to be decided (Kumar, 2022).

Indian Navy (IN) is also custodian of India's sea-based nuclear strike capability. Currently IN has one operational nuclear ballistic submarine (SSBN) – INS Arihant. Second SSBN, INS Arighat, is expecting commissioning in 2024. (Abhijit, 2023) Third SSBN, designated as S4 or unofficially as Arihant-stretched, was secretly launched on November 23, 2021. (Rahul, 2021) The launch was not reported by official sources suggesting that India wants to keep its sea-based nuclear deterrent up gradation plans secretive. In total, India is expected to induct four SSBNs by 2030, and potentially more at later stages (Sauray, 2016). The expansion of IN SSBN fleet will significantly strengthen India's sea-borne assured second strike capability. But on flip side it will intensify security perceptions of neighboring nations, particularly Pakistan, forcing them either to take counter actions or develop analogous capabilities. A tabular comparison of India Navy current and future major combatants is given:

Warship Type	Total Number in 2023	Expected Number in 2033s	Comments
Air Craft Carrier (STOBAR)	2	3	INS Vishal will be third aircraft carrier
Landing Platform Dock (LPD)	1	4	4 new LPDs will be built
Destroyers (DDGs)	10	18	8 NG Heavy Destroyers/ Cruisers will be built
Heavy Frigates (6000+ tons) (FFG)	3	10	7 Nilgiri class FFG will be operational
Standard Frigates (4000+ tons) (FFG)	9	10	10 Talwar class frigates will be operational
Multi-Mission Corvettes (FFL)	0	8	8 NG multi-mission Corvettes will be built
Anti-Submarine Corvettes (ASW FFL)	5	16	16 ASW Shallow Water Crafts will be operational
Missile Corvettes/Boats (ASuW FFL + FACM)	13	6	Six NG Missile Corvettes will be built
Offshore Patrol Vessels (OPVs)	10	21	11 NG-OPVs will be built in coming years
Mine Countermeasure Vessels (MCMV)	0	12	12 new MCMVs will be built
Nuclear Ballistic Submarines (SSBN)	1	4	INS Arihant, INS Arighat and two S-4 class SSBNs
Nuclear Attack Submarines (SSN)	0	6	Six Project 75-A SSNs will be added
Hunter Killer Submarines (SSK)	15	18	Six Type 75-I SSKs will be added

Table 1: Contemporary Indian Navy Major Combat Vessels and Future Projection (Hackett et al., 2023)

4.7. New Generation Asymmetric Threats

Iran, although a smaller player in Indian Ocean, has showcased capability to impart significant influence on regional geopolitical environment. As a littoral state with control over the Strait of Hormuz, Iran has the ability to influence and disrupt maritime traffic in the region. Thus, Iran's geographical proximity to the Persian Gulf provides it with a strategic advantage in the Indian Ocean, enabling the country to use its position as a deterrent against the United States and other external actors. Similarly, Bab el-Mandeb, another strategic choke point, is also under the influence of Iran-backed Houthis militia. Both Iran and Houthis have successfully demonstrated their capability to block sea lanes passing through Persian Gulf and Red Sea by employing asymmetric tactics. By controlling these two key choke points of Indian Ocean, Iran has been able to impart its influence at global scale.

Perhaps the most impeding non-traditional threat is currently being witnessed in the Red Sea. Houthis, a non-state faction backed by Iran, have been using missiles and drones to target merchant and naval vessels across Bab-el-Mandab. Majority of these missiles and drones are

rudimentary designs, but pose significant threat when employed in mass-strikes. Although Houthis claim that they are targeting American and Israeli merchant vessels only in response of Israel's aggression against Palestine. But situational ambiguity and fog of crisis has placed entire shipping at risk. Numerous shipping companies, including industry giants like Maersk, Shell, and BP, have already halted their operations in the Red Sea. The majority of shipping vessels are now opting for the longer route around the Cape of Good Hope to reach the Atlantic Ocean. This shift is anticipated to reduce shipping operational efficiency by around 25 percent, placing additional strain on the global supply chain and adversely affecting the worldwide economy (Jenni, 2023). The impact of Houthi attacks is further evident as reportedly over 586 container ships have rerouted around Africa by first half of February, leading to a 82 percent decrease in container tonnage transiting through the Suez Canal since the onset of Houthi attacks. Redirecting ships around the southern tip of Africa in the Indian Ocean is estimated to incur up to an additional \$ 1 million in fuel costs for each round trip between Asia and northern Europe emitting approximately 70 percent more greenhouse gas emissions per trip. (UNCTAD, 2024)

To enhance maritime security in the Red Sea shipping corridor, the United States has lately initiated a multinational security operation code named, "Operation Prosperity Guardian". This operation falls under the purview of Combined Task Forces and is supervised by Task Force-153. U.S. Navy, Royal Navy, and French Navy have successfully intercepted numerous drone and missile strikes by the Houthis yet maintaining this defensive cover is challenging. The deployment of a large number of expensive air-defense and anti-ballistic missiles is unsustainable against continuous attacks by the Houthis using inexpensive and rudimentary drones and missiles. Even targeted strikes by the U.S. and the U.K. against Houthi military assets have not deterred further attacks. The most important takeaway is that in the past; no militant organization has used such long-range and destructive weapons against international shipping on such a scale. Global navies in general and maritime industry in particular were found ill prepared to counter the scale and level of such a formidable threat. This, definitely, will have far reaching consequences for maritime security and global economy. (Kusovac, 2023)

5. Implications for Pakistan

With a coastline stretching over 1000 kms along the Arabian Sea and proximity to strategic access points to the northern entrance of the Indian Ocean, Pakistan's position is increasingly important in Indian Ocean. The firmly established friendly ties with China, historic relations with United States, and deep seated rivalry with India, Pakistan is also at the epicenter of unfolding great power politics in Indian Ocean. There is hence need to explore available strategic options with a view to safeguard Pakistan's national interests and contribute towards regional strategic stability via sustenance of Balance of Power.

5.1. Threat to CPEC and Gwadar Port

The power competition in Indian Ocean is likely to have profound impact on Pakistan's future objectives. This is particularly true for China-Pakistan Economic Corridor (CPEC) and commercial operations of Gwadar port. China's role in the region has been a driving force behind the development of CPEC. It is a stimulus to enhance connectivity and open up new trade routes for Pakistan. The U.S. Indo-Pacific strategy that aims to contain China and its influence in the Indian Ocean has brought strategic complications which could impact the smooth functioning of CPEC.

With ambitions to act as net-security provider in Indian Ocean, India has been attempting to disrupt China-Pakistan Economic Corridor (CPEC) and the Gwadar port project through various means. India has been key abettor of militant groups in Balochistan that work to target and sabotage CPEC projects in Pakistan. RAW has reportedly established a special desk within to design and especially target CPEC in Pakistan. Special funds have been allocated to RAW for the purpose. In several terrorist attacks, Chinese nationals have been targeted by hostile outfits, mostly backed by Indian RAW. Additionally, New Delhi has been employing strong diplomatic means, in conjunction with information warfare, to build international opposition against CPEC and related projects. India has been attempting to propose new connectivity projects as well. This is being done to weaken BRI & CPEC. The most recent example is the proposed India-Middle East-Europe Economic (IMEC) corridor, to bypass China-led initiatives, including CPEC. These attempts have failed to materialize but they showcase New Delhi's hostility towards CPEC and Gwadar port.

5.2. Quad, AUKUS, and Pakistan

The U.S. Indo-Pacific strategy and its increasing defense and economic collaboration with India, especially in maritime domain in the shape of Quad, have major concerns for Pakistan. Given Pakistan's geographical location and its proximity to key maritime routes, increased Quad activities may jeopardize Pakistan's maritime interests. The expanded Malabar series of naval exercises are now actively conducted by Quad in both Indian as well as western Pacific. The aim of these naval maneuvers is to enhance operational capabilities and interoperability amongst navies of member states. India's active participation in the Quad and its pursuit of enhanced naval capabilities may contribute to a more assertive maritime posture, ultimately impacting Pakistan's maritime security calculus.

While the primary focus of AUKUS is Indo-Pacific region, it will also have significant ramifications in the region of Indian Ocean. In addition to the risks of regional nuclear proliferation, AUKUS agreement has the potential to incentivize other nations to acquire nuclear propulsion technologies by exploiting vulnerabilities in nuclear proliferation control regimes. For example, India, a member of the Quad and a signatory to numerous bilateral security agreements with the United States, consistently anticipates a deeper engagement within Washington's Indo-Pacific strategic framework. Leveraging AUKUS as a pretext, India may seek to obtain similar nuclear propulsion technology from a foreign source (possibly France), for its Project 75-A nuclear attack submarine project (SSN). Given the existing collaboration between France and India in submarine development, the prospect of Indo-French cooperation for construction of nuclear attack submarines cannot be dismissed easily.

The potential acquisition of advance nuclear propulsion technology as AUKUS provides, India can significantly augment its nuclear submarine fleet. Historically, Indian Navy operated only one SSN, dubbed Chakra class during Cold War. The nuclear submarine was leased from USSR. Unlike nuclear ballistic submarines (SSBNs), which are meant purely for nuclear deterrence, SSNs are employed in conventional conflict and therefore pose extreme threat to Pakistan Navy. Likewise, another grave concern is improvement in Indian navy's nuclear propulsion technology for its SSBNs which it can acquire with French propulsion technology now available to it. Unlike Australia, which is non-nuclear weapon state, India has nuclear weapons and an active sea-borne nuclear retaliatory program based on its domestic fleet of nuclear ballistic submarines. INS Arihant has also completed its deterrent patrol in recent years.

In other words, the ballistic missile submarine is ready for operational deployment. Thus, in case of India, an AUKUS style agreement will result in rapid proliferation of nuclear arms in Indian Ocean. This is not to mention Indo-US nuclear agreement which has previously dented the Non-Proliferation regime (NPT). This allowed India to acquire nuclear fissile material from overseas and spare some local reactors solely for production of weapon grade uranium for its ballistic missile submarines. Such developments compel Pakistan to opt for analogous capabilities to restore Balance of Power. The proliferation of nuclear submarines in the Indian Ocean will disrupt the regional balance of power and trigger a naval nuclear arms race. The growing number of nuclear submarines will present substantial challenges in terms of command and control and the safety of nuclear assets in Indian Ocean, which in extreme case, can have global consequences.

5.3. India-U.S. Strategic Agreements and Impact on Pakistan

The strategic agreements between India and the United States have direct impact on Pakistan's strategic calculations. In brief, three such factors can be highlighted. First, the enhance interoperability, availability of high-end equipment, access of advance intelligence, and expansion of logistical network will significantly enhance India's military capabilities, particularly in Indian Ocean. Indian Navy has expanded its fleet of U.S. made cutting edge P-8I Poseidon Maritime Patrol Aircrafts (MPAs) which have significantly augmented India's anti-submarine warfare capability (ASW) (Xavier, 2021) besides substantially adding to Maritime Domain Awareness (Situational Awareness). In parallel, India is in process of procuring 24 MH-60 Romeo ASW helicopters (Elizabeth, 2021). Moreover, the materialization of 31 MQ-9C drones from U.S. will expand India's intelligence, surveillance, and reconnaissance (ISR) outreach in maritime domain (Dinaker, 2023). These procurement and capability enhancement will distort Indo-Pak Balance of Power and intensify Pakistan's security dilemma.

Second, the intensifying defense cooperation between India and the U.S. will degrade Pak-U.S. mutual relationship, particularly in military domain. The United States view India as key player in Indian Ocean for containing China, both through economic and military means. From Washington perspective, a strong Indian navy will be better positioned to counter China, not only in Indian Ocean but in western Pacific as well.

By denying access to high-end U.S. equipment and cutting military aid to Pakistan, Washington seeks to render Pakistan into position where it will no longer be able to challenge India military particularly naval might. This will allow - at least from Washington's perception - India to dedicate majority of Indian military potential against China on land, something in line with U.S. interests.

Third, U.S. support for India's aggressive naval modernization will pose significant threat to Pakistan's national security. India's rapid naval expansion, including the acquisition of aircraft carriers, advanced surface ships, submarines, and naval aircrafts, signify a shift towards a more assertive maritime posture. In addition, Indian plans to develop fleet of nuclear submarines - both SSNs and SSBNs - will introduce new set of complexities and uncertainties in an already fragile Indo-Pak strategic balance. India's pursuit of a robust sea-based nuclear deterrent throws challenges at Pakistan's security calculus and necessitates a reassessment of its own naval capabilities. The nuclear dimension in naval arms race will further heighten the tensions, erode stability whilst increasing the likelihood of inadvertent outbreak of a conflict.

5.4. Blockade of Choke Points and Pakistan Maritime Trade

The employment of rudimentary long-range weapons by non-state actors at sea has raised new set of challenges for maritime security. The new standards in warfare set by Houthis have showcased that such actors can disrupt maritime activities, particularly at choke points and virtually impose naval blockade. Pakistan is overwhelming dependent on sea-commerce for economic sustenance and majority of its maritime trade transits through Persian Gulf and Red Sea. Any crisis or blockade situation at these crucial maritime nodes will have profound impact on strategic and economic interests of Pakistan. In particular, as a net importer of oil, Pakistan's energy security would be highly vulnerable in the event of disruptions in the supply chain caused by blockades at these straits.

6. Counter-Options for Pakistan

Pakistan has to undertake series of measures to better position itself according to transforming power dynamics in Indian Ocean. By effectively utilizing its strategic position, diplomatic clout, and military prowess, Pakistan can take credible measures to retain regional Balance of Power. The growing complexity and intensification of security challenges in Indian Ocean necessitates robust naval prowess. On one axis, Pakistan Navy must seek enough capability to deter Indian Navy on conventional scale. On other side, Pakistan Navy should be able to counter non-traditional and low-intensity threats to safeguard its maritime routes and preserve sea lines of communications. However, the most important approach will be to effectively employ diplomacy through maritime domain for expansion of its influence and development of robust partnerships with regional and global powers.

6.1. CPEC and Gwadar Port as Strategic Leverage

Strategic diplomacy, centered on CPEC, offers Pakistan an effective tool to strengthen ties with regional countries and major stakeholders in the world. Pakistan can effectively utilize CPEC, to address economic and developmental challenges. Early operationalization of CPEC can be an effective instrument in shaping a balanced power dynamics in the Indian Ocean.

Serving as the linchpin of CPEC, Gwadar port can bolsters Pakistan's strategic position as a key player in regional geopolitical environment. Once fully operational, Gwadar port will act as a strategic node for the maritime transit trade. This will enable Pakistan to diversify its economic activities and reduce dependence on traditional trade routes. The role of Gwadar port in maritime connectivity will bolster economic prospects and alongside contribute to the reduction of India's influence in the Indian Ocean. Development of shipyard at Gwadar alongwith a naval station in close proximity by Pakistan Navy can profoundly enhance Pakistan's strategic relevance in South Asia as well as in Middle Eastern regions.

In addition, full development of Gwadar port could foster diplomatic alliances with key players, creating a counterbalance to India's influence and providing a diplomatic leverage. Once Gwadar becomes a symbol of regional stability, offering economic opportunities and cooperation, it will diminish India's narrative of being the regional hegemon or 'net security provider' as it professes to be. In essence, Gwadar's multifaceted contributions position Pakistan as a crucial player in reshaping the geopolitical dynamics in the Indian Ocean, countering India's influence and fostering own strategic interests.

6.2. Modernization of Pakistan Navy (PN)

For retaining regional Balance of Power, it's crucial to augment naval prowess of Pakistan. In order to counter aggressive expansion by Indian navy, Pakistan Navy (PN) is now in process of undertaking necessary countermeasures. This involves expansion of naval fleet by induction of new platforms, replacement of older systems with modern high-end systems, and procurement of next generation capabilities at all tiers of naval forces. The roadmap for Pakistan naval modernization has been presented by both former Chief of Naval Staff (CNS) Admiral Zafar Mahmood Abbasi and Admiral Muhammad Amjad Khan Niazi on separate occasions during the past few years.

PN envisions to commission fifty warships which will include twenty major warships in near future. PN has recently procured four Type-054AP frigates from China which have replaced obsolete Tariq class frigates. From Romania, PN has purchased two Yarmook class corvettes while two additional vessels will be commissioned soon. From Turkey, Pakistan is acquiring four Milgem class corvettes – with each pair built in Turkey and Pakistan respectively. All four vessels have been launched. As a follow on project, Pakistan is in process of developing Jinnah class frigates which will be constructed indigenously.

In the realm of underwater forces, Pakistan Navy is currently modernizing its existing Khalid class submarines from Turkey, and is also in process of acquiring eight Hangor class submarines from China. In aerial domain, PN has raised fleet of RAS-72 ASW aircrafts (Dawn, 2023) and is in process of acquiring Sea-Sultan long-range maritime patrol aircraft (Xavier, 2021). In addition, PN is already operating CH-4B combat drones of Chinese origin and is evaluating TB-02 combat drones from Turkey. (Ibrahim, 2022) Beside induction of various platforms, PN is also developing and deploying next generation missile systems featuring improved range, speed, and sensors. For Pakistan, development of credible and effective defensive naval capability is crucial to deter potential aggression from Indian Navy, ensure preservation of national maritime interests and above all Balance of Power for strategic stability.

6.3. Active Diplomatic Engagement through Naval Domain

Pakistan can employ naval diplomacy as a strategic instrument to counter India's expanding geopolitical influence in the Indian Ocean by strengthening relations with regional and extra-regional players. Engaging with neighboring countries through regional forums and organizations, such as the Shanghai Cooperation Organization (SCO) and the Economic Cooperation Organization (ECO), can foster economic integration and promote collective security measures. Strengthening ties with key international players, including China, Russia, and Middle Eastern countries, can facilitate Pakistan to overcome the negative fallout from India's growing assertiveness and deepening Indo-U.S. collaboration in Indian Ocean.

Instead of joining certain axis of power, Pakistan can adopt a balanced approach in foreign relations, maintaining friendly ties with the United States as well as China. Mutual co-operation among naval forces can be strengthened through diversification of bilateral and multi-lateral exercises, port visits, and joint patrols. Similarly collaboration in the domain of academia, joint-projects, and technology sharing can deepen Pakistan relation with allied countries. In particular, Pakistan can formulate friendly relation with its South Western neighbor Iran using maritime domain as tool of co-operation. Iran has direct influence in Persian Gulf and exercise

dominance over Bab el-Mandeb through Houthis in Western Yemen. By avoiding hostilities and undertaking mutual confidence building measures, Pakistan can significantly minimize vulnerability of its maritime trade transiting through Persian Gulf and Red Sea.

On national scale, Pakistan Navy can further diversify the scope of its multinational AMAN series of exercises to effectively meet the diplomatic requirements of future. Similarly by actively participating in combined task forces, interoperability with foreign navies can be developed to collectively counter shared threats – particularly in non-traditional realm. In essence, naval diplomacy emerges as a multifaceted strategy that allows Pakistan to assert itself as a key player in shaping the maritime dynamics of the Indian Ocean, countering India's influence, and safeguarding its own strategic interests.

7. Conclusion

The intensification of great power rivalry in the Indian Ocean has profound implications for Pakistan. Washington's China containment policy in Indo-Pacific involves development of new alliances and collaborative frameworks like Quad and AUKUS. Similarly, deepening Indo-U.S. strategic co-operation is also a product of growing interests of alliance to counter increasing footprint of China in the Indian Ocean especially CPEC under BRI. India, with ambition of becoming a sole regional hegemon (policeman), is actively projecting itself as net-security provider in Indian Ocean. India's assertive naval modernization is a vivid reflection of these ambitions. These developments, however, are destabilizing as they have intensified regional security dilemmas and triggered naval arms race. Situated at the crossroads of complex geopolitical forces, Pakistan faces both challenges and opportunities. The China-Pakistan Economic Corridor (CPEC) has the potential to emerge as a linchpin in transforming geopolitical landscape, aligning Pakistan with China's broader Belt and Road Initiative and positioning the country as a key player in maritime trade routes. The U.S. Indo-Pacific strategy and India's maritime ambitions pose challenges, necessitating a calibrated and adaptive response from Pakistan. The strategic options available to Pakistan encompass a spectrum of diplomatic, sea based nuclear, naval, economic, and security measures, requiring astute decision-making to safeguard national interests and foster regional stability. It also necessitates a close collaboration with China and PLA navy to ensure Balance of Power in the region.

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CHINA - U.S. NAVAL BUILDUP AND EMERGING BALANCE OF POWER IN INDO-PACIFIC

Ahmad Ibrahim

Abstract

The article highlights fast track naval build-up by China and United States which is imparting transformative impact on the power dynamics of Indo-Pacific region. Rapid production of naval vessels by China's industrial complex has turned People Liberation Army Navy (PLAN) into largest navy in the world. However, United States Navy (USN) still dominates PLAN in terms of qualitative advantage and net-tonnage as superior technological systems are being employed by U.S. Navy's bigger and more capable naval vessels. This article provides detailed overview of current strength of PLAN and U.S. Navy as well as their on-going and near-future modernization programs. These modernization programs cover the surface, sub-surface, and aerial domain. The article also provides analysis how these advancements will enhance their combat capability with respect to emerging threat environment in Indo-Pacific region. Using theoretical lens of Balance of Power (BoP) theory, the article predominately focuses on naval prowess to gauge the relative strength of both nations. However, it also incorporates and briefly discusses other important parameters including differences in strategies being employed, role of geographical factor, and formulation of new alliances and security arrangements by Washington like AUKUS and Quad, and their efficiency particularly from when compared with NATO's example. The analysis concludes by assessing the impact of these factors on the evolving balance of power in the Indo-Pacific, and how balance of power in Indo-Pacific is likely to change depending upon future trajectories of China and U.S. force modernization drive.

Key Words: People Liberation Army Navy (PLAN), United States Navy (USN), Indo-Pacific Region, Naval Build-up, Balance of Power

1. Introduction

China's rise as a major power is redefining the global geopolitical order. China is actively pursuing ambitious projects like the Belt and Road Initiative (BRI), aiming to enhance its influence through infrastructure development and economic partnerships at global scale. Over the past few decades, China's economic prowess has translated into substantial military advancements, with a particular focus on expanding and strengthening its naval capabilities. The construction and militarization of artificial islands in South China Sea, and growing friction with Taiwan, underscore Beijing's intension to assert its territorial claims in strategically important regions. These developments signify China's strategic intent to project power, protect its extended maritime interests, and secure critical sea line of communication (SLOCs) which in turn is reflection of a broader strategy to extend Beijing's sphere of influence.

The United States perceives China's growing influence as a major threat to its long-standing hegemony – particularly in the Indo-Pacific region. For decades, the U.S. has maintained a significant influence in the region. However, Washington fears that Beijing's expanding footprint – both economic and military, can undermine the economic and strategic architecture that has supported U.S. led order in the Indo-Pacific region. Therefore, Washington is following a multi-faceted strategy involving modernization of its military capabilities – particularly United States Navy (USN) and establishment of strategic alliances with key regional players and.¹

2. Indo-Pacific from Balance of Power Theoretical Lens

Balance of Power (BoP) is one of the key subsets of the Realist school of thought and has been defined in several ways. Classical or traditional realist scholars such as Hans J. Morgenthau have argued that balance of power is a state of affairs in which power is distributed among several nations with roughly equal strength, preventing any one nation from dominating the others.² Palmer and Perkins has described the balance of power as a system of countervailing pressures and shifting alliances that prevent any one state or coalition from becoming so powerful that it can dominate others.³ According to them the balance of power functions as a stabilizing force in international relations by ensuring that no single state or group of states can upset the equilibrium necessary for global security.

Morgenthau, while taking a traditional realist perspective and its emphasis on human beings dictating the drive for domination and power, argues that the balance of power can mitigate this behavior and will subsequently ensure the order and stability of the international system. According to him, the balance of power and its resultant policies aimed at the establishment and maintenance of order are deemed quintessential for international political stability. However, his core argument is that the balance of power is a consequence of the

¹ Ahmad, I., & Khan, M. A. (2024). Great power rivalry in Indian Ocean: Implications and options for Pakistan. *Academic Journal of Social Sciences*, 8(1), 77–78.

² Morgenthau, H. J. (1985). *Politics among nations: The struggle for power and peace* (6th ed.). McGraw-Hill.

³ Palmer, N. D., & Howard, C. P. (1969). *International relations: The world community in transition* (3rd ed.). Houghton Mifflin.

struggle for power in which states primarily intend to acquire superiority rather than the explicit establishment of a balance of power.

On the other hand, Neo-realists such as Kenneth Waltz have developed the balance of power as a refined theoretical approach in a systematic and consistent manner. According to Waltz, the international system is inherently anarchic, in which states must rely on self-help to ensure their survival. This leads to a natural tendency among states to balance against more powerful actors to prevent any one state from achieving overwhelming dominance. Waltz argues that this balancing behaviour is a structural consequence of the international system itself, rather than a deliberate policy choice by states. He emphasizes that the balance of power is not a result of conscious efforts to create equilibrium but is rather an outcome of states pursuing their own security in an anarchic world.⁴

According to neorealism, there are two key ways of balancing: internal balancing and external balancing. The former implies channeling the resources of states for increasing military capacity, prevention of internal crisis, and effective organization of the state in order to strengthen and safeguard oneself for competing in an effective manner. As far as external balancing is concerned, it deals with the formulation of alliances with the purpose of stopping a rising power. Waltz argues that despite the difficulty with respect to state collaboration, the emergence of existential or common threats leads states group together against a threatening-cum-dominating state.⁵

Sino-U.S. power struggle in the Indo-Pacific region reflects the applicability of balance of power theory. Beijing and Washington are engaged in mutual competition to expand their influence while undermining that of adversary in the process. China's rapid expansion of economic infrastructure, growing dependency on sea-lanes for trade, massive development of naval fleet, territorial issues with Japan and Taiwan, and militarization of artificial island to assert claims in disputed South China Sea, all accounts for Beijing's growing influence. As a counterbalance, U.S. is strengthening its naval prowess, increasing forward presence, and developing alliances with other major players. Initiative like Quad, AUKUS, and bilateral strategic agreements with India also represents Washington's power balancing measure against rising China. The most eminent aspect is rapid naval expansion by both China and United States to achieve naval superiority over each other.

3. People's Liberation Army Navy (PLAN): Current Strength and Modernization

People's Liberation Army Navy (PLAN) has undertaken remarkable expansion and technological improvements in recent years. With 355 naval platforms operational, PLAN is currently the largest navy in terms of number of ships.⁶ However, majority of these ships are smaller in size when compared with American counterparts. Therefore, in terms of tonnage, PLAN is still two times smaller than United States Navy (USN). This tonnage gap, albeit, is

⁴ Waltz, K. N. (1979). *Theory of international politics*. Addison-Wesley.

⁵ Andersen, M. S. (2018). Balance of power. *Norwegian Institute of International Affairs*.
<https://doi.org/10.1002/9781118885154.dipl0339>

⁶ Congressional Research Services. (2022, January 20). China naval modernization: Implications for U.S. Navy capabilities—Background and issues for Congress. *Congressional Research Service Report*, 5.

rapidly shrinking since China is now producing heavier warships at much faster rate compared to United States.

PLAN currently operates two aircraft carriers, *Liaoning* and *Shandong*. *Liaoning* was acquired from Ukraine in 1998 and was refurbished into carrier vessel. It is conventionally powered, with an estimated full load displacement of 60,000 to 66,000 tons, and can reportedly accommodate an air wing of 30 or more fixed-wing airplanes and helicopters. *Shandong* is domestically produced modified version of the *Liaoning* design and can operate a larger air wing of 40 aircrafts. Its displacement is estimated at 66,000 to 70,000 tons. Both utilize short take-off, barrier-arrested recovery (STOBAR) system for conducting carrier aviation operations.⁷ Use of ski-jump significantly reduces the combat capability of both carriers.

To compensate this capability gap, China has produced *Fujian* flat-top aircraft carrier which features Electromagnetic Aircraft Launch System (EMALS). EMALS improves carrier operations by allowing more efficient, smoother, and flexible aircraft launches thereby improving the sortie rate and minimizing maintenance requirements. The 80,000 tons carrier is being equipped with niche technologies and will accommodate aviation wing of approximately 80 aircrafts including J-35 stealth aircrafts, fixed wing KJ-600 Airborne Early Warning (AEW) aircrafts, Z-20 anti-submarine warfare (ASW) helicopters, and drones of varying capabilities.⁸

PLAN surface fleet comprises of mixture of new and aging naval vessels. Besides gradually phasing out obsolete platforms, China is also upgrading mid-tier warships with new sensors and weapon systems. In parallel, PLAN is commissioning new generation of modern and heavier warships equipped with cutting edge combat capabilities.

The largest and most capable warship in PLAN disposal is Type-055 *Renhai* class heavy destroyer. Displacing more than 12,000 tons, this warship is categorized as cruiser by United States. Equipped with 112 vertical launch tubes, these destroyers are armed with wide array of missile systems including HHQ-09 long-range SAM, YJ-21 hypersonic missile, and YJ-18 supersonic missile.⁹ Currently eight warships are operational with more in various phases of production.¹⁰ Type-052D/DL *Luyang-III* class destroyer, with 7500 tons displacement, is the most prolific destroyer in PLAN fleet. With 25 examples operational and more hulls in production, these destroyers are equipped with 64 VLS and carry similar weapon systems as Type-055.¹¹ Six ships of its predecessor class, called Type-052C *Luyang-II*, are also

⁷ International Institute for Strategic Studies (IISS). (2024). *The Military Balance 2024* (pp. 19–20).

⁸ Dahm, J. M., & Singer, P. W. (2024, June 6). China's latest aircraft carrier is much more than a big ship. *Defense One*. <https://www.defenseone.com/ideas/2024/06/chinas-latest-aircraft-carrier-much-more-big-ship/397188/>

⁹ Wertheim, E. (2023, March). Type-55 *Renhai* class cruiser: China's premier surface combatant. *U.S. Naval Institute Proceedings*. <https://www.usni.org/magazines/proceedings/2023/march/type-055-renhai-class-cruiser-chinas-premier-surface-combatant>

¹⁰ Luck, A. (2024, May 28). China launches 10th Type-055 vessel. *Naval News*. <https://www.navalnews.com/naval-news/2024/05/dalian-shipbuilding-launches-type-055-increases-production-at-dagushan/>

¹¹ Ozburk, T. (2023, March 12). China launches two more Type-52DL destroyers in Dalian. *Naval News*. <https://www.navalnews.com/naval-news/2023/03/china-launches-two-more-type-052dl-destroyers-in-dalian/>

operational.¹² Beside this, numerous older generation destroyers, after necessary upgrades, are in active service with PLAN.

PLAN has large inventory of frigates of varying capability. With 39 ships deployed, Type-54A *Jiangkai-II* class frigate is currently the most capable and most abundant frigate in PLAN inventory. These 4200 tons frigates have multi-mission capabilities but are primarily configured for ASW duties. After Type-054A, China has launched new 5000 tons heavy Type-054B class frigate which will carry more advance sensors and weapon systems and will replace outdated frigates in PLAN arsenal.¹³ Beside destroyers and frigates, PLAN operates large fleet of corvettes and missile boats which are designed for littoral operations. Type-056A *Jiangdao* ASW corvettes and Type-22 *Houbei* class FACM account for a substantial share of PLAN surface fleet.

PLAN underwater fleet, comprising of conventional as well as nuclear submarines, has been modernized and expanded in recent years. Currently, bulk of PLAN submarine fleet consists of conventionally powered submarines – including submarines equipped with Air Independent Propulsion System (AIP). Standard conventional submarines fleet consists of 08 improved *Kilo* class, 12 Type-39G *Song* class, and 04 vintage Type 35 *Ming* class submarines.¹⁴ While AIP equipped submarine fleet comprise of 20 Type-39A/B/C *Yuan* class submarines.¹⁵ China has recently launched Type-39C class of AIP equipped submarine which is being mass produced to replace obsolete non-AIP submarines. U.S. Department of Defense estimates that 42 Type-39 A/B/C *Yuan* class submarines will be operation in PLAN by 2025.¹⁶

PLAN nuclear submarine fleet is relatively moderate in size. Two Type-093 *Shang* class and four Type-093A *Shang-II* class SSNs are currently operational with three Type-91 *Han* class SSNs in active reserve.¹⁷ Sea-based second strike capability is provided by six Type-94 *Jin* class SSBN each armed with 12 JL-02 SLBMs providing strike range of 7,000kms.¹⁸

China is also steadily replacing older nuclear attack and nuclear ballistic submarines with newer versions. PLAN is working to develop new class of nuclear attack submarine, designated Type-95, which will be equipped with VLS tubes for launching submarine launch cruise missiles (SSCMs). The induction of SSGNs will essentially enhance the operational flexibility of PLAN's nuclear attack submarine fleet. Similarly, Beijing's future sea-borne assured second strike capability will be structured on next generation SSBN, designated Type-096. These SSBNs will be integrated with new JL-03 SLBM which will provide estimated strike envelop in excess of

¹² Sea Forces. (n.d.). Type-52C Luyang-II class guided missile destroyer. *Sea Forces*.

<https://www.seaforces.org/marint/China-Navy-PLAN/Destroyers/Type-052C-Luyang-II-class-DDG.htm>

¹³ Luck, A. (2024, January 18). Chinese Navy next-generation frigate starts builder trials. *Naval News*.

<https://www.navalnews.com/naval-news/2024/01/chinese-navy-next-generation-frigate-starts-builder-trials/>

¹⁴ International Institute for Strategic Studies (IISS). (2024). *The Military Balance 2024* (p. 256).

¹⁵ International Institute for Strategic Studies (IISS). (2024). *The Military Balance 2024* (p. 256-257).

¹⁶ Sutton, H. I. (2021, July 8). Chinese Navy's latest Type-39C Yuan class. *Covert Shores*.

<http://www.hisutton.com/Chinese-Type-039C-Yuan-Class-Submarine.html>

¹⁷ International Institute for Strategic Studies (IISS). (2024). *The Military Balance 2024* (p. 256).

¹⁸ Rajagopalan, R. P. (2023, October 31). China's growing submarine capabilities. *The Diplomat*.
<https://thediplomat.com/2023/10/chinas-growing-submarine-capabilities/>

10,000kms and will be capable of delivering multiple-nuclear warhead per missile.¹⁹ Estimates suggest that PLAN underwater fleet will grow to 76 submarines by 2030 including 08 SSBNs, 12 SSNs/SSGNs, and 55 SSKs/SSPs.²⁰

China's is augmenting its amphibious warfare potential by commissioning more and bigger amphibious warfare vessels. Beside numerous small landing ship transport (LST) vessels, China has commissioned eight Type-71 *Yuzhoo* landing platform dock (LPD).²¹ These 20,000 ton warships can carry amphibious missions by employing marines through watercrafts as well as rotary-wing aircrafts. More importantly, four Type-75 *Yushen* landing helicopter docks (LHDs) have been put into service in recent years.²² Displacing approximately 40,000 tons, these vessels can deploy dozen rotary-wing aircrafts and landing crafts, and also function as command and control vessels for large scale amphibious operations. Follow up and even more capable LHD, designated Type-76 LHD, is in developmental phase.²³ Acting as mini-aircraft carrier, this LHD class will reportedly be equipped with EMALS for manned and unmanned fixed-wing aircrafts and will act as crucial asset for regional power projection.

Beside warships, submarines, and aircrafts, land based anti-ship ballistic missiles (ASBMs) can also be prominently featured in China's A2/AD strategy. DF-21D and DF-26 are road mobile ASBMs with ranges of 1,500km and 4,000kms respectively. These missiles serve as additional layer of China's A2/AD envelop, enhance PLAN's defensive perimeter and serve as deterrent against potential adversaries in the Western Pacific.²⁴

China's naval modernization reflects a comprehensive and strategic effort to transform its navy into a formidable blue-water force capable of protecting its expanding maritime interests. PLAN technological developments have significantly enhanced its operational range, power projection, and combat readiness. As China continues to invest in its naval capabilities, it is poised to play a more influential role in regional and global maritime security dynamics, challenging the traditional naval superiority of United States and potentially redefining the strategic calculus of the Indo-Pacific region.

4. United States Navy (USN): Current Strength and Modernization

The United States Navy (USN) is most advanced navy in the world and operates a diverse fleet that includes nuclear powered aircraft carriers, nuclear submarines, destroyers, and amphibious assault ships, along with a growing number of unmanned vessels. USN currently operates 296 warships of all types and is structured into six fleets.²⁵ Designed for power

¹⁹ Caggiano, L. (2023, May). China deploys new submarine-launched ballistic missile. *Arms Control Association*. <https://www.armscontrol.org/act/2023-05/news/china-deploys-new-submarine-launched-ballistic-missiles>

²⁰ Congressional Research Service. (2022, November 10). China naval modernization: Implications for U.S. Navy capabilities. *Congressional Research Service*, 15.

²¹ International Institute for Strategic Studies (IISS). (2024). *The Military Balance 2024* (p. 257).

²² International Institute for Strategic Studies (IISS). (2024). *The Military Balance 2024* (p. 257).

²³ Luckm A. (2024, June 17). Type-76 amphibious carrier takes shape in Shanghai. *Naval News*. <https://www.navalnews.com/naval-news/2024/06/type-076-amphibious-carrier-takes-shape-drone-airwing-emerges/>

²⁴ Filipoff, D. (2023, May 01). China's anti-ship firepower and mass firing scheme. *CIMSEC*. <https://cimsec.org/fighting-dmo-pt-8-chinas-anti-ship-firepower-and-mass-firing-schemes/>

²⁵ Congressional Research Service. (2022, November 10). China naval modernization: Implications for U.S. Navy capabilities. *Congressional Research Service*, 7.

projection on global scale, U.S. Navy is the largest navy in world when net-tonnage is taken into account.

The U.S. Navy aims to expand its fleet to as many as 523 ships, comprising 373 manned and 150 unmanned vessels.²⁶ However, the likelihood of achieving a fleet of this size is quite low. On average, it takes 10-15 years for a new class of ship to progress from the design phase to deployment.

U.S. Navy currently operates 11 nuclear powered air craft carriers. Existing Nimitz class aircraft carriers are gradually being replaced by Ford class aircraft carriers. Unlike Nimitz class, Ford class incorporates cutting edge technologies including Electromagnetic Aircraft Launch System (EMALS) and advanced arresting gear which significantly improves aircraft launch and landing mechanisms. These carriers serve as the centrepiece of the US Navy's power projection capabilities, enabling rapid deployment of air assets globally, supporting military operations, and serving as effective tool of naval diplomacy.

The U.S. carrier aviation has witnessed significant improvement in recent decades. Each carrier aviation wing comprising of fifth generation F-35B stealth aircrafts, advance blocks of F/A Super Hornet fighter aircrafts, E/A-18G Growler electronic warfare (EW) aircrafts, E-2D Hawkeye airborne early warning (AEW) aircrafts, and MH-60 SeaHawk ASW helicopters, provides formidable multi-spectrum combat capability. Additionally, carrier based drones, like MQ-25 Stingray are being deployed from flat-tops to serve as unmanned tanker as well as ISR asset.²⁷

Although U.S. Navy is undertaking multi-domain modernization but its surface fleet modernization efforts have suffered numerous set-backs in past decade. The failure of Zumwalt stealth destroyer program and Littoral Combat Ship (LCS) program has undermined U.S. drive to expand the number of warships by and replace older hulls. Under Zumwalt program, USN was planning to commission 32 warships equipped with futuristic technologies.²⁸ However, higher cost and reliability concerns regarding weapon systems compelled U.S. Navy to reduce the total order to mere three warships.²⁹

Similarly, United States' Littoral Combat Ships program, consisting of Freedom class and Independence class warships, has also failed to meet the intended objectives. These two different classes of multi-mission warships are modular design and could be equipped with varying mission module depending upon mission requirement. In total, 35 warships consisting of 19 Independence class and 16 Freedom class were planned with option of more batches. However, both classes of LCS have suffered from propulsion issues, structural failures, high

²⁶ LaGrone, S. (2022, July 26). Navy's Force Design 2045 plans for 373-ship fleet, including 150 unmanned vessels. *USNI News*. <https://news.usni.org/2022/07/26/navys-force-design-2045-plans-for-373-ship-fleet-150-unmanned-vessels>

²⁷ Newdick, T. (2021, December 2). Navy's MQ-25 Stingray tanker drone goes aboard a carrier for the first time. *The War Zone*. <https://www.twz.com/43361/navys-mq-25-stingray-tanker-drone-goes-aboard-a-carrier-for-the-first-time>

²⁸ Congressional Research Service. (2022, August 26). Navy DDG-51 and DDG-1000 destroyer program: Background and issues for Congress. *Congressional Research Survey*, 24. <https://sgp.fas.org/crs/weapons/RL32109.pdf>

²⁹ Congressional Research Service. (n.d.). Navy DDG-51 and DDG-1000 destroyer program. *Congressional Research Survey*, 24–27.

maintenance costs and poor availability rate. Similarly, the revolutionary modular design also has proven to be too complicated to be practical. These factors have compelled U.S. Navy to prematurely retire LCS warships.³⁰ The phasing out of LCS fleet has reduced overall numerical strength of U.S. Navy.

To compensate aforementioned programs failures, USN has initiated Constellation class frigate program for producing 20 advance multi-mission frigates.³¹ Based on proven design, these frigates are meant to restore numerical gaps while providing next generation combat capabilities. However, construction of very first Constellation class frigate is already three years behind schedule.³² Issues like increment in weight and design instability has compromised the delivery timeline of entire program.³³ Similarly, DDG(X) program, directed to serve as replacement of Ticonderoga class cruisers and old Arleigh Burke class destroyers, will materialize only in late 2030s.³⁴ In parallel, USN will continue to commission advance version (flight-III) of Arleigh Burke class destroyers which currently constitute the backbone of US Navy surface fleet.³⁵

U.S. Navy submarine force purely comprise of nuclear submarines. Currently, 50 nuclear attack submarines (SSNs), 04 nuclear cruise missile submarines (SSGNs), and 14 nuclear ballistic missile submarines (SSBNs) are operational in USN. Ohio class SSBNs, each equipped with 20 Trident D-5/D-5LE Submarine Launch Ballistic Missiles (SLBMs), constitute the sea-leg of US nuclear triad and provides assured second strike capability.³⁶ Additional four Ohio class submarine have been modified to carry tomahawk cruise missiles. Three classes of nuclear attack submarines including Virginia, Seawolf, and Los Angeles, are operational with duties including destroying enemy vessels, supporting carrier operations, and undertaking surveillance.³⁷

U.S. Navy is developing next generation submarines and in parallel also up-arming its submarine fleet with more capable weapon systems. Colombia class SSBN project is underway to fully replace aging Ohio class SSBNs by 2042. In total, 12 Colombia class SSBNs are planned and project has been regarded as top-priority by USN since 2013.³⁸

³⁰ LaGrone, S. (2022, March 29). All Freedom littoral combat ships in commission tapped for early disposal. *USNI News*. <https://news.usni.org/2022/03/29/all-freedom-littoral-combat-ships-in-commission-tapped-for-early-disposal>

³¹ LaGrone, S. (2018, February 16). Navy picks five contenders for next-generation frigate program. *USNI News*. <https://news.usni.org/2018/02/16/navy-picks-five-contenders-next-generation-frigate-ffgxprogram>

³² Shelbourne, M. (2024, April 3). Constellation frigate delivery delayed three years. *USNI News*. <https://news.usni.org/2024/04/02/constellation-frigate-delivery-delayed-3-years-says-navy>

³³ Trevithick, J. (2024, May 30). Navy's new Constellation-class frigate is a mess. *The War Zone*. <https://www.twz.com/sea/navys-new-constellation-class-frigate-is-a-mess>

³⁴ LaGrone, S. (2024, January 10). Navy wants three-year overlap between Arleigh Burkes and DDG(X). *USNI News*. <https://news.usni.org/2024/01/10/navy-wants-3-year-overlap-between-arleigh-burkes-and-ddgx-considering-propulsion-system>

³⁵ Shelbourne, M. (2022, April 25). Navy puts forth 9-ship multi-year deal for Arleigh Burke destroyers. *USNI News*. <https://news.usni.org/2022/04/25/navy-puts-forth-9-ship-multi-year-deal-for-arleigh-burke-destroyers>

³⁶ NTI. (n.d.). United States. *NTI*. <https://www.nti.org/countries/united-states/>

³⁷ NTI. (2024, March 6). United States submarine capabilities. *NTI*. <https://www.nti.org/analysis/articles/united-states-submarine-capabilities/>

³⁸ Congressional Research Service. (2024, February 16). Navy Columbia (SSBN-826) class ballistic missile submarine program: Background and issues for Congress. *Congressional Research Service*.

Beside induction of new vessels, U.S. Navy is replacing its traditional missile systems with superior examples. Harpoon anti-ship missile is being replaced by Naval Strike Missile (NSM) which offers better range, advance targeting capability, and stealth characteristics. Tomahawk Block-V cruise missile also offers significant improvement over older versions in terms of precision, range, guidance system, payload modularity, and low-observability.

In the domain of hypersonic missiles, U.S. Navy has plans to equip its three Zumwalt destroyers and twenty Virginia class SSNs with Conventional Prompt Strike (CPS) hypersonic missiles by 2025.³⁹ Hypersonic missiles, when launched from stealth platform, will provide unmatched combat potential. It will enhance U.S. Navy's ability to conduct high-speed, long-range strikes potential while providing advantage associated with element of surprise, low observability, and survivability in parallel. The integration of next generation missile systems will not only strengthen the US Navy's naval warfare capabilities but also aligns with broader U.S. military objectives to maintain a technological edge and ensure strategic superiority in an increasingly contested maritime domain.

5. Comparative Assessment of Naval Forces and Related Factors

PLAN, supported by China's vast industrial complex, has produced more naval vessels than any other nation in past decade. As discussed before, PLAN currently operates largest number of naval vessels in world. However, unlike U.S. Navy, majority of PLAN vessels are smaller in size. Therefore in terms of net-tonnage, U.S. Navy displaces 4.5 million tons, while PLAN displaces 2.0 million tons.⁴⁰ But U.S. Navy has to maintain and protect its interests at the global scale. This dilutes U.S. Navy ability to concentrate overwhelming combat prowess against China. On flip side, China can direct its entire fleet in its immediate maritime neighbourhood. This significantly strengthens PLAN position against U.S. Navy as it can numerically overwhelm U.S. forces' qualitative superiority.

It's worth noting that China is now mass producing larger vessels with heavier tonnage and superior weapon systems, and is narrowing down the qualitative gap against American counterpart. China has already switched to medium STOBAR carriers to bigger and more capable CATOBAR carriers. Next generation LHDs, destroyers, and frigates, all are bigger in size and weapon load capacity than current generation counterparts. Additionally, Chinese shipyards have much higher production rate than American shipyards. Combine all these factors, it can be predicted that PLAN will be in dominant position in Indo-Pacific in coming years. A comparative account of major warships operated by both navies is given below.

<https://s3.documentcloud.org/documents/24434027/report-to-congress-on-columbia-class-ballistic-missile-submarine-program-feb-16-2024.pdf>

³⁹ Axe, D. (2022, November 20). The U.S. Navy is about to pack hypersonic missiles into its new stealth destroyers. *Forbes*. <https://www.forbes.com/sites/davidaxe/2022/11/20/the-us-navy-is-about-to-pack-a-dozen-hypersonic-missiles-apiece-into-its-new-stealth-destroyers/>

⁴⁰ Marrone, A., & Calcagno, E. (2023). Naval combat systems: Development and challenges. *Istituto Affari Internazionali*, 21; 32.

Naval Vessel Type	People's Liberation Army Navy (PLAN)	United States Navy (USN)
Nuclear Powered Aircraft Carrier (CVN)	00	11
Conventional Powered Aircraft Carriers (CV)	02	00
Landing Helicopter Dock (LHDs)	03	09
Landing Platform Dock (LPDs)	08	22
Cruisers (CG)	08	15
Destroyers (DDGs)	42	73
Frigates (FFGs)	49	00
Corvettes/Littoral Combat Ships (FFLs/LCS)	50	23
Conventional Submarines (SSK)	46	00
Nuclear Attack Submarines (SSNs/SSGNs)	06	52
Nuclear Ballistic Missile Submarines (SSBNs)	06	14

Numeric Comparison of Major Naval Vessels of Current PLAN and U.S. Navy⁴¹

Despite a favourable future outlook, the contemporary deficiencies on PLAN part cannot be ignored at all. Perhaps the biggest limitation is lack of experience regarding modern naval warfare in general and blue water operations in particular. U.S. Navy has rich history of employing aircraft carriers and other assets with synergy. Such learning is either derived from exercises or is purely theoretical in case of China. Beside gaps in experience in planning and training, Chinese naval systems are also not combat proven. Although PLAN has deployed naval warships for low-end threats like piracy and traffickers, but no Chinese vessel has ever seen high-mid intensity conflict in modern era. This suggests that PLAN growing might is untested and has high probability of suffering from unintended setbacks during conflict. China has taken measures to overcome these key deficiencies. Participation in joint exercises with allies, use of high-end tools like artificial intelligence (AI) and machine learning (ML) to better plan and execute training and planning can help to mitigate such gaps to considerable extent.⁴²

Beside numeric or tonnage comparison of both navies, there are numerous other factors which should be taken into account. Foremost, it's important to understand that Indo-Pacific theatre – characterized by maritime domain, is very different from that of Cold War's theatre which was predominately continental in nature. Indo-Pacific is about sea-control and sea-denial strategies where synergy between all dimensions of forces in maritime domain is required.

⁴¹ International Institute for Strategic Studies (IISS). (2024). *The Military Balance 2024*. For PLAN: 256–259; For USN: 39–53.

⁴² Bresnick, S. (2024, April 3). China bets big on military AI. *CEPA*. <https://cepa.org/article/china-bets-big-on-military-ai/>

By design, sea-denial strategies are easier to employ than sea-control strategies.⁴³ Sea-denial focuses on preventing and deterring adversary from using specific maritime areas using assets like anti-ship missiles, submarines, and mines. China has invested heavily in this regard by developing multiple layered A2/AD network comprising of land based anti-ship ballistic missiles, MPAs equipped with long-range missiles, long-range supersonic and hypersonic missiles, and multi-range air-defense systems. This A2/AD network is supported by robust intelligence surveillance and reconnaissance (ISR) systems consisting of satellites, manned Airborne Warning and Control System (AEWCs), Electronic Intelligence (ELINT) aircrafts, radars, and drones linked together via data-link and centralized command & control (C&C) system.

In contrast, U.S. Navy is historically designed and operated for sea-control missions. Therefore, it needs much superior capability to successfully breach sea-denial envelop of China, sustain presence in increasingly complex and threatening environment, and achieve requisite objective without suffering unbearable losses. This necessitates a more extensive and technologically advanced fleet, which is far more resource-intensive. U.S. has invested significantly in this regard. Besides producing more and superior naval vessels, numerous other measures are being taken. United States' answer to China's A2/AD strategy is multi-domain operations and archipelagic defense, aiming to penetrate and disintegrate the enemy's A2/AD system to exploit the benefits of the regained freedom of movement to establish a favorable environment for the U.S. forces.⁴⁴ Measures like operationalization of F-35 B/C stealth aircrafts from aircraft carriers as well as LHDs, augmentation of ship-borne air-defense systems, strengthening of network centrality, advancement in early-warning systems, introduction of carrier-based drones, employment of low-radar signature cruise missiles, development of hypersonic missiles, standardization of long-range tilt-rotor crafts, proliferation of unmanned surface and underwater vessels, raising of forwards military bases on friendly nations, and improvement in logistical network are one of the few important examples in this regard.

One common attribute between Cold War model and contemporary Indo-Pacific model is the *containment strategy* of United States. Just like U.S. strategy of containing Soviet Union by encircling it with allies and off-shore military bases, Washington is attempting to restrict China within first island chain in Indo-Pacific. First island chain stretches from Japan to Taiwan and eventually leads to South China Sea. Another chain, known as, second island chain, runs from Japan to Guam and ends at Indonesia. These chains represent physical barrier within which United States want to contain China's military forces in general and PLAN in particular. Washington is deepening military relations with Western Pacific nations to increase their military capability and also station U.S. forces and military infrastructure.⁴⁵

Beside naval modernization, a concurrent approach followed by United States is formulation of alliances and establishment of security arrangements. Quadrilateral Security

⁴³ Chang, C. (2018, September 12). Nature of sea denial and sea control strategies. *CIMSEC*. <https://cimsec.org/the-nature-of-sea-control-and-sea-denial/>

⁴⁴ Meraner, F.-L. R. (2023, February 9). China anti-access/area denial strategy. *TDHJ*. <https://tdhj.org/blog/post/china-a2ad-strategy/>

⁴⁵ Brands, H., & Cooper, Z. (2024, March 12). Dilemmas of deterrence: United States' smart new strategy has six daunting trade-offs. *CSIS*. <https://www.csis.org/analysis/dilemmas-deterrence-united-states-smart-new-strategy-has-six-daunting-trade-offs>

Dialogue (Quad), established in 2007, now provides an informal platform for mutual collaboration between United States, Japan, Australia, and India. Although not a military alliance, Quad has played important role in deepening military co-operation among all four nations as is evident in collective participation of Quad nations in Malabar exercises.⁴⁶ AUKUS, a trilateral security arrangement between Australia, United States, and United Kingdom, for providence of eight nuclear attack submarines (SSNs) and other modern military hardware to Australia, is key example how Washington is up-arming its regional allies for counterbalancing China.⁴⁷ Furthermore, the defensive posture of Japan is gradually incorporating offensive capabilities with the support of United States.⁴⁸ Similarly, Indo-U.S. bilateral security agreements like LEMOA, COMCASA and BECA, are directed to enhance logistics support, communication comparability, intelligence sharing, and procurement of high-end military technologies.⁴⁹ By formulating such militarized alliances and security arrangements, Washington seeks to collectively counter Chinese expansion and retain U.S. dominated balance of power in the Indo-Pacific region.

The Indo-Pacific related alliances and arrangements have numerous key shortcomings and thus cannot be regarded equivalents of NATO. Unlike Article-V of NATO treaty, there is no clause of collective defense in any Indo-Pacific specific agreement conducted by United States. Thus, there is no legal binding for any Washington or its allied nation to commit for collective defense and support each other directly through military means in case of crisis with China. As a result, these alliances are more about strategic alignment and regional stability rather than a binding defense pact, limiting their deterrence power compared to NATO in the context of the Indo-Pacific naval competition.⁵⁰

Another major shortcoming is limited compatibility in terms of military training, doctrines, equipment, and operational arts between U.S. forces and its Indo-Pacific allies. Unlike NATO, where decades of integrated planning and standardized procedures have created a highly cohesive military alliance, the Indo-Pacific allies of the U.S. have diverse military structure and varying levels of training standards and equipment's technology. Thus, requisite combat interoperability, despite shared strategic objectives and joint exercises, cannot be generated in case of conflict.

In nutshell, both United States and China have their strengths and vulnerabilities when power competition in Indo-Pacific is taken into consideration. The future balance of power will be determined by the ability of each state to augment its strengths and overcome its vulnerability.

⁴⁶ Sharma, A. (2023, September 1). Malabar exercise bolsters Quad group amid growing strategic challenge in the Indo-Pacific. *Australian Institute of International Affairs*. <https://www.internationalaffairs.org.au/australianoutlook/the-malabar-exercise-bolsters-quad-group-amid-growing-strategic-challenge-in-the-indo-pacific/>

⁴⁷ Cheng, M. (2022). AUKUS: The changing dynamic and its regional implications. *European Journal of Development Studies*, 2(1), 1–7.

⁴⁸ Bradford, J. F. (2022). U.S.-Japan alliance modernization and maritime Southeast Asia. *Asian Survey*, 62(4), 666–694.

⁴⁹ Mann, B. S. (2024). Demystifying Indo-U.S. natural and strategic partnership. *International Studies*, 60(3), 349–368.

⁵⁰ Andrews, D. M. (2024, March 22). Faux alliances: AUKUS and Quad are no Asian NATO. *Australian Institute of International Affairs*. <https://www.internationalaffairs.org.au/australianoutlook/faux-alliances-aukus-and-the-quad-are-no-asian-nato/>

For United States, it is important to construct and commission next generation warships with cutting-edge technologies as per schedule. Delays or cost overrun will undermine U.S. Navy combat potential. Similarly, the progression of Washington's strategic agreements with Indo-Pacific allies will be key determinant. If Washington manages to replicate NATO in Indo-Pacific, it will greatly increase probability of USA dominating China and sustaining its order in the World. The likelihood of this scenario, despite all efforts involved, appears little. Otherwise, China is expected to gradually tilt the future balance of power in its favor which will not only transform the Indo-Pacific but the future global system as well.

6. Conclusion

China and the United States fast-track naval modernization efforts are gradually reshaping the power dynamics in Indo-Pacific region. China is modernizing and expanding PLAN to safeguard its diversifying interests and protect maritime trade. On the other hand, the United States aims to maintain its dominance by ensuring superiority of U.S. Navy in Indo-Pacific theatre. U.S. Navy currently retains significant qualitative and tonnage advantage. However this advantage is rapidly eroding as PLAN is also developing and deploying advance technologies and mass producing bigger and more capable vessels. Beside naval modernization, there are numerous contributing factors which can play decisive role in shaping the regional balance of power. China benefits from its geographical proximity, enabling it to concentrate its forces more effectively within the Indo-Pacific, whereas the U.S. faces the challenge of dispersing its naval assets globally. Furthermore, the U.S. strategy of forming alliances, such as the Quad and AUKUS, seeks to counterbalance China's rise, although these alliances, unlike NATO, lack dedicated collective defence mechanisms. Despite the technological advancements and force expansion on both sides, the balance of power in the Indo-Pacific remains fluid. However, considering the extent of strategic, geographical, political and naval complexities involved for United States, there is higher probability that future balance of power in Indo-Pacific will be more inclined towards Beijing instead of Washington.

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INDO-FRENCH STRATEGIC SYMBIOSIS: IMPLICATIONS FOR
REGIONAL STABILITY OF SOUTH ASIA

Sufian Ullah

Abstract

How does the Indo-French strategic alliance manifest, and what are its implications for regional strategic stability of South Asia? This article answers the above question by analyzing how both powers pursue their vested interests in the contemporary strategic environment. This paper argues that France and India are closely aligned and thriving towards an extensive relationship by facilitating each other in geopolitical endeavours and pursuing deep cooperation in defense and other fields like civil nuclear cooperation. Besides pursuing shared commercial interests, the scope of this alignment is also focused on obstructing China's growing influence in the Indo-Pacific region. The paper identifies key driving factors that facilitate enhanced strategic partnership between the two states. By tracing the origins of strategic relationship, the paper goes on to explain how this partnership is manifested through enhanced collaborations in the nuclear, military and other domains of advanced technologies. The paper explores these aspects in the backdrop of already strained stability in South Asia and finds out how deepening strategic partnership between New Delhi and Paris specifically contributes to India's assertive military posture and strategic ambitions, consequently undermining military balance in the region. It also analyses that cooperation in domain of nuclear capable platforms including Rafale aircraft directly undermine the spirit of nuclear non-proliferation regime.

Keywords: South Asia, Strategic Stability, Indo-Pacific, Geopolitics, Nuclear Non-proliferation

Introduction

With increasing multipolarity in the contemporary international security environment, the evolving India-France strategic alliance raises critical questions about how can it potentially redefine the regional stability of South Asia thereby influencing the global framework on nuclear governance. Recent years have witnessed Indo-French relations flourish, bringing the two nations closer through enhanced strategic cooperation amidst converging geopolitical aspirations. During French President Emmanuel Macron's visit to New Delhi in January 2024, India and France signed an agreement for the joint production of military equipment including conventional Scorpene submarine for Indian Navy and production of H125 helicopters through industrial partnership.¹ The leadership of two states reaffirmed to bolster as well as expand the scope of their strategic partnership. While this bilateral relationship has drawn considerable scholarly focus recently, this paper attempts to explore key strategic convergences and drivers behind this growing bilateral relationship and analyses how it may affect the regional stability of South Asia. For this analysis, this paper comprises three sections: the first one focuses on the driving factors that bring India and France closer to each other, the second section offers salient aspects of Indo-French defense cooperation, and the third section discusses broader implications for regional security and impact on broader international nuclear norms governing mechanism.

India-France Strategic Partnership – Key Drivers and Convergences

India has established broader strategic relationships with several major powers to meet the growing demands of its defense and security sectors. To consolidate its role as a net security provider to the West, the Modi government has engaged in military cooperation with numerous regional and extra-regional powers through effective military diplomacy. In the twenty-first century, India has gradually diminished its reliance on Russian weaponry as the arms imports from Russia have reduced to less than half of New Delhi's total arms imports in the past few years.² Given U.S. attempts to dissuade India away from Russia-supplied defense equipment,³ New Delhi's strategic collaborations with Western states have already increased. In the last more than two decades, India has cautiously engaged the U.S. and France for the acquisition of advanced and sophisticated weapons-related technologies, reducing its reliance on Moscow.

Against the above backdrop, India and France established a renewed strategic partnership in 1998.⁴ Since then, France has emerged as India's most trusted and uncontroversial strategic partner. The Ministry of External Affairs in New Delhi notes that this strategic partnership has grown to encompass several sectors including security, space, defense, and civil nuclear cooperation.⁵ The sense of shared convergences of interests has brought Paris and New Delhi

¹ Manoj Kumar, "India, France agree on Joint Defence Production," *Reuters*, 27 January 2024, <https://www.reuters.com/world/india-france-agree-joint-defence-production-statement-2024-01-27/>.

² K. Alan Krontadt, "India-Russia Relations and Implications for U.S. Interests," *Congressional Research Service*, 24 August 2022, <https://crsreports.congress.gov/product/pdf/R/R47221/3>.

³ K. Alan Krontadt and Shayerah I. Akhtar, "India-U.S. Relations: Issues for Congress," *Congressional Research Service*, 16 June 2023, <https://sgp.fas.org/crs/row/R47597.pdf>.

⁴ "India – France Relations," *Ministry of External Affairs, Government of India* (Jan 2016), available at http://www.mea.gov.in/portal/foreignrelation/france_jan_2016.pdf

⁵ "India France Relations," *Ministry of External Affairs*, August 2013, https://www.mea.gov.in/Portal/ForeignRelation/India-France_Relations.pdf, accessed on 19 May 2024.

closer to each other. This strategic partnership is a confluence of three common and interlinked characteristics that include the shared, yet not identical, vision towards the broader Indo-Pacific region. This involves: first, the containment of China's rise; second, pursuing amendments in the contemporary international order that do not seek to comprehensively revise the existing order but adapt it to changing circumstances according to the evolving geopolitical aspirations of both state,⁶ and third, a strategic relationship based on arms transfer and civil nuclear cooperation largely driven by commercial interests. The converging characteristics of this bilateral relationship are discussed below.

Pivot to Indo-Pacific: Containing the Rise of China

India and France endorse the Indo-Pacific concept that brings them closer to each other. Both New Delhi and Paris hold distinct views about the Indo-Pacific and this difference is not based on geographical considerations, but rather the strategic construction of this concept. Indo-Pacific is a 'geographical translation of a strategic concept' that aims to provide a shared framework to define policies.⁷ The two states share a unique ground of bilateral relations with the U.S. and China and thus have their distinct approaches towards the Indo-Pacific concept and respective responses to the rise of China.

France believes that geographically the Indo-Pacific region stretches from "Djibouti to French Polynesia and shores of East and Southern Africa to American coasts".⁸ France considers itself an important player and a resident power in the region. It possesses more than 2 million square kilometres of territories in the Indian Ocean, a dozen islands in these seas and 200 nautical miles of Exclusive Economic Zones (EEZ) around each one of these. It constitutes nine out of eleven million (almost 93%) of France's EEZ falling in the Indo-Pacific region.⁹ France also considers itself the guardian of the strategic route between the Cape of Good Hope and the Gulf countries. Although it is generally recognized as an important European power, France considers itself as an important stakeholder more specifically in the Indian Ocean Region (IOR) owing to its perceived littoral and economic interests.¹⁰ It possesses two significant islands including Reunion Island and Mayotte in the region that host a dedicated force of 2000 French troops,¹¹ while two patrol boats and French frigates are based on Reunion Island.¹² Control over

⁶ Mariya Gringberg, "Flexibility in Order: Three Conditions that Preclude Change in International Order," *Notre Dame International Security Center*, 13 March 2021, https://ndisc.nd.edu/assets/423360/grinberg_ndisc_seminar_12.03.21.pdf.

⁷ Fraderic Grare, "Exploring Indo-Pacific Convergences: The Australia-France-India Trilateral Dialogue," *The Washington Quarterly* 43, no. 4 (2020): 157.

⁸ Ibid: 159.

⁹ Ministry of the Armed Forces, "France's defence strategy in the Indo-Pacific. Paris: Ministère des Armées," (2019), https://dkiapcss.edu/wp-content/uploads/2020/02/France-Defence_Strategy_in_the_Indo-Pacific_2019.pdf, accessed on 8 April 2024.

¹⁰ David Brewster, "The Mozambique Channel is the next security hotspot," *The Interpreter*, 19 March 2021, <https://www.lowyinstitute.org/the-interpreter/mozambique-channel-next-security-hotspot>.

¹¹ Charles Millon, "France's Strategy in the Indo-Pacific," *Geopolitical Intelligence Services*, 21 February 2022, <https://www.gisreportsonline.com/r/frances-strategy-in-the-indo-pacific/>.

¹² Alistair Cole and Jean-Pierre Cabestan, "The Ties That Bind: Protection and Projection in France's Indian Ocean Islands of Mayotte and Réunion," *Geopolitics* (2024): 15, <https://www.tandfonline.com/action/showCitFormats?doi=10.1080/14650045.2023.2294794>.

these islands is key for France not only to uphold its Indo-Pacific strategy but also to promote other perceived interests like military protection, security concerns, economic interests and so on.¹³ French military bases in Djibouti and the United Arab Emirates further augment its presence and ability to exert influence in the IOR.¹⁴

On the other hand, India declared its Indo-Pacific doctrine in 2018 during Prime Minister Narendra Modi's address at Shangri La Dialogue in June 2018 in which he emphasized the need to prevent the return of geopolitical rivalry in the region. New Delhi's vision of the Indo-Pacific is often seen as an extension of its Act East Policy.¹⁵ While it proclaims not to align with any power in the ongoing geopolitical rivalry, New Delhi's closer strategic collaboration with Washington is focused on its geopolitical priorities in the region. Nonetheless, despite having a confrontational relationship with Beijing, New Delhi cautiously maintains a semblance of cooperation with the former. France's presence in the region is traditionally not contested. To further augment its presence, India appears as the most obvious partner to help France achieve its desired goals. Recent years have witnessed a surge in maritime security collaboration between the two states.¹⁶

The evolving geostrategic environment in the region further serves as an enabling factor to draw India and France closer to each other. The gradually decreasing American hegemony worldwide, China's growing influence in Europe, Africa, and the Mediterranean, and strengthening relations between China and Russia are among the key factors encouraging India and France to see each other as key tools to diversify their strategic partnerships. France's Defence Strategy on the Indo-Pacific Region mainly focuses on containing China's likely growing military footprint in the blue seas of Indian Ocean in the coming years.¹⁷ The US-led alliance system has selected India as a balancer and stabilizer against China in the broader Indo-Pacific region. French President Francois Hollande remarked, "India reassures whereas China is scaring".¹⁸ Likewise, while talking about the Indo-French defense relationship, the French Minister of Defence, Jean-Yves Le Drian, said in July 2013, "In the South Asian region, India appears to us as a factor of stability".¹⁹ This confluence of interests brings both states towards closer bilateral cooperation.

France's Indo-Pacific strategy notes that given ongoing strategic competition between China and the U.S., France remains committed to working for a multilateral international order

¹³ Ibid: 2.

¹⁴ Isabelle Saint-Mézard, "The French Strategy in the Indian Ocean and the Potential for Indo-French Cooperation," *RSIS*, March 2015, https://www.files.ethz.ch/isn/189458/PR150312_French-Strategy.pdf, accessed on 01 June 2024.

¹⁵ Allan Gyngell, "To Each Their Own Indo-Pacific," *Australian Outlook (Australian Institute of International Affairs)*, May 29, 2018, <http://www.internationalaffairs.org.au/australianoutlook/to-each-their-own-indo-pacific/>.

¹⁶ Shreya Sinha, "India's Military Modernization: Role and Impact of France," *Journal of Asian Security and International Affairs*, vol 10, no. 3 (2023): 325-341.

¹⁷ "France's defence strategy in the Indo-Pacific," 9.

¹⁸ Yves-Marie Rault, "France & India: Decoding the Strategic Partnership," *Institute of Peace and Conflict Studies*, November 2013, <https://www.files.ethz.ch/isn/175040/SR147-Yves-IndiaFrance.pdf>, accessed on 21 June 2022.

¹⁹ Ibid.

in cooperation with partners like India.²⁰ France's pivot to the Indo-Pacific and the desire to influence norms in the region are directly affected by China's growing presence.²¹ As France considers itself a resident power in the region, it cautiously manages its relations in the dwindling regional balance of power. Experts suggest that France must use the development of trilateral security partnership between Australia, United Kingdom, and United States, commonly known as AUKUS as a moment to explore avenues of deeper cooperation with other Asian and non-aligned states.²² By capitalizing on its assets including geographical resources, consistent military deployments, and relations with local powers, France can assume the role of a balancing power instead of being trapped between the U.S. and China.²³

Aspirations to Amend the International Order – A Shared World View

The liberal international order witnessed the sole primacy of the U.S. after the disintegration of the Soviet Union in 1991. In recent years, the current shape of the international order has come under greater scrutiny as the rise of discontented powers like China and Russia challenge the U.S. ability to solely maintain and preserve the order. The U.S. National Security Strategy 2022 identifies these two states as pursuing revisionist foreign policies.²⁴ There is an apparent consensus that the international order is swiftly shifting towards multipolarity. Although several states including China, India and France emphasize the need to embrace and uphold multipolarity, there is visible disagreement in the perspectives of these states with regards to the shape and composition of this multipolar world order. While some states like close allies of the U.S. endorse an international system led by a single superpower and propagate that power should be distributed among several major powers,²⁵ others call for greater representation of emerging powers in the global decision-making processes.²⁶ This suggests that while some states pursue revisionism, they only desire amendments to the international order instead of complete change or destruction of the existing order altogether.

²⁰ "France's Indo-Pacific Strategy," *Government of France*, https://ambafrance.org/IMG/pdf/en_indopacifique_web.pdf, accessed on 21 June 2024.

²¹ Mahima Duggal, "The China Factor in France's Indo-Pacific Strategy," *Journal of Indo-Pacific Affairs*, Vol 5, No. 4 (2022): 5.

²² Eric Frecon, "France's Third Path for the Indo-Pacific? Credentials and Challenges," *ISEAS Perspective*, Vol 12 (2022): 2.

²³ Jérémy Bachelier and Céline Pajon, "France in the Indo-Pacific: The Need for a Pragmatic Strategic Posture," *Focus Strategique* (2023), https://www.ifri.org/sites/default/files/atoms/files/ifri_bachelier-pajon_france_in_the_indo-pacific_oct2023.pdf, accessed on 21 June 2024.

²⁴ "National Security Strategy," *The White House Washington*, <https://www.whitehouse.gov/wp-content/uploads/2022/10/Biden-Harris-Administrations-National-Security-Strategy-10.2022.pdf>, October 2022, accessed on 18 July 2024.

²⁵ "Great Power Competition: Implications for Defense – Issues for Congress," *Congressional Research Services* (2024): 42, <https://sgp.fas.org/crs/natsec/R43838.pdf>, accessed on 13 April 2024, and "Wang Yi Elaborates on an Equal and Orderly Multipolar World and a Universally Beneficial and Inclusive Economic Globalization," *Ministry of Foreign Affairs of the People's Republic of China*, 07 March 2024, 1.

²⁶ Indian Prime Minister Narendra Modi's address to United Nations General Assembly on 26 September 2020, cited in "Indian and United Nations," *Permanent Mission of India to the United Nations New York*, https://www.mea.gov.in/Images/amb/India_United_Nations_new1022.pdf, accessed on 13 April 2024.

France and India are among those states that increasingly lean towards Western powers in the ongoing geopolitical rivalry, yet they seek selective revision of some of the components of the international order. Observers point out that India, despite its closer inclination towards the U.S. and other Western states after the demise of the Soviet Union, holds a revisionist orientation at the global level.²⁷ Without directly undermining the U.S.-led liberal political order, New Delhi seeks revisionism to alter certain aspects of the world order and emerge as a significant actor in the evolving international system. Revising the composition of the United Nations Security Council (UNSC) and securing its permanent membership is one example in this regard. Additionally, this aspiration is complemented by ongoing attempts to achieve hegemony in the immediate neighborhood and enhance political and military roles in the Indo-Pacific Region.²⁸ In this manner, the Modi government intends India to become an influential, rather than reactive player at the international level.²⁹

France, on the other hand, has politically remained a part of the Western camp since the beginning of the Cold War. Despite a long history of being a unique and dominant European great power, France has played the role of guardian of the liberal international order along with other Western powers. Nevertheless, the successive leaderships in Paris have cautiously pursued the ambition to restore the country's lost status of glory in the post-war years.³⁰ This strategy has been largely based on leveraging France's participation and influential role in key international institutions like the UNSC. Assuming the responsibility to promote shared global objectives, France has vehemently pushed the idea of multipolarity to retain its great power status as opposed to sole leadership of any other state including the U.S.³¹ French leadership has been critical of U.S. policy approaches at the global level on issues like invasion of Iraq, socio-economic imbalances between global North and South, use of veto power by the permanent members of the UNSC particularly on issues of war crimes.³² France also actively supports India's bid for a permanent seat in the UNSC.³³ Additionally, particularly during the leadership of President Trump, President Macron adopted critical approach to oppose the hardcore

²⁷ Takenori Horimoto, "Explaining India's Foreign Policy: From Dream to Realization of Major Power," *International Relations of the Asia-Pacific* 17, no. 1 (2017): 475.

²⁸ Sufian Ullah, "Realignments and evolving nuclear capabilities in the Indian Ocean: effects on security environment," *Australian Journal of Maritime and Ocean Affairs*, Vol 13, No. 4 (2021): 262-273.

²⁹ Harsh V. Pant, "Introduction," in *The Rise of the Indian Navy: Internal Vulnerabilities, External Challenges*, ed., Harsh V. Pant (New York: Routledge, 2016): 6.

³⁰ Pernille Rieker, "French Status Seeking in a Changing World: Taking on the Role as the Guardian of the Liberal Order," *Fr Polit* 16 (2018): 421.

³¹ Alexei Chikhachev, "Saving the Hegemony: French Perspective on the Changing World Order," *Russian International Affairs Council*, 18 September 2023, <https://russiancouncil.ru/en/analytics-and-comments/analytics/saving-the-hegemony-french-perspective-on-the-changing-world-order/>.

³² "Why France wishes to regulate use of the veto in the United Nations Security Council," *Ministère De L'Europe Et Des Affaires Etrangères*, <https://www.diplomatie.gouv.fr/en/french-foreign-policy/france-and-the-united-nations/france-and-the-united-nations/france-and-the-united-nations-security-council/why-france-wishes-to-regulate-use-of-the-veto-in-the-united-nations-security-65315/>, accessed on 13 April 2024, and Elisabetta Martini, "UN Security Council Reform: Current Developments," *Istituto Affari Internazionali*, <https://www.iai.it/sites/default/files/iai0926.pdf>, accessed on 13 April 2024.

³³ Nadia Sarwar, "Expansion of the United Nations security Council," *Strategic Studies* 31, no. 3 (2011): 272.

unilateral policies of the Trump administration. The establishment of Paris Peace Forum, as seen by some experts, is an effort to duplicate the United Nations.³⁴ Therefore, while Paris seeks to preserve the Western-led contemporary world order, it aspires to bring some adjustments in the international system that opposes U.S. hegemony and calls for a balanced distribution of power.

French President Emmanuel Macron seemingly aspires leadership role in the EU after Brexit. Considering President Trump's retreat from commitments to NATO members, Macron urged the EU member states to develop a coordinated defense strategy in which France would occupy a central role.³⁵ To exhibit a more assertive European posture under French leadership, Paris may use its military clout to further its military presence in the Indo-Pacific region and strengthen strategic cooperation with India.³⁶ The U.S. is also not likely to have an objection to such partnerships that do not, at least overtly, seek revisionism, resist China's growing geopolitical and military influence, and share the burden of maintaining acceptable regional and global order.

Therefore, while adhering to the shared goal of preserving liberal international order, both India and France have a common objective of selective revision of the existing international order.³⁷ Soon after the Cold War, India effectively used the shared vision towards multipolarity of the international system to garner strategic benefits from France. Rakesh Sood, India's former Ambassador to France, points out that French leadership has been apprehensive of 'American Triumphalism'.³⁸ In the past two decades, India has effectively used the tag of its 'strategic non-alignment' to its advantage.³⁹ This goes even to the issue of Afghanistan, where the two sides did not actively join the U.S.-led security forces in the war against terrorism. While being a part of the Western alliance system, France strives to maintain strategic autonomy in its decision-making. This has been exemplified in it taking different positions from the U.S. on many issues. On the other hand, despite being inclined towards the U.S. in the past two decades, India has managed to effectively project the image of strategic autonomy. This provides a strong factor for the convergence of interests between Paris and New Delhi. French leadership has even seen India's nuclear policy as an echo of Charles de Gaulle's drive for strategic autonomy.

³⁴ Chikhachev, "Saving the Hegemony".

³⁵ Julie Gaubert, "Macron calls for coordinated EU nuclear defence strategy – with France at Centre," *Euro News*, 02 February 2020, <https://www.euronews.com/2020/02/08/macron-calls-for-coordinated-eu-nuclear-defence-strategy-with-france-at-centre>.

³⁶ "France in the Indo-Pacific: Proactive Power and Solutions Provider," *The Foundation for Strategic Research*, <https://www.frstrategie.org/sites/default/files/documents/publications/fiches-indo-pacifique/2023/anglais/No.4%20-%20Military%20presence%20and%20defence%20diplomacy.pdf>, accessed on 3 December 2024.

³⁷ R Sharma, "UNSC Reform and India's Candidacy: A Critical Analysis," *Journal of Defense Studies*, 10, no. 3 (2016): 37-51, and P Saroj and A Choudhury, "India's quest for Permanent Seat at United Nations Security Council: An Analysis," *International Journal of Research and Analytical Reviews* 5, no. 4 (2018):

³⁸ Rakesh Sood, "Emmanuel Macron is new French President: Merci France – says Europe," *Observer Research Foundation*, 10 May 2017, <https://www.orfonline.org/research/emmanuel-macron-is-new-french-president-merci-france-says-europe>.

³⁹ Saroj K. Aryal and Manish J. Pulami, "India's 'Strategic Autonomy' and Strengthening its Ties with the U.S.," *Przegląd Geopolityczny*, Vol 44, (2023): 116-128.

Confluence between Arms Import and Export

With a surge of 47% in defence exports in the past decade, France has surpassed Russia to become the world's second-largest arms exporter by accounting for 11% of all arms transfers in the world.⁴⁰ The Indian military is one of the key consumers of French-manufactured defence-related equipment. The French strategic cooperation with India is driven by its commercial approach to arms deals, rather than being a 'strategic alliance.' France has traditionally followed this commercial approach previously in its policy of providing military hardware to South Asian countries. Interestingly, at a certain period in history, both Pakistan and India received similar French weapons, like Alouette III helicopters.⁴¹ During the Cold War, France retained ambiguous positions towards conflicts between Pakistan and India. However, this trend changed in the aftermath of Cold War when India apparently drifted away from its traditional policy of non-alignment and inched closer to Western states.⁴² In February 2000, Indian Prime Minister Atal Behari Vajpayee told a French newspaper that France had now to 'make a strategic decision between India, a great democratic power and Pakistan, a little country under military dictatorship'.⁴³ It was a virtual ultimatum to France to openly choose between the two South Asian countries and reflected that India saw Franco-Pakistani relations as a major hindrance to its defense cooperation with France. Resultantly, France has adopted pro-India positions on several issues because of its close ties with the latter. After establishing a strategic partnership with India, New Delhi lures France to offer political support on multilateral forums and expects it to abandon arms transfer to Pakistan. Recently, France supported the Indian stance on terrorism in the aftermath of the Pulwama attack and opposed any formal meetings in the UN to discuss Jammu and Kashmir by maintaining that India-Pakistan differences should be handled bilaterally.⁴⁴

This enhanced strategic cooperation is a product of commercial interests and certain common perceptions and goals fixed at the systemic level. After the collapse of the Soviet Union which was the main supplier of weapons to India, BJP leaders called for massive investment in India's defence capabilities and urged the government to leverage bilateral relations with strong powers like France.⁴⁵ The Congress government introduced

⁴⁰ Pieter D. Wezeman, Katarina Djokic, et al., "Trends in International Arms Transfers, 2023," *SIPRI Fact Sheet*, March 2024, https://www.sipri.org/sites/default/files/2024-03/fs_2403_at_2023.pdf, accessed on 21 June 2024.

⁴¹ Jerrold F. Elkin and W. Andrew Ritzel, "The Indo-Pakistan Military Balance," *Asian Survey* 26, no. 5 (1986): 526.

⁴² Several experts believe that India's foreign policy in post-Cold War era reflected that non-alignment became irrelevant and lost its meaning. For details, see Arijit Mazumdar, "India's Search for a Post-Cold War Foreign Policy: Domestic Constraints and Obstacles," *India Quarterly*, vol 67, no. 2 (2011): 119.

⁴³ Constance Roger, "Indo-French Defence Cooperation: Friends in Need or Friends Indeed?," *Institute of Peace and Conflict Studies* (March 2007): 21, <https://www.files.ethz.ch/isn/55131/IPCS-ResearchPaper7-Constance.pdf>, accessed on 13 April 2024.

⁴⁴ "Security situation in Kashmir – Reply by the Ministry for Europe and Foreign Affairs to a written question in the National Assembly," *French Embassy in New Delhi*, 19 November 2019, <https://in.ambafrance.org/France-calls-for-restraint-in-Kashmir-dispute>.

⁴⁵ Mazumdar, "India's Search for a Post-Cold War Foreign Policy," 165-182.

economic policy in 1991 that aimed to opening the market to external world and look for alternative partners. This attracted high technology and defence sector industries, like Dassault and Aerospatiale, of France to settle in India. This paved way for Foreign Direct Investment and the entry of multinational corporations into India.⁴⁶ It was supplemented by France's diplomatic support to India on several key issues of global significance. In January 1998, President Jacques Chirac argued that India's exclusion from the global nuclear order was unacceptable and must be corrected.

Interestingly, France did not condemn India's nuclear tests conducted in Pokhran in 1998⁴⁷, and did not support Clinton Administration's sanctions against India after Pokhran II (though Russia did) and even advocated lifting up of these sanctions.⁴⁸ C. Raja Mohan notes that the nuclear tests could open further avenues of commercial and political ties of India with France.⁴⁹ France projects India as a responsible nuclear weapons state and based its position on the notions that 'India had been a firm supporter of non-proliferation, it had solely relied on its own capacity to conduct these tests, and it opposed exporting its technical knowledge abroad.'⁵⁰ Similarly, President Chirac also hinted at supporting an Indian permanent seat at the UN Security Council. Emmanuel Bonne, the diplomatic advisor to President Macron, reiterated this support at the 36th session of strategic dialogue between the two states in 2023.⁵¹ This support for the Indian stance is driven by the French view of a multipolar world, instead of a U.S.-dominated unipolar world. This is evident from French political leadership's desire to resist U.S. unilateralism and fears regarding the hegemony of its hyperpower.⁵² More recently, France is one of the major nuclear exporters that support India-specific waiver in its bid for membership of Nuclear Suppliers Group (NSG).⁵³ These aspects signify unequivocal support that provides a strong foundation for an effective strategic partnership between the two states.

The 2008 White Paper of France noted that the Asian powers would grow in importance by 2025, India's gross domestic product could triple over the next two decades, and regional

⁴⁶ Sanjay Gupta, "The changing patterns of Indo-French relations: From Cold War estrangement to strategic partnership in the twenty-first century," *French Politics*, Vol. 7, No. 3/4 (2009): 254.

⁴⁷ Yves-Marie Rault, "France & India: Decoding the Strategic Partnership," *Institute of Peace and Conflict Studies, Special Report* 147 (November 2013), <https://www.files.ethz.ch/isn/175040/SR147-Yves-IndiaFrance.pdf>, accessed on 13 April 2024.

⁴⁸ C. Raja Mohan, "India and Nuclear Weapons," *IPG* 498 (1998): 381, <https://library.fes.de/pdf-files/ipg/ipg-1998-4/artmohan.pdf>, accessed on 13 April 2024..

⁴⁹ Ibid.

⁵⁰ Constance Roger, "Indo-French Defence Cooperation: Friends in Need or Friends Indeed?", *Institute of Peace and Conflict Studies* (March 2007): 11.

⁵¹ "France reiterates support for India as a permanent member of UNSC," *Business Standard*, 05 January 2023, https://www.business-standard.com/article/current-affairs/france-reiterates-support-for-india-as-a-permanent-member-of-uns-123010501186_1.html.

⁵² Michel Duclos, "Jacques Chirac – The Explorer of the Multipolar World," *Institut Moutaigne*, 4 October 2019, <https://www.institutmontaigne.org/en/expressions/jacques-chirac-explorer-multipolar-world>.

⁵³ Ji Yeon-jung, "A Path to NSG: India's Rise in the Global Nuclear Order," *Rising Powers Quarterly*, Vol. 2, No. 3 (2017): 25.

conflicts may get out of control.⁵⁴ France realizes that India is a top client for the purchase of military equipment and given its aspired ambitious role in the region that requires significant military modernization, the Indian defense industry offers a huge market to French arms exports. According to the Stockholm International Peace Research Institute (SIPRI), France has emerged as the world's second-largest arms exporter as its arms exports have increased by 47 percent in the last decade.⁵⁵ The surge in arms exports is because of huge demands for arms in countries like India, which not only emerged as the largest arms importer of the world⁵⁶ but also as the largest recipient of French arms exports.⁵⁷ The French defense cooperation with India constitutes 30% of the total arms imports of the latter.⁵⁸ Premier Modi's assertive foreign policy approach has given further impetus to defense cooperation with France. After Modi visited France in April 2015, French arms exports to India increased by around 715% during 2015-19, and the trend continues to increase to date.⁵⁹

Salient Aspects of Indo-French Strategic Cooperation

The Indo-French cooperation extends to nuclear, military, and high technology domains. Both states established a bilateral strategic relationship in January 1998 when French President Jacques Chirac visited New Delhi.⁶⁰ In a short span of five months, this partnership stood its first test when France only gave a moderate response to Indian nuclear tests and decided to be among the few states that did not sanction New Delhi.⁶¹ India's decision to trigger a nuclear arms race in South Asia marginally strained its relations with countries like the U.S., Germany, Japan, Australia, but the French government's stance gave it breathing space to reassert its status as a so-called responsible nuclear state. This aspect weighs positively on the mindset of Indian leadership and gives impetus to establishing a deeper partnership with Paris. Defense cooperation between the two states has increased multifold since then. India has traditionally bought Mirage 2000 aircraft and Scorpène class submarines from France. India promised to buy 126 Rafale aircraft from Dassault Company, at a time when France confronted challenges to sell

⁵⁴ Bruno Tertrais, "The French White Paper on Defense and National Security: Towards a Stronger and More Streamlined Force," Madrid: Real Instituto Elcano, August 7, 2008, p. 3, and "The French White Paper on Defence and National Security," *Odile Jacob Publishing Corporation* (2008): 33, https://koziej.pl/wp-content/uploads/2015/07/France_White_Paper_English2008.pdf, accessed on 13 April 2024.

⁵⁵ "European arms imports nearly double, US and French exports rise, and Russian exports fall sharply," *Stockholm International Peace Research Institute (SIPRI)*, 11 March 2024, <https://www.sipri.org/media/press-release/2024/european-arms-imports-nearly-double-us-and-french-exports-rise-and-russian-exports-fall-sharply>.

⁵⁶ According to SIPRI estimates, India is the largest arms importer with a 9.8% share of all arms imports all around the world. For details, see Wezeman and Djokic, et al., "Trends in International Arms Transfers, 2023," *SIPRI Fact Sheet*, March 2024,

⁵⁷ "European arms imports nearly double, US and French exports rise, and Russian exports fall sharply," *SIPRI*.

⁵⁸ *Ibid.*

⁵⁹ Elizabeth Roche, "India was world's second-largest arms importer in 2015-19: Report," *Mint*, 10 March 2020, <https://www.livemint.com/news/india/arms-imports-from-russia-decreased-in-2015-19-due-to-drop-in-india-sales-report-11583772984894.html>.

⁶⁰ Jean-Luc Racine, "The Indo-French Strategic Dialogue: Bilateralism and World Perceptions," in Summit Ganguly, *India as an Emerging Power*, (New Delhi: Routledge, 2003), 153.

⁶¹ "Modi's visit to France and Europe-India ties," YouTube video, 1:08:16, posted by "Brookings Institution," 11 July 2023, <https://www.youtube.com/watch?v=cHSPSO0PwXw>.

this platform. This purchase order not only gives huge boost to French defence industry but provides an impetus to bilateral relations between the two states.⁶² India has traditionally depended on Russia for the procurement of defense equipment. However, Rafale's acquisition from France, which holds a technological advantage over Russian Sukhoi 30 MKI, is changing this dynamic by replacing overreliance on Moscow as New Delhi's ultimate strategic ally. During President Macron's visit to New Delhi on India's 75th Republic Day, both sides announced 'defense industrial roadmap' to deepen collaboration on defense production concerning joint development of military hardware.⁶³ The Indo-French defense cooperation aims to go beyond the buyer-seller relationship and create synergies between French expertise in arms production and India's large defense market. This defense cooperation continues in four streams that include the exchange of high-level visits, joint military exercises, training and arms procurement, research and development programs.

India and France regularly hold strategic dialogue to address global issues. Frequent ministerial and high-level military visits give impetus to agreements and cooperative actions. The two sides regularly conduct joint military exercises, which also include participation in multilateral exercises, to achieve maximum interoperability. Joint military exercises *Shakti*⁶⁴ between the two armies are biannually held alternatively in France and India and focus on counter-terrorism operations.⁶⁵ Naval exercise *Varuna*⁶⁶ is held annually in the Indian Ocean or Mediterranean Sea with a special focus on naval operations like air defense, anti-surface warfare, and anti-submarine warfare.⁶⁷ These exercises have been conducted since 1983 and have become an integral part of the bilateral cooperation.⁶⁸ In the air force domain, the two sides regularly conduct exercise Garuda, with the latest being held in Jodhpur India from 26 October to 12 November 2022 which also featured the participation of Rafale fighter aircraft.⁶⁹ These regular military exercises signify the depth of security relations between the two states.

France's vested interests in the Indo-Pacific framework serve as a catalyst for enhancing collaboration with India. The traditional field of strategic cooperation has been officially

⁶² Mukesh Shankar Bharti, "Indo-French Defense Partnership and Regional Balance in South Asia" *The Copernicus Journal of Political Studies*, No 1-2 (2022): 74.

⁶³ Suhasini Haider and Dinakar Peri, "India-France Defence Ties Take a Big Leap," *The Hindu*, 30 January 2024, <https://www.thehindu.com/news/national/india-france-announce-defence-industrial-roadmap-space-defence-cooperation-after-modi-macron-meet/article67780915.ece>.

⁶⁴ *Shakti* literally means "power" in Sanskrit. The term is used for the bilateral military exercise conducted between India and France.

⁶⁵ "France and Security in the Indo-Pacific," *Ministere Des Armees*, https://franceintheus.org/IMG/pdf/France_and_Security_in_the_Indo-Pacific_-_2019.pdf, accessed on 08 June 2024.

⁶⁶ *Varuna* refers to a goddess associated with oceans and water. Naval exercises terms as *Varuna* symbolizes maritime cooperation.

⁶⁷ Dr Sheryn Lee and Dr Ben Schreer, "Europe and the Indo-Pacific: Evolving Security Engagement," in *Asia-Pacific Regional Security Assessment 2022: Key Developments and Trends* (London: The International Institute for Strategic Studies, 2022), 236.

⁶⁸ Remy Davison, "Containing the Dragon: The European Pivot to the Indo-Pacific," in Chin-Peng Chu and Sang-Chul Park, eds., *Strategies in Changing Global Orders: Competition and Conflict versus Cooperation* (Singapore: Springer Nature, 2023), 126.

⁶⁹ Rajeswari Pillai Rajagopalan, "India, France Conclude Garuda Exercise 2022," *The Diplomat*, 18 November 2022, <https://thediplomat.com/2022/11/india-france-conclude-garuda-exercise-2022/> and "Exercise Garuda – VII at Air Force Station Jodhpur," *Ministry of Defence and Press Information Bureau*, 18 October 2022, <https://pib.gov.in/PressReleasePage.aspx?PRID=1871611>, accessed on 08 June 2024.

extended into the maritime domain. In January 2017, the two sides signed a White Shipping Agreement that allows exchanging information regarding commercial shipping and developing a shared picture to track movements at sea.⁷⁰ This was followed by another agreement in October 2017 to expand arrangements for the sharing of information and increase maritime domain awareness. Premier Modi and President Macron signed the Joint Strategic Vision for Cooperation in the IOR on 10 March 2018 during the latter's visit to New Delhi.⁷¹ Both sides agreed to enhance collaboration in the provision of arms and military logistics especially in the western Indian Ocean.⁷² Paris and New Delhi have also signed a Memorandum of Understanding (MoU) on 'Joint Maritime Domain Awareness in the Indian Ocean' in 2019 to enhance cooperation between the Indian Space Research Organisation (ISRO) and France's National Centre for Space Studies (CNES).⁷³ This agreement laid the basis for space cooperation between the two states to collaborate on the joint development of maritime surveillance satellites to cover areas from the Mediterranean Sea to the Indian Ocean.⁷⁴ This framework of collaboration shall provide an operational system to detect, identify, and track different ships. Given the presence of France's military facilities on the Réunion and Mayotte islands, these Indo-French agreements will significantly enhance the Indian Navy's operational flexibility by diversifying its strategic options.⁷⁵

In the domain of military procurement, the major weapons that the Indian Air Force (IAF) has purchased from France include Alouette helicopters, Mirage fighter aircraft, and the induction of 36 nuclear-capable Rafale fighter aircraft that has further strengthened India's air capabilities.⁷⁶ Indian Army has been regularly purchasing Milan anti-tank missiles from France since 1984.⁷⁷ In the naval domain, the most significant deal is the P-75 Scorpene Project that was signed in 2006 and relates to the procurement of six Scorpene-class submarines by India in a joint initiative between French company Direction des Constructions Navales Services and Mazagon Docks Limited (MDL), Mumbai.⁷⁸ These submarines are built under the right to transfer technology that shall boost the technical expertise of the Indian defense industry in

⁷⁰ C. Raja Mohan and Darshana M. Baruah, "Deepening the India-France Maritime Partnership," *Carnegie India* (26 February 2018): 5, https://carnegie-production-assets.s3.amazonaws.com/static/files/Mohan_Baruah_Deepening_The_India_France_Maritime_Partnership.pdf, accessed on 08 June 2024.

⁷¹ Yong Deng, *China's Strategic Opportunity: Change and Revisionism in Chinese Foreign Policy* (Cambridge: Cambridge University Press, 2022), 180.

⁷² Ibid.

⁷³ Mukesh Shankar Bharti & Akshithaa Singh, "India and France bilateral partnership for advancing strategic autonomy in the Indo-Pacific region: Special reference to the Indo-French strategic partnership," *Cogent Social Sciences* Vol 9, No. 1 (2022): 7.

⁷⁴ "India And France To Jointly Build Maritime Domain Awareness Satellites Starting In 2019," *Space Watch Asia Pacific*, <https://spacewatch.global/2018/08/india-and-france-to-jointly-build-maritime-domain-awareness-satellites-starting-in-2019/>, accessed on 4 June 2024.

⁷⁵ Rajeswari Pillai Rajagopalan, "What's behind the rising India-France maritime activity in the Indo-Pacific?," *Observer Research Foundation*, 27 March 2020, <https://www.orfonline.org/research/whats-behind-the-rising-india-france-maritime-activity-in-the-indo-pacific-63753>.

⁷⁶ Gaurav Kampani, "India's Quest for the 'Credible' in the Nuclear Deterrence," in *The Oxford Handbook of Indian Politics*, eds., Sumit Ganguly and Eswaran Sridharan (Oxford: Oxford University Press), 599.

⁷⁷ B. Krishnamurthy, *Indo-French Relations: Prospects and Perspectives* (Michigan: Shipra Publications, 2008), 72.

⁷⁸ Priya Tyagi, "Aerospace and Defence News," in *Indian Defence Review*, ed., Bharat Verma 27, no. 3 (2012): 59-72.

shipbuilding and submarine construction, particularly hull fabrication and systems integration.⁷⁹ Five of these submarines including *INS Kalvari*, *INS Khanderi*, *INS Karanj*, *INS Vela*, and *INS Vagir* have been commissioned in the last few years, while *INS Vagsheer*, the last of these submarines, was launched in April 2022.⁸⁰ India has initiated a new deal worth USD 6 billion for the purchase of 26 Rafale marine aircraft for the Indian Navy's growing aircraft carrier capabilities.⁸¹ Reportedly, France has submitted a positive response to India's tender, and successful materialization of the deal shall increase India's total inventory of Rafale aircraft to 62.⁸² Rafale Marine is an altered version of the original Rafale to suit maritime requirements and is currently being deployed on the French Navy's Charles De Gaulle aircraft carrier. Once deployed aboard *INS Vikrant*, Rafale Maritime shall significantly enhance the Indian Navy's power projection capabilities and its ability to exert sea control in the Indian Ocean.

The Indo-French joint research and development programs significantly contribute towards New Delhi's 'Make in India' drive by facilitating home-grown and state-controlled defense industry. Safran, a leading high-tech industrial group in France, has manufactured rocket propulsion systems for India's Vikas and Ariane rockets used for space launches.⁸³ Safran also has a long-standing cooperation with Hindustan Aeronautics Limited (HAL) in the manufacturing of Shakti (Ardiden) engines for helicopters and Rafale aircraft.⁸⁴ French company Snecma collaborates with DRDO in building Kevari engines for Indian Air Force. French company GIAT also collaborates with DRDO in manufacturing light tanks. The seven largest French defense companies – working in aerospace, naval, and land sectors – participated in the Indian DefExpo held in February 2020. DRDO and French company MBDA are jointly developing short-range surface-to-air missiles for Indian naval defense applications. In the civil-nuclear cooperation sector, the Indo-U.S. nuclear deal opened the international nuclear market for India to access nuclear fuel supply, reactors, and other related equipment and facilities. However, even before the U.S. Congressional approval, France emerged as the first NSG member state to sign an MoU with India in September 2008. Previously, both countries had signed an agreement in March 1983 on the supply of enriched uranium for the U.S.-built nuclear power plant at Tarapur.⁸⁵

⁷⁹ Shreya Sinha, "India's Military Modernization: Role and Impact of France," *Journal of Asian Security and International Affairs*, vol 10, no. 3 (2023): 325-341.

⁸⁰ Ibid and Xavier Vavasseur, "Indian Navy Commissions 5th Scorpene Submarine *INS Vagir*," *Naval News*, 23 January 2023, <https://www.navalnews.com/naval-news/2023/01/indian-navy-commissions-5th-scorpene-submarine-ins-vagir/>.

⁸¹ Manjeet Negi, "France responds to India's bid for acquisition of 26 Rafale Marine fighters," *India Today*, 20 December 2023, <https://www.indiatoday.in/india/story/rafale-marine-aircraft-france-indian-navy-ins-vikrant-ins-vikramaditya-defence-ministry-arms-deal-2478550-2023-12-20>.

⁸² "Indian, French governments negotiating 26 Rafale marine fighter jet deal," *Business Standard*, 14 June 2024, https://www.business-standard.com/external-affairs-defence-security/news/indian-french-governments-negotiating-26-rafale-marine-fighter-jet-deal-124061400348_1.html.

⁸³ "Fifty years of Indo-French Space Cooperation," *Diplomacy and Beyond*, 4 April 2017, <https://diplomacybeyond.com/india-france-indo-french-space-co-operation/>.

⁸⁴ "We propose full technology transfer for engine to power next gen fighters: French manufacturer Safran," *The Economic Times*, 05 Feb 2020.

⁸⁵ "AROUND THE WORLD; France Signs Agreement On Uranium for India," *New York Times*, 25 March 1983, <https://www.nytimes.com/1983/03/25/world/around-the-world-france-signs-agreement-on-uranium-for-india.html>, accessed on 16 June 2024.

In April 1992, French officials declared unwillingness to extend this supply agreement on the condition that India accepts full-scope safeguards of the International Atomic Energy Agency (IAEA).⁸⁶ However, on 30 September 2008, a nuclear energy agreement was signed by both sides to allow New Delhi to acquire nuclear equipment and fuel.⁸⁷ In 2008, French company Areva signed an agreement with Nuclear Power Corporation of India (NPCIL) to supply 300 tons of uranium annually and a deal worth US\$ 12.3 billion for construction of six nuclear power plant (NPP) units in Jaitapur, Maharashtra.⁸⁸ In 2011, French Ambassador to India asserted that the NSG decision to bar the transfer of enrichment and reprocessing technologies to non-NPT signatories does not undermine the waiver granted to India in 2008 and 'nothing in the existing and future guidelines shall be interpreted as detracting from that exemption'.⁸⁹ Hence, the commercial interests in France also shape its nuclear diplomacy and stance on India's possible inclusion in NSG despite not being a signatory to NPT. In 2010, France, along with the U.S., asked Japan to conclude a nuclear agreement with India. More recently, the two sides have been in discussion on agreement for cooperation in development of small modular nuclear reactors.⁹⁰ In addition to Missile Technology Control Regime (MTCR), France also continues to support India's membership in other three multilateral export control regimes including NSG, Wassenaar Arrangement, and Australia Group.

Impact on Regional Stability and Global Nuclear Norms

The strategic cooperation between India and France contributes to India's increasingly assertive military posture. In August 2019, Premier Modi termed New Delhi's relationship with Paris as an 'alliance'.⁹¹ The growing convergence of interests between these two states and unabated military cooperation – that seems to be driven more by commercial interests rather than pursuing some mutual goals – have negative consequences for strategic stability in South Asia. The French leadership terms India as a factor of stability in South Asia owing to its perceived threat posed by China's growing influence and to justify the sales of military equipment to the huge Indian defense market. France's supply of nuclear-capable Rafale fighter jets not only undermines the spirit of global non-proliferation norms by transferring nuclear-capable delivery systems to a non-NPT signatory state but also undermines strategic stability in South Asia.

Despite the upgrades in the existing fleet of the India Air Force, Rafale is likely to take over the air-based nuclear strike role. The Rafale is assigned to carry the Air-Sol Moyenne

⁸⁶ "India Nuclear Chronology," *Nuclear Threat Initiative*, December 2010, https://media.nti.org/pdfs/india_nuclear.pdf, accessed on 16 June 2024.

⁸⁷ Jaclyn Tandler, "French Nuclear Diplomacy," *The Non-Proliferation Review*, Vol 12, No. 2 (2014): 125-148.

⁸⁸ Mukesh Shankar Bharti and Akshithaa Singh, India and France bilateral partnership for advancing strategic autonomy in the Indo-Pacific region: Special reference to the Indo-French strategic partnership," *Cogent Social Sciences*, Vol 9, No. 1 (2023): 10 and Sitakanta Mishra, "India's Civil Nuclear Network: A Reality Check," *Air Power Journal*, Vol 5, No. 4 (2010): 117.

⁸⁹ Satish Kumar, ed., *Indian's National Security Review 2012* (New Delhi: Routledge, 2012)

⁹⁰ Sudhi Ranjan Sen, Rajesh Kumar Singh, and Ania Nussbaum, "France and India to Discuss Accord on Small Nuclear Reactors," *Bloomberg*, 24 January 2024, <https://www.bloomberg.com/news/articles/2024-01-24/france-and-india-discuss-partnering-on-small-nuclear-reactors-as-macron-visits>.

⁹¹ "Modi's visit to France and Europe-India ties,".

Portée (ASMP-A) nuclear cruise missile in the French Air Force⁹² that has also used these fighter jets to rehearse a nuclear strike mission, exhibiting the capability of the Rafale to carry nuclear warheads. In May 2024, France conducted the successful test of an upgraded nuclear-capable ASMP-A missile launched from Rafale.⁹³ Hence, in addition to submarine-based nuclear capabilities, Rafale's employment in a nuclear role serves as a potent element in France's overall nuclear deterrence strategy. Experts also point out that Rafale is used for the nuclear mission in the French Air Force and India could potentially convert it to serve a similar role in the Indian Air Force.⁹⁴ Being an 'omnirole' aircraft, the expected induction of 26 Rafale marine aircraft in the Indian Navy for deployment onboard aircraft carriers shall significantly add to the role of the Indian Navy in New Delhi's nuclear triad. Given this capability of Rafale, it would be unrealistic for India's adversaries to factor in this aircraft exclusively as a conventional capability. Rafale aircraft can carry different warheads while traveling at a maximum speed of Mach 1.8.⁹⁵ It is equipped with lethal and highly precise missiles that can hit the intended target with significant precision, with a circular error probable of 8-10 meters.⁹⁶ Rafale is armed with laser designation pods for precision targeting from air to ground along with modern electronic warfare capabilities, which enables it to track eight different targets simultaneously. Rafale aircraft is also equipped with Meteor, one of the most advanced beyond visual range (BVR) air-to-air missiles capable of striking at the range of 120-150 km, making it a strategic weapon.⁹⁷

Reports suggest that Rafale aircraft will be deployed in two equally sized squadrons: one in West Bengal and the other at Ambala Air Base Station – located only 220 kilometers from the Pakistani border.⁹⁸ Rafale fighters will have the capability of launching standoff weapons for the counter force strikes and would add to India's offensive capabilities by giving it the option to carry out short- and long-range missions against Pakistan. By providing a sense of air superiority and reconnaissance capability, this fighter jet may tempt Indian leadership obsessed with the temptation to use nuclear capability in counterforce missions⁹⁹ to employ Rafale in a nuclear first-strike role and launch attacks on selected military targets on land and sea. This is also evident from the fact that in the aftermath of the February 2019 crisis, Premier Narendra Modi lamented the absence of French aircraft Rafale which he hoped might have produced better

⁹² Yogesh Joshi, Frank O'Donnell and Harsh V. Pant, "India's Evolving Nuclear Force and its Implications for U.S. Strategy in the Asia-Pacific," *Strategic Studies Institute, U.S. Army War College* (June 2016): 8.

⁹³ "France Successfully Tests Launch of Upgraded ASMPA_R Nuclear-Capable Missile from Rafale Fighter," *Global Defence News*, 22 May 2024, <https://armyrecognition.com/news/aerospace-news/2024/france-successfully-tests-launch-of-upgraded-asmpa-r-nuclear-capable-missile-from-rafale-fighter>.

⁹⁴ Hans M. Kristensen & Matt Korda, "Indian nuclear forces, 2018," *Bulletin of Atomic Scientists*, Vol. 74, No. 6 (2018): 363.

⁹⁵ "Dassault Rafale and FA-18E Super Hornet," *Armed Forces*, https://armedforces.eu/compare/multirole_aircraft_Dassault_Rafale_vs_FA-18E_Super_Hornet, accessed on 16 June 2024.

⁹⁶ "France confirms delivery of 600 AASM guided bombs to Ukraine," *Global Defence News*, 19 January 2024, <https://armyrecognition.com/news/army-news/2024/france-confirms-delivery-of-600-aasm-guided-bombs-to-ukraine>.

⁹⁷ Gilles Bouquerat, "France and South Asia," in Sumit Ganguly and Frank O'Donnell, eds., *Routledge Handbook of International Relations of South Asia* (New Delhi: Taylor and Francis, 2022).

⁹⁸ Dinakar Peri, "Five Rafales arrive at Ambala airbase," *The Hindu*, 29 July 2020, <https://www.thehindu.com/news/national/rafale-jets-ambala-induction/article61678277.ece>.

⁹⁹ Christopher Clary and Vipin Narang, "India's Counterforce Temptations: Strategic Dilemmas, Doctrine, and Capabilities," *International Security*, Vol 43, No 3 (2019): 7-52.

results for the Indian Air Force in close engagement with Pakistan Air Force.¹⁰⁰ Therefore, Rafale fighter jets are more than just force multipliers, rather they carry the risk of undermining the adversary's nuclear deterrent capability and jeopardizing deterrence stability in South Asia. It is important to note that the acquisition of this capability is taking place against the worrisome backdrop surrounding the possible erosion of India's No First Use nuclear doctrine and its increasing willingness to carry out pre-emptive nuclear first strikes against Pakistan.¹⁰¹

South Asian strategic stability is already marred by prevailing military asymmetries. India's force modernization continues to widen this gap and lead to a military imbalance in the region. Despite already possessing greater military resources, recent years have witnessed India acquiring a wide array of nuclear-capable delivery means, ballistic missile defense (BMD) systems, anti-satellite weapons, developing a large stockpile of fissile material, and other force multipliers including supersonic delivery means.¹⁰² The continued support of Indian military prowess by major powers including France accentuates instability in the region by disturbing military balance and feeding into India's ambitious designs of establishing hegemony and supremacy in the IOR.¹⁰³ By developing a blue-water navy, India aims to establish its pre-eminence in the IOR and beyond. The self-assumed role of a regional policeman compels India to adopt an offensive posture whereby it is likely to aggressively use the naval military capabilities to pursue its perceived interests. As India seeks to dominate the Indian Ocean, it may seek to deny the same to China in the South China Sea in the coming years. Through its Act East policy, India aims to enhance its role around the Strait of Malacca and the South China Sea – a region that India identifies as a secondary area of maritime interest¹⁰⁴ – that would give it access to the Western Pacific where it may operate in joint operations with the U.S. Navy. Indian Navy is steadily ingressing in this region through multiple activities including the participation in bilateral naval exercises – such as MILAN exercises – and establishing defense ties with countries like Vietnam, Brunei, and the Philippines.¹⁰⁵

India's growing control over the sea lines of communication (SLOCs) – under the pretext of net security provider – may help it to establish sea control and dominance that runs counter to the interests of the regional states, including Pakistan.¹⁰⁶ Exacerbating these concerns would only encumber France's declared interest in keeping the region stable. Countries like Pakistan would thus be forced to take appropriate security measures to safeguard its vital trade and maritime interests in its extended Exclusive Economic Zone. Considering India's aspirations to extend its

¹⁰⁰ Shishir Gupta, "If we had Rafales, we'd have shot down 4-5 Pakistani jets after Balakot: IAF ex-chief Dhanoa," *The Print*, 20 February 2020, <https://theprint.in/defence/if-we-had-rafales-wed-have-shot-down-4-5-pakistani-jets-after-balakot-iaf-ex-chief-dhanoa/363080/>.

¹⁰¹ Aqeel Akhtar and Sufian Ullah, "India's Sea-based Nuclear Forces and Strategic Stability in South Asia," *Australian Journal of Maritime and Ocean Affairs*, Vol 15, No. 1 (2023): 54-68.

¹⁰² Rizwana Abbasi and Sufian Ullah, "Rising Strategic Instability and Declining Prospects for Nuclear Disarmament in South Asia: A Pakistani Perspective," *Asian Journal of Peacebuilding*, Vol 10, No. 1 (2022): 215-241.

¹⁰³ Liliang You, "Looking at the "Security Dilemma" between India and Pakistan from Structural Realism," *Advances in Social Science, Education and Humanities Research* 325 (2019): 114.

¹⁰⁴ *Ensuring Secure Seas: Indian Maritime Security Strategy* (New Delhi: Indian Navy, 2015): 32.

¹⁰⁵ Sufian Ullah, "Analysing India's Naval Development Strategy," *IPRI Journal*, Vol. 19, No. 1 (2019): 86-110.

¹⁰⁶ Sufian Ullah and Zeeshan Hayat, "India as a Net Security Provider in Indo-Pacific and Implications for the Region," *NUST Journal of International Peace & Stability*, Vol. 4, No. 1 (2021): 26-39.

naval reach to the Straits of Hormuz, the acquisition of greater ability to conduct enduring operations at sea would increase the possibility of interactions between the adversarial navies. Should India continue to observe opacity with regard to co-mingling of strategic and conventional assets like the deployment of nuclear-capable missiles on surface vessels, such ambiguity may result in an escalation of a military confrontation to the nuclear level.

The Indo-French nuclear cooperation is another impediment to strategic stability in South Asia. France was the first country to enter into a civil nuclear cooperation agreement with India after the latter was granted an exceptional NSG waiver in 2008. Reports suggest that French defense company Thales has expressed interest in building India's fleet of nuclear-powered attack submarines.¹⁰⁷ In this regard, a detailed presentation on the Barracuda-class – France's latest low-enriched uranium (LEU) fuelled nuclear-powered attack submarine (SSN) – was given to the visiting Indian Chief of Naval Staff in November 2017.¹⁰⁸ Given French expertise in the manufacturing of nuclear submarines and India's aspirations for a large fleet of nuclear submarines, cooperation between New Delhi and Paris on military nuclear propulsion and other sensitive areas is possible. This has become more probable in the backdrop of the AUKUS deal between Australia, the United Kingdom, and the U.S. France's strained ties with the U.S. and Australia in the backdrop of AUKUS deal, in which Australia backed-off off deal with France in the last moment and entered into an agreement with the U.S. and United Kingdom to acquire nuclear attack submarine, has encouraged it to ally with India. The advocates of possible Indo-French collaboration propagate that in the event of visible French distrust towards the U.S. and the United Kingdom, India could use the opportunity to procure a nuclear-attach submarine from France.¹⁰⁹ Ashley Tellis, a notable Indian-American voice in Washington DC suggests that under a possible trilateral arrangement called INFRUS involving India, France, and the U.S., Washington DC could encourage Paris to provide New Delhi with French naval nuclear propulsion technology.¹¹⁰ While most of such suggestions are put forth under the pretext of 'China threat theory' that highlights Beijing's growing influence as a cause of concern for the U.S., India, and France, the systemic implications of such possibility on prevailing nuclear order based on the cautiously crafted international non-proliferation regime are somehow overlooked.

As India plans to build and operate a fleet of nuclear submarines along with an arsenal of sea-based nuclear forces, materialization of proposed INFRUS shall directly implicate global efforts to strengthen the non-proliferation regime. Any collaboration between India and France involving nuclear-powered submarines shall raise concerns regarding misuse or diversion of nuclear technologies and expertise for military purposes. India already keeps eight of its nuclear reactors and a whole stock of weapons-usable reactor-grade plutonium outside of IAEA

¹⁰⁷ "Thales Looking At Role In India's Nuclear Submarine Project," *Indo-French Chamber of Commerce*, 22 April 2018, <https://www.ifcci.org.in/communication/news/n/news/thales-looking-at-role-in-indias-nuclear-submarine-project.html>.

¹⁰⁸ Yusuf Unjhwala, "French Barracuda Project's Utility to India," *Live Mint*, 29 November 2017, <https://www.livemint.com/Opinion/rqItXdEokaHko48UWoc7CN/French-Barracuda-projects-utility-to-India.html>.

¹⁰⁹ Rahul Jaybhay, "The AUKUS Deal and India's Submarine Dilemma," *The Diplomat*, 14 April 2023, <https://thediplomat.com/2023/04/the-aukus-deal-and-indias-submarine-dilemma/>.

¹¹⁰ Ashley J. Tellis, "Striking Asymmetries: Nuclear Transitions in Southern Asia," *Carnegie Endowment for International Peace* (2022): 256, https://carnegie-production-assets.s3.amazonaws.com/static/files/202207-Tellis_Striking_Asymmetries-final.pdf, accessed on 16 June 2024.

safeguards.¹¹¹ Although France has opted to use LEU for its nuclear submarines¹¹², India still uses highly enriched uranium (HEU) for its naval propulsion requirements.¹¹³ Providing India with nuclear powered submarines, sans any additional requirements to pursue arms control or disarmament, shall further drift its nuclear program away from international obligations and towards aggressive posturing.¹¹⁴

In addition to that, India's enhanced civil nuclear capabilities may facilitate its nuclear weapons modernization, due to difficulties in the verification of dual-use goods. Through foreign cooperation with several countries including France, India will be receiving large quantities of fissile material for its civilian nuclear program allowing it to divert all its domestic reserves into the production of nuclear weapons.¹¹⁵ This is more probable because India does not have a Comprehensive Safeguards Agreement with the IAEA and only applies facility-specific safeguards in its declared civil nuclear facilities.¹¹⁶ Several studies have already pointed out that India is currently the fastest-growing nuclear weapon state in the world and has enough stockpiles to produce more than 2600 nuclear weapons.¹¹⁷ Indo-French civil nuclear cooperation goes contrary to the spirit of the international non-proliferation mechanism, as it discriminately allows one non-NPT signatory state to acquire nuclear technologies. The already decaying credibility of the non-proliferation regime requires countries to give up discriminatory policies and adopt rules-based measures to strengthen the regime. Since India does not adhere to any of the major global non-proliferation and disarmament-related obligations such as NPT and Comprehensive Nuclear Test Ban Treaty (CTBT), access to the global nuclear market without any additional obligations would only diminish New Delhi's resolve for future disarmament.

Conclusion

The significance of the evolving India-France strategic alliance is underscored by growing multipolarity in the international system. Both states pursue distinct yet intertwined geopolitical ambitions in the broader Indo-Pacific region as well as at the international system level that brings them closer to each other. This paper has explored key motivating drivers and strategic convergences that bring New Delhi and Paris closer to each other. It identified its pivot to 'Indo-Pacific' to contain the rise of China, shared aspirations to partially alter the international

¹¹¹ Mansoor Ahmed, "India's Nuclear Exceptionalism: Fissile Materials, Fuel Cycles, and Safeguards," *Harvard Kennedy School, Belfer Center for Science and International Affairs*, May 2017, <https://www.belfercenter.org/sites/default/files/files/publication/India%27s%20Nuclear%20Exceptionalism.pdf>, accessed on 30 June 2024.

¹¹² Alain Tournyol du Clos, "France's Choice for Naval Nuclear Propulsion: Why Low Enriched Uranium was Chosen," *Federation of American Scientists* (2016): 2, <https://uploads.fas.org/2016/12/Frances-Choice-for-Naval-Nuclear-Propulsion.pdf>, accessed on 30 June 2024.

¹¹³ Sufian Ullah, "India's Naval Nuclearization: Repercussions for Crisis Stability," *South Asian Voices*, 27 June 2018, <https://southasianvoices.org/indias-naval-nuclearization-repercussions-stability/>.

¹¹⁴ Akhtar and Ullah, "India's Sea-based Nuclear Forces and Strategic Stability in South Asia,".

¹¹⁵ "The South Asian Nuclear Balance: An Interview With Pakistani Ambassador to the CD Zamir Akram," *Arms Control Association*, <https://www.armscontrol.org/act/2011-12/south-asian-nuclear-balance-interview-pakistani-ambassador-cd-zamir-akram>, accessed on 16 June 2024.

¹¹⁶ Muhammad Waseem Qutab, "NSG Membership for India and Pakistan: Debating 'Critical' Aspects," *IPRI Journal*, Vol 19, No. 1 (2019): 2.

¹¹⁷ Ahmed, "India's Nuclear Exceptionalism," and Syed Saddam Hussain Shah and Syed Javaid Khurshid, "Estimating India's Nuclear Weapons-Producing Capacity," *Bulletin of the Atomic Scientists*, 2 November 2018, <https://thebulletin.org/2018/11/estimating-indias-nuclear-weapons-producing-capacity/>.

order, and confluence of interests as being among the largest importers and exporters of arms in the world as key driving forces behind the symbiosis between the two states. By discussing the salient aspects of these bilateral relations, the paper analyses the possible implications of this thriving partnership on regional stability and discusses how it specifically impacts the global nuclear norms. After establishing bilateral strategic partnership with each other in January 1998, India and France have extended their cooperation in different domains including nuclear, military, and other fields of advanced technology. The most salient of these aspects include Mirage 2000 aircraft, scorpene class submarines, rafale aircraft, joint military exercises *Shakti*, naval exercises *Varuna*, other areas of cooperation including maritime surveillance satellites and so on. Additionally, besides MTCR, France continues to support India's bid for membership in all export control regimes including NSG, Australia Group and Wassenaar Arrangement. This paper concludes that the bilateral strategic cooperation between India and France contributes to former's increasingly assertive military posture and adversely impacts strategic stability in South Asia.

RUSSIA-UKRAINE WAR IN BLACK SEA: ANALYSING THE EMPLOYMENT OF UNMANNED COMBAT SYSTEMS BY UKRAINE

Ahmad Ibrahim

Abstract

The article examines the strategic dynamics of the Russia-Ukraine conflict in the Black Sea, focusing on the transforming conduct of naval warfare. The employment of unmanned combat systems by Ukraine in Black Sea represents a strategic innovation that could redefine future naval warfare. This conflict serves as a crucial case study in how smaller nations can utilise technology to counterbalance larger powers in the maritime domain. To better understand the conventional disparity between Russian Black Sea Fleet (BSF) and Ukrainian Navy, the article provides a pre-war comparative analysis of naval vessels operated by both forces. Later, it gives brief overview of objectives which Moscow wanted to achieve in Black Sea in the opening days of conflict. Later the article provides a periodic recap of major incidents that have taken place in the Black Sea conflict till August 2024. The overview highlights approximately all major naval losses suffered by both naval forces. Particularly, attrition losses suffered by Black Sea Fleet against Ukrainian unmanned combat aerial vehicles (UCAV) like TB-02 and kamikaze unmanned surface vehicles (USVs) have been accounted. The article underscores the employment tactics of unmanned assets by Ukraine and how Russia has failed to effectively counter such threats despite conventional superiority in traditional sense. Furthermore, it explores how such systems will evolve in future conflicts and will reshape the conduct of future naval warfare.

Key Words: Black Sea Fleet, Ukrainian Navy, Unmanned Combat Aerial Vehicles (UCAVs), TB-02, Kamikaze Unmanned Surface Vehicles (USVs).

Introduction

Covering an area of 436,402 square kilometers, the Black Sea is an inland sea located at the southeastern flank of Europe (Black Sea Geography, 2024). With relatively enclosed geography with limited outlets, it is surrounded by six countries: Turkey, Bulgaria, Romania, Ukraine, Russia, and Georgia. Black Sea is connected to the Mediterranean Sea through the Straits of Bosphorus and the Dardanelles, making it a crucial maritime gateway between South-Eastern Europe, North Africa, and Asia.



Figure I: Black Sea Map (Britannica, 2024)

Historically, Black Sea has been a competing ground for NATO and Soviet Union. This competition still persists in modern day power politics between Russia and NATO. For NATO, Black Sea offers a maritime buffer against Russia's potential expansion thus playing important role for maintaining stability in Eastern Europe and the Caucasus region (Toucas, 2017). With balanced military presence in Black Sea, NATO sought to maintain regional balance of power, deter Russia's aggression while avoiding risks of military escalation. This approach of NATO, however, failed to deter Russia's invasion on Ukraine.

Black Sea conflict serves as a critical case study for exploring the opportunities presented by unmanned combat systems in maritime domain. This article will explore how Ukraine's use of unmanned combat systems (UCS) has influenced the conflict by serving as a viable counterbalance to Russia's naval superiority. Besides discussing Russia's military objectives and conflict progression in Black Sea, this research seeks to address key questions including: How

has Ukraine employed unmanned combat systems in the Black Sea? What limitations of Russian military have been observed as far as countering Ukraine's asymmetric tactics in Black Sea is concerned? And how these systems will evolve further and shape the conduct of future naval warfare?

The argument put forth is that Ukraine's use of unmanned combat systems has shifted the traditional naval balance of power in Black Sea. The article will argue that the employment of unmanned systems has created nascent opportunities for sea denial and precision strikes, which Russia has struggled to counter effectively. The article will rely on qualitative data analysis, and will utilize data collected through recent research articles, analytical pieces, military reports and open-source intelligence (OSINT) to assess the effectiveness of Ukraine's unmanned systems. This research aims to contribute to the broader discourse on modern naval warfare and the role of unmanned systems in reshaping future conflicts.

Russia-Ukraine Naval Comparison in Black Sea

The Russian Navy, divided into four fleets (Northern Fleet, Pacific Fleet, Black Sea Fleet, and Baltic Fleet) and one flotilla in Caspian Sea, ranks among the largest in the world. Although much of its fleet dates back to the Soviet era, it remains sufficiently capable of carrying out both offensive and defensive operations in territorial and offshore waters. Pre-conflict Russian Black Sea Fleet comprised a mix of surface combatants - including flagship Moskva cruiser, submarines, amphibious ships, and auxiliary vessels. Considering the regional strategic dynamics, the fleet was specifically designed for amphibious operations and local sea-control. The Head Quarters of fleet is stationed in Sevastopol, Crimea (Delanoe, 2019).

During the Crimean crisis, Russia captured the majority of Ukraine's surface fleet docked in Sevastopol and about 75% naval personnel swore allegiance to Moscow leaving Ukraine's naval presence in the Black Sea nearly nonexistent (Annati, 2023). In compensate this significant loss, Kyiv sought to rebuild its naval capabilities by signing agreements with Turkey for two Milgem-class corvettes (with option of two more) and TB-02 unmanned combat aerial vehicles (UCA Vs) (Vavasseur, 2020). The TB-02s, equipped with micro-munitions, began arriving in 2021 (Ozberk, 2021). Meanwhile both corvettes, configured according to Ukraine's requirements, are currently conducting sea trials in Turkey (Ozberk, 2024).

At the time of Russian invasion, Ukrainian Navy comprised of a Krivak-III class frigate - named Hetman Sagaidachnyy, few gunboats and auxiliary vessels. Hetman Sagaidachnyy, was scuttled to avoid its capture by Russian forces (Janes, 2022). It is worth noting that majority of remaining Ukrainian naval vessels were captured by Russian forces on 14 March 2022. Comparative overview of Russia's Black Sea Fleet and Ukrainian Navy is as follows:

Naval Assets	Russian Black Sea Fleet	Ukrainian Navy Fleet
Aircraft Carrier (CV)	0	0
Cruisers (CGs)	1	0
Destroyers (DDGs)	0	0
Frigates (FFGs)	5	1
Corvettes (FFLs)	8	0
Anti-Submarine Crafts (ASW-C)	6	0
Fast Attack Craft Missile (FACM)	5	0
Patrol Ships (PB)	3	11
Mine Countermeasure Vessels (MCMV)	10	1
Landing Ships/Crafts (LSTs)	10	2
Nuclear Submarines (SSBN/SSGN/SSN)	0	0
Conventional Submarines (SSK)	6	0

Table 1: Pre-conflict Fleet Distribution of Russian Black Sea Fleet and Ukrainian Navy in 2022 (Hackett, 2022)

Russian War Objectives

On 24 February 2022, Russia launched multi-front invasion on Ukraine (Zinets, 2022). Russian ground forces penetrated from four different directions: Northern front from Belarus towards capital Kyiv; North-Eastern front from Belgorod towards Kharkiv; Eastern front into Donbas region; and Southern front from Crimea across the coastal belt towards Odessa in West and Mariupol in East. The offense pattern suggested that Russia wanted to swiftly pierce through Ukrainian defenses and seize key population centers of Ukraine - particularly Kyiv. This would have allowed Moscow to overthrow current pro-EU regime and replace it with pro-Russian government. Considering the force disparity, common assumption was that Moscow will prevail and government in Kyiv will disintegrate within a week. However, stiff Ukrainian resistance, supported by NATO, not only halted Russian invasion, but forced it to retreat from various fronts.

In Black Sea it was also anticipated that Russian Black Sea Fleet will easily establish sea-control, impose naval blockade of Ukraine, and open extra front across Ukrainian coast by launching amphibious attacks on cities of Odessa and Mykolaiv (Delanoe, 2024). The successfully capturing of these regions would have allowed Russia to undertake deeper exertion to cut-off Ukrainian connectivity with Black Sea. This plan, however, also failed in initial stages.

Russian Black Sea Fleet, despite all theoretical naval superiority over Ukrainian counterpart, failed to live up to its reputation.

Black Sea Conflict Overview

After invasion, the first military strategic initiative secured by Russian Navy was capturing of Snake Island (Benecki, 2022). By 28 February, Turkey had closed the Bosphorus and Dardanelles straits for naval traffic essentially blockading Black Sea (Mongilio, 2022). Throughout month of March Russian warships bombarded Ukrainian coastline off Odessa but didn't attempt any amphibious operation. Despite overwhelming force disparity, Ukraine successfully employed asymmetric tactics to challenges Russia's naval superiority in Black Sea. On 24 March 2022, a Russian Alligator-class landing ship called Saratov was destroyed by Ukrainian Tochka-U tactical ballistic missile. The attack took place when ship was docked at Berdyansk and also caused damage to nearby vessels (Shamrnas, 2022).

The attack compelled Russia to rely on Sevastopol naval base for naval operations to keep fleet out of Ukrainian missiles range. The most promising success was achieved on 13 April 2022 when Moskva missile-cruiser, the flag ship of Russian Black Sea Fleet, sank after getting struck by two shore-launched Neptune cruise missiles (Beaumont, 2022). It's now known that U.S. provided predictive intelligence about cruiser movement using P-8 Poseidon Maritime Patrol Aircraft (MPA) operating close to Black Sea (Cooper, 2022). The information was further supported by real-time intelligence provided by TB-02 drone (Hambling, 2022). Sinking of Moskva was not only a major psychological blow to Moscow, but also significantly degraded combat potential of Black Sea Fleet. Equipped with 64 S-300F long-range surface-to-air missiles, Moskva was key Russian asset for establishing airspace denial zone over Black Sea. Its sinking provided much needed space to Ukraine for employing airpower - particularly drones - for combat operations in Black Sea.

Following Moskva demise, Russian military installations at Snake Island came under repeated attacks by Ukrainian TB-02 UCAVs, forcing Russia to relinquish Snake Island by the end of June of following year (Roblin, 2022). Beside important ISR asset (intelligence, surveillance, and reconnaissance), TB-02 was also used successfully by Ukraine for direct targeting of Russian combat vessels including Raptor class patrol boats, Serena class landing ship (AFP, 2022) and allegedly even a Buyan-M class missile corvette (GDC, 2022). On 17 June, a pair of Harpoon missiles launched from coast sank Vasily Bekh rescue-tug boat- making second kill for coastal missile system (Brown, 2022). By end of June, Ukraine has successfully sunk Moskva cruiser, amphibious warships, and several patrol vessels thereby undermining Russia's ability to mount attack on Ukraine's western coast.

For next couple of months, Ukraine avoided any further attacks and Russia re-aligned itself for developing countermeasures against Ukrainian aerial drones and missiles. On 29 October 2022, a large-scale formation comprising of nine aerial suicide drones and seven kamikaze unmanned surface vehicles (USVs) attacked Russian Black Sea Fleet docked at Sevastopol (Lister, 2022). Although Russian officials claimed that attack was successfully repelled. But OSINT suggested that a Natya class minesweeper and Admiral Makarov guided-missile frigate were damaged by kamikaze USVs (Harding, 2022). The coordinated attack was first of its kind and redefined the employment methodology of unmanned systems in modern naval warfare. By this point, Russia had drastically slowed down operations in Black Sea and

decided to retain defensive position in harbor. This led to an operational stand-still in Black Sea for more than half a year.

On 23 May 2023, Russian intelligence gathering ship, named Ivan Khurs, was damaged when it was ambushed by three kamikaze USVs (Newdick, 2023). In a major night raid at Sevastopol on 13 September 2023 two landing ships were severely damaged and a Kilo class hunter-killer submarine was wrecked beyond repair (MWM, 2023). The attack was conducted by Ukrainian Su-24 fighter aircraft using Storm-shadow cruise missiles (Axe, 2023). A day later, Sergey Kotov patrol ship was damaged by suicide drone boat, and was later sunk in another suicide drone boat attack (Talmazan, 2024). On November 2023, a volley of cruise missiles launched by Ukraine struck Zalyv Shipbuilding yard in Kerch, severely damaging a newly built Karakurt class missile corvette (Starkova, 2023). A month later, Ukrainian Air Force successfully destroyed Novocherkassk landing ship near Southern Crimea using air-launched cruise missiles (Osborn A. , 2023). So far in year 2024, Ukraine has used kamikaze drone boats with remarkable success and sank a Tarantul class missile corvette, (Altman, 2024) a Ropucha-1 class landing ship, (Kirby, 2024) and a patrol boat. As far as sea action is concerned, there are two known incidents in which Russia has used lancet kamikaze drone to destroy Ukrainian patrol boats (Altman, 2022).

According to Oryx database, 16 Russian warships have been destroyed and six have been damaged as of mid-August 2024. Unmanned systems have destroyed warships and damaged nine vessels. Usually smaller and nimble vessels have been sunk by aerial combat drones while bigger and slower warships have fell victims of kamikaze drone boats. Tabular overview of Russian Black Sea warships destroyed by various Ukrainian weapon systems is given below:

Warship and Weapon Types	Cruiser	Frigate	Corvettes/ Patrol Ships	Patrol Boats	Landing Ships	Submarine	Total
Short-Range Ballistic Missile	00	00	00	00	03	00	03
CoastalCruise Missile System	01	00	01	00	00	00	02
Air Strike by Fighter Aircraft	00	00	01	00	00	01	02
TB-02 UCAVs	00	00	00	05	00	00	05
Suicide USVs	00	00	02	00	02	00	04
Grand Total	01	00	04	05	05	01	16

Table 2: List of Russian Warships destroyed by Ukraine (Oryx, 2024)

Exploring Employment of Unmanned Systems

The most eminent aspect of Russia-Ukraine war in Black Sea is wide scale adaptation of drones including; medium altitude and long endurance (MALE) combat drone, weaponized commercial aerial drones, and kamikaze drone boats, in maritime domain. This has greatly undermined the Russia ability to exercise naval prowess in Black Sea. Brief description of each asset and its employment is discussed below.

The extensive employment of TB-02 UCAV in maritime domain has been undertaken by Ukraine for the first time. Being a mid-sized MALE combat drone, TB-02 carries only micro-munitions which are effective against small targets. It cannot carry anti-ship missiles. However, despite all technical limitations, TB-02 has emerged as valuable asset for Ukraine to challenge Russian dominance in Black Sea. In brief two employment approaches can be underscored. First, TB-02s were used for Intelligence, Surveillance, Target-Acquisition and Reconnaissance (ISTAR) role to force-multiply Ukraine's overall combat potential. Reportedly, TB-02 UCAV played important role in the sinking of Moskva cruiser by providing over-the-horizon (OTH) tracking capability and acting as crucial component of Ukrainian kill-chain. Moskva sinking and absence of Russian air power granted TB-02 UCAVs greater freedom of operation over the Black Sea. Similarly, Russian rescue tugboat Vasily Bukh was also sunk by harpoon missiles using assistance of TB-02.

Second, TB-02s were used to directly destroy sea-targets using guided munitions. Instead of directly engaging Russian warships equipped with potent air-defense system, like Admiral Grigorovich class frigates, TB-02s targeted smaller vessels like Raptor class assault boats and small landing vessels. By taking advantage of low radar-cross-section (RCS) and thermal signature, TB-02s have conducted successfully strikes against assets protected by air-defense systems. On Snake Island alone, TB-02s knocked out three air-defense systems, one helicopter on ground, and a command post (Sutton, 2022). Coupled with high-degree of automation, advanced surveillance systems, resilience against jammers, payload modularity, and ability to operate from dispersed locations, TB-02 has settled benchmarks as far as efficiency of aerial drones in naval warfare is concerned.

Another nascent development in Black Sea conflict is employment of loitering munitions and FPV (first-person view) drones to target naval installations and vessels. Loitering munitions are suicide drones with high-degree of automation which allows these drones to loiter above battlefield for extended duration and hit target with precision. The human input from launch to engagement is very limited and incorporation of a higher degree of autonomy allows these munitions to exploit vulnerabilities in the enemy's defenses and engage beyond visual line of sight (BVLOS) and even over the horizon (OTH) targets with precision (Ibrahim, 2022). In contrast, FPV combat drones are suicide drones which are equipped with payload, are radio-controlled by human operator, who use live video feed from drone's onboard camera. (Milasauskas, 2024) Unlike traditional UCAVs, which act as a launch platform for weapons, loitering munitions and FPV combat drones are weapons themselves and carry integrated warhead.

Allegedly, kamikaze aerial drones were used by Ukraine in conjunction with suicide drone boats to target Sevastopol harbor on 29 October 2022. This combined attack formation successfully breached the harbor defenses and damaged two warships. The attack compelled Russia to beef-up the defense against this new type of threat. On 22 March of next year, Ukraine attempted similar attack formation against well-protected Sevastopol naval station. This time, however, all attacking drones were successfully intercepted by Russian defenses. Although Ukraine has used kamikaze aerial drones with remarkable success against land based targets. But the performance of Ukrainian suicide aerial drones in maritime domain has been mediocre at best. In contrast, Russia has been more innovative with usage of such drones in Black Sea. First ever kill of loitering munitions in naval warfare was achieved by Russian Lancet suicide drone

against Ukrainian Gyrusa-M patrol boat on 04 November 2022 (Ozberk, 2022). Similarly, FPV drone was used for defensive role for the first time by Russian forces. On 29 May, Russian sources released footage of Ukrainian suicide drone boat being hit by Russian FPV drone (Satam, 2024). The incident was practical demonstration of a much-anticipated tactic.

It's worth noting that use of loitering munitions and FPV drones in Black Sea have been rather limited. Unlike land-based operation, tracing targets in vastness of open seas is a very challenging undertaking. Thus, shore-launched, small and less-ranged suicide aerial drones have limited applicability. Albeit, near coastal areas and choke points these munitions can offer promising results. Beside range shortcoming, such munitions have limited payload due to size restriction which narrow down the targeting envelop to smaller vessels. Additionally, the efficiency of these munitions is questionable against warships protected by multi-layer defenses. Such warships can either be caught off-guard or a swarm tactics are needed to saturate warship defenses (Ibrahim, 2023). Aforementioned reasons elaborate why such munitions have been employed on comparatively limited scale in Black Sea conflict by both sides.

While discussing suicide drones, relatively successful use of weaponized-commercial drones by Ukraine also deserves consideration. Ukraine used weaponized cheap Chinese built Mugin-5 drones to target Black Sea Fleet headquarters in Sevastopol on August 2022 (Shcherbak, 2024). These commercial drones are readily available and can be configured for military use in large quantities. Although such drones have operational and structural limitations, particularly when pitched against warships, but for engaging coastal infrastructure such drones can have valuable contribution as attack platform as or decoys.

Perhaps the most eminent and highly featured weapon in Black Sea conflict is the armed unmanned surface vehicle (USVs) alternatively dubbed as suicide drone boat or kamikaze sea-drone. These drones are equipped with electro-optical device, radio antennae for remote-control, and are armed with explosive payload designed to detonate upon impact with target. The presence of antennae suggests that Ukrainian examples are remotely operated by human. However, such vessels can also be pre-programmed to operate more independently. Historically, explosive-laden boats have been used in limited capacity by navies and non-state actors. Usually such boats were either operated by wire-guidance mechanism or by were piloted by human operator - thus narrowing down their scope of operation (Roger, 2020). However, advancements in technology have reduced the human factors and have enhanced the level of autonomy. The war in Black Sea has showcased their true potential to evolve as potent anti-surface warfare (ASuW) asset in near future.

Ukraine's armed USVs are product of Black Sea conflict and have gradually evolved with lessons learnt from each attack. These suicide drone boats are small, fast, expendable and have low-profile making them a hard target to detect and intercept. These drones incorporate higher level of autonomy and usually rely on star-link connectivity for operation. At the same time, these drones are cheap, easy to build and employ commercial grade technologies which are easily accessible. The first prototype was developed in the summer of 2022. The first production version, called Mykola, was involved in attacks on Sevastopol during months of October and November in year 2022. This 5.5m long drone had operational range of 800kms and could carry payload of 200kg. By using commercial water-jet of jet-ski, Mykola achieves the max speed of 43knots. (Sutton, 2022). Magura-V5 is the second generation armed USV and came to limelight when Russian Navy intelligence ship Ivan Khurs was attacked on 24 May 2023 far south of

Crimea. This demonstrated Magura-V5 capability to travel at longer ranges and target ships in open seas. Compared with Mykola, Magura-V5 has similar physical dimensions and max speed, but has longer range, carries bigger payload of 320kg, supports improved data-link, and is equipped with superior electro-optical and infra-red sensor (Sutton, 2023).

The third generation, and currently the most capable armed USVs in Ukraine disposal are called Sea Baby. Made with reinforced hull, this drone boat can transverse rough sea and can strike surface vessels in the entire Black Sea. With 6m length, USV has more range (1,000kms), more speed (49 knots) and carries nearly a ton payload (850kg). Beside built-in explosive warhead, several new alternations of Sea Baby USVs have been developed. It can be additionally equipped with thermobaric rockets, grad rockets, supplementary fuel-tanks, and even a pair of R-73 Archer IR surface to air missile. The rockets are added to provide additional firepower to disrupt or destroy enemy defenses which can intercept this drone. Since Russia has been using helicopters to destroy these drones, therefore a pair of R-73 Archer missile was added to engage aerial threats (Sutton, 2024). As conflict will progress, its likely more advance versions of USVs will be developed by Ukraine.

Russian Limitations in Black Sea

Through-out Black Sea conflict, Russia has repeatedly showcased certain shortcomings which were successfully exploited by Ukraine. To begin with, Black Sea was never a focal point for Russian military command. Black Sea front was meant to deny Ukraine's maritime connectivity and mount amphibious assault on Ukrainian coasts to open additional front from South. As Russian army, which invaded Ukraine from multiple fronts, began to push back, more resources and focus were directed to sustain land fronts, leaving Black Sea Fleet exposed to Ukraine's asymmetric attacks.

Foremost limitation was the absence of Russian air-power over Black Sea. Presence of air-coverage would have allowed Russia to degrade Ukrainian efforts of deploying asymmetric operations. Additionally, employment of Russian fighter aircrafts in the Black Sea airspace would have denied TB-02 UCAV operations. Furthermore, Russia's airborne ISR assets, like Airborne Early Warning and Control (AEWSCs) aircrafts would have provided OTH situation awareness for Russian Navy. Sinking of Moskva, despite presence of multi-layer air-defense system, is attributed to element of surprise as cruiser was caught off-guard due to insufficient early warning and ISR capability- particularly against OTH threats (Axe, 2022).

Second, Russian Black Sea Fleet had limited air-defense capability at the time of invasion on Ukraine. With exception of Moskva missile-cruiser, no other warship of fleet was equipped with long-range air-defense missiles. The overwhelming dependency on Moskva backfired once the cruiser sank. It created a big void in Black Sea Fleet air-defense capability. Yes, two Admiral Grigorovich class frigates, equipped with Shtil medium-range air-defense missiles, were operational and one of the frigates, namely Admiral Essen, also shot down a TB-02 UCAV (Recognition, 2022). But only two frigates were inadequate to provide protective cover to other assets of Black Sea Fleet (Axe, 2022). This led to high attrition against Ukrainian drones. Rudimentary measures, like installation of land based Tor-M2 SAM system on patrol ship (Militamyl, 2022), also couldn't deliver requisite results.

And finally, Russian high command gave no consideration to forthcoming threats despite clean intelligence, and continued to operate without taking necessary precautions. For example, Russia was aware of Neptune missile battery, yet Moskva continued to operate close to Snake Island within strike range of missile. Same mistake was repeated by Vasily Bekh rescue tug boat which was sailing in targeting envelop of newly delivered shore-based Harpoon missiles. Frequent losses of patrol boats against TB-02 UCAVs, is another example of incompetence and neglect displayed by Russian Black Sea command. Similarly, kamikaze USV was firstly spotted ashore and was reported by various open sources. Russia ignored the gravity of danger posed by this new form of threat and later paid the heavy price. Defensive measures like helicopters' patrols, physical barriers like floating booms and nets, and deceptive camouflage paint schemes have also proven inadequate to reliably safeguard Russian warships against suicide drone boats (Sutton, 2023).

Russia-Ukraine war in Black Sea has now entered into the phase of frozen conflict. With Bosphorus and Dardanelles straits closed, Russia can no longer replenish its Black Sea Fleet with additional warships and submarines. Similarly, Ukraine neither has the capability to establish sea control in Black Sea due to absence of warships, nor it can acquire any major naval asset from foreign source. Kyiv will continue to focus on asymmetric tactics to deny freedom of operations to Russians in Black Sea. Meanwhile, primary focus and the bulk of resources of both antagonists are being directed towards land battles.

Unmanned Systems in Naval Warfare: Future Outlook

Russia-Ukraine war in Black Sea have paved way for innovative unmanned systems which once mature can shape the conduct of future naval warfare. These unmanned systems will provide low-cost low risk solution in complex battlespace. With integration of newer capabilities, unmanned systems will become more capable and operationally flexible in all domains of naval warfare. In future, besides providing inherent ISR duties, UAVs/UCAVs will be employed for stand-off strike missions, air-defense, ASuW, ASW operations, and other complex missions. Many modern examples like U.S. *MQ-25 Stingray* (Rogoway, 2024), China's *WJ-700* (Osborn K. , 2021), and Turkey's *Akinci* (Sünnetci, 2024) are either being planned or already being equipped with anti-ship cruise missiles, loitering munitions, and similar guided weapons. Enhanced autonomy and dynamic decision making capability will allow these unmanned systems to effectively operate in swarms and as loyal-wingman. Jet-powered UAVs/UCAVs, particularly with built-in stealth features, will further elevate the combat potential of these systems making them equivalent or even superior than manned-aircrafts. Such UAVs/UCAVs will likely be integrated into network-centric warfare systems, enabling seamless communication with other unmanned systems, surface ships, and submarines to execute complex multi-domain operations.

Similar developments will be observed in the domain of loitering munitions. These munitions have low RCS and hovering capabilities which enable them to exploit enemy's defensive vulnerabilities. In future, loitering munitions are expected to become standard load-out of many naval vessels. Low tonnage vessels, like fast attack crafts (FACs) and off-shore patrol vessels (OPVs), which cannot be equipped with cruise missile due to size limitations, can support loitering munitions for significant increment in firepower, strike precision and engagement range. Additionally, heavier vessels, like destroyers and frigates, can be equipped

with loitering munitions for improving operational flexibility. These munitions bridge the gap between deck guns and cruise missiles, offering a middle ground in both range and firepower. They are particularly effective against targets that are too small for cruise missiles or beyond the reach of guns. Naval aviation and sub-surface assets can also gain advantages from specialized versions of these loitering munitions. In swarms, these munitions can overwhelm even layered defenses and can offer remarkable operational flexibility when employed with varying payloads, like warheads, jammers, and decoys.

Future holds bright prospects for kamikaze drone boats also. Due to their small size, these drones have restricted range and endurance, which degrade their usefulness particularly in open seas. Effective use of air-power, electronic warfare (EW), and even anti-surface warfare (ASuW) can disrupt USV operations. Despite these limitations, drone boats are likely to impart major impact in the conduct of naval warfare in future. Technological advancements – like higher degree of autonomy, and refinement in employment tactics, can enhance the operational flexibility of USVs in future. (Ibrahim, 2023). Supervised autonomous drone boats will be able to operate in swarms and in conjunction with other manned-unmanned systems for overwhelming enemy defenses (Ibrahim, 2024). In future, drone mother-ships may be used for employing variety of USVs for conducting wide spectrum of naval operations in closed as well as open seas (Harper, 2023).

Traditional naval war fighting strategies are being challenged by innovative asymmetric tactics involving employment of unmanned systems. By effectively using unmanned combat systems, Ukraine has disrupted Russia's naval superiority in Black Sea. As these technologies continue to evolve, they are likely to become even more integral to naval strategy, particularly for nations facing conventional power asymmetries in naval domain.

Conclusion

The ongoing Black Sea conflict, besides exposing limitations of Russia's naval might, has also underscored the growing significance of unmanned combat systems in modern naval warfare. Despite being outmatched in traditional naval power, Ukraine has successfully employed UAVs/UCAVs, weaponized commercial drones, and kamikaze sea drones to conduct sea-denial operations and target high-value Russian naval assets, thereby disrupting Russian naval operations in Black Sea. For Ukraine, continued investment and evolution of these systems will be crucial to maintaining its defense against Russian naval forces. Conversely, Russia will need to adapt by developing effective countermeasures and enhancing its own unmanned capabilities to maintain dominance in the Black Sea. In nutshell, the Black Sea Conflict has demonstrated that the future of naval warfare is increasingly driven by unmanned systems. As technology will evolve further, more capable and superior unmanned systems will emerge which will eventually impart redefining impact on the conduct of future naval warfare.

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INDIA'S PURSUIT OF EMERGING MILITARY TECHNOLOGIES: IMPLICATIONS FOR REGIONAL SECURITY

Safia Mansoor

Abstract

Emerging military technologies have become central to state's strategic endeavours and contribute significantly to achieving military-cum-political objectives. The strategic competition for these advanced military technologies has not remained restricted to major powers nay, has created a spill over effect in South Asia. In this backdrop, this paper aims at discussing India's quest to integrate emerging military technologies into its force structure and its emphasis on key areas. Moreover, it will analyse impact of these technologies on force posture of India, notably with respect to Pakistan. The research is significant as it underlies ramifications of India's relentless quest for emerging military technologies on regional security. The theoretical framework employed is Regional Security Complex Theory (RSCT) by Barry Buzan and Ole Waever. The methodology used is qualitative whereas the type of research is exploratory in nature. This research concludes that India's quest and merger of emerging military technologies in its force structure will disturb the conventional and nuclear military balance in South Asian region and therefore is horrendously detrimental to regional security.

Key words: Emerging Military Technologies, India, Pakistan, Regional Security Complex Theory (RSCT), Regional Security.

Introduction

Militaries all over the world have been under technological transformation owing to emergence of new and disruptive military technologies. In contemporary times, various military powers have been incessantly incorporating different and novel technologies in their arsenal such as AI-Artificial Intelligence, Hypersonic weapons- HSWs, LAWs-Lethal Autonomous Weapons, DEWs-Directed Energy Weapons, quantum, and cyber technology. These technologies known as emerging military technologies carry massive potential to generate new domains of warfare, increase state's existing capabilities, horrendously disrupt security calculus alongside existing balance of power.

Besides strategic competition for these advanced military technologies among the major powers, the spill-over effect of this competition is palpable in South Asian Region. India's quest and merger of emerging military technologies in its force structure will disturb the conventional and nuclear military balance in South Asian region and therefore is horrendously detrimental to regional security. India is taking strident leaps in various domains of emerging technologies. Amongst the various emerging military technologies, India is working to integrate Artificial Intelligence, Directed Energy Weapons, Hypersonic Weapons, and Cyber technologies in its military forces. India's pursuit of emerging military technologies will have colossal repercussions for South Asian regional security complex.

The South Asian Security Complex is grounded in India-Pakistan rivalry and given the high security interdependence between both states, India's acquisition/development and integration of such technologies immensely increases military asymmetry between both countries, disrupts nuclear equilibrium in South Asia, make India's force posture more aggressive towards its rival Pakistan and therefore increase the chances of inadvertent escalation. It also leads to another arms race in the region and cumulative impact of all the development and their potential ramifications will severely undermine the regional security. In this backdrop, this paper aims to address the key questions: a) What are key focus areas for emerging military technologies in India, and how is it advancing in each of these domains? And b) How India's integration of emerging military technologies in armed forces has been implicating South Asian Regional Security Complex?

Theoretical Framework: Regional Security Complex Theory

In 1983, Barry Buzan first used the term 'Regional Security Complex' in the landmark work 'People, States, and Fear', whereas this theory further underwent development in post-cold war era. Barry Buzan and Ole Waever from the Copenhagen school of thought are the key proponents of RSCT- Regional Security Complex Theory. As per this theory, although states in system are entrapped in security interdependence global web; however, military and political threat moves faster over miniscule distances causing insecurity to be primarily lined with

geographical proximity. Fear mainly arises from the neighbours rather than states that are distant (Sudurski, 2022).

In an international system characterised by geographical diversity, RSCs Regional Security Complexes or simply regional based clusters signify the pattern of state's security interdependence. States within RSCs have more acute security interdependence rather than states that are outside RSC. This theory emphasises security relations between states with relative intensity that in turn beget unique regional patterns framed by past behaviour of animosity and cordiality as well a distribution of power. Previously Buzan has defined security complex as set of states whose key security concerns and perceptions are intertwined to such an extent that makes it impossible to analyse and resolve their national security issues separate from each other.

However, this definition later acquired a constructivist touch and is now defined as set of units with interlinked key process of either securitisation or securitisation, or even both, causing to analyse or resolve their security issues in conjunction with each other (Buzan, 2003). With respect to South Asian Region, India's incessant quest for emerging military technologies have horrendous impact on Regional Security Complex of South Asia that in turn would be grounded in arch rivalry between Pakistan and India.

In the context of Regional Security Complex Theory (RSCT), the overall security of India and Pakistan is closely linked to each other and their broader regional dynamics. Security concerns primarily manifest within South Asia, where the interactions between these two states significantly influence regional stability. The multi -level interactions between India and Pakistan reveal a complex web of amity and enmity, heavily shaped by their security interdependence. In this region, clear patterns of cooperation and conflict characterize the security landscape, illustrating how the security of one state directly affects the other.

Given the geographical proximity of both states, their security interdependence is extremely high and any security development in one state causes a threat perception for another. Difference in power distribution between states is also huge; however, the nukes have remained source of strategic stability between both states. But with India's relentless acquisition and incorporation of emerging military technologies in its armed force structure, the military asymmetry between both states tremendously surge, endowing India to adopt an aggressive force posture towards Pakistan that in turn would heighten the probability of inadvertent escalation.

Within same security complex, India's quest for such technologies cannot be separated from security of other states such as Pakistan, thereby impacting the strategic equation between nuclear rivals. Given the geographical proximity, Pakistan's security is highly interdependent with respect to India and in case of emerging military technologies its efforts substantially lag behind India. These technologies when weaponised by India not merely detrimentally impact escalation ladder and blurs distinction between nuclear and conventional attack, these will catalyse another arms race in region.

Emerging Military Technologies and India

The volatile security environment in South Asia is shaped by various factors that intensify the region's threat perceptions. One significant factor is the ongoing rivalry between the two nuclear-armed neighbours, India and Pakistan, who share a lengthy border. A thorough analysis of the strategic stability in South Asia reveals that India has adopted a pre-emptive counterforce doctrine. This shift involves bolstering its conventional and strategic precision-strike capabilities to conduct offensive operations deep into the territory of adversaries. Additionally, India's military modernisation and strategic communication efforts align with these overall trends (Masood and Baig 2023). In tandem with this, India has embarked itself on a quest for emerging military technologies to enhance its military capabilities vis-à-vis its rival states in the region.

The term 'emerging military technologies' implies advanced and novel technological developments that are currently being tested, researched, as well as implemented for military uses. Such technological advancements imply a leap in strategy, capability, and efficiency, as they are created for furthering effectiveness of military in various domains such as air, land, sea, and even cyberspace. These technologies include Artificial Intelligence, Directed Energy Weapons, Lethal Autonomous Weapons, Quantum computing and cyber technologies, and hypersonic technologies (Saylor, 2024). India, one of the key players in South Asia has been constantly working on such technologies in order to increase its military effectiveness.

Two significant transformations within the Indian Armed Forces. The first is a shift towards 'Atmanirbharta' or self-reliance, while the second involves a heightened focus on emerging technologies. While promoting self-reliance or indigenisation in defence has invigorated the entrepreneurial drive of the Indian private sector and is crucial for maintaining the country's strategic autonomy, integrating emerging technologies is equally vital due to the evolving nature of modern warfare (Upadhyay, 2023). It is essential to consider the rationale behind India's pursuit of dual-use technologies. The burgeoning capabilities in nano-technology, missile, and space, may be attributed to strategic partnership between US and India that in turn is to contain China's ascendancy. Moreover, India's threat perception from China as well as Pakistan also play a vital role in India's rapid modernisation in its military apparatus to fulfil capability gaps to curb various threats by acquiring disruptive technologies.

'The Technology Perspective and Capability Roadmap' of India emphasises the technological developments primarily for joint warfighting. As per this plan, to ensure national security in the 21st century, the Indian military must excel across a spectrum of operations, ranging from humanitarian aid to conventional warfare. This requires a strategic approach where the Department of Defence shapes the security environment in ways that align with national interests, responds effectively to diverse crises, and anticipates future challenges. Central to achieving this broad operational capability is the acquisition of information superiority and the advanced technologies that facilitate it. The combat forces need to be more agile, mobile, and lethal, with technology playing a crucial role in this transformation.

Investments in defence must prioritise research and technological development to address emerging and unpredictable threats. Technological superiority will be essential for maintaining a military edge. Our technology investment strategy will focus on three key areas: harnessing the rapid advancements in technology, advancing the Information-based Revolution in Military

Affairs (RMA), and addressing asymmetric threats. By prioritising these areas, the Indian military can enhance its operational effectiveness and maintain a decisive advantage in the face of evolving security challenges (MoD, 2018). Following are the key areas upon which India is working with respect to emerging military technologies.

Artificial Intelligence

India's integration of AI in military domain dates back to 2018 when DoD- Department of Defence for the first time issued 'Artificial Intelligence Strategy' (Levesques, 2024). As per this strategy, India's inability to integrate AI will beget legacy system inconsistent to people's defence, undermining collaboration among partners and allies coupled with diminished access to various market detrimental to living standards and prosperity. Consequently, 75 new AI technologies were launched by Defence Minister of India, Rajnath Singh in 2022 during AIDef-AI in Defence Symposium (Standard, 2022). For institutionalization of AI in defence domain, India's Department of Defence formulated a task force in February 2018 for 'Strategic Implementation of AI for National Security and Defence' and based on its recommendation, DAIC-Defence AI Council alongside DAIPA – Defence AI Project Agency were constituted in 2019.

DAIC's key purpose is provision of significant guidance for enabling development of different AI operating frameworks and, structural support alongside changes at policy-level for integration of AI in military domain. As far as DAIPA is concerned, its primary aim is to adopt and develop standards with regards to development of technology for Artificial Intelligence projects. Moreover, DAIPA is tasked to review adoption plan of AI enabled-cum-led processes and systems with user's groups. India's defence ministry has decided to allocate \$12 million or Rs 100 crore to DAIPA on annual basis for initiating AI projects, capacity building in AI, developing AI-related data and infrastructure (Mansoor, 2024).

India's CAIR- Centre for Artificial Intelligence and Robotic is an organisation solely responsible for carrying out research in robotics and artificial intelligence. It is primary institution that nurtures India's R & D in Artificial Intelligence. The key tasks of CAIR includes formation of autonomous technologies in the fields of path planning, underwater mine detection, combat, logistics, sensors, localization, and target identification. In 2018, India indigenously built UCAV - Unmanned Combat Aerial Vehicle named as Rustom-2 that flies at medium altitude having long-endurance. Additionally, various projects are underway such as MARF-Multi Agent Robotics Framework system for reconnaissance and surveillance, integrated early warning systems, UUV-Unmanned Underwater vehicles named Matsya for surveillance under the sea, and AURA-Autonomous Unmanned Research Aircraft.

Furthermore, in 2017 India ordered production of 200 DAKSH robots to diffuse bombs, notably in the difficult terrain. Another achievement in AI domain is successful testing of unmanned aerial vehicle named Rustom II built for surveillance up to 250km (Arif, 2019). Indian army has been developing drones for ISR-intelligence, Surveillance, and Reconnaissance purpose and it demonstrated this capability in 2021 by displaying swarms of 75 UAVs in Dakshin Shakti exercise. Although exact nature, number, and extent of public-private partnership with regards to AI military technologies remains unclassified, various revealed AI projects are dedicated to imagery analysis, ship-tracking, drone-collision avoidance, and atmospheric visibility. Each armed service branch of India has AI-application centres: Navy has INS Valsura;

Army has Military College of Telecommunication Engineering; and Airforce possesses Air Force Station at Rajokri. Another key development by Indian Navy is IMSAS- Indigenous Maritime Situational Awareness System which is state-of-art system for enabling real-time command and control (Ali, 2023).

Hypersonic Technologies

India's pursuit of hypersonic weapons dates back to 2007 when Dr. Abdul Kalam addressed the DRDO's Defence Research and Development Organisation Director's conference and envisaged hypersonic cruise missiles as indispensable defence systems for India in upcoming 15 years. The quest of hypersonic technology of India is grounded in successful testing of Brahmos supersonic cruise missile also titled as PJ- 10 which is medium range missile that in turn can be launched from submarines, ships, air, and land (Bhan, 2022). Being regarded as the state-of-art fastest supersonic cruise missile, it was a product of joint venture between NPO Mashinostroyeniya company of Russia and India's Brahmos Aerospace.

There is an ongoing hypersonic missile program at India's Brahmos Aerospace with the key objective of developing Brahmos-II missile modelled on Tzirkon Russian missile, an anti-ship missile with scramjet engine with the ability to climb to 28km and travel at Mach 9 (Simha, 2024). India is expected to build hypersonic missile by 2028; however, these Brahmos hypersonic and supersonic technologies can only be used by Russia and India as later is signatory to MCTR-Missile Control Technology Regime which forbids export and sale of missile with 300km range and ability to carry 500kg payload to any other state excluding Russia.

For the export of Brahmos missile, Philippine signed deal with India in 2022 but that deal will entail missile with reduced range of 290km in accordance with MCTR (Singh, 2024). Given the unpredictable behaviour of state with regards to imposition of sanctions on state in past, India has also been carrying out parallel program for acquiring hypersonic capability to curb the impact of sanctions on India. Since 2008, India's DRDO has been working on HSTDV- Hypersonic Technology Demonstrator Vehicle in order to test performance of scramjet at Mach 6 and altitude up to 20km. This project has dual applications which can be used in launching satellites for civilian purpose at low-cost and simultaneously propelling long-range cruise missiles. In June 2019, India tested HSTDV for the very first time which was followed by second successful test in September 2020 with the speed Mach 6 and 30km altitude (Mike Yeo, 2021). More recently, India tested this technology for third time on 27 January, 2023 and has become fourth state in world after US, China, and Russia to successfully test this hypersonic technology (Tripathi, 2024).

The demonstration of that vehicle implies possession of various key technologies such as aerodynamic configuration with regards to hypersonic manoeuvring, employing scramjet propulsion for dual purpose of ignition as well as sustained combustion alongside the separation mechanism of vehicles as hypersonic velocities. As per the scientists of DRDO, this vehicle possesses the capability to launch long-range cruise missile as well as hypersonic missiles. HTDV prototype built with \$4.5 million requires three more tests in upcoming five years to fully develop a hypersonic weapon that can carry nuclear and conventional warheads (Yeo, Pittaway, Ansari, Raghuvanshi, & Martin, 2021).

Directed Energy Weapons

One of the key emerging technologies is the DEW-Directed Energy Weapons which employs direct lethal force created by concentrated particle beams, microwaves, and laser onto target with matchless speed. Various advantages of DEWs over conventional weapons include low detectability, low-cost per shot, logistical benefits, and unmatched accuracy as well as lightning speed. As far as Indian DEWs program is concerned, it's mostly a classified defence program; however, as per open sources and reports, the integration of DEWs into India's arsenal is evident from various initiatives such as DURGA-Directionally Unrestricted Ray-Gun Array and KALI-Kilo Ampere Linear Injector that have been under development for several years. These program's classified nature implies particular parameters in secrecy, operational range, implying sensitivity and strategic significance of these advanced weapon systems. Moreover, the proposed systems which are said to be inducted by 2024 may possess the ability to obliterate incoming projectiles and missiles during flight's terminal phase up to 25km range (Baruah, 2023).

One of the most vital offshoot of DEW program is evident from India's anti-drone system which has been mutually developed by BEL-Bharat Electronics Limited and DRDO-Defence Research and Development Organisation and deployed by India for last two years. This anti-drone system has both soft kill and hard kill options. Soft kill implies use of concentrated and intense beams to disable and disrupt communications, PNT-Positioning, Navigation, and Timing Systems, and Command and Control of the target; whereas hard kill implies destruction through direct collision (Siddiqui, 2023).

Moreover, the Defence ministry of India announced on March 11, 2022 regarding identification of 18 key platforms for design and development by defence industry. It entailed Directed Energy Weapons with or more than 300 kilowatts, mainly, High-Powered Laser Devices and High-Powered Electromagnetic Devices (Baruah, 2023). One of the most pertinent organization in this regard is HQ IDS- Headquarters Integrated Defence Staff which is joint service headquarters of Indian Army, Airforce, and Navy and serves to be the point organization for emergence of policy, doctrine, procurement, and war fighting.

Head Quarters Integrated Defence Staff has identified DEWs as one of the significant technologies to be prioritized until 2025 as documented in 'Technology Perspective and Capability Roadmap,' defence document which provides private and public defence industry of India a strategic direction in accordance with which Indian armed forces aim to pursue capabilities in upcoming fifteen years that would steer development processes of present and future technologies. (Head Quarters Integrated Defense Staff, 2013).

For instance, in case of laser weapons, India intends to integrate these weapons in platforms of three services such as submarines, naval destroyers, and fighters. The DEWs are quintessential with respect to anti-ballistic missile capability and India is working on such technologies. As per LASTEC- Laser Science and Technology Centre, DRDO's dedicated laboratory for development of lasers and other such technologies, laser weapon can fire high energy beam with 25kilowatts potency to obliterate and intercept ballistic missiles even in its terminal phase (Mansoor, 2024). As per officials, India is working on solid-state lasers with 100-kilowatt potency for destroying ballistic missiles in boost phase.

Cyber Technologies

Cyber challenges in the contemporary era are regarded as one of the key intrusive technologies and India is investing heavily in this area. In 2015, India unrolled 'Digital India Program' entailing Spectrum Optical Fibre Project. The investment of India army in the latest cyber technologies includes offensive operations and intelligence. In broader areas, India is enhancing number of skilled cyber experts and concurrently developing potential to harness information technology sector to counter attacks in sensitive areas such as 'ethical hacking; and 'honeypots' and to ensure cyber security defence. Government of India also developed Defence Cyber Agency in August 2021 and divulged that air force, army, and navy had established Cyber Emergency Response Teams.

Moreover, Indian army also revealed in 2021 that it had developed Quantum Lab at MCTE-Military College of Telecommunication Engineering to work on advanced secure communication (Shang-su & Basrur, 2022). Another technological leap is the development of Maya Operating System which is a replacement of Microsoft Windows. This new system aims at fortifying the digital domain of Indian Defence Ministry and

is accompanied with novel endpoint detection-cum-protection system named as "Chakravyuh" that will buttress the OS. Furthermore, this shift from secure alternative of Operating System coupled with end point anti-virus and anti-malware system signifies technological upgradation in digital domain and security breakthrough (CyberPeaceCorps, 2024).

Implications for Regional Security

The strategic milieu in South Asia is presently oscillating between quest for technological modernization and innovation through inclusion of novel strategic weapons on one hand and ensuring deterrence stability on the other. As per the conventional wisdom, India is a nuclear power with restrained nuclear weapons against the nuclear warfighting and follows the No First Use Policy. However, in practical terms, there is less certainty in India's restrained nuclear posture, evident from various official statements and development of array of capabilities favouring the counter force and pre-emption that are contrary to India's professed strategy of minimum deterrence or assured retaliation.

Staunch counter force options are buttressed by these emerging technologies notably by Artificial Intelligence and precise delivery vehicles such as hypersonic missiles that leads to flexibility of command-and-control structure. Such technological innovation may be extremely useful in interception (capabilities) of strategic assets of Pakistan with the aims of neutralizing nuclear capabilities of Pakistan and would break India's strategic paralysis and in turn provide it free end to wage conventional war (limited in nature) in the absence of any fear pertaining to threat of nuclear use by Pakistan.

Furthermore, it can lower the lower threshold and enhance the chances of nuclear brinkmanship (Jalil, 2020). It could not only incentivize India to launch pre-emptive strikes against Pakistan in unconventional as well as conventional terms, but could also cause the military planners of Pakistan to downgrade their restrained approach and resort to nuclear preventive strike. Emerging military technologies could play a prominent role in stimulating decision-making pace amidst crisis situation. In South Asia strategic milieu, the probability of

catastrophic or rapid escalation is already extremely high due to destructiveness and speed of nuclear weapons. This is also described in terms of ‘wormhole’ implying opening up of holes in deterrence’s fabric through which adversarial states (and in this case India) can suddenly and inadvertently enter and traverse between strategic and sub-conventional levels of conflict in non-linear ways (Jaffrey, 2022) .

Various advanced military technologies such as hypersonic delivery systems and AI are instrumental in accelerating survivability, lethality, and precision of warfare’s conventional tools in several ways threatening traditional conception of stability and create new ways for transforming conflict escalation into strategic crisis wherein horizontal and vertical escalation consolidate with warm hole impacts. Such risks are further accentuated by the possibility of cyber-attacks owing to development of lethal cyber technologies which are difficult to attribute and anticipate. Cyber-attacks on dual-use Command and Control Systems as well as conventional targets colossally erode deterrence stability. Furthermore, such kind of attacks may be carried out against nuclear systems that in turns undermines already precarious strategic stability in the region.

India’s pursuit of hypersonic weapons (HSWs) has detrimental impact on regional security environment of South Asia. HSWs dual ability to carry nuclear and conventional warhead; besides, it entails military and civilian applications alongside utility as offensive and defensive weapons. Although it is said that such technologies may prove beneficial for strategic stability, the possession of such technologies by India whose rival (Pakistan) is devoid of such defence and novel technologies and is conventionally smaller, HSWs severely undermine the strategic stability in the region. India-Pakistan deterrence equilibrium gets undermined by acquisition of new or disruptive military technology by either state as it endows possessor with substantial strategic advantage in conflictual scenario. In addition, even during the peacetime, this kind of strategic advantage endows the possessor state to employ coercive tactics to subjugate the rival state.

Emerging military technologies, notably the HSWs, furthers first-strike tendencies providing the state with confidence to carry out first strike against rival state while using HSWs, and then having the ability to use missile defences to nullify Pakistan’s retaliatory strike disrupts the equilibrium between them. Moreover, close geographical proximity between Pakistan and India hampers the deterrence equation by decreasing flight times of HSWs. Given the lack of counter measure for such weapons with respect to Pakistan and flight time reduction from 5-10 minutes to few minutes due to hypersonic weapons will jeopardize deterrence between both states. Such unfavourable conditions and technological edge will embolden India to employ belligerent attitude owing to its enhanced counterforce capabilities. Additionally, the conventional-nuclear entanglement also signifies the related scenario in which dual- capable technologies such as HSWs cannot be distinguished upon deployment that whether they are carrying conventional or nuclear payload, therefore causing extreme difficulty for targeted state to find an adequate response to aggressor (Abbasi, 2023).

Such emerging technologies also decrease the probability of conflict resolution, given the substantial edge due to efficacy and precision. The uncertainty surrounding nuclear posture of India and strategic ambiguity associated with emerging military technologies will instigate crisis instability during conflictual scenario in region. With respect to DEWs, India's pursuit in this regard will destabilize the region as it will have a spill-over effect in the region and may initiate an arms race in region compelling Pakistan to resort to such technologies to counter India's ever-enhancing military capabilities.

Moreover, DEWs, notably High energy laser weapons with its anti-ballistic missile capability poses another potent challenge to strategic stability and in turn regional security environment. These cutting-edge technological weapons with the ability to destruct and intercept ballistic missiles put Pakistan at a disadvantageous position as it again enhances the counterforce capabilities of India vis-à-vis Pakistan.

Furthermore, it will lead to increasing military asymmetry between India and Pakistan given their enormous potential in provision of considerable operational advantage to Indian military forces. In addition, DEW's inimitable attributes such as precision in targeting objects, speed-of light responsiveness, deep magazines, tailored targeting effects enable the possessor state to get strategic advantage in warfare (Romeo, 2023). The militarization of AI by India would have an impact on regional security in both conventional and nuclear domains.

Owing to India's military integration of AI, India-Pakistan deterrence equation might become unbalanced, thereby disrupting the strategic stability. As per the New START (New Strategic Arms Race Treaty), strategic stability includes arms race stability and crisis stability. Arms race stability includes lack of drive to enhance nuclear force whereas crisis stability implies lack of incentive to carry out first strike. AI integration will endow the Intelligence, Surveillance, and Reconnaissance (ISR) capabilities to India that in turn would enhance its ability to find, track, as well as target the military assets of adversary, notably Pakistan. Furthermore, AI will buttress the pre-emptive strike capability of India that may disrupt the crisis stability between India and Pakistan.

This could boost India's confidence in effectively executing a disarming counterforce strike against Pakistan. The concept of deterrence becomes even more intricate if India employs offensive counterforce capabilities alongside its Ballistic Missile Defence Systems. The integration of AI and autonomous military systems by India introduces new risks of miscalculation and unintended escalation, as rapid data processing might lead to hasty decisions during crises. More broadly, these advancements could spark a high-tech arms race in South Asia, potentially undermining both India and Pakistan's ability to manage and resolve conflicts effectively. This could shorten the window for diplomatic resolution and elevate the risk of nuclear confrontation (Altaf & Javed, 2024).

On the conventional side, AI-backed systems can tremendously enhance efficiency of logistics systems by cutting down costs and wastage, leading to better functioning of Indian Armed Forces. AI systems would increase India's cyber-war capabilities which includes defensive capabilities — secure communication links and protected military assets, and offensive capabilities—ability to attack military assets of adversary. Moreover, intelligent unmanned systems with the capability to provide ISR can serve dual purpose: on one hand, they can facilitate in identifying potential targets when used for analysing and interpreting data; while on the other hand, they can substantially reduce threat to armed forces personnel when employed for patrolling in conflict zone.

Pakistan's Response

Pakistan's vision prioritizes the advancement of AI to drive economic, educational, and social progress. President Arif Alvi's Presidential Initiative for Artificial Intelligence and Computing (PIAIC) aims to enhance opportunities in national business, research, and education within the fields of block-chain, AI, and cloud computing. In parallel, the Punjab government introduced the National Initiative for Artificial Intelligence and Security (NIAIS) in 2019. This initiative seeks to bridge the skills gap between the labour market and educational institutions while also addressing the implications for national defence capabilities.

In 2020, the Pakistan Air Force's Centre for Artificial Intelligence and Computing (CENTAIC) launched a Cognitive Electronic Warfare (CEW) program aimed at leveraging AI and Machine Learning (ML) for enhanced analytical and tactical decision-making. CENTAIC specializes in areas such as Big Data, ML, Deep Learning, Predictive Analysis, and Natural Language Processing, catering to both military and civilian requirements. In 2022, the Pakistan Army announced the establishment of its Cyber Command, which is believed to consist of two divisions. One of these divisions, the Army Centre of Emerging Technologies, is expected to focus significantly on AI among its key research areas (Ali, 2023).

Pakistan has been developing its domestic drone program. In 2009, the National Engineering and Scientific Commission (NESCOM) collaborated with the Pakistan Air Force (PAF) to create the indigenous UCAV 'Burraq,' capable of carrying a 50 - kilogram payload over 200 km. Equipped with a Barq air-to-surface laser-guided missile, Burraq was used in counterterrorism against Tehreek-e-Taliban Pakistan (TTP) in North Waziristan. Global Industry Defence Solutions (GIDS) introduced the Shahpar I in 2013 for ISR and disaster management. Following its success, Shahpar II launched in 2021, while Shahpar III debuted in 2023 with enhanced features, including synthetic aperture radar and a 1,650-kilogram payload. Pakistan also has tactical UAVs like UQAB and SATUMA Jasoos II, and it has procured Cai Hong 4 drones from China and Bayraktar Akinci A from Türkiye. (Khan, 2024). Despite these developments, Pakistan's investment in DEWs and other emerging technologies remains either absent or miniscule necessitating incorporation of new military trends commensurate with security needs of the country.

Conclusion

India's quest for emerging military technologies isn't in isolation with other states in the region, notably its arch rival Pakistan. India making significant leaps in such technologies is enhancing military asymmetry with Pakistan as the latter lags behind countering threats from the former in this regard. These technologies' weaponisation has dangerous and far-ranging ramifications that not merely blurs distinction between conventional and nuclear attack, but also runs up escalation ladder. Furthermore, it will generate a new and lethal new arms race between states in the region, primarily between two nuclear rivals. Its overall undermines the stability in South Asian Region. Inclusion and military application of such technologies would have multifaceted repercussions to regional security, notably strategic stability. It would increase temptation of India to harness first strike capabilities owing to enhanced counterforce capabilities. Additionally, such developments will spur new arms race in region and concurrently endows India to initiate conflict and adopt a belligerent posture due to strategic advantage provided by such technologies. Consequently, South Asian Security Complex becomes more volatile and regional security becomes more threatened.

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INDIAN MILITARY DOCTRINAL EVOLUTION AND ITS LIMITATIONS: A CRITICAL APPRAISAL

Ahmad Ibrahim

Abstract

India doctrinal evolution has taken place according to New Delhi's growing threat perceptions. This research article has discussed the evolution and fundamentals of Indian military doctrines with respect to John Mearsheimer's concept of three basic offensive war fighting strategies. The research has highlighted the deficiencies in Sundarji doctrine which led to the transition towards a swift and limited war fighting strategy in form of Cold Start Doctrine. Cold Start Doctrine was directed to exploit war-fighting space below the nuclear threshold. This article has evaluated the strength and limitations of Cold Start Doctrine, and how it failed to achieve its full functional capacity due to operational short comings of Indian military. The article further briefly discusses the employment of tactical nuclear weapons (TNWs) by Pakistan to lower nuclear threshold for thwarting India's Cold Start Doctrine. Article has evaluated Uri (2016) and Pulwama-Balakot Crisis (2019) with respect to India's refining doctrinal framework. The future aspiration of theaterisation, aimed at creating unified theatre commands to enhance operational efficiency, is also explored. The enduring security dilemma between the two nations is used as a framework to understand why India is undertaking doctrinal transition and is now incorporating force theaterisation. The article concludes by exploring the challenges which India is likely to face for theaterisation of its military forces and its potential impact on South Asian strategic stability.

Key Words: Sundarji Doctrine, Cold Start Doctrine, Tactical Nuclear Weapons, Operational Shortcomings, Theaterisation, Security Dilemma.

Introduction

India's military doctrines have undergone significant transformations since the late 20th century, reflecting its evolving strategic objectives, regional security concerns, and military ambitions. From the Sundarji Doctrine of the 1980s, which was rooted in and large-scale defensive-offense warfare, to the more dynamic and aggressive Cold Start Doctrine (CSD) in the early 2000s, these shifts have been driven by India's need to address changing threats, especially from Pakistan and now from China also. As India's security environment has become more complex, these doctrinal shifts underscore the Indian military's efforts to achieve New Delhi's ambitions of becoming regional hegemon and effectively coercing its adversaries.

The Sundarji Doctrine, named after General Krishnaswamy Sundarji, sought to employ India's conventional military superiority in large, decisive battles, on the Western front with Pakistan. However, this doctrine efficiency become especially after the overt nuclearization of South Asia in 1998. The employment of large military formations posed risks of nuclear escalation exposing the lack of flexibility in Sundarji doctrine. Recognizing this, India developed the Cold Start Doctrine—a proactive, limited-war strategy designed to allow for rapid, flexible military operations within Pakistan without crossing its nuclear threshold.

While ambitious in nature, Cold Start Doctrine also encountered significant challenges particularly due to Indian Military's operational limitations. Additionally, Pakistan's deployment of Tactical Nuclear Weapons (TNWs) as a direct response to Cold Start, poured cold water on Cold Start. By lowering its nuclear threshold, Pakistan sought to deter Indian incursions by signaling the risk of a swift nuclear escalation.

In recent years, India has sought to move beyond Cold Start through the development of a more integrated and flexible approach to warfare. The Joint Doctrine of the Indian Armed Forces (JDIAF), introduced in 2017, represents a significant step toward jointness and integration across the Army, Navy, and Air Force. This doctrine emphasizes multi-domain operations, network-centric warfare, and seamless coordination between the services to counter both conventional and non-traditional threats. Additionally, India's aspiration for theaterisation—the creation of unified theatre commands—is aimed at streamlining command structures and improving the operational efficiency of its forces, aligning them with modern war-fighting concepts.

By using the concept of the security dilemma, the article evaluates the evolution of India's military doctrines and has analyzed their relative strengths and limitations in a volatile and nuclearized South Asian environment. It also explores Pakistan's countermeasures, particularly the employment of TNWs, which highlights the persistence of Indo-Pak security dilemma. This doctrinal evolution on both sides of the border signified the intensification of security dilemma in South Asia, where each state's military modernization and doctrinal shifts trigger countermeasures from the other, further heightening regional instability. By examining India's recent moves toward joint operations and theaterisation, this study offers an analysis of India's evolving military strategy and its implications for regional security.

Security Dilemma and John Mearsheimer's Three Strategies of Offensive Warfare

Concept of security dilemma, coined for the first time by John H. Herz in 1950, still holds paramount importance as far as understanding military strategies and doctrines is concerned. According to him, security dilemma is, “A structural notion in which the self-help attempts of states to look after their security needs tend, regardless of intention, to lead to rising insecurity for others as each interprets its own measures as defensive and the measures of others as potentially threatening.”¹ Security dilemma, also called spiral model, describes a situation where actions taken by a state to increase its security are perceived as threatening by other states, leading them to take similar measures, thereby increasing the overall insecurity in the region.

This concept is highly relevant to the evolution of India's military doctrines. From research perspective, applying the security dilemma framework provides valuable insight how India's doctrinal shifts has ignited arms race in region. India shifted from Sundarji Doctrine due to lack of flexibility in force employment and risk of strategic nuclear weapons of Pakistan. In an attempt to exploit the war fighting gap below the nuclear threshold, India crafted Cold Start Doctrine for fighting limited and rapid conventional war against Pakistan. While it was aimed at providing India with a deterrence mechanism in response to Pakistan's sub-conventional warfare, it generated significant concern within Pakistan. This threat perception led to the development of TNWs in the shape of Nasr Hatf-IX missile system, to counter India's rapid and multi-front armored invasion.

Similarly, India's current move toward theaterisation—the restructuring of its military commands into integrated theatres for joint operations across services—can be analyzed through the same concept. While India views this doctrinal evolution as necessary for improving military readiness and joint operational capability, against Pakistan and China, it could provoke both adversaries to strengthen their military prowess and deepen their military relations even further. This cycle of action-reaction reflects the security dilemma which will ultimately heighten the regional instability.

This highlights how the evolution of Indian military doctrines or even future joint theatre commands, must be analyzed not only in terms of India's security needs but also in the context of regional security dynamics. The unintended outcome could be an increased risk of conflict, whether through arms races or miscalculations. The gradual transition of Indian military doctrines reflects India's shifting focus from varying war fighting strategies. From John Mearsheimer's perspective, there are three basic types of offensive war fighting strategies:

First, *Attrition* – involving time consuming battles meant to destroy as much enemy forces as possible thus casting major losses to life and material on both sides. This strategy relies heavily on firepower to wear down defenses and depends significantly on size ratio of offender and defender. The side with greater manpower and material base will ultimately prevail in battle of attrition.²

¹ John H. Herz, *Political Realism and Political Idealism* (University of Chicago Press, 1951), 157.

² John J. Mearsheimer, *Conventional Deterrence* (Cornell University Press, 1983), 33-35.

Second, *blitzkrieg* - aimed at piercing the vulnerable spots of defender and penetrating deep in defender's territory to cut off its network of supplies, reinforcements and command & control. Its success depends on robustness, fire power and survivability of armored forces.³

Third, *fait accompli*, - a limited aim strategy relying on seizing a small but vital piece of territory by initial offense using element of surprise and speed. The success of this strategy depends entirely on elements of surprise and speed, thereby focuses on achieving the requisite objective before the defender could activate its defenses or the international community could intervene.⁴ Indian doctrinal evolution reflects all these three strategies. Sundarji doctrine was based on attrition; Cold Start relied on blitzkrieg; while contemporary strategy of using surgical strikes is designed to achieve specific objectives quickly before Pakistan or the international community could dilute India's assertive actions.

The Sundarji Doctrine

Ever since its independence, India has relied on defensive conventional posture. Indian former Defense Minister George Fernandes has summarized it as, "a non-aggressive, non-provocative defense policy based on the philosophy of defensive defense."⁵ Fundamentally, Indian military has maintained Sundarji Doctrine as its operational war doctrine against Pakistan throughout the time period of 1981 - 2004.⁶ General K. Sundarji introduced the concept of strike and holding corps in Indian army which was first tested in Brasstacks exercises. The foundation of this doctrine was laid on two notions: first, Indian forces are larger in size and can overwhelm Pakistan military with numbers; second, strategic depth of India allows it to absorb the first wave of attack, and retaliate back at the time and place of its choosing. These two variables in Indian doctrinal equation are signified by concepts of holding corps and strike corps.

The defensive element of Indian army was based on seven holding corps which were deployed in forwards positions against Pakistan.⁷ These three corps were meant to absorb the offense of Pakistan army and exhaust its battle momentum. Each corps was structured to comprise of infantry divisions and mechanized divisions supported by few armored regiments to grant limited offensive capability at tactical level.⁸

The offensive prowess of Indian military was in shape of three strike corps stationed in central India (I Corps in Mathura, II Corps in Ambala, and XXI Corps in Bhopal), and were built around an armored division and mechanized infantry coupled with several regiments of towed artillery.⁹ In case of war, it was the job of strike corps to counter attack with armored columns

³ Mearsheimer, *Conventional Deterrence*, 35-39.

⁴ Mearsheimer, *Conventional Deterrence*, 53-56.

⁵ George Fernandes, "The Dynamics of Limited War," *Strategic Affairs*, Vol. 7 (October 16, 2000), 16.

⁶ Tariq M. Ashraf, "Doctrinal Reawakening of Indian Armed Forces," *Military Review*, Vol. 84, No.6 (November-December 2004), 54.

⁷ V.R. Raghavan, "Limited War and Nuclear Escalation in South Asia," *Nonproliferation Review*, Vol. 8, No. 3 (February 2008), 8.

⁸ Raghavan, "Limited War and Nuclear Escalation in South Asia."

⁹ Raghavan, "Limited War and Nuclear Escalation in South Asia."

and if necessary, penetrate Pakistan territory after neutralizing Pakistan military strike corps with severe battles of attrition.¹⁰

Limitations of Sundarji Doctrine

Despite symbolizing massive retaliatory punishing force, India has failed to achieve requisite deterrent value from its conventional posture. Operation Parakram illuminated four major structural and operational flaws of Sundarji doctrine. First, a war fighting doctrine crafted for major war is not applicable in limited warfare. Rationality demands limited response for limited objectives. A full blown conflict as a punishing strategy against militancy is neither a justifiable course of action, nor does it guarantee achievement of political objectives. Second, deeply stationed Strike corps lacked the element of surprise thus giving the adversary sufficient time space for counter-deployment, and to international community to intervene and dilute the crisis. Third, large corps sized formations are easy to spot, track and engage. Against an antagonist equipped with nuclear weapons, concentration of such large military force in a comparatively confined location can make it an appealing target. Fourth, the limited strike potential of holding corps meant that India cannot afford to conduct any surprise attack or major counter offense against Pakistan military, and was fully reliant on deeply stationed strike corps for this task.¹¹

Failure of *Sundarji* Doctrine can be blamed on its retaliatory punishing nature. It granted Pakistan opportunity to successfully overcome Indian deterrence with sub-conventional means, and counter-deter Indian conventional forces with its own assertive nuclear posture of Asymmetric Escalation. For specifically dealing with sub-conventional threats, a doctrine of limited yet efficient response was finally crafted in shape of Cold Start Doctrine.

The Cold Start Doctrine

Indian military establishment revealed Cold Start Doctrine as a war fighting concept in April 2004. Its goal was to enhance capacity of its armed forces to conduct efficient conventional strikes against Pakistan in such brief interval of time that it could deny International Community intervention during conflict and to keep scale of conflict below nuclear threshold to refute Islamabad's retaliatory nuclear ambitions.¹² Through this doctrine, India sought to fully exploit its conventional robustness against Pakistan.

The doctrine of rapid limited response required a major overhaul of Indian command structure and operational capabilities at tactical and strategic level. The offensive arm of Indian military was being raised in shape of eight Integrated Battle Groups (IBGs) which are division size armored formations supported by mechanized infantry, artillery regiments and mobile air defense units.¹³ These IBGs would carry sufficient offensive punch to break through vulnerable defensive positions of Pakistan military. Mobility is key - as it's meant to fully utilize the element of surprise, and battle centricity to avoid fog of war. In this way, a division sized IBG

¹⁰ Pravin Sawhney and V. K. Sood, *Operation Parakram: The War Unfinished* (SAGE Publications June 23, 2003), 81.

¹¹ Pravin Sawhney and V. K. Sood, *Operation Parakram*, 163.

¹² Pravin Sawhney and V. K. Sood, *Operation Parakram*, 164.

¹³ Himanil Raina, "Integrated Battle Groups Are India's Response to Pakistan", *The National Interest*, November 18, 2018, <https://nationalinterest.org/blog/buzz/integrated-battle-groups-are-indias-response-pakistan-36402>

could provide better results in comparison with much larger strike corps via concept of ‘mass power instead of mass forces’. Meanwhile, the holding corps are reorganized as ‘pivot corps’ with the addition of more armor and artillery thus enhancing their strike capabilities too.¹⁴

Though the actual operational details of Indian military order of operation as per the framework of Cold Start Doctrine remained classified, still it was possible to calculative speculate its salient features. Hypothetically, in case of Indio-Pak kinetic hostilities, three to five IBGs may conduct shallow penetration of 50-80 kms inside Pakistan’s territory within the time frame of three to four days.¹⁵ The extent of penetration depth will depend on the degree of New Delhi’s political goals. These IBGs will adopt ‘bite and hold’ strategy and in meantime pivot corps shall undertake offensive maneuvers as a diversionary tactic to complicate Islamabad military response. The IBGs will initiate their course of operation during deployment phase of pivot corps. Only the swiftness of operation will determine the extent Indian forces will be able to unhinge Pakistan’s combat forces and break its cohesion to the point of no recovery.¹⁶

Advantages Offered by Cold Start Doctrine

Theoretically, Cold Start doctrine offered five major advantages over former conventional war doctrines of Indian military. First, the division sized forward deployed IBGs are more robust and flexible in operational usage. Smaller size means better control, and better control means more result oriented operational conductance. Network-centricity further catalyzes their efficiency by minimizing risks associated with fog of war at tactical level. Second, although IBGs can deliver significant blow to enemy forces during war time, however the absence of decisiveness in their offensive capabilities render them less threatening in contrast to strike corps which could pose existential threat to Pakistan.¹⁷ It diffuses Islamabad’s justification to use strategic nuclear weapons, and hence grants better escalation control.

Third, the addition of offensive element in pivot corps grants two major advantages to Indian strategy makers: one, in case large military response is required, pivot corps could be used for strike purposes; two, these pivot corps could be used for defensive role also. Thus, Indian military will be able to exercise options of offense and defense using same corps.¹⁸ Fourth, in comparison with large corps size formations, it’s hard to detect, track and engage division sized IBGs. Pakistan’s reconnaissance assets will have to deal with complex tasks of keeping eye on all strike corps and pivot corps alongside IBGs. It will be a major challenge for Pakistan military intelligence sources to predict the real intensions of all these assets in times of strategic predicament.¹⁹ And finally, smaller size IBGs offer less lucrative target for nuclear weapons. The

¹⁴ Walter C. Ladwig III, “A Cold Start for Hot Wars? India’s New Limited War Doctrine,” *International Security*, Vol.32, No.3 (2007), 165.

¹⁵ S. Paul Kapur, “India and Pakistan’s Unstable Peace: Why Nuclear South Asia is Not Like Cold War Europe,” *International Security*, Vol. 30, No 2 (Fall 2005), 138-139.

¹⁶ Gurmeet Kanwal, “Cold Start and Battle Groups for Offensive Operations,” *ORF Strategic Trends*, Vol. 4, No. 18.

¹⁷ Ladwig, “A Cold Start for Hot Wars,” 166.

¹⁸ Ladwig, “A Cold Start for Hot Wars.”

¹⁹ Ladwig, “A Cold Start for Hot Wars,” 167.

enhanced mobility combined with additional armor greatly increases the survivability of armored forces against possible nuclear strikes.²⁰

Limitation of Cold Start Doctrine

Despite of rapid progress in increasing the operational capacity of Indian combat forces, they have yet to develop their conventional capabilities to meet the minimum requirements of coherent operationalization of Cold Start Doctrine. Plus, Pakistan's counter initiatives involving both nuclear and non-nuclear measures, have further complicated the strategic calculus of South Asia. Currently there are following shortcomings hindering the practical execution of CSD.

First, in a defensive war, Pakistan is well equipped with sufficient anti-tank assets which can be employed as static defenses, forwards defenses and mobile defenses. Thus, Indian armor despite being significant in size still lack sufficient potential to pierce Pakistan defenses without facing serious risks of failure. Second, the element of surprise is pivotal for successful execution of CSD. But Pakistan has wide array of surveillance and recon assets in its disposal. These assets include AEWCS, UAVs, and ground based radars, providing Pakistan the capability to look deep inside Indian territory. It will not be possible for India to concentrate its forces close to border and initiate attack without alerting Pakistan defenses. Third, Indian ground forces lack sufficient fire support units. Very limited number of self-propelled artillery and gunships badly hinders its offensive capabilities. Fourth, Indian Air Force has always kept distance from Army borne war doctrine. Even if IAF follows the approach of CSD, it simply does not have enough assets and capabilities to provide air cover to Indian army and engage in close air support missions at the same time. The dwindling strength of IAF and narrowing of PAF and IAF capability gap has undermined a critical component needed for execution of CSD. And finally, the strategy of *bite and hold* offers no end point. Even if Indian forces manage to capture a vital territory, their ability to defend it against Pakistan counter-offenses will be questionable. It can give incentive to Pakistan for opening a new front of its choice and escalate the conflict. This kills the core objective of CSD, i.e. keep the conflict restricted to avoid risking breach of nuclear threshold.

Pakistan's Full Spectrum Minimum Credible Deterrence

Pakistan's response against Cold Start Doctrine appeared in the shape of strategy of Full Spectrum Deterrence (FSD). According to declaratory stance of Pakistan's National Command Authority (NCA), the 'full spectrum' is a qualitative solution against rapidly evolving war fighting concepts of Indian armed forces like Cold Start Doctrine (CSD) and Pro-Active Operations (PAO).²¹ Due to Pakistan's economic restrictions, it can no longer afford to engage in an active arms race with India, and instead is de-hyphenating its conventional calculus with respect to India by exploring multiple options of nuclear deterrent.²²

²⁰ Andre Gsponer, "The Neutron Bomb and Other New Limited War Weapons", *Bulletin of Peace Proposals*, Vol. 13, No. 3 (1982), 221-225.

²¹ Adil Sultan, "NCA's 'Full Spectrum' Response," *The Express Tribune*, November 7, 2013, <https://tribune.com.pk/story/628052/ncas-full-spectrum-response/>

²² Fayyaz Walana, "General Assembly Statement: PM Urges UN Session on N-Disarmament," *The Express Tribune*, September 27, 2013, <https://tribune.com.pk/story/610061/general-assembly-statement-pm-urges-un-session-on-n-disarmament-front-page/>

By developing these weapons, Pakistan lowered its nuclear threshold to the point where it could deter *any* aggression by Indian military. The fulcrum of Pakistan's TNWs exists in the shape of Nasr (Hatf IX) which is explicitly designed for counter conventional force role and serves as nuclear deterrent against Indian CSD. Pakistan first tested Nasr on April 20, 2011 using dual tube Transporter Erector Launcher (TEL).²³ The wheeled TEL coupled with capsuled launch tubes provides shoot-n-scoot capability. The missile, with max range of 70 kms, carries appropriate low yield nuclear payload with speculated blast yield of 0.5kT – 5kT of TNT.²⁴ The missile has thrust vectoring nozzles indicating that it has inflight maneuverability for increasing its survival against ground based anti-air fire. According to Pakistan military top brass, Nasr (Hatf IX) has poured cold water on cold start.²⁵

Pakistan also maintains ambiguity about redlines of its nuclear threshold. So far, most comprehensive indicators are mentioned by Lt. Gen. Khalid Kidwai who listed five parameters which will determine the decision of using of nuclear weapons: First, India invades Pakistan and conquers large part of its geographical territory; second, significant size of Pakistan army or Pakistan Air Force is destroyed; third, India imposes naval blockade against Pakistan; and fourth, India yields political instability in Pakistan or induce massive internal subversion.²⁶ Even if we take above mentioned articulation of Pakistan's red lines, it leaves little room in spectrum-of-conflict which could be exploited to impose kinetic war against Pakistan. At the lowest threshold, Pakistan wields ample conventional capability which can effectively counter India's limited conventional aggression.

Pro-Active Operations and Surgical Strikes

Pro-Active Operations Doctrine (PAO) is often used synonymously with Cold Start Doctrine. For some analysts, PAO doctrine is evolved and refined form of CSD. It retains many components of CSD but focuses more on rapid, limited yet robust time-sensitive preemptive strikes in retaliation of hostile aggression. As per PAO doctrine, Indian military seeks to swiftly mobilize and execute surgical strikes across the border while keeping the scale of strike limited yet effective to avoid and deter further escalation. However, it's worth noting that since there is no official acknowledgement regarding differentiation of both doctrines, so any comparative proposition of both doctrines is calculative speculation at best.

India's surgical strikes can be regarded as manifestation of India's PAO doctrine, underscoring its requirement of time-sensitive, limited yet decisive retaliatory strikes while minimizing the risk of escalation to full-scale war. This approach, in theory, grants Indian military operational flexibility to response against varying degrees of threats. The examples of

²³ "Pakistan Successfully Test-Fires Nuclear Capable Hatf-9," *The Express Tribune*, April 20, 2011, <https://tribune.com.pk/story/152425/pakistan-test-fires-nuclear-capable-missile/>

²⁴ Mansoor Ahmed, "Pakistan's Tactical Nuclear Weapons and Their Impact on Stability," *Carnegie Endowment for International Peace*, <https://carnegieendowment.org/2016/06/30/pakistan-s-tactical-nuclear-weapons-and-their-impact-on-stability-pub-63911>

²⁵ "Nasr Pours Cold Water on India's Cold Start Doctrine: Bajwa," *Dawn News*, July 6, 2017, <https://www.dawn.com/news/1343581>

²⁶ Paolo Cotta-Ramusino and Maurizio Martellini, "Nuclear Safety, Nuclear Stability, and Nuclear Strategy in Pakistan: A Concise Report of a Visit by Landau Network Centro Volta" (Como, Italy: Landau Network, January 2001), 05.

Uri Crisis (2016) and Pulwama-Balakot Crisis (2019) can be explored to evaluate the efficiency of India's newly adopted surgical strike strategy.

The Uri Crisis (2016)

The Uri Crisis (2016) ignited when four militants attacked Indian Army brigade Headquarters (HQ) on September 18, 2016, and killed 19 Indian troops.²⁷ India blamed Pakistan-based organization Jaish-e-Mohammed (JeM) for attack, and vowed to take revenge. After ten days, India claimed that it has conducted retaliatory surgical strikes against launch-pads across Line of Control (LoC) in Azad Kashmir. The strikes, as argued by Indian officials, took place between 28-29 September and resulted in death of dozens of militants.²⁸ Pakistan, however, categorically refuted these claims and stated that only routine cross-border firing have taken place.²⁹ Despite multiple demands, India failed to provide any credible proof to support its claims.³⁰ However, the strong media propagation indicated that these so-called strikes were more directed to satisfy Indian public sentiments and its hype was exploited by Indian Prime Minister Narendra Modi for political scoring.³¹

The crisis significantly heightened tensions between India and Pakistan, with both countries engaging in heated rhetoric and military posturing. The crisis, instead of signaling India's willingness to exercise assertive response against Pakistan, undermined its credibility instead. The crisis, however, once again showcased the fragility of peace between both nations.

Pulwama-Balakot Crisis (2019)

Unlike Uri (2016), Pulwama-Balakot Crisis (2019) actually resulted in breaking of hostilities which resulted in exchange of air-strikes by both sides. The cross-border strikes quickly escalated turned into major upheaval. The crisis started on February 14, 2019, when a suicide bomber attacked convoy of Indian paramilitary forces, killing more than 40 personnel.³² The attack resulted in widespread outrage in India and Indian Government again blamed JeM for orchestrating the attack.

On February 26, 2019, Indian Air Force (IAF) struck land targets in Balakot located in Pakistan's Khyber Pakhtunkhwa province, marking the first time since 1971 that Indian fighter jets crossed the Line of Control (LoC) into Pakistan. India claimed that air-strikes successfully

²⁷ "Militants attack Indian Army Base in Kashmir," *BBC News*, September 18, 2016, <https://www.bbc.com/news/world-asia-india-37399969>

²⁸ "India claims surgical strikes against militants in Pakistan," *The Washington Post*, September 29, 2016, https://www.washingtonpost.com/world/india-hits-militant-launchpads-in-pakistan-in-escalation-between-nuclear-armed-rivals/2016/09/29/e0145168-d97e-4149-977a-24d08b16ea0b_story.html

²⁹ "Surgical Strikes: Pakistan rejects India's claims," *Al-Jazeera*, September 30, 2016, <https://www.aljazeera.com/news/2016/9/30/surgical-strikes-pakistan-rejects-indias-claims>

³⁰ M Ilyas Khan, "India's surgical strikes in Kashmir: Truth or Illusion," *BBC News*, October 23, 2016, <https://www.bbc.com/news/world-asia-india-37702790>

³¹ Parashant Jha, "Modi goes beyond knee-jerk reaction to Uri, harps on Pak's vulnerabilities," *Hindustan Times*, September 25, 2016, <https://www.hindustantimes.com/analysis/pm-modi-s-three-pronged-response-to-pakistan/story-b15wED5ZXXMBgFTevvEDEJ.html>

³² Rifat Fareed, "Kashmir suicide attack kills dozens of Indian security forces," *Al-Jazeera*, February 14, 2019, <https://www.aljazeera.com/news/2019/2/14/kashmir-suicide-attack-kills-dozens-of-indian-security-forces>

destroyed JeM training camps and delivered heavy toll. However, Indian government failed to provide credible evidence to support its claim.³³ In-fact, analysis by neutral observers revealed that IAF actually missed the intended targets by slight margin.³⁴

Pakistan categorically denied India's official stance and stated that the air-strikes hit the uninhabited area and no loss of life has taken place. However, since air-space of Pakistan was violated and its territorial integrity was compromised by Indian strikes, appropriate response by Pakistan Air Force (PAF) was crucial to restore the credibility of its conventional deterrence.

Next day on 27 February, PAF launched retaliatory strikes along the LoC and engaged six targets. The IAF attempts to thwart PAF resulted in first ever air-to-air engagement between both rivals since 1971. PAF fighter aircrafts shot down an Indian Mig-21³⁵ and allegedly a Su-30MKI in air-to-air combat.³⁶ During heat of conflict an Indian Mi-17 helicopter was also shot down by Indian Spyder SAM system in a friendly fire incident.³⁷ Pulwama-Balakot crisis can be regarded as the litmus test of IAF and PAF combat capabilities. IAF not only failed to strike ground targets with precision³⁸ but also failed to repel PAF counterstrike very next day. The aerial clash on that fateful day highlighted the technical and planning domination of PAF over IAF. It underlined IAF limitations in point air defense role,³⁹ training standards⁴⁰ and quality of weapon systems.⁴¹

³³ Asif Shahzad and Abu Arqam Naqash, "Pakistani villages asks: where are bodies of militants India says it bombed," *Reuters*, February 28, 2019, <https://www.reuters.com/article/us-india-kashmir-village/pakistani-village-asks-where-are-bodies-of-militants-india-says-it-bombed-idUSKCN1QH298/>

³⁴ Nathan Ruser, "Did Balakot Air Strike hit their target? Satellite Imagery raises doubts," *The Wire*, March 01, 2019, <https://thewire.in/security/balakot-airstrikes-india-pakistan-satellite-images>

³⁵ David Cenciotti, "Indian Air Force MiG-21 Bison Shot Down By Pakistan Air Force Jet," *The Aviationist*, February 27, 2019, <https://theaviationist.com/2019/02/27/indian-air-force-mig-21-bison-shot-down-by-pakistan-air-force-jet/>

³⁶ "Second Indian Aircraft Was Shot down by PAF Pilot Nauman Ali Khan, Details Surface," *The News*, March 04, 2019, <https://www.thenews.com.pk/latest/439733-second-indian-aircraft-was-shot-down-by-paf-pilot-nauman-ali-khan-details-surface>

³⁷ Dinakar Peri, "How Did an Indian Air Force Mi-17 Helicopter Get Shot down by the IAF?," *The Hindu*, June 02, 2019, <https://www.thehindu.com/news/national/how-did-an-indian-air-force-mi-17-helicopter-get-shot-down-by-the-iaf/article27400844.ece>

³⁸ Did Balakot Airstrikes Hit Their Target? Satellite Imagery Raises Doubts," *The Wire*, March 01, 2019, <https://thewire.in/security/balakot-airstrikes-india-pakistan-satellite-images>

³⁹ Forward deployed aircrafts are used for point defense roles and are kept in hardened shelters for safety. Only after 27/2 air combat, India initiated construction of shelters for its fighter fleet. See, "Great Step! Missile, Blast-Proof Shelters to Be Built for IAF Fighter Jets near Pakistan, China Borders," *The Financial Express*, March 12, 2019, <https://www.financialexpress.com/defence/great-step-missile-blast-proof-shelters-to-be-built-for-iaf-fighter-jets-near-pakistan-china-borders/1513371/>

⁴⁰ Through-out 27/2 confrontations Indian personnel conducted series of training mistakes. Like Mi-17 pilots didn't turn on IFF system (Identification of Friend or Foe) and Indian Air Defense fired SAM without completing SOPs. See, Rajiv Tyagi, "Fratricide? When a Mi 17 V5 Helicopter Fell to the Death of Six IAF Personnel on Board on Feb 27," *The Citizen*, <https://www.thecitizen.in/index.php/en/NewsDetail/index/4/16594/Fratricide-When-a-Mi-17-V5-Helicopter-Fell-to-the-Death-of-Six-IAF-Personnel-on-Board-on-Feb-27>

⁴¹ In BVR combat between PAF F-16 and IAF Su-30MKI, Indian R-77 missiles were out-ranged by Pakistan's Aim-120C missiles. Now IAF is replacing Russian R-73 with Israeli Derby-ER BVR missiles. See, "IAF Plans to Arm Its Su-30MKI Fleet with I-Derby ER BVRAAMs," *Jane's 360*, May 30, 2019, <https://www.janes.com/article/88867/iaf-plans-to-arm-its-su-30mki-fleet-with-i-derby-er-bvraams>

The entire situation painted a grim picture of IAF operational potential. The situation was alarming for Indian establishment as besides highly provocative cruise missiles option, IAF was only choice in India's disposal for conducting pre-emption. But with the lost element of surprise, out ranged stand-off weapons, out-classed air to air missiles and questionable expertise of Indian pilots to execute such complex multi-tasking, raise doubts about true combat potential of Indian conventional forces.

Overall, Indian armed forces are indeed better postured for regional multidimensional power projection within South Asia. But as downside, this expansionist approach over stretches its armed forces and reduces the instantaneous power projection capability in a given theatre of war. Therefore, despite having net conventional advantage over Pakistan, India cannot afford to utilize the entire combat momentum against Pakistan as it might give Islamabad incentive to use strategic nuclear weapons. Pakistan threat perceptions are primarily India centric. This allows Pakistan to maintain sufficient defensive capability to repel India specific threat by using conventional and nuclear options.

Both Uri (2016) and Pulwama-Balakot (2019) crisis represents significant moments in Indo-Pak security environment. In both cases, India and Pakistan managed to avoid a broader conflict. But both episodes highlighted the fragility of peace in the region and the potential for miscalculation between two nuclear-armed neighbors. The crisis also reinforced the role of nuclear deterrence and international diplomatic intervention in preventing further escalation. In parallel, it showcased India's growingly assertive approach to exploit the gaps in Pakistan's nuclear deterrence for exercising kinetic options – which so far has been successfully undermined by Pakistan's conventional forces.

Indian Military Theaterisation

The Joint Doctrine of the Indian Armed Forces (JDIAF), released in 2017, undertook fundamental transition in India's military strategy by stressing on jointness and integration of tri-services for achieving multi-domain operations' capability. By ensuring synergy between conventional forces, nuclear forces, space and cyber warfare capabilities, future conflicts can be won. Central to the doctrine is network-centric warfare, enabling real-time intelligence sharing and rapid decision-making. JDIAF also emphasis on developing jointness in training, logistics, intelligence, and decision making processes within Indian armed forces. Overall, the JDIAF aims to create a more integrated and robust Indian military capable of responding to both conventional and unconventional threats in a volatile and complex strategic environment of future.⁴²

Although not direct product of JDIAF, the broad contours of military theaterisation align with fundamentals of JDIAF like integration and jointness across the services. The JDIAF emphasizes the need for tri-service integration and unified approach to modern warfare in the form of multi-domain operational capability, which are also foundational principles for military theaterisation.

⁴² "Joint Doctrine Indian Armed Forces," *HQ Integrated Defence Staff – Ministry of Defence*, April 2017.

India is currently undertaking military theaterisation to restructure the Indian Armed Forces into integrated theatre commands. Instead of working as discrete units, Army, Navy and Air Force will operate under the aegis of a unified operational command in a given war theatre. Instead of 17 different commands of tri-services, five theatre commands will be raised. Later, the plan revised to formulate three theatre commands instead of five. The basic idea is to streamline command and control, enhance jointness, and improve the military's ability to conduct coordinated multi-domain operations.⁴³

After establishment of Chief of Defense Staff (CDS) post in 2019 and commencement of work on crafting framework for theatre commands, it was anticipated that India will be able to raise first command within three years.⁴⁴ However, no theatre command has been raised so far. Strong disagreements between tri-services over the basic structuring hampered the progress on theaterisation.⁴⁵ But now tri-services have agreed on broad contours of theaterisation and further progress is expected in near future without further delays.⁴⁶ By following a bottom up approach instead of top-to-bottom approach, Indian military is currently focused on jointness and integration of services as initial step before undertaking theaterisation. The first theatre command will be raised against Pakistan with headquarters in Jaipur.⁴⁷ This command will also serve as test bed for evaluating the challenges and issues with theaterisation. Indian army's South Western Command, Western Command, Southern Command, and elements from Northern Command will merge together with IAF's Western Command, South Western Command, and elements from Central and Southern Commands, to constitute a unified Pakistan centric Western Theatre Command (WTC). Later, China centric theatre command can be dubbed as Northern Theatre Command (NTC) will be established and its headquarters will be based in Lucknow. Karwar is expected to be headquarters of India's Maritime Theatre Command (MTC).⁴⁸ Unlike Pakistan and China centric land based theatre commands which will be rotated between army and air force, Maritime Theatre Command will be headed by navy only.⁴⁹

⁴³Bhaswar Kumar, "Indian military theaterisation plans gathers pace, but China has 8 year lead," *Business Standard*, May 15, 2024, https://www.business-standard.com/external-affairs-defence-security/news/indian-military-theatreisation-plans-gather-pace-but-china-has-8-year-lead-124051501339_1.html

⁴⁴ Amritya Nayak Dutta, "India's joint military theatre command process to finish in 3 years," *The Print*, February 04, 2020, <https://theprint.in/defence/indias-joint-military-theatre-command-process-to-finish-in-3-years-says-cds-bipin-rawat/359711/>

⁴⁵ Snehash Alex Philip, "India's military theatre commands could be delayed as there is no consensus on basic structure," *The Print*, June 17, 2021, <https://theprint.in/defence/indias-military-theatre-commands-could-be-delayed-as-theres-no-consensus-on-basic-structure/679292/>

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It's can be analyzed that WTC will be the largest command and will be configured to deal Pakistan specific threat by incorporating the doctrinal lessons of CSD and PAOs. Limited synergy, difference in employment methodologies, and lack of force compatibility are the prime factors which have always compromised the Indian military's ability to execute CSD. However, with dedicated tri-services assets in its disposal, WTC will be able better postured to conduct multi-domain operations against Pakistan.

While avoiding breach of Pakistan's nuclear threshold, this command will be able - at least in theory - employ rapid, limited, yet decisive actions in a network-centric environment to subdue Pakistan's conventional defenses while denying Islamabad the justification to employ tactical or strategic nuclear weapons. This approach appears synonymous to CSD/PAOs; however with integrated tri-service assets, WTC will be better postured to effectively employ its combat prowess in synergy to achieve requisite outcomes.

India's gradual transition in its doctrinal posture and now military theaterization represents New Delhi's persistent security dilemma. In past, India's threat perceptions were predominantly Pakistan specific. From Sundarji doctrine to Cold Start, all were crafted to tackle nuclear-armed Pakistan. However, the decision to theaterize its forces reflects how seriously New Delhi perceives the likelihood of two-front war. Splitting tri-services into two very distinct theatres may present valid solution for time being. But it's worth noting, as dicatetd by concept of security dilemma, both China and Pakistan will formulate countermeasures accordingly. Although it's unlikely that Pakistan will also undertake theaterization for time being, but rapid increment in military capabilities of China as well as Pakistan can overstretch Indian resources, create complications as far as distribution of resources between theater commands is concerned, and can reduce India's ability to utilize theater commands in support of each other in case of high-intensity conflict.

Conclusion

India's military doctrinal evolution reflects its efforts to address growing security challenges and the enduring rivalry with Pakistan. The transition from the Sundarji Doctrine to the Cold Start Doctrine was driven by a desire to exploit the conventional war-fighting space below the nuclear threshold, but operational shortcomings have limited the full realization of Cold Start's potential. Pakistan's deployment of tactical nuclear weapons (TNWs) further complicated India's strategic calculus, challenging the effectiveness of its limited war doctrine. The study of the Uri (2016) and Pulwama-Balakot (2019) crises reveals India's ongoing doctrinal refinements, which now include aspirations for theaterization aimed at enhancing joint operations and operational efficiency. However, the path to theaterization presents significant challenges, including inter-service coordination and strategic coherence, which may impact South Asian strategic stability. India's evolving military strategy remains constrained by the region's security dynamics, raising questions about its ability to fully implement its doctrinal ambitions without exacerbating tensions with Pakistan.

AUSTRALIA'S NAVAL MODERNIZATION AND ITS IMPACT ON FUTURE INDO-PACIFIC BALANCE OF POWER

Ahmad Ibrahim

Abstract

The research article examines the naval force modernization and strategic implications of Australia's rapidly expanding naval capabilities on Indo-Pacific power dynamics. Using theoretical lens of Balance of Power, article has evaluated how Canberra is expanding its power by enhancing military capabilities and by augmenting alliances with major powers. While Quad showcases multilateral co-operative arrangement between U.S., Australia, Japan, and India, it is AUKUS which is expected to impart major influence on future Indo-Pacific. With acquisition of nuclear attack submarines and development of advance naval combat capabilities, Canberra's ability to project power across the Indo-Pacific is set to increase substantially. This modernization marks a shift from a predominantly defensive maritime posture toward a more assertive role. The article has provided overview of Australia's current naval capabilities and has explored its naval modernization programs in all domain of naval warfare. It also analyses the broader geopolitical ramifications of Australia's growing naval strength, particularly in relation to AUKUS, within the Indo-Pacific region.

Key Words: Indo-Pacific Region, Naval Force Modernization, AUKUS, Quad, Nuclear Attack Submarines (SSN), Balance of Power

Introduction

Located at Southern hemisphere between Indian Ocean and Pacific Ocean, Australia is the sixth largest country with coastline stretching nearly 60,000 kilo-meters. The country's northern region is close to Southeast Asia while its eastern and western regions open to the Pacific and Indian Oceans, respectively, giving Australia a dual-oceanic connectivity. Its geographical isolation, vast coastline, and strategic location make it a critical player in regional geopolitics. To its north, Australia is separated from Asia by the Timor and Arafura Seas, while the Coral Sea lies to its northeast. To the west, the Indian Ocean offers Australia direct access to major maritime trade routes connecting the Middle East, Africa, and Europe. The Pacific Ocean, which forms its eastern boundary, connects Australia to major trading partners like the U.S., China, Japan, and Southeast Asian nations (Kapetas, 2021).

Australia's defense posture has evolved significantly over the decades, shaped by its unique geographical isolation and its reliance on strong alliances, most notably with the United States. Historically, Australia's naval force was built around the need for homeland defense and regional peacekeeping missions. Throughout much of the 20th century, Australia operated a relatively modest naval fleet, emphasizing smaller, conventionally-powered vessels designed primarily for coastal defense and anti-submarine warfare. However, the growing China's influence in Indo Pacific, along with its rapid naval modernization, has raised concerns in Canberra. In response, Australia is gradually expanding its naval capabilities, but the overarching defense posture has remained largely defensive in nature (Brown, 2020). The signing of the AUKUS pact, however, represents a fundamental departure from this historical posture.

The 2021 announcement of the AUKUS trilateral security pact between Australia, the United States, and the United Kingdom marked a pivotal moment in the strategic recalibration of Australia's defense posture. As part of the agreement, Australia committed to acquiring nuclear-powered submarines, propelling its naval capabilities into a new era and signaling its intent to play a more active role in regional security. In a world where geopolitical tensions are escalating in the Indo-Pacific, AUKUS is designed to counter the growing influence of China and ensure that key maritime routes remain free and open. As Australia shifts from a primarily defensive to a more assertive posture, AUKUS is poised to reshape both its naval capabilities and the broader security dynamics of the Indo-Pacific for decades to come.

This research article has provided an overview of Australia's current naval capabilities and how Royal Australian Navy (RAN) is undertaking comprehensive force modernization in all domains of naval warfare. These modernization efforts encompass force expansion as well as procurement of advance offensive systems to allow RAN project power at extended ranges for long duration of time. The dual approach being followed by Canberra to enhance its military prowess in response of China's rapid rise as economic and military power has been validated by theoretical lens of Balance of Power. The article has utilized data collected from official reports, books, research articles, online analytical papers, and Open Source Intelligence (OSINT) to craft a refined picture of Australia's future naval ambitions. In addition, the impact of Australia's naval modernization on future geopolitical dynamics of Indo-Pacific has been analyzed.

Overview from Lens of Balance of Power Theory

When viewed from Balance of Power theory, Australia's ongoing naval modernization will have major impact on the strategic environment of Indo-Pacific region. Balance of Power theory, rooted in realist school of thought, argues that states seek to prevent any single power from dominating the international system. To do so, states either augment their own military capacity or formulate alliances with states of shared interests to counter potential threats and sustain the power equilibrium (Nexon, 2009). Australia's naval modernization, particularly from perspective of AUKUS trilateral security arrangement, validate this theoretical framework as Washington together with Canberra, seeks to respond to the shifting power dynamics due to rapid rise of China as economic as well as military power. (Kimar, 2023)

Australia is following both approaches simultaneously as underscored by Balance of Power theory. Beside naval modernization efforts, Canberra is also developing strategic alliances with major powers. Quad and AUKUS underscores Canberra's growing relations with other like-minded powers which includes United States, Japan, United Kingdom, and India. The provision of nuclear attack submarines (SSNs) and advance military capabilities, from balance of power perspective, will allow Australia to counterbalance China's growing naval prowess. From broader U.S strategy of offshoring balance, AUKUS represents Washington's confidence towards Canberra as frontline ally. This will allow Washington to effectively counterbalance China without over stretching its own resources in order to ensure regional order stability as favorable to Western interests. However, naval modernization in the Indo-Pacific is not a risk free endeavor either. As balance of power theory states, increasing military potential can yield security dilemmas, where states perceive each other's defensive measures as threats, leading to arms race and eventually causing strategic instability. Australia's naval buildup, while aimed at deterring Chinese aggression, could be interpreted by Beijing as an aggressive move, prompting further militarization of the Indo-Pacific region. (Türkcan, 2022)

Royal Australian Navy (RAN) Current Strength

Royal Australian Navy (RAN) is responsible for safeguarding Australia's maritime interests at regional scale. Historically, Australia has formulated alliances with leading maritime power to safeguard its extended maritime connectivity with rest of world. Being a member of Quad, RAN has been participating in joint naval exercises with United States, Japan, and India. But traditionally, RAN has remained a defensive force with limited offensive capabilities. However, now its combat posture is gradually shifting with development of offensive naval capabilities. AUKUS, a trilateral strategic agreement signed between Australia, United Kingdom, and United States on September 15, 2022, has placed Canberra at a pivotal position to counter rapid expansion of China in Indo-Pacific. (House, 2021)

The major surface combatants of current RAN are three Hobart class destroyers and eight Anzac class frigates. The Hobart-class destroyers are top tier warships of RAN and were commissioned between 2017 and 2020. Displacing approximately 7200 tons at full load, these modern ships feature advanced radar arrays including U.S.-made Aegis combat management system. These destroyers are equipped with 48-cell Mark 41 vertical launch system (VLS) for supporting surface-to-air missiles and are primarily tasked with air-defense duties. In parallel,

eight Harpoon anti-ship missiles and MU-90 torpedoes provide surface warfare and anti-submarine capability respectively. (Hobart class Guided Missile Destroyer (DDGH), 2024)

Anzac-class frigates, based on the German MEKO design, are second tier surface warships of RAN and were commissioned between 1996 and 2006. Displacing around 3600 tons, these frigates are primarily designed for anti-submarine warfare (ASW). In addition, eight Harpoon anti-ship missiles, and 8-cell Mark 41 VLS equipped with ESSMs provide decent surface and air-defense capability. These warships were acquired between 1996 and 2006 and have been periodically modernized. But considering their small size and limited range, these warships are getting inadequate to full-fill Australia's future threat perceptions and are thus entering into retirement phase (Anzac Class Frigates FFG, 2024).

Two Canberra class landing helicopter docks (LHDs) constitute the core of amphibious war fighting capability. Defensive air borne anti-submarine warfare (ASW) capability is provided by MH-60 Seahawk helicopters. Long range air borne anti-submarine warfare (ASW), and intelligence, surveillance and reconnaissance (ISR) capability is granted by P-8A Poseidon MPAs operated by Royal Australian Air Force (RAAF) (Giegerich, 2024). These assets provide decent air-support capability to RAN.

The underwater arm of RAN consists of six Collin class diesel electric submarines (SSKs). These submarines, after receiving necessary modifications, will remain in service for another decade. However, these submarines are considered suitable for defensive operation in territorial waters and lack the capability to operate in open oceans for extended period of time. In total, RAN has 41 commissioned combat vessels of all categories and is pre-dominantly a defensive force. (Giegerich, 2024)

Royal Australian Navy (RAN) Modernization Efforts

Australia is periodically increasing its defense spending. In 2024, its defense budget stood at \$37 billion, showcasing 6.3% increment compared with last year (Arthur, 2024). Initially, Australia committed additional \$190 billion for defense for decade 2020-2030, (McGuirk, 2020) suggesting 2.3% increment in share of national economy. (Hurst, 2023). However, revised figures under the new National Defence Strategy and Integrated Investment Plan suggest that \$718 billion will be spent on defense by 2033 (Uren, 2024). Australia's defense spending is expected to reach \$100 billion per year by 2033-34, surpassing 2.3% of national GDP (Blenkin, 2024). A major portion of this budgetary increment will be directed towards modernizing naval forces.

Australia's decision to expand Royal Australian Navy (RAN), particularly its surface combatant force and underwater fleet, is driven by a strategic imperative to enhance its naval prowess to better align Canberra's interests in the face of a shifting geopolitical landscape. This expansion is significant, both in terms of the size and tonnage of the future fleet. Beside expansion of RAN, modernization of Royal Australian Air Force (RAAF) with superior aircrafts, weapon package, and support assets will further augment Australia's defensive capabilities in the maritime domain.

According to Defense Strategic Review, RAN will commission nine Tier 1 warships and 11 Tier-2 warships. Previously, 12 Tier 1 surface combatants were planned. Three Hobart class destroyers and six Hunter class frigates have been classified as Tier 1 warships while 11 general purpose frigates will fall in category of Tier 2 warships. (National Defence: Defence Strategic Review 2023, 2023) Currently, Australia is developing long range strike capabilities by procuring sea and air based cruise missiles. RAN is acquiring ship borne Tomahawk cruise missiles which will be carried by Hobart class destroyers (Trevithick, 2021).

RAN future combat fleet will be based on six new Hunter-class heavy frigates. Based on British Type-26 frigate design, these multirole warships will offer significant enhancement in terms of range and combat capability. The first Hunter-class vessel is under construction (Manuel, 2024) with the first ship expected to enter service in 2032 (Hunter Class Frigate, 2024). Six frigates will be constructed in two batches of three ships each. Displacing 8,200 tons each, these frigates will feature advanced Australian-developed CEA phased array radar systems, as well as the Aegis combat management system. They will be equipped with a range of sensors, including hull-mounted sonar and towed array sonar, and advanced defensive countermeasures. Warship will have capacity to support one MH-60R Romeo ASW helicopter and an uncrewed system (BAE, 2024). These warships will also have 32 cell Mark-41 VLS to carry surface to air missiles as well as Tomahawk cruise missiles. The second batch of three Hunter frigates may feature up to 96 vertical launch missile cells and sixteen cruise missile canisters for Naval Strike Missile (NSMs), making them formidable assets in any naval engagement (Felton, 2023). The equipping of Tomahawk cruise missile suggests that all major warships of RAN will possess the capability to engage surface targets from long ranges with high precision.

In addition to the Hunter-class frigates, Australia plans to acquire a new class of frigates, referred as Project Sea 3000, focused specifically on anti-submarine warfare. This future class of frigates will likely be a foreign design, with candidates including the German MEKO A200, the South Korean Daegu class frigate, the Spanish F110, and the Japanese Mogami-class frigate. Australia plans to directly purchase three from one of these foreign suppliers, with an additional eight to be built domestically under transfer of technology agreement. The commissioning of these frigates shall double the net-size of Australian surface combat fleet (Felton, 2024).

Perhaps the most innovative aspect of Australia's naval modernization is the development of unmanned systems and optionally manned combat ships. These vessels can operate with or without a crew, allowing them to undertake dangerous missions without risking human lives (Grady, 2024). While the exact specifications of these ships are not yet known, they are expected to be equipped with Mark-41 VLS and Aegis combat management system which will grant multi-domain strike capabilities. Australia's decision to partner with the U.S. Navy on this project means it will benefit from American advancements in unmanned naval technology. The U.S. Navy's Large Unmanned Surface Vehicle (LUSV) program offers insights into what these Australian ships might look like. The LUSV is designed to be 60-90 meters long, displace 1,000-2,000 tons, and carry up to 32 vertical launch missile cells. This aligns with Australia's requirement for a robust, corvette-sized vessel capable of performing a range of combat roles. (Ferguson, 2024)

In parallel, Royal Australian Air Force (RAAF) is also purchasing AGM-158B JASSM-ER cruise missiles for its multi-role fighter aircrafts (Hughes, 2022). Both these long-range cruise missiles will significantly extend the strike envelop of Australian force. This range and precision increment of fighter aircrafts, when coupled with P-8 Poseidon MPA will significantly improve strike envelop of Australia in naval domain. RAAF is also in phase of inducting 72 F-35A Lightning-II stealth aircrafts (Hurst, 2021). These stealth aircrafts are replacing older aircrafts. Though these aircrafts will be operated by air forces, but their deployment in maritime domain can significantly augment air defense envelop for safe operations of other tiers of naval forces.

AUKUS and Australia's Nuclear Submarines' Ambitions

The most eminent and widely discussed dimension of Australia's naval modernization is the acquisition of eight nuclear attack submarines (SSNs) in a deal worth \$368 billion under the framework of AUKUS (Greene, 2023). Nuclear submarines can remain submerged for months, travel faster, and cover greater distances than their conventional counterparts. These submarines will be based on Royal Navy's next generation SSN-R project and will be called SSN-AUKUS (Office, 2023).

SSNs will be integrated into RAS with a periodic approach. Initially, RAN personnel will collaborate with counterparts from the United States and the United Kingdom to undergo joint crew training regarding new technology. Subsequently, starting in 2027, SSNs from the United States Navy (USN) and Royal Navy (RN) will undertake rotational visits to Australia for developing RAN familiarity with maintenance and the operational use of SSNs. From 20230 onwards, as a stop gap measure, the United States will lease three – with option of two more – second hand Virginia-class SSNs to the RAN. Finally, in the early 2040s, the first SSN-AUKUS produced at an Australian shipyard will be delivered to the RAN for active deployment (Doherty, 2023).

The advanced endurance and stealth capabilities of nuclear-powered submarines (SSNs) will greatly extend the operational reach of the RAN. Transitioning from a primarily defensive force focused on sea-denial, the RAN will now have the capacity for sustained power projection in the Western Pacific, particularly in the South China Sea. For the U.S. and its allies, maintaining a forward, continuous naval presence and extending their reach in the Indo-Pacific is critical to counter Beijing's expanding naval influence. In addition to SSNs, Washington is also exploring deeper collaboration with Canberra in areas such as artificial intelligence, cyber and quantum technologies, hypersonic missile systems, and enhanced undersea capabilities. These advancements aim to create synergy between U.S. and Australian forces, reinforcing the collective combat posture in the Indo-Pacific theatre. (Ibrahim, 2023)

To compensate the time gap, Australia is also planning to give life-extension upgrade to its existing Collin class submarines (Vavasseur, 2021). The upgrade will also involve modifications in weapon package to support sub-launched tomahawk cruise missiles. The feasibility of such extensive upgrade, however, is still underway (Felton, 2022). These modifications, provided it will happen, will allow RAN to employ Collins for offensive roles as a stop gap measures till the arrival of nuclear attack submarines.

Since its announcement, AUKUS has faced criticism from various parts of the international community. China and Russia have repeatedly voiced their concerns, labeling AUKUS as an irresponsible move that could destabilize the region, fuel an arms race, and undermine global non-proliferation efforts (TASS, 2024). Additionally, nuclear disarmament watchdogs have raised alarms over the potential access of Non-Nuclear Weapon States (NNWS) to advanced nuclear technologies. In response, Washington has sought to alleviate these concerns by ensuring that Australia will not have direct access to the nuclear reactors within the SSNs. The reactors for the SSN-AUKUS vessels will not be constructed in Australia but will be imported from the U.S. or UK as sealed units, requiring no refuelling throughout their operational lifespan (Probyn, 2023). Additionally, Australia's SSNs will be equipped with conventional weapons only and therefore will not play any part in proliferation of nuclear weaponization of Indo-Pacific region (Doherty, 2023). This suggests, although Washington, London, and Canberra have exploited the loop-holes in Nuclear Non-Proliferation Treaty (NPT) (Borger, 2023), but necessary safeguards have been undertaken to keep AUKUS free from nuclear weaponization axis.

A tabular comparison of Australia's major naval combatants equipped with long range guided weapon systems is given below. The comparison takes into account the current strength of RAN and expected strength of RAN in 2040s. (Giegerich, The Military Balance, 2024)

Type of Warship	Current RAN Strength	Future RAN Strength
Multi-Mission Destroyers (DDGs)	03x Hobart class DDGs	03x Hobart class DDGs
Heavy Frigates (FFG)	N/A	06x Hunter class FFGs
Light Frigates (FFL)	11x Anzac class FFLs	11x Project Sea 3000s
Large Optionally Crewed Surface Vessels (LOSVs)	N/A	06x LOSVs
Conventional Submarines (SSK)	06x Collin class SSKs	N/A
Nuclear Attack Submarines SSN/SSGN)	N/A	08x AUKUS-SSNs
Total Strength	20	34

Impact on Indo-Pacific Region

Australia's rapid naval modernization, particularly through initiatives like the AUKUS agreement, will have a profound impact on the balance of power in the Indo-Pacific region. In brief, five key takeaways can be highlighted.

First, these modernizations will significantly shift the balance of power by enhancing Australia's ability to operate in contested areas like the South China Sea and Western Pacific (particularly within first island chain), areas that are critical to Chinese maritime interests. The

deployment of nuclear-powered submarines will give Australia an upper hand in maintaining a stealthy, prolonged presence in these waters, extending its strategic reach and complicating China's military planning. This development is likely to be viewed as a direct challenge to Beijing's growing influence in the region, and could provoke further militarization, leading to traditional security dilemma where one nation's efforts to enhance its security triggers counterbalancing measures from rival states, particularly China. To nullify RAN's growing naval potential, PLAN may undertake forward deployment of its own nuclear attack submarines, warships, and carrier-strike groups which will dilute the security environment of ASEAN region and may open unnecessary battlefield in case of crisis.

Second, Australia's enhanced naval capabilities, backed by the U.S. and the U.K. through AUKUS, will strengthen the collective deterrence posture of Western allies in the Indo-Pacific. This creates a formidable counterweight to China's expanding naval power and its assertive behavior in regional waters, thereby contributing to a more multipolar balance. While U.S.-China competition has long been the defining feature of Indo-Pacific dynamics, Australia's modernization could accelerate the emergence of a broader coalition of balancing powers, including Japan, India, and other ASEAN countries, seeking to contain China's rise. This may compel Beijing to formulate similar strategic arrangements to counterbalance AUKUS or even Quad. Such approach will have far reaching ramification as far as destabilization of global balance of power is concerned.

Third, these modernization efforts will intensify the arms race in the region, prompting neighboring countries, especially those wary of both China's and Australia's expanding military capabilities, to bolster their own naval and maritime forces. This is particularly relevant to Southeast Asian nations, which may feel compelled to strengthen their maritime defenses to avoid being left vulnerable in the midst of growing great power competition. Nations like India can exploit such opportunities to support its hegemonic designs in Indian Ocean Region, compelling Pakistan to undertake stabilizing measures. This one example showcases how rapid build-up at one place impacts the strategic stability at extra regional scale. In this sense, Australia's modernization could introduce both stability and instability: stability through a stronger deterrent against potential Chinese aggression, but instability by fueling an arms race that escalates regional tensions and may cause political instability.

Fourth, beside the risks of regional nuclear proliferation, AUKUS could encourage other nations to pursue nuclear technologies by exploiting weaknesses in existing non-proliferation regimes. For instance, India, as a member of the Quad and a party to several bilateral security agreements with the U.S., has long sought deeper engagement in Washington's Indo-Pacific strategy. Although India was excluded from AUKUS, New Delhi has nonetheless welcomed the agreement as it aligns with its anti-China stance. Using AUKUS as a precedent, India may seek to acquire similar nuclear propulsion technology from foreign sources, most likely France, for its Project 75-A nuclear attack submarine (SSN) program. Given the existing strong ties between France and India in submarine development, the possibility of Indo-French cooperation in this domain cannot be ruled out. Similarly, this can open new mods of bilateral and multi-lateral co-operation as far as nuclear propulsion technologies and even nuclear attack submarines is concerned. The proliferation of SSNs, even if not equipped with nuclear armaments, will pose risks of major crisis in the form of command & control complications, safety of nuclear assets,

and risks of nuclear accidents. It's worth mentioning that such measures will weaken the credibility of nuclear non-proliferation regimes even further.

In sum, Australia's rapid naval modernization will play a key role in shaping the balance of power in the Indo-Pacific. By enhancing its strategic depth and operational reach, Australia will be better equipped to contribute to regional security, particularly in containing Chinese maritime expansion. However, these developments will also trigger competitive responses from both regional powers and middle states, leading to a more complex and potentially volatile security environment in the Indo-Pacific.

Conclusion

Australia's naval modernization represents a strategic effort by Canberra to maintain a balance of power in the Indo-Pacific region. By building larger and more technologically capable naval force, Australia seeks to counterbalance China's rapid expansion of naval might. Additionally, Canberra is actively working with United States to consolidate regional alliances with other major powers to effectively contain Beijing's growing influence. Australia's force modernization programs – particularly under the ambit of AUKUS, indicates that Australia is gradually transforming its hard power in the maritime domain from defensive to offensive posture which synchronizes with the political aptitude of Canberra. Through the lens of balance of power theory, this force modernization and alliance formation is a rational response to the changing power dynamics in Indo-Pacific, directed to prevent China from achieving hegemonic dominance in the Indo-Pacific. However, AUKUS also underscores the fact that China's growing military power has forced the U.S. to take extraordinary steps to maintain its strategic dominance. Australia, despite being a distant nation, has been drawn into China-U.S. geopolitical rivalry. The precedent set by AUKUS may inspire other nations to follow suit, and under current global circumstances, competing powers are likely to explore more assertive military options. As a result, the Indo-Pacific region could emerge as the primary battleground in a new Cold War-like competition. Thus, the risks of intensification of security dilemmas and ignition of arms races can potentially escalate tensions and undermine regional stability.

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Geopolitics, Governance, and Global Dynamics

CIVIL -MILITARY DISCORDANCE AND THE POLITICAL CULTURE OF PAKISTAN

Dua Hamid, Javaria Shaikh and Dr. Asia Mukhtar

Abstract

Throughout history, the relationship between civilian governments and military institutions has been debated. Scholars like Huntington emphasized division of powers, while Schiff advocated collaboration. Pakistan's weak democratic foundation has led to struggles between governmental power and public demands. Unique challenges, including conflict with India and historical inequities, have amplified the military's political role, particularly due to the Kashmir conflict. Recent events, like the 2014 protests, strained civil-military relations, exacerbated by social media. This article uses mixed methods to assess trust between civilians and the military and explores expert insights into civil-military relations. The main objective of the article is to determine how a weak political culture has led to strained civil-military relations in Pakistan. Findings of the article indicate urban dissatisfaction with military politics and disillusionment with government and judiciary. The article recommends that improving relations requires a new political agreement, redefined military roles, more democratic political parties, a stronger Parliament, and enhanced civic culture, underdeveloped since 1947.

Key Words: Civic Culture, Civil-Military Relations, Democracy, Political Culture

Introduction

Throughout history, scholars have intensely debated to figure out an ideal situation for civil-military relations. During the Cold War era, when traditional concept of security prevailed with the emphasis on military defense of the borders and territory of a state, scholars such as Samuel P. Huntington emphasized on the objective control of the military by civilian government. However, as the nature of threats evolved and non-traditional aspects of security became highlighted, scholars such as Morris Janowitz and Rebecca Schiff asserted that the civilian government and military need to work in collaboration and concordance to address the dynamic threats of the current age. One defining factor in civil-military relations is the political system and political culture of a state. In a democratic political system where the government is responsive to the demands and needs of the citizens, there is stability and lesser need for the use of force. However, in cases of weaker democracies, where the political culture is weak and the government fails to draw a balance between its responsiveness to the citizens and the exercise of the governmental authority, a higher level of instability can be easily predicted. Additionally, social trust plays a pivotal role in the stability of political systems. The case of Pakistan presents a unique example of a democracy that has been marred with recurrent martial laws and complexly intertwined power struggle between the civil-military institutions. More recently, as the criticism against the political involvement of military has exponentially increased, it has simultaneously raised questions about the political culture of Pakistan. To investigate the issue civil-military relationship, this study uses mixed-methods research to claim that while there is a dire and critically urgent need of improving civil-military relations in Pakistan, it needs to be accompanied with the improvement in the political culture of the state. Secondary data is used to trace the historical background of civil-military relations in Pakistan. Questionnaires have been used to assess the public opinion to evaluate in case there is trust deficit between the public, civilian government and military. Semi-structured interviews have been conducted to seek the solutions and recommendations for improving the civil-military relations and political culture in Pakistan.

Literature Review

For figuring out an ideal balance for civil-military relations, Peter Feaver has highlighted a significant problematique. According to Feaver, while the military should be strong enough to defend the state against any external threats, it should also not be coercive enough to itself turn against the state (Owens, 2017). Traditionalist school of thought, led by Carl von Clausewitz and Samuel Huntington emphasizes on the objective control of the military by the civilian government. By asserting that ‘war is a continuation of policy by other means’, Clausewitz established the primacy of civilian command and control over the military. War should be a decision of the civilian government rather than the military and that the civilian values are supposed to keep a check even on the war-time military actions. During the Cold War era, as the traditional threats dominated the security studies, Samuel Huntington adopted the Clausewitzian approach to emphasize objective civilian control on the military. According to Huntington, the recognition of autonomous military professionalism would render the military politically neutral (Huntington, 1957).

However, scholars such as Morris Janowitz and Rebecca Schiff assert that an objective control and practical disassociation between the civilian government and the military is neither achievable nor desirable in the contemporary age with a rather transformed nature of threats. The concordance theory by Rebecca Schiff asserts that it is not imperative for the developing states to adopt the Western prescribed model of

separation between the civil-military institutions to achieve greater political maturity. Rather, the ability of three stakeholders to agree on some key indicators can help states achieve stability and political maturity. The three key stakeholders include the citizens, civilian or political elites and the military. While the concordance theory does not categorically indicate a single favorable form of government, it does necessarily prescribe that an active agreement between the stakeholders is required either in the form of legislation, decree or constitution. Domestic military intervention would reduce, while leading to political maturity when the military cooperates with the political elites and the citizenry based on consensual agreement. Schiff's theory highlights four main areas in which concordance should be achieved: the social composition of the officer corps, political decision-making process, military recruitment method and the military style (Schiff, 2009).

According to Gabbriel Almond and Sideny Verba the political culture of a state has a non-negligible impact on the political system of the country. Quoting the examples of Britain and America as successful democracies, Almond and Verba assert that for a democracy to be successful, its citizens need to be well-informed and actively participating in politics. A passive and disinterested citizen will only lead to a weak democracy. For a successful democracy, the next thing required is the governmental role of balancing its position between diametrically opposed roles of governing and decision making on one hand, while being responsive to the needs and demands of the public on the other hand. In times of crisis, such as wars, the tension between the roles of exerting governmental authority and being responsive to the demands of the public becomes the greatest. In times of crisis and in situations of intense politics, instability can arise in a democratic political system as the government would struggle to balance its role between exercise of authority and responsiveness to the public. If the demands of the public are met, politics can return to its normal discourse. However, when the government fails to meet the demands of the public in times of crisis, instability can be aggravated, and the democratic political system can be derailed.

The balance, according to Almond and Verba can be achieved through electoral process at regular intervals. By means of elections, a political party is given the authority to exercise governmental power for a certain period. The responsiveness part is maintained by making sure that elections are held regularly to make the parties in power accountable and responsive to the public demands. However, in practical terms a significant gap exists between the sense of obligation to participate in political life and the actual political participation.

In situations where the public is less actively participating in politics, the weakness of the citizen allows the elitist groups to act. Another sine qua non of democratic political system is the level of social trust between the citizens and the political elite. The citizens need to trust the political elite to delegate the power of decision-making to them. Social trust and cooperation get the citizens into a cooperative mechanism that leads towards political stability and prosperity.

Research Methodology

Mixed method research methodology has been used for this study. The data collected for this study is through the triangulation approach in which firstly secondary

data was gathered for civil-military relations over the course of history of Pakistan. Secondly, the fact findings and analysis were done through quantitative data, gathered through survey (collecting closed ended questions) from general educated public. Thirdly, analysis and recommendations were presented based on interviews conducted with SME's. Interviewees include senior military officials, academicians and senior politicians. The proposed model of analysis for this study is as follows:

Triangular Approach

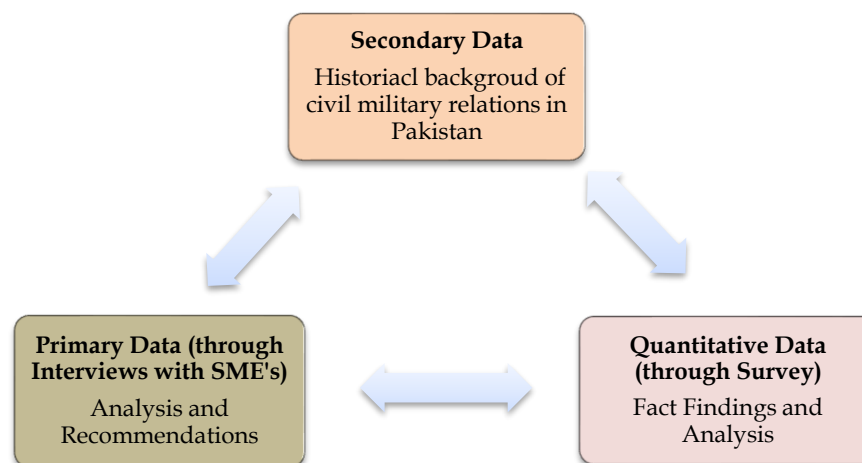


Figure 1.1: Author's Proposed Research Methodology- Triangulated Research Method

Data Collection

The data collection process for this study has been based on primary and secondary sources. For primary data collection methodology, surveys (based on closed ended questionnaire), one to one interview with (senior military officials, academicians and politicians) have been registered. The primary data available in open source (including official statements, official reports, treaties and books) has been harnessed and used for this research. The secondary data includes the research articles written by eminent scholars on the subject, Think Tank Reports, Magazine Articles and other available sources on the internet.

Historical Background of Civil Military Relations and the Political Culture of Pakistan

Pakistan, since its inception has faced turbulent, volatile and violent conditions. Among other discrepancies in the resource division between India and Pakistan the division of military assets was also unjustified in many respects, contrary to the agreement of 64% shares with India and 36% shares with Pakistan, Pakistan was forced to agree upon one-third of the share of military assets. Only 9 out of 46 training establishments were in Pakistan and all 17 ordinance factories were in India. The ammunition reserves were hardly sufficient for a week (Pakistan-Army-Web-Portal, 2018). With these limited sources, on the Western front was Afghanistan unready to recognize the Durand Line as the legitimate border, while on the Eastern front the contention with India over the

division of princely states had resulted in the Kashmir conflict of 1947-48. Such circumstances had turned Pakistan into a 'security state' right from the beginning and gave military a central role in the sustenance of the state. Additionally, as a part of the colonial legacy, while the civil and military bureaucracies were strongly developed, the political institutions were not developed equally. With a weak political and democratic legacy, several factors like leadership vacuum after the demise of Jinnah and Liaqat Ali Khan and delay in the general elections have played a significant role in preventing the democratic political culture from gaining strength in Pakistan since the initial years. It took seven years to prepare the first draft of the constitution in 1954, only to be dismissed even before it was implemented. As claimed by Almond and Verba, in times of crisis, the government must deal with the strenuous task of balancing its role between exercising governmental authority and being responsive to the demands of the citizens. While the general elections had still not taken place, the rising political instability created a vacuum, providing space for military intervention in domestic politics (Parliamentary History, 2020). General Ayub Khan imposed martial law in 1958.

The subsequent history is a tug-of-war between the weak and instable democratic civilian governments and the strong military institution. As depicted in the table below none of the elected governments in Pakistan prior to the People's Party regime in 2008-2013 had been able to complete its elected term with a smooth and unhindered transfer of power to another elected government.

Table 1.1 Tenure of Civilian and Military Regimes in Pakistan

Era	Administration	Causes of Coming to Power	Nature of Regime
1958-1969	General Ayub Khan	Martial Law due to political instability	Military
1971-1977	Zulfiqar Ali Bhutto	After the East Pakistan debacle, military handed power to civilian government	Civilian with attempts to control military
1977-1988	General Zia-ul-Haq	Military coup following political crisis and protests against Bhutto	Military dictatorship
1988-1990	Benazir Bhutto	General elections following Zia's death	Civilian
1990-1993	Nawaz Sharif	Elected after dismissal of Benazir Bhutto	Civilian
1993-1996	Benazir Bhutto	Re-elected after dismissal of Nawaz Sharif	Civilian
1997-1999	Nawaz Sharif	Re-elected after dismissal of Benazir Bhutto	Civilian
1999-2008	General Pervez Musharraf	Military coup against Nawaz Sharif	Military dictatorship
2008-2013	Asif Ali Zardari	General elections following Musharraf's resignation	Civilian
2013-2018	Nawaz Sharif	Elected after Zardari's tenure	Civilian
2018-2022	Imran Khan	Elected with alleged military support	Civilian

Table generated by the Researchers by consulting data from different sources used in the Article

The instigation of Martial Law and the abrogation of the constitution by the military government of Ayub Khan referred to the fact that the constitution was superficial in nature and the political institutions remained inherently weak even after a decade of independence. It would simply be implausible to assume that a military regime would lay down the foundations of democratic political culture in Pakistan. In addition to the abrogation of the constitution, two other initiatives of Ayub Khan wreaked havoc on the democratic political culture of Pakistan. As the direct electoral process was replaced with the introduction of indirect voting by means of electoral college in the constitution of 1962, the political participation of the public was critically reduced. Furthermore, the crackdown against Fatima Jinnah, the more popular candidate in the elections disillusioned the public from the political system of the state- thus reducing the trust of public on the institutions. Amidst mounting public resentment of the military regime and growing popularity of Zulfiqar Ali Bhutto and Sheikh Mujib-ur-Rehman in West and East Pakistan respectively, Ayub Khan had to succumb to the public pressure and thus resigned in 1969 (Khakwani, 2003).

Ayub Khan's regime was succeeded by another military regime of General Yahya Khan. Despite the fact that general elections were held in 1970, the failure to honor the mandate of the public culminated with other resentments to result in the secession of East Pakistan. After the creation of Bangladesh, the military returned to the barracks while handing over the political power to Zulfiqar Ali Bhutto. As per the constitution of 1973, enacted in the era of Z.A. Bhutto, the civilian control was expanded and the military was obligated to take oaths of non-interference in political matters of the state. Numerous of the initiatives of Bhutto, such as the forceful retirement of over two dozen officers of the high command of military and navy as well as over-centralization and land reforms led him towards a political suicide on two fronts. On one hand, the civil-military strife was intensified, whereas the feudal lords and Islamists joined to form the opposition alliance of Pakistan National Alliance. Accused of rigging in 1977, Bhutto's government had to face intense opposition. As the government became incapable of balancing its role between asserting the governmental authority while also responding to the demands of the citizens. Ultimately, the vacuum created led the state towards another Martial Law under Zia-ul-Haq in July 1977.

The eleven years long military dictatorship of General Zia ul Haq further ravaged whatever was left off the democratic political culture of Pakistan. From altering the political system of Pakistan from parliamentary democracy to presidential form of government, to the appointment of high-ranking military officials as provincial governors and judges, Zia's regime witnessed the supremacy of the military over the civilian institutions. Additionally, as Bhutto had been penalized with death penalty in Zia's regime, it indicates a critically inappropriate imbalance of power in the civil-military institutions of Pakistan. The nail in the coffin for the disruption of political culture came with the crackdown on political parties and the elections of 1985 were held without political parties (Dawn-Staff, HOW ZIA RULED: 1977-1988, 2017). While the military regime of Zia ended abruptly with the plane crash of General Zia ul Haq, the political culture of Pakistan had been so weakened that neither the public was well-acquainted with

democratic principles nor the political leadership was well-versed with the democratic ethos.

Consequently, the decade between 1988-1998 was a juggle of political power between the Pakistan Muslim League Nawaz and the Pakistan People's Party, with none of them being able to complete their tenure. The elections of 1988 brought Benazir Bhutto to power with popular support, however, still not with absolute majority. Bhutto's strife with Sharif, the instability in Baloch assembly, the worsening economic conditions after the IMF Conditionality, the rift between President Ghulam Ishaq Khan and mounting tensions between Benazir and the armed forces resulted in President Ghulam Ishaq Khan applying article 52\2 (b) to topple down the government of Benazir Bhutto in 1990 (Sekine, 1992). Bhutto was succeeded by Nawaz Sharif as the 12th Prime Minister of Pakistan. Despite having a considerable majority in the parliament, Sharif too, could not complete his term. Sharif had major rifts with the armed forces over foreign policy decision making in cases of Gulf War and the relations with India (Pattanaik, 2000). Sharif's government had the same fate as that of Bhutto as President Ghulam Ishaq Khan using the Article 52\2 (b) dissolved the national assembly and ousted Nawaz Sharif. Bhutto was reelected in 1993, only to be dismissed three years later, once again without completion of the electoral term. Strain in relation with President Farooq Leghari, charges of corruption and incompetence, rising stagflation and the rift with military over the Mirage Deal prepared the ground for Bhutto's dismissal in 1996 (Burns, 1996). The second tenure of Nawaz Sharif was marked with the Kargil crisis that also caused a serious strain in the civil-military relations. As it has been evident in the discourse of civil-military relations and the political culture of Pakistan, strenuous crisis has often resulted in the overthrow of democratic regimes by military dictators. The same happened as Nawaz Sharif was ousted by General Pervaiz Musharraf.

The next decade was once again dominated by direct political control of military on the domestic affairs. Under General Musharraf's regime, most of the civil services institutions became dominated by serving or retired armed officers. Additionally, with the slogan of accountability, President Musharraf created the National Accountability Bureau that was used as a tool to ward off politicians who disagreed or countered Musharraf's policies. Later, in the name of reconciliation and 'fresh start', the National Reconciliation Order was passed. Inspired by the Turkish model of Mustafa Kamal Ataturk, Musharraf wanted to give a direct and constitutional role to military in the domestic affairs, for which the National Security Council was created. Furthermore, in case of foreign policy, President Musharraf made Pakistan the frontline state in America's war on terror- whether that aligned with the national interests of Pakistan or not. (Khan & Wazir, 2010).

The government of Pakistan People's Party that came in power in 2008 after the elections conducted in the aftermath of Musharraf's resignation, was the first elected government to complete its tenure. Three critical issues in the regime of Asif Zardari and Yousuf Reza Gillani indicated the strained civil military relations. The first issue arose as President Zardari insisted the ISI chief to collaborate with the Indian intelligence to investigate the Mumbai attacks. This was refused by the military intelligentsia. The

second divergence arose over the Karry Lugar bill which included 1.5 US dollar of non-military aid being given to Pakistan. The military objected to it on the grounds that it might be a violation of sovereignty and national integrity of Pakistan. The third and major rift in civil-military relations arose after the killing of Osama bin Laden in Abbottabad. While the military leadership claimed that it had allowed US aircrafts to use its airspace, the civilian government under Asif Zardari clearly refused any prior information regarding the US Operation (Haqqani, 2015). The matters worsened with the Memo-gate scandal, according to which, Asif Zardari had allegedly asked for American help to refrain the military leadership of General Ashfaq Pervez Kayani from overthrowing the government (Taj, Shah, & Ahmed, 2016).

As the government of Pakistan People's Party transferred the power smoothly through democratic electoral procedure in 2013 to Pakistan Muslim League Nawaz, strain in civil-military relations was evident from the beginning. As 2014 was the year of Dharnas, with Pakistan Tehreek-e-Insaaf staging a four month sit-in protest in Islamabad, there had been clear indications that the Dharna had the backing of men in uniform (Khan M. I., 2017). The backing of public protests by the military indicates the fact that during this era, even the political culture of the state had not remained independent of the military influence. Additionally, the civil-military relations had been strained over the action against terrorists. While the Nawaz government had been more inclined towards dialogue, the military unilaterally launched a security operation in Waziristan. As the TTP responded to the military operation in the form of APS attacks, momentarily it led to convergence between the political parties as well as the civil-military institutions as the National Action Plan was created. The convergence, however, did not last long as the military soon became critical of the civilian government for being incapable of handling multiple issues such as the settlement of internally displaced people.

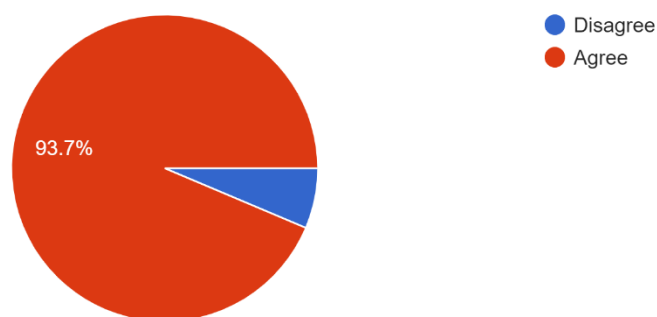
As mentioned in the table above, the PML(N) government was succeeded by the democratically elected government of Pakistan Tehreek-e-Insaaf. Imran Khan's ascent to power had been popular in the military circles who had kept on asserting that there was no divergence in civil-military relations. While the initial years of PTI's government showcased an unprecedented level of civil-military coordination, Khan's take on the military's involvement in politics shifts dynamically and dramatically when he got ousted by means of a no-confidence motion. As Khan began his direct and indirect verbal accusation of military's involvement in a US led conspiracy to oust him from the government, the populist base of PTI's leader became increasingly critical of the role of armed forces in the domestic political sphere of the country. The impact of Khan's jibe on military resonated to the point that the ex-COAS General Qamar Bajwa remarked "Army draws its strength from people and any effort to create wedge between army and population won't be tolerated" (Almedia, 2022). The gravity of the matter became more evident with the state's spymaster holding a press conference along with DGISPR to provide clarification for the rumors made against the army. According to DG ISI, Khan had offered extension to General Bajwa in exchange of extended support for his government, which was refuted based on being an unconstitutional act (Yousaf, 2022).

Main Findings

- According to the perspective of Rebecca Schiff, it is significant to trace the political cultural history of a nation for stable civil-military relations. Pakistan, since its independence has inherited a system of strong military and bureaucracy with a weak democratic political culture. Inherited from the colonial legacy, the military and bureaucratic institutions were maturely developed while the democracy traditions had not gained strength.
- The incompetence of political elites in drafting a constitution, holding general elections and fostering a democratic culture by appealing to the masses had significantly weakened the public trust on political parties and political elite of the state. A large majority of the respondents also do not consider the politicians capable and qualified enough to foster a democratic culture.

The dynastic politics in Pakistan has not allowed democracy to prosper at grass root levels in Pakistan.

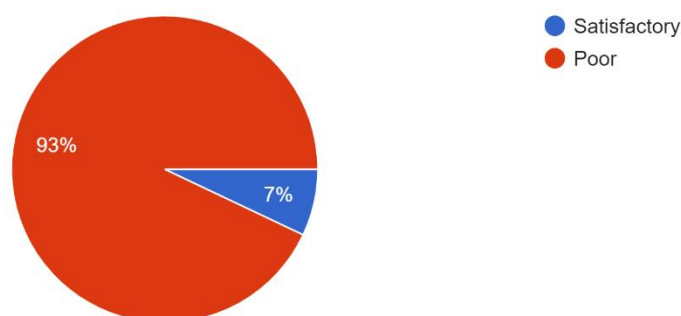
126 responses



- Not only has the public weak trust in the political elite, rather the trust deficit on other important institutions is alarmingly high.

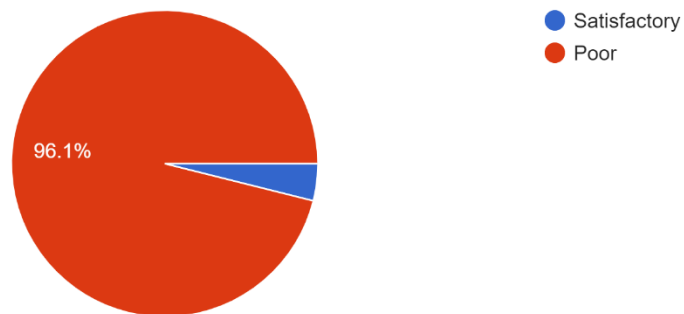
The current level of public trust on Judiciary in Pakistan to dispense justice is considered

128 responses



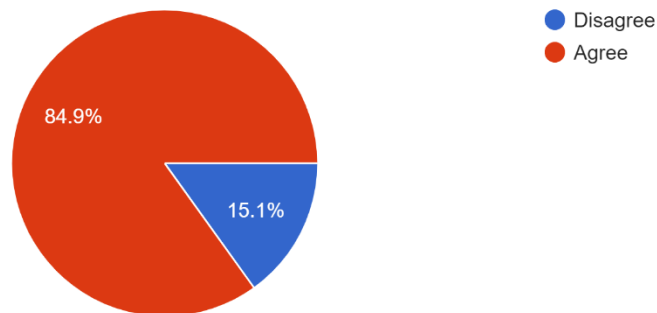
The public trust on police in Pakistan to protect life and legitimate property of citizens is considered.

128 responses



The politicians and major political parties are mostly to be blamed for not allowing Parliament to gain strength.

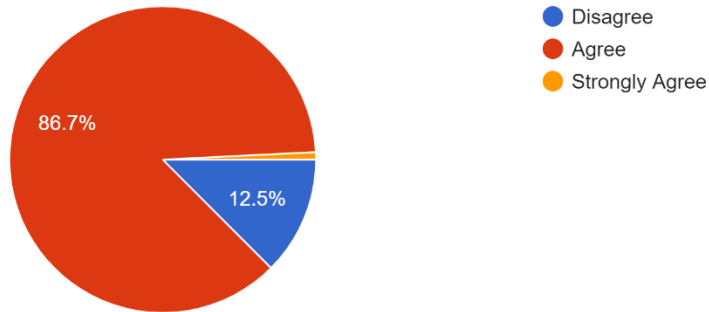
126 responses



- Out of seven and a half decades of its existence, Pakistan has spent more than 3 decades under direct military rule (Ayub Khan from 1958-1969, Yahya Khan from 1969-1971, Zia-ul-Haq from 1977-1988 and Pervez Musharraf from 1999-2008). Even during the years of civilian government, there has been evidence of covert involvement of the military in the political sphere.
- Despite the critique against the military's involvement in politics, the public has been generally in reverence of the military. Despite the concerns of the political role of military, a vast majority of people consider that military has played a significant role in providing territorial integrity and security against traditional threats.

Pakistan Military has and continues to play significant role in providing territorial integrity and security against traditional (conventional and nuclear) threats from other countries.

128 responses

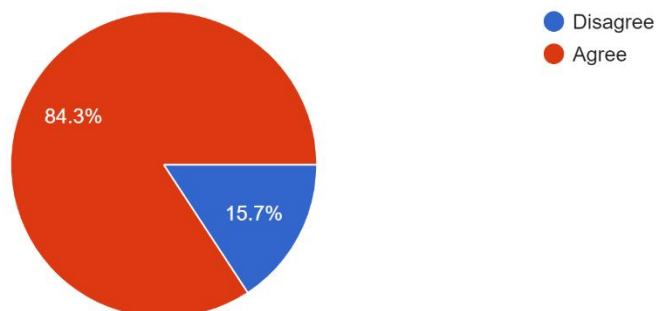


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- Out of 127 respondents, approximately 65% consider that any federal or provincial institutions, other than the military, are not strong enough to thwart the threat of terrorism.
- A vast majority, with 85% of the respondents consider that no civil-political institutions, other than the military, are qualified enough to handle any natural disasters without the support from the military. However, more recently with the ousting of Imran Khan through the No-Confidence move has gathered immense and intense criticism against the armed forces of Pakistan.
- Approximately 74% of the respondents consider Pakistan military responsible for political instability in the country. Around 77% of the respondents consider the military responsible for corrupting politicians by facilitating changing loyalties amongst politicians. 80% of the respondents consider that the military intervention in politics has weakened democracy and reduced the role of parliament in Pakistan.
- A considerable majority of the respondents opine that the military should be completely apolitical.

Pakistan military should be completely apolitical.

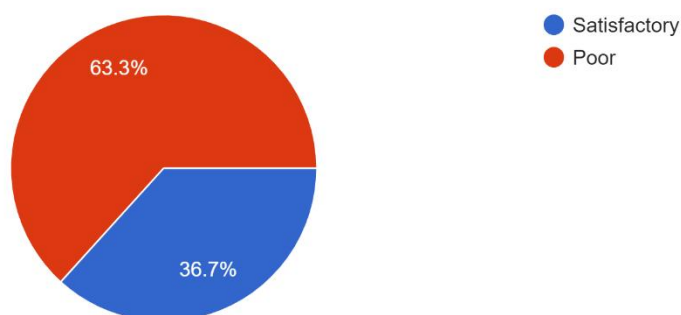
127 responses



- Over 80% of the people consider that there is need for comprehensive parliamentary oversight of defense budget. According to the respondents, the public trust on military is significantly declining

The current level of public trust on Military in Pakistan is considered.

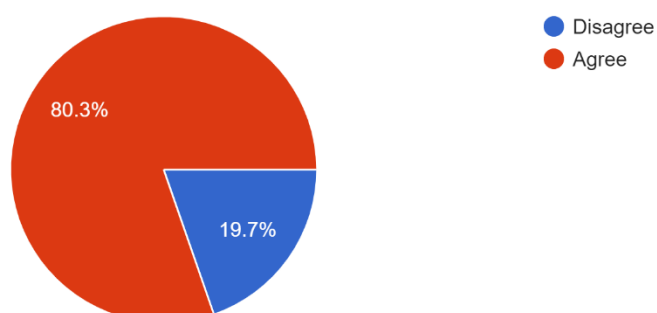
128 responses



- However, with an increasing number of respondents claiming that the military interference in politics has been unjustified, a similarly large number of respondents upheld the opinion that throughout the history
- the politicians and political parties have been responsible for military intervention

Throughout the history, political parties are to be largely blamed for disruption in democracy and military intervention.

127 responses



Conclusion

Pakistan inherited a weak democratic system at its inception in 1947, with a history of colonial rule that did not foster democratic values and institutions. In contrast, the military, inherited from the British Indian Army, was well-organized and structured, initially playing a crucial role in maintaining order and security. This juxtaposition of a weak democratic foundation and a strong military institution has been a defining feature of

Pakistan's political landscape. The military's role expanded over the years, becoming deeply involved in governance and national security affairs.

With the changed nature of threats, from hosting over 3 million Afghan refugees and 1 million Kashmiri refugees, high levels of environmental pollution and degradation, increased water scarcity, and the prevailing threat of terrorism, the security environment for Pakistan is highly complexed (Khan R. M., 2009). The Pakistan army had played a significant role in tackling with both traditional and non-traditional security threats. In addition to the practical and visible examples of the military combating with the wide range of threats, the fact that a significant majority of people believe that army successfully defends the state from external threats declare the centrality of military for security. Whether the task is that of infrastructure building in case of Karakoram Highway, or army extending help in times of 2005 earthquake or 2022 floods, Pakistan's military has been on its toes for dealing with traditional and non-traditional security threats (Janjua, 2021). Furthermore, as the findings of the survey highlight, most of the people (84%) believe that no other institution would be capable of handling natural disasters without the support from military, and 65% consider that any federal or provincial institutions other than the military would be incapable in thwarting the terrorist threat. This perception of military as a more stable and efficient institution, compared to the often-fragmented civilian governments, has led to a greater reliance on the military for governance and decision-making, further weakening democratic norms and institutions in Pakistan.

Pakistan's weak political culture since its inception has significantly contributed to the country's struggles with democracy. Characterized by frequent military interventions, weak civilian institutions, and political instability, Pakistan's democratic journey has been tumultuous. The military has intervened directly in governance multiple times, citing reasons such as corruption and inefficiency in civilian governments. This has undermined the development of stable democratic institutions. Civilian institutions, including the judiciary and parliament, have often been weak and easily influenced by the military and other powerful actors, limiting their ability to govern effectively. Pakistan has experienced frequent changes in government, often through non-democratic means such as military coups or political assassinations, leading to a perception of political instability among the public. As a result, the military has been seen as a stronger institution.

However, despite the practical evidence and the public opinion indicating that military is one of the strongest and most competent institutions of Pakistan, there is a growing dissent regarding the involvement of military in the domestic political sphere. An in-depth analysis of the civil-military relations in the light of Rebecca Schiff's theory would reveal that the growing discordance in the civilian government and military leadership is now also combined with growing speculation of the public regarding the role of military in politics- all of which leads to the weakening of the internal fabric of the state.

While the civil-military relations in Pakistan have not been smooth since the beginning, the contemporary era has seen a dramatic episode of intense critique on the military that made the COAS and DG-ISI appear in the public eye to provide a clarification for the defense of the armed forces. Whether it's the excessive access to social and electronic media and information, or the use of a 'democratic tool' to oust a political leader that enjoyed populism, there have been increasing factions of public being delusional with the state's institutions-more specifically the military. The condition of the public's trust in the politicians, police, judiciary and other agencies for dealing with non-traditional security threats is equally poor, rather worse than the trust in military. While the military is criticized for disrupting the political democratic process, the politicians and political parties are not free of blame. The dynastic politics and incompetence of available leadership has prepared ground for military intervention. Additionally, in the contemporary era with the emergence of non-traditional security threats and blurring of the lines between peace and war due to hybrid warfare, it has become equally difficult to create a rigid distinction between the spheres of action of military and civilian governments.

Efforts to strengthen democracy in Pakistan have been impeded by this civil-military discordance. Achieving a more balanced civil-military relationship will require reforms that enhance civilian oversight of the military, which can be done through strengthening political culture and democratic institutions, enhance political awareness among youngsters in order to increase their participation in political matters and to promote a culture of democratic governance.

Recommendations

1. The subject-matter-experts consulted for their opinions have given valuable suggestions to improve the civil-military discordance that could hence improve the stability and security of Pakistan in traditional as well as non-traditional spheres.
 - The respondent from academia sector asserted that 'adherence to the constitution is the only solution'; since constitution is the unanimously agreed document to run state affairs. Unless the constitution is followed in true spirit and adapted through parliamentary procedures, the mobility and practicality between and among the state institutions would be futile.
 - One of the respondents retired from the armed forces suggested that media should be controlled and true facts of services, sacrifices military provided for the nation over the course of history should be highlighted on different platforms, so that the young generation will know the truth. Military needs nation's support at their back, they fight with the support of the nation
 - One of the respondents, being a political activist claimed that the only solution is to make the let democracy bud, grow and prosper from the grass-root level; only that would be an actual representation of the public opinion.
 - Lastly, another respondent retired from the military claimed that there is need of 'larger consensus between the public, government and armed forces'. This

exactly resonates with the Concordance theory of Rebecca Schiff in which she prescribes agreement between the same key stakeholders.

2. In Pakistan, strengthening the political culture is imperative for the country's democratic development. This entails fostering strong public political participation beyond mere voting and election processes. There is a critical need for heightened political awareness among the populace, ensuring that citizens are politically educated and informed about the issues affecting their lives and the nation as a whole.
3. A politically educated public is crucial for promoting informed decision-making and voting for wider national interests rather than narrow sectarian or personal agendas. Encouraging informal gatherings with political discussions can help stimulate political consciousness and debate, fostering a culture where citizens actively engage with political issues and hold their representatives accountable.
4. This shift towards a more active and aware citizenry is essential for reducing civil-military discordance and strengthening democratic institutions in Pakistan. It can lead to a more responsive and accountable political leadership, ultimately contributing to a more stable and vibrant democracy in the country.

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VIOLATIONS OF INTERNATIONAL HUMANITARIAN LAW: A CASE STUDY OF ISRAEL-GAZA CONFLICT

Ehsan Ahmed Khan, Javaria Shaikh

Abstract

International Humanitarian Law (IHL) considers as a foundation for regulating armed conflicts and safeguarding the rights of individuals affected by such conflicts. Despite its worldwide recognition, its application in various contentious circumstances, particularly exemplified by the Israel-Gaza conflict, remains a subject of intense discussion. Employing a qualitative research design, this paper explores the nuances of the Israel-Gaza dispute. It meticulously highlights numerous violations of IHL, encompassing breaches of its fundamental principles, including distinction, proportionality, neutrality, and humanity. These violations, attributed to both the Israeli Defense Forces and Hamas, underscore the formidable challenges in maintaining ethical and legal standards amidst ongoing warfare. This paper stresses the critical importance of addressing IHL violations within the Israel-Gaza conflict. It demands for accountability, ethical conduct, and genuine efforts toward peace and reconciliation. This article urges sustained actions for a lasting solution, highlighting the principal importance of adhering to IHL principles to guarantee long-term peace in the region. In addition, it accentuates the significance of international cooperation and support in fostering compliance with IHL and promoting a culture of respect for humanitarian norms. The paper stresses the need for impartial investigations into alleged violations of IHL and the prosecution of those responsible. It also calls for actions to increase the protection of civilians and humanitarian workers in conflict zones. By promoting adherence to IHL, this paper maintains, the international community can play a pivotal role in mitigating the humanitarian impact of armed conflicts and advancing the cause of peace and justice.

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Key words: International Humanitarian Law (IHL), Proportionality, Decimation, Combatants, Distinction.

1. Introduction

International Humanitarian Law (IHL), commonly known as the Law of Armed Conflict, regulates the conduct of armed conflicts and protect those who are not or no longer involved in conflict. IHL has evolved through several decades, including significant milestones such as the foundation of the Red Cross in 1864 and the adoption of the Geneva Conventions in 1864 and 1949. Additional Protocols, developed in 1977, increased rights for victims of both international and non-international armed conflicts. The fundamental principles of IHL include distinction (distinguishing between civilians and combatants), proportionality (ensuring that military actions are proportionate to objectives), neutrality (parties not involved in conflict should not be targeted), and humanity (requiring humane treatment of all individuals). The Geneva Conventions and Additional Protocols provide regulations to protect the wounded, ill, and prisoners of war, and it emphasizes on non-discrimination. IHL supports the protection of civilians, limits the means and techniques of combat, and compels parties to take preventive steps while also establishing an accountability framework to hold violators responsible. However, despite global acceptability, IHL's application remains controversial, particularly in the ongoing Israeli-Gaza conflict.

The Israel-Gaza conflict has deep historical roots and diverse origins, spanning over years of events and changes. Israel's defence forces have flagrantly broken all principles of international law during the last 76 years and never held accountable. Recently, the events of October 7, 2023, and Israel's brutal reaction have refocused attention on the application of IHL, which has always been challenging.

This research paper delves deeply into the violations of International Humanitarian Law (IHL) committed during the Israel-Gaza conflict. The purpose of this article is to examine the hostilities conducted and the protection of people during the conflict. Using a qualitative research design, the paper explores the subtle aspects of the Israel-Gaza war, relying on both secondary and primary data sources. International Humanitarian Law serves as the conceptual framework for this study, which explains the violations of international law in the Israel-Gaza conflict. These violations are studied in light of both Israel's and Gaza's actions, illustrating the complexities and problems of maintaining ethical and legal principles in the midst of ongoing conflict. This article further emphasizes the need of addressing violations of IHL in the Israel-Gaza conflict, as well as the need for accountability, ethical conduct, and genuine efforts for peace and to bring sustainable resolution of the conflict. However, as Israel – Gaza is an ongoing conflict this paper covers statistical data of casualties from October 7th, 2023 till April, 2024.

2. International Humanitarian Law

IHL is a set of norms and principles governing the conduct of armed conflicts. The main aim of IHL is to reduce human suffering caused by wars and conflicts by controlling belligerent behaviour and safeguarding individuals who do not or no longer participate in hostilities. The origins of IHL can be traced back to ancient civilizations and religious ideologies, where specific regulations and norms attempted to restrict the savagery of battle.

However, the present framework of IHL began to emerge in the nineteenth century, particularly by the efforts of Henry Dunant, who experienced the horrors of the Battle of Solferino in 1859. Dunant's advocacy resulted in the formation of the International

Committee of the Red Cross (ICRC) and the acceptance of the first Geneva Convention in 1864, which sought to safeguard wounded troops on the battlefield (Inter-Agency Standing Committee, 2010).

2.1 Key Principles of IHL

a. **Principle of Distinction.** The principle of Distinction is the foundation of IHL. It emphasizes the need to distinguish between the combatants of war and the civilians, as well as between military based areas and civilian areas. According to the principle of distinction belligerents are compelled to direct their actions solely against military and to avoid civilian casualties (ICRC).

b. **Principle of Proportionality.** Proportionality principle dictates that during the conflict the use of force must be proportionate to the military targets and objective being pursued. It prohibits excessive or indiscriminate attacks against civilians or civilian objects disproportionate to the expected military advantage. This principle aims to balance military necessity with humanitarian considerations (ICRC). Moreover, this principle says that in situations where unintentional harm to civilians or civilian objects is unavoidable, the principle of proportionality applies. This means that individuals responsible for planning or authorizing an attack must abstain from initiating or must halt an attack if it is likely to result in excessive damage to civilians or civilian objects compared to the anticipated military advantage.

c. **Principle of Neutrality.** The principle of neutrality recognizes the status of individuals and entities that do not participate in hostilities, such as humanitarian organizations and medical personnel. It mandates that these entities should be respected and protected by belligerents and should not be targeted or subjected to harm during armed conflicts.

d. **Principle of Humanity.** Humanity principle emphasises the humane treatment of all individuals who are not or are no longer participating in conflicts, including civilians and captured combatants. It prohibits acts of violence, cruelty, and torture, emphasizing the need to protect the inherent dignity of every person, even during the armed conflict (Shaw, 2021).

IHL also have few following components and instruments to protect innocents during wartime

a. **Geneva Conventions.** The Geneva Conventions work as a foundation of IHL system that enacted from 1864 and eventually came to an end in 1949 and it's made up of a set of four Conventions. The primacy of their charters is to outline and secure the right of the wounded, sick, ship wrecked persons, prisoners, and civilians during wartime. The treaties transcribe legal norms associated with the treatment of people who fall into these categories and they also oblige nations to comply with those norms.

b. **Additional Protocols.** Geneva Convention's Additional Protocols were adopted in 1977 which has further strengthened and expanded the protection of victims of armed conflicts. From the Additional Protocols, Protocol I emphasis the protection of civilians particularly in International armed conflict, whereas

Protocol II talks about the protection of civilians in specifically non-international armed conflicts.

c. **Customary International Humanitarian Law.** The Customary International Humanitarian Law encompasses practices and rules that have developed over time and are widely recognized as binding on all states, notwithstanding of whether they are parties to specific treaties. The International Committee of Red Cross (ICRC) along with various other legal scholars have played an important role in recognising and codifying customary rules of IHL (Shaw, 2021).

d. **International Criminal Court (ICC).** Establishment of International Criminal Court in 2002 marked a significant step in ensuring accountability for serious violations of IHL. The ICC has jurisdiction over individuals accused of genocide, war crimes, crimes against humanity, and the crime of aggression. Its role is to prosecute those responsible for the most severe breaches of IHL (Shaw, 2021).

2.2 Sources of IHL

Key instruments of Modern IHL documents include

- The Hague Regulations, which governs the laws and customs of land warfare.
- The Geneva Convention (I), aiming at improving the condition of wounded and sick military personnel in the field.
- The Geneva Convention (II), aims at improving the conditions of wounded, sick, and shipwrecked armed forces members at sea.
- The Geneva Convention (III) on the Treatment of POW.
- The Geneva Convention (IV) protects civilians during wartime.
- Protocol I and protocol II addresses the protection of victims of international armed conflicts and non-international armed conflict, significantly.

3. Historical Background of Israel-Gaza Conflict

The deeply rooted and diverse Israel-Gaza conflict is a result of a complex interaction of historical, political, religious, and territorial disagreements between Israelis and Palestinians. The roots of the conflict may be traced back to the late nineteenth and early twentieth centuries, when major Jewish immigration to Palestine began as part of the Zionist movement, which an aim to build a Jewish homeland in the territory, ruled by the Ottomans. The influx of Jewish settlers heightened tensions with the Arab population, which resulted in growing clashes and competing national aspiration. However, the 1917's Balfour Declaration is vital to understanding the historical context of the Israel-Gaza conflict.

The Belfour declaration was issued by the British government during World War I, the declaration expressed support for the establishment of a "national home for the Jewish people" in Palestine. This declaration was a pivotal step in the Zionist movement, which has provided international recognition and legitimacy to Jewish objectives for statehood in Palestine (Elmali, 2023).

Moreover, the declaration had laid the groundwork for the establishment of the State of Israel in 1948 and contributed to the escalation of conflict between Jews and Arabs. The united nation's proposal for a partition, in 1947, aimed to divide Palestine into two separate states for Jews and Arabs, with Jerusalem as an international zone. This plan

was widely accepted by the Jews, whereas, the Arab leaders rejected it. This led to armed conflict and the establishment of the State of Israel in 1948.

Soon after the establishment of Israel, the First Arab-Israeli War triggered, with neighbouring Arab states, including Egypt, Jordan, Syria, and Iraq. Israel emerged victorious from the conflict, which led to the displacement of hundreds of thousands of Palestinians. The armistice agreements, after that, left Gaza under Egyptian control and the West Bank under Jordanian control. This was followed by the Six-Day War in 1967 initiated by Israel in a pre-emptive strike on Egyptian air forces (Elmali, 2023). Israel swiftly defeated the combined forces of Egypt, Jordan, and Syria, occupying the Sinai Peninsula, Gaza Strip, West Bank, and Golan Heights. The geopolitical landscape of the region got significantly altered after this victory and led to Israel's military occupation of Gaza and the West Bank.

The Yom Kippur War was another war between Israel and Arab states, fought in 1973. It started with a surprise strike on Israel around Yom Kippur and Ramadan. Despite initial Arab gains, Israel finally repelled the attacks. The war ended with a cease-fire and no significant territorial changes, but it had long-term consequences for the area, instigated changes in military policies and diplomatic efforts to resolve the Arab-Israeli conflict.

Following all the full-scale Wars, Israel began constructing settlements in the occupied territories, including Gaza, that are considered illegal by the International Law. However, throughout the history, various efforts have also been done to address the conflict through peace negotiations, such as the Oslo Accords in the 1990s, aimed to establish a framework for peace between Israel and the Palestinians, leading to limited Palestinian self-governance in parts of the West Bank and Gaza. However, the peace process faced numerous complications, including continued violence and conflict escalation (Elmali, 2023).

3.1 Rise of Hamas in Gaza

The rise of Hamas, a militant Islamist organization, further complicated efforts for peace, as it won Palestinian legislative elections in 2006 and subsequently seized control of Gaza in 2007 (Robinson, 2024). This led to a political and territorial split between Hamas in Gaza and Fatah in the West Bank, exacerbating internal Palestinian divisions and contributing to conflict escalation. Periodic flare-ups of violence, including major conflicts, as Operation Cast Lead in 2008-2009, Operation Pillar of Defense in 2012, and Operation Protective Edge in 2014, have resulted in extensive casualties, destruction, and international condemnation. Despite occasional ceasefire agreements and international mediation efforts, the underlying issues fuelling the Israel-Gaza conflict, including the blockade on Gaza and status of Palestinian territories, remain unresolved, posing significant challenges to peace and stability in the region. The underlying grievances and political dynamics fuelling the Israel-Hamas conflict remain unresolved, posing significant obstacles to achieving lasting peace in the region (Robinson, 2024).

3.2 Recent Developments

On October 7, 2023 Al-Qassam Brigades of Hamas executed armed assaults on Southern Regions of Israel, which were the Palestinian territories occupied by Israel, along with Jerusalem and several Israeli municipalities. Operation Al-Aqsa Flood, resulted in over 1,400 fatalities and the seizure of around 240 hostages by Hamas. In response, the Israeli air force conducted airstrikes on Gaza approximately three hours after the attacks,

indicating a profound shock within Israel (Elmali, 2023). Benjamin Netanyahu, the Prime Minister of Israel has declared a state of war, while Yoav Gallant, the defence minister, announced plans for a comprehensive blockade on the Gaza Strip, encompassing the withholding of electricity, fuel, and food supplies, citing the necessity to counteract what he referred to as "human animals" (Aljazeera, Israeli Defence Minister orders 'Complete Siege' on Gaza, 2023).

Despite Israel's initial claims of acting in self-defence, its military campaign quickly escalated into a wide-ranging and merciless operation, resulting in the indiscriminate bombing of residential areas and civilian infrastructure in Gaza. This ongoing Israeli offensive has resulted in the deaths and injuries of thousands of innocent civilians, prompting a critical examination in accordance with International Law, particularly IHL.

4. Classification of conflict under International Law:

Classification of Israel-Gaza conflict as international Armed Conflict (IAC) or Non-International Armed Conflict (NIAC) according to Law of Armed Conflicts is important in order to determine the legal regime for protection of individuals and accountability for those who violate IHL under International Criminal Law (ICL).

4.1 International Armed Conflict (IAC). As per the guidelines outlined in Article 2 of Geneva Conventions of 1949 and subsequent Additional Protocols, the characterization of a conflict as an IAC is based on the engagement of two or more states in the conflict (Solis, 2016). This means a conflict can be classified as IAC if,

4.1.1 It involves two or more states directly in hostilities or

4.1.2 It is meeting the criteria of "armed conflict" as defined in IHL which typically involves the use of armed forces.

4.2 Non-International Armed Conflict (NIAC). Article 3 of Geneva Conventions applies to NIACs that occur within the territory of a country (Solis, 2016). These conflicts typically involve a government facing opposition from internal groups, rather than a conflict between states.

5. Classification of Israel-Gaza Conflict.

It is a complicated task to determine that which branch of IHL applies to the ongoing hostilities in Gaza between the Israeli armed forces and Hamas military wing, either the law governing IAC or NIAC. However, an assumption can be made, to classify current Israel Gaza Conflict as IAC, based on the following reasons:

5.1 Occupation Status. Even though Israeli troops has withdrawn from the ground, but it still maintains control over many aspects of Gaza, including borders, airspace, and territorial waters. This continued control suggests an ongoing occupation (Baldwin, 2023).

5.2 Geographical Proximity. The geographical proximity between two territories, allows Israeli authorities to exercise governmental functions from outside Gaza, further indicating a state of occupation.

5.3 Control and Authority. Israel's control over Gaza and its ability to potentially re-establish full control within a reasonable time frame suggest a level of authority that aligns with the criteria for an IAC.

5.4 Legal Implications. Designating the conflict as an international armed conflict reinforces legal protections for individuals and objects affected by the hostilities. It also enables prosecution for war crimes under the jurisdiction of ICC.

5.5 Protection for Civilian Populations. Categorizing the conflict as an IAC ensures that civilian populations on both sides benefit from the protections outlined in the Geneva Conventions (GC IV), including access to the ICRC for verification of detention conditions and family reunification efforts (Baldwin, 2023).

5.6 Prohibited Methods of Warfare. The designation of the conflict as an international armed conflict prohibits the use of methods or means of warfare that could cause widespread, long-term, and severe damage to the natural environment, providing additional safeguards.

Regarding treatment of Hamas forces, under IAC, they may not qualify for prisoner of war (POW) status as they are not part of the regular or irregular armed forces of the Palestinian State (Hemptinne, 2023). However, military considerations often dictate treating them as armed forces for targeting purposes, despite not formally belonging to a recognized party to the conflict. This approach may create a "hybrid category" under humanitarian law to balance humanitarian interests and military considerations effectively.

6. Violations of IHL in Israel- Gaza Conflict

At the core of the Israel-Gaza conflict is a deeply tragic story of human suffering and continual disregard for international humanitarian law. The ongoing violence, observed with dismay by the global community, creates a path of destruction that is hard to fathom. This conflict has witnessed frequent and serious violations of the rules intended to safeguard civilians and mitigate the brutality of warfare.

Gaza is home of around 2.23 million people, with 80% being refugee's dependent on humanitarian aid. Despite its small size of 365 km², Israel exercises complete control over its land borders and 45 km-long coastlines. Since 2007, Israel has enforced a total siege on the Gaza Strip, treating it as a hostile zone. This siege, affecting sea, land and air, violates International Law and amounts to collective punishment for all Gaza people. Consequently, Israeli military has initiated six wars between 2008 and 2021, with a seventh starting on October 7th, 2023. This ongoing conflict is characterized by an unprecedented level of destruction and civilian casualties caused by the Israeli army (Fact Sheet, War on Gaza: Violations of International Humanitarian Law, 2023).

Keeping in view the above mentioned four principles of International Humanitarian Law, the Israel-Gaza conflict alleged of numerous allegations and concerns regarding violations of International Humanitarian Law (IHL).

6.1 Violation of Principle of Distinction. As this principle requires that during the conflict the civilians and combatants must be distinguished, along with civilian objects and military objectives. Both Israel and Hamas, the militant group controlling Gaza, have been accused of failing to adequately distinguish between these groups. Israel has been criticized for use of disproportionate force with

“heavy and indiscriminate Weapons, ammunitions, rockets and bombs” in densely populated areas, which has led to numerous civilian casualties (Press Release, 2024). While it argues that it targets only militants and military infrastructure, reports from international organizations and human rights groups suggest that many civilian casualties have occurred. Israeli forces have openly targeted facilities which are being considered "protected" by International Law, including hospitals, schools, and places of worship. Moreover, bombing also directly targeted medical facilities, destroying ambulances, and killing of medical staff. Whereas, Hamas has been accused of launching indiscriminate rocket attacks towards Israeli population centres, without distinguishing between military targets and civilians. This violates the principle of distinction by putting civilians at risk.

6.2 Violation of Principle of Proportionality. According to this principle, use of force must be proportionate to the military objective only and must not lead to excessive civilian harm. Both parties have faced allegations of disproportionate use of force. Israel's military operations, such as airstrikes and artillery shelling, have caused significant civilian casualties and damage to civilian infrastructure. Critics argue that the scale of Israel's response often exceeds what is necessary to achieve its military objectives. Hamas's rocket attacks, while generally less destructive than Israeli airstrikes, have also been criticized for their indiscriminate nature and the disproportionate harm they cause to Israeli civilians compared to the military value of the targets.

6.3 Violation of Principle of Neutrality. This principle requires that entities not involved in the conflict be respected and not be targeted. In the Israel-Gaza conflict, the principle of neutrality has been violated in several ways. Humanitarian organizations and medical facilities in Gaza have been damaged and destroyed in Israeli military operations. Despite the neutral status under IHL, Israeli defence forces (IDF) have targeted various medical facilities, hospitals, clinics, and laboratories where thousands of civilians sought protection and shelter. Statistics highlights that Gaza's Health system has been completely destroyed. 32 hospitals out of 36 are destroyed including two largest hospitals (Nasser Medical Complex and Gaza City's Alshifa Medical Complex) (Press Release, 2024). Moreover, educational, cultural and religious assets of Palestinians in Gaza have also been destroyed. According to statistics, Israel has demolished 80% schools and all universities, 241 mosques entirely and 318 partially and 3 churches where civilians were having shelter were bombed (Press Release, 2024). Notwithstanding, there have been reports of Hamas using civilian infrastructure, such as schools and hospitals, for military purposes, which violates the principle of neutrality and puts civilians at risk.

6.4 Violation of Principle of Humanity. This principle emphasizes the importance of preventing unnecessary suffering and treating all individuals with compassion and dignity. Israel has faced criticism for the blockade of Gaza, which has led to a humanitarian crisis, including shortages of food, medicine, and other essential goods. The blockade has been described by some as collective punishment, which is prohibited under IHL. Moreover, since Oct. 7, 2023, the death toll reached up to 42,510, including 38,621 civilians, 15,780 children and 10,091 women (Press Release, 2024), with 85% of Gaza's population is in internal displacement having severe shortage of food, medicines and clean water. Also, the

aggression led to the forceful expulsion of 1.7 million Palestinians from the northern Gaza Strip (Staff, 2024).

7. Analysis and Findings

By analysing the ongoing crises in Gaza, Israel and IDF are clearly accused of genocide, forceable expulsion and ethnic cleansing of Palestinians in following ways.

7.1 The Rome Statute, in Article 6, as well as the Convention on the Prevention and Punishment of the Crime of Genocide, both define **genocide** as any act committed with the objective to destroy, any particular national, ethnic, racial, or religious group. It can be killing group members, severely injure them mentally or physically, and inflicting destruction upon them either completely or partially. The killing of 42,510 Palestinians (Press Release, 2024), including destruction of Mosques, Schools, lone houses and other religious and cultural landmarks echoes the genocide in Gaza. Such statistics prompted the petition of 790 scholars and legal experts from around the world stating that the situation in Gaza amounts to genocide (Staff, 2024). “Craig Mokhiber, Director of the New York Office of the High Commissioner for Human Rights” (OHCHR), also considered that the situation in Gaza is genocide (Fact Sheet, War on Gaza: Violations of International Humanitarian Law, 2023).

7.2 Forcible expulsion, which is a crime against humanity committed through acts that entail the displacement of civilians in any civilian group targeted in a wide-spread or systematic attack, is explicitly prohibited in the “Rome Statute”. According to article 8 of the Rome Statute, authorities cannot move or deport the population of a territory directly or indirectly under their occupation. In Gaza, aggression resulted in a massive wave of deportation that led to the forceful expulsion of 1.7 million Palestinians from northern Gaza to its southern point. Under Article 49 of the Fourth Geneva Convention, it is prohibited to perform forced collective or individual deportations or exchanges of protected populations in occupied areas. In a military order of around a million Palestinians (half of the population of Gaza), the Israeli army demanded them to evacuate from northern Gaza and move to its south on October 13, 2023. UNRWA directorate pointed out that number of displaces in Gaza is over 1.7 million including 400.000 living in its structures (Report U. S., 2024). Another Israeli intelligence document has also been leaked with an official plan to displace all of the Gaza city population to the Egyptian desert of Sinai, because of the established anxiety and pandemonium caused to be moved from north to south.

7.3 Ethnic cleansing encompasses a number of violations and crimes, including: killing of civilians, forced displacement, torture, attack on unarmed population, hinders humanitarian supply delivery, and very extensive property damage. International Court of Justice Resolution No. 91/2007 defines it as forcing or intimidating people to move out or stay out of a region in order to change the population’s ethnicity. Actions of Israeli authorities reflect ethnic cleansing in Gaza that uses internationally banned weapons to drive Palestinians out, an intentional scheme to deal with Israel’s demographic apprehensions (Report U. S., 2024).

7.4 The ongoing violations of International Humanitarian Law in Gaza have prompted calls for an impartial inquiry, particularly concerning attacks on innocent civilians, which could constitute war crimes under international law. A joint request has been received to the Prosecutor of ICC from five countries to investigate the situation in Gaza, underscoring the gravity of the allegations (Report U. S., 2024).

7.5 Accusations are also being made by Naledi Pandor, South African Foreign Minister, against Israel, alleging "the murder of children and women," and her call for the ICC to issue arrest warrants for decision-makers of Israel have stirred significant international attention. The ICC, empowered to investigate war crimes and crimes against humanity, has announced its intention to investigate the alleged war crimes committed in Gaza. Despite Israel not being a member state of the ICC, the court asserts jurisdiction over the actions of both entities, Hamas militant groups in Israel and Israeli forces in Gaza (Qamar, 2023).

7.6 International legal experts have pointed out specific violations, including deliberate attacks on civilian targets and the excessive use of force, blockade for delivery of humanitarian aid (Qamar, 2023). These actions, such as strikes on residential buildings at night without warning, raise serious concerns regarding compliance with the principles of the law of armed conflict, notably the principle of distinction and obligation of precaution to protect civilians. Moreover, currently main humanitarian issue is how to implement and sustain an aid operation in Gaza, which desperately needed. According to Human Rights Watch, "Israel has been recently accused of 'deliberately starving Gaza's population by blocking the delivery of water, food and fuel', many starving innocents lost their lives waiting for aid convoys. Statistics shows that 300,000 Palestinians are suffering from true famine (Press Release, 2024). However, these actions of Israel considered as a method of warfare that can be clearly described as a war crime (Report, 2023)."

7.7 Criticism has been levied against the ICC for perceived double standards in its handling of cases, particularly concerning accountability for Israeli officials compared to other world leaders accused of similar offenses. The continued lack of accountability for human rights violations against Palestinians, coupled with the enduring blockade of Gaza, has intensified international scrutiny and calls for justice.

7.8 Failure of ICC in prosecuting Israel for declared war crimes in Gaza, world major power is to be blamed. Despite significant pressure from UN Secretary-General Antonio Guterres, the United States, being Israel's staunchest ally, openly thwarted the adoption of a resolution on December 8. The resolution sought an "immediate humanitarian ceasefire," marking the latest instance of several US vetoes on draft resolutions concerning the ongoing conflict (Aljazeera, UN Security Council in Intense Negotiations on Gaza Humanitarian Resolution , 2023).

7.9 The ongoing conflict in Gaza, with its devastating impact on civilians and the apparent targeting of civilian populations, underscores the urgency for the ICC to address these allegations, impartially. Failure of this not only undermine the credibility of international justice but also perpetuates freedom for grave violations of human rights and international humanitarian law in future as well.

7.10 Crimes against humanity in Israel and Palestine serve a vital role in determining the ICC's credibility. If the actors who committed the war crimes and the crimes against humanity in these regions are not held accountable, this can have a very bad impact on the reputation and credibility of the court. International collaboration will be especially important for the ICC's future reputation. Member states have to unite and denounce serious human right violations in the name of the rule of law and ensure accountability for the most severe offenses. This in turn bolsters the international community's solidarity in human rights and creates the second commitment to prevent and deal with cases of atrocities.

7.11 The Israel-Gaza conflict raises question marks to effectiveness of IHL warranting a careful re-evaluation of the concepts of humanity, distinction, and proportionality. The actions of powerful international actors, such as the US, EU and other pro-Israel lobbies, in supporting Israel despite alleged war crimes points to inconsistent and selective application of IHL.

7.12 Analysis of aforesaid echo that the Israel-Gaza conflict presents numerous challenges to IHL in interpretation as well as application. Both sides have been accused of violating the principles of IHL. For this demonstration of a clear and unwavering commitment of holding accountable those who have committed war crimes under International Law, including senior members Israel Defense Forces and Hamas is needed. In addition, world Major Powers need to play effective role in taking measures to end atrocities in Gaza by both sides (Israel and Hamas).

8. Conclusion

By explaining the principles of International Humanitarian Law, this paper highlights the ethical considerations surrounding the conduct of war and the protection of civilians in this protracted and deeply entrenched conflict. The historical background of the Israel-Gaza conflict underscores the complex interplay of political, religious, and territorial disputes that have contributed to its enduring nature. From the early Zionist movement to the establishment of the State of Israel and the subsequent rise of Hamas in Gaza, the conflict has been marked by violence, displacement, and unresolved grievances.

Through a critical analysis of recent developments, including the events of October 7, 2023, this paper highlighted the profound impact of the conflict on civilian populations and the urgent need for accountability for alleged violations of IHL. The indiscriminate bombing of residential areas, the blockade of humanitarian aid, and the targeting of civilian infrastructure raise serious concerns about compliance with the principles of distinction, proportionality, and humanity. However, the failure of the ICC to prosecute alleged war crimes in Gaza underscores the challenges of achieving justice and accountability in the face of political obstacles and power dynamics. Calls for impartial inquiries and accountability mechanisms highlight the importance of upholding ethical and legal norms in conflict settings.

In light of the findings and analysis presented in this paper, ultimately, addressing the violations of IHL in the Israel-Gaza conflict requires a concerted effort to uphold ethical standards, promote accountability, and pursue genuine efforts for peace and reconciliation. Only through an unbiased commitment of major powers to these principles, a sustainable resolution to the conflict can be achieved, by ensuring the protection of civilians and the promotion of justice and human rights for all affected parties.

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MARITIME POLLUTION IN PAKISTAN AND ITS IMPACT ON MARINE LIFE: CHALLENGES AND WAY FORWARD

Hamna Ghias Sheikh, Gul Hameed

Abstract

Marine pollution is a major threat to marine biodiversity, ecosystems and socio-economic conditions of coastal communities in Pakistan. Driven by industrial, agricultural and plastic pollution, mounting levels of marine pollution are largely resulting in habitat destruction, biodiversity loss and difficulties in conduct of subsistence activities. Lack of waste management system and public awareness further compound the problem. The present study gives a comprehensive analysis of marine pollution, its sources, types and mechanism as well as the damage it does to marine environment. The study also examines existing domestic and international legislation on marine pollution eradication and puts forth recommendations in the form of both short and long term measures for pollution mitigation in Pakistan. The study also emphasizes the need to sensitize public attention on this pressing issue and advocates awareness campaigns regarding oil spill response preparedness, investment in resilient infrastructure and plastic pollution eradication initiatives. Long term measures stem from analysis of several case studies of island countries. These measures include protection of critical infrastructure, ecosystem conservation as well as increased research and development. Effective implementation of these measures can help Pakistan transition into a sustainable and secure future.

Keywords: Marine pollution, Pakistan, Karachi Harbour, Industrial waste, Agricultural pollutants, Plastic pollution, subsistence activities, international legislation, Long term measures.

INTRODUCTION

Marine pollution is a grave threat to sensitive marine environment and ecosystems in Pakistani coastal areas. It jeopardizes biodiversity, threatens fisheries and affects subsistence activities of coastal communities resulting in compromised socio-economic conditions of local population. Despite several pieces of domestic legislation and many regulatory bodies being in place, implementation remains a challenge. The damage to marine environment and ecosystems in Pakistan is due to various sources which include industrial, agricultural and plastic pollution. Apart from this, maritime activities such as shipping and port operations are also sources of marine pollution.

The present study conducts a thorough examination of the causes, sources, intensity and impact of marine pollution in Pakistan with a special focus on pollution in Karachi Harbour which is a hub of maritime activities in Pakistan. Employing a qualitative research method, the study aims to achieve many objectives. These include analysis of sources and extent of pollution, impact of marine pollution on ecosystems and subsistence activities, evaluation of existing regulations and international conventions on marine pollution and finally, propose both short and long term measures for eradication of marine pollution in Pakistan.

By achieving these objectives, the present study seeks to enhance understanding of marine pollution and its various dynamics in Pakistan and give insight to policymakers and regulatory bodies for effective management and mitigation of marine pollution. Through concerted efforts, it is possible to conserve Pakistan's marine environment for future generations.

Problem Statement

The damage to marine ecosystems coming from industrial, agricultural and plastic pollution along with maritime activities is a grave threat to marine biodiversity, fisheries, and subsistence activities of coastal communities. There are several pieces of domestic legislation and many regulatory bodies, but effective implementation and enforcement mechanism still remain a challenge. Moreover, poor infrastructure for waste management and limited public awareness add to the gravity of the issue.

Literature Review

A thematic review was conducted to organize and synthesize existing literature based on finding recurrent themes. An exhaustive literature review yielded previous research on marine pollution in Pakistan and its impact on marine life. Chhatwal [1] delves into the intricate dynamics of environmental pollution, encompassing both land and marine ecosystem. Through a comprehensive exploration, Chhatwal provides foundational insights into the origins, impacts, and management strategies pertaining to pollution. Despite being published over three decades ago, Chhatwal's work remains highly relevant, offering timeless perspectives on the historical evolution of pollution issues and early attempts to mitigate their effects. By examining the historical context of pollution control efforts, Chhatwal's work lays the groundwork for understanding contemporary environmental challenges and underscores the importance of proactive measures to address pollution in both terrestrial and marine environments.

Dr Asif Ali Abro and other have highlighted the impact of untreated municipal sewage on marine environment along Karachi coast. About 471 million gallon municipal wastewater finds its way into the sea every day. Karachi being the most populated city

with a big industrial area produced about 12000 metric tons of solid waste of which about half is discharged into the sea. These colossal amounts of pollution impinge heavily on marine life and environment. With these alarming statistics it can be said that Karachi coast is experiencing a dire sanitation crisis. The authors have proposed that projects initiated under the Greater Karachi Sewerage Plan be implemented on priority basis.

Faiza Ilyas in her report brings a stark reality to light regarding the untreated domestic and industrial waste that finds its way into the sea in Pakistan [2]. This report sheds light on a critical issue that has far-reaching implications for marine ecosystems, public health, and the overall well-being of coastal communities. The report underscores the alarming statistic that over 90 percent of untreated domestic and industrial waste is discharged directly into the sea in Pakistan. These various types of pollutants include domestic waste as well as industrial waste often containing toxic chemicals and heavy metals. This revelation highlights the magnitude of the problem of marine pollution in the region, the damage it does to marine life and the urgent need for decisive action to address it. By drawing attention to this critical issue, the report emphasizes the need for regulatory interventions and mitigation measures to curb the flow of untreated waste into the sea. Industrial activities in coastal regions have been recognized as significant contributors to environmental pollution, with implications extending beyond terrestrial ecosystems to marine environments. In the study conducted by Idrees, Nergis, and Irfan [3], the focus was placed on monitoring industrial emissions and assessing air quality in Karachi, Pakistan, a coastal city experiencing rapid industrialization. The authors aimed to illuminate the intricate relationship between industrial activities, air pollution, and its repercussions on marine ecosystems. By scrutinizing various pollutants and contaminants present in the air, the researchers provided nuanced insights into the magnitude of industrial contributions to air pollution within the coastal city. The research findings highlighted the prevalence of harmful gases, particulate matter, and other airborne pollutants emitted by industrial facilities in Karachi. These emissions not only deteriorate air quality but also pose indirect threats to marine ecosystems and coastal environments due to their interconnected nature. The study underscored the critical need for understanding the complex linkages between land-based pollution and its consequences for marine ecosystems.

Ahmad, Aslam, and Hussain's [4] study provides a comprehensive assessment of plastic pollution in the coastal areas of Karachi, Pakistan, focusing on specific locations including West Warf, Kemari Jetty, and Manora. Through a detailed case-study the authors meticulously analyzed the prevalence and impacts of plastic pollution in these coastal regions. Their research provides valuable insights into the extent of plastic pollution, shedding light on the diverse range of plastic debris present in marine environments. By elucidating the detrimental effects of plastic pollution on marine ecosystems, wildlife, and coastal communities, the study underscores the urgent need for effective mitigation measures to address this pressing environmental issue. The findings of Ahmad et al.'s study contribute significantly to the existing literature on plastic pollution in coastal areas, emphasizing the importance of concerted efforts from policymakers, environmental agencies, and local communities to combat plastic pollution and safeguard marine ecosystems for future generations.

Research Methods

A qualitative research method was employed to conduct the present study. Data was gathered through secondary sources including books, journal articles, and web based sources, etc.

Research Objectives

- To analyze the sources and extent of maritime pollution in Pakistan
- To assess the impact of maritime pollution on marine ecosystems and coastal communities
- To evaluate the effectiveness of existing regulations in addressing maritime pollution
- To propose immediate and long-term measures for mitigating maritime pollution in Pakistan

ANALYSIS OF MARINE POLLUTION IN PAKISTAN

In Pakistan, marine pollution is predominantly constrained to those areas which receive high amounts of waste coming from industries and both sea based and land based human activities [5]. Although, the coast of Pakistan faces semi-diurnal tides, owing to which they are washed twice a day removing some of the pollutants. However, inside the harbors and creeks, the pollutants oscillate for several days, until they are dispersed and most of the time settle down at the bottom. Pakistan's maritime environment is deteriorating due to a complex combination of variables, ranging from plastic waste to industrial and human waste. Even though Pakistan is part of the London Convention on the Prevention of Marine Pollution, Dumping of Wastes and Other Matter, an agreement to prevent dumping of garbage into the sea, there is still no practical implementation of pollution prevention measures. This waste includes things like plastic bags, bottles, sewage, and even waste from hospitals that could be dangerous. Because of this pollution, the beautiful blue water at the popular sea view sites in Karachi, has turned black.

Mechanism of Marine Pollution from Karachi

Karachi being country's most populated city harbouring a large number of industries is major source of marine pollution. About 100 km long, Karachi coast of Pakistan is situated between the Ghara Creek and river Hub on the west. Starting from Hub river outfall, open sea coast of Karachi ends at Korangi Creek [6]. While there is no clear consensus on any single population count in Karachi, it is safe to say that it has now reached an alarming figure about 30 million. There are about 6600 industrial units in Karachi divided in four main industrial areas including the Site Association of Industry, the North Karachi Association of Trade and Industry (NKATI), the Korangi Association of Trade and Industry (KATI) and the F. B Area Association of Trade and Industry (FBATI) [7]. There being no proper system of waste disposal, recycling or treatment in any of these industrial areas, pollution from industrial areas and domestic sewage eventually end up in the coastal waters of Karachi. It is taxing marine environment beyond acceptable limits and is responsible for ecological decay and damage to environment. Existing sewage treatment plants are either non-functional or operating at greatly reduced capacity [8].

Example of Karachi Port and Port Qasim

Karachi Port and Port Qasim are two big ports in Karachi and additionally there are two fish harbours. Approximately, 35% of cargo is handled by Port Qasim while Karachi Port caters 60% of outgoing trade of the country. Dumping of waste oil, release of oily bilge water, oil spills and other sources of pollution from port operations are persistent worries. There is a need to develop sustainable technologies to make port practices environment friendly.

Sources and Types of Marine Pollution in Karachi Harbor

There are different types of pollution, i.e. air pollution, soil pollution, water pollution, etc.; however, in reality, there is only one form of pollution as all pollutants whether in the air or on land eventually end up in the oceans. Sources of marine pollution from land as well as maritime activities are discussed below:

Land Based Sources of Marine Pollution Industrial waste

Every year, the International Union for Conservation of Nature (IUCN) estimates that thousands of tonnes of industrial waste are dumped into the sea. In Pakistan, coastal areas are the hub of industrial waste. In Karachi, where major industries are located, industrial waste contaminates the sea and becomes the main source of marine pollution. Industrial waste poses a great threat to marine life. In Karachi, the absence of effluent treatment plants, especially in two of the major industries [9], Sindh Industrial Trading Estate (SITE) and Korangi Industrial and Trading Estate, leads to the discharge of waste containing hazardous materials including heavy metals and oil, into the parts of rivers, creeks, and harbors.

The area surrounding Port Qasim [10] has witnessed substantial developments, particularly in industries such as chemicals, oil refineries, and tanneries. These industries convert various substances into the effluents, including hydrocarbons, heavy metals, and fertilizers. Discharges from petroleum industries contain a range of materials, including grease, oil, phenol, and heavy metals like iron, chromium, copper, and zinc. The areas around Karachi's harbour and Port Qasim are considered hotspots with a significant amount of contaminated water present in that area, posing a threat to marine life. Sindh Environmental Protection Agency [10] (SEPA) is actively working for the protection of the marine environment. According to them, SEPA took legal action against those polluting the marine environment, but industries employed various tactics to evade accountability. This shows that industrial waste is the major source of marine pollution.

Agricultural Pollutants

Pakistan is an agricultural country and a large-scale agricultural activity takes place in coastal areas of the country. Agricultural pollutants in the form of chemical fertilizers, nutrients, pesticides and herbicides, etc. enter our seas. These pollutants contain several heavy metals including zinc, cadmium, lead and nickel, etc. which often pass through water treatment systems [11] and end up in the sea. The Sindh EPA has the authority to regularize pesticide use; however, it is not doing so. These agricultural nutrients not only harm fresh water bodies but also enter coastal waters and affect marine life. Other than herbicides and pesticides, nutrient pollution from agricultural activity also endangers marine life. Excess nutrients like phosphorus and nitrogen, when released into sea, cause algae and seaweeds to grow exponentially. This causes oxygen levels in water to deplete making it difficult for marine life to survive [12].

Domestic Wastes

Wastewater, sewage and other domestic effluents are another manmade hazard to marine life. In Pakistan's coastal areas, domestic waste having gone through various channels, eventually ends up in the sea. According to WWF 2019 report, Karachi city alone produces about 475 million gallons wastewater daily out of which around 88% enters Arabian Sea untreated [13]. This waste from various domestic sources entering our seas is also another threat marine life has to face.

Plastic Wastes

One of the major sources of pollution is plastic waste. The Indus River, a vital source of water for communities in Pakistan, is facing challenges related to plastic pollution. According to a survey conducted by the World Bank an estimated 90 percent of the plastic in the Upper Indus Basin ends up in the river, causing harm to aquatic life. Sanitary products with multilayered packaging are considered the most common type of plastics found in rivers that end up in the oceans. Plastic waste usually accumulates at barrages and canals, degrading into multiple micro plastics and toxins, not only affecting the quality of water but also marine life. Micro plastics further accumulate in marine species, simply causing a threat to marine life. In Pakistan, poorly handled plastic trash frequently finds its way into rivers, streams, and eventually the sea. This includes single-use plastics like bags, bottles, and packaging materials. Around 55 billion plastic bags are used annually in Pakistan, according to a report by the World Wide Fund for Nature [14] (WWF) Pakistan. Many of these bags are disposed of inappropriately and end up in marine habitats.

Micro plastics

Tiny plastic particles that are less than 5 millimeters in size are known as micro plastics. Marine life is significantly threatened by micro plastics. According to the study conducted by the Marine Science and Technology Bulletin, micro plastics were found in a variety of fish in the coastal area of Karachi. After analyzing 336 fish specimens [15], micro plastics were found both in the gills and digestive systems of the fish. Plastic pollution, in this way, is one of the main sources of marine pollution in Pakistan.

Riverine Transport

Much of the plastic waste is transported through rivers in Pakistan. Indus River [16] acts as a conduit from transporting the plastic waste from urban areas towards the coast. Urban areas serve as the hub of plastic waste owing to the concentration of population, industrial activities, and different consumption patterns. The accumulated plastic wastes from the urban centers reach the coast through rivers. In this way, riverine transport plays a major role in transport of plastic to the ocean, posing a threat to marine life. Furthermore, the Indus River, which feeds into the Hub River, plays an important role in transporting plastic waste from cities to the coast. The Indus carries approximately 11,977 tonnes [16] of plastic to its mouth each year, with nearly 10,000 tonnes entering the Arabian Sea, endangering marine life and coastal environments. Low-density polyethylene (LDPE), sanitary products, and multilayered packaging are the most common types of plastic found in these waters transported through Hub river.

POLLUTION FROM MARITIME ACTIVITIES

Shipping and Port Activities

Historically, shipping and ports have operated with little damage to environment; however, oil spills of 1960s caused immense marine pollution and death of seabirds. It brought maritime transport into global focus and triggered the institution of MARPOL. Shipping today is responsible for 947 million tons of CO₂ annually constituting 3% of total global emissions. [17] Pakistan's shipping industry contributes greatly to the country's economy as about 90% of Pakistan's trade is seaborne. However, pollution from shipping including oil spills, waste discharge from ships as well as harmful emissions from maritime transport have been damaging to marine environment. Due to lack of latest green technologies onboard ships and on ports, the situation has worsened over time.

Dredging and Wrecking

Marine environment is greatly suffering as a result of the widespread dredging and reclamation operations. Such operations are taking place in Karachi's Clifton Beach. These processes affect the chemical, biological, and physical environment in both short and long term. Deoxygenation of coastal and the subsurface waters has immediate repercussions, including direct physical harm to marine life. Moreover, chemical and biological alterations brought about by dredging and reclamation diminish the diversity, biomass, and quantity of marine life. Fish and shellfish, which are essential parts of the marine food chain, are at risk due to high quantities of heavy metals from these operations.

Shipbreaking

Shipbreaking industry in Pakistan is also a significant contributor to marine pollution as industrial activities mostly take place near coasts. These activities produce large amounts of wastes including chemicals, heavy metals and other dangerous substances. These substances are mostly disposed of very irresponsibly. Shipbreaking activities involve dealing with hazardous substances such as lead-based paints, dangerous left-over substances in merchant vessels and the like. These can pose risks to human safety and when these substances along with many others are released into the sea, they cause irreparable damage to marine life and quality of water. Mostly ship-yards in Pakistan lack facilities to prevent pollution and waste management systems, pollution including toxins i.e. lead, mercury, and other carcinogens affect workers, surrounding communities and overall environment. It takes an enormous toll on fisheries, agriculture, etc.

Ship Generated Waste

Ships are floating cities and moving from port to port during their normal operations, generate a lot of waste. Waste generated by ships themselves and by crew or passengers onboard includes bilge water, cargo residues, ballast water, food, sewage and garbage. In Pakistan, the problem of vessel-generated waste is a hazard for sensitive balance of marine ecosystems. Harmful discharge of waste from ships contaminates coastal waters and causes immense damage to marine life including birds and animals.

Oil Spills

In 2003, a Maltese oil tanker Tasman Spirit carrying Iranian crude oil ran aground near Karachi port spilling approximately 30,000 tons of oil into the sea. [18] Another example of it is that of oil tanker MT Heng Tong 77, as there was a substantial oil spill into the Arabian Sea as a result of the ship colliding with a bulk carrier. Widespread

environmental harm was caused by the spill, as oil slicks traveled across the surface of the water and reached coastal regions, including coast of Karachi. Such accidental oil spills are very dangerous and can have continuous deteriorating impact long after the accidents occur. In case of an oil spill accident, oil swiftly spreads on the ocean surface and covers everything which comes into contact with it. It results in killing of marine animals, plants and also seabirds. Seabirds and marine animals, having oil on their bodies, become susceptible to hypothermia as they lose their ability to bear cold temperatures. Moreover, these birds swallow oil and die due to internal damage and organ failure. Oil spills can also affect fish eggs resulting in birth and developmental abnormalities.

Tourism

Maritime tourism is a booming industry worldwide. Many coastal countries have developed strong and robust maritime tourism sectors which contribute significantly to their GDPs. As of 2021, global marine tourism market size has been estimated to be 71670 million USD. [19] Although Pakistan is yet to develop a robust maritime tourism sector, yet marine pollution from tourist visits is very much noticeable. Garbage, litter and plastics on the beaches and contamination of coastal waters from recreational activities (diving, snorkeling, boating, etc.) has damaged coastal marine environment.

IMPACT OF MARINE POLLUTION ON MARINE LIFE AND SUBSISTENCE ACTIVITIES

Loss of Biodiversity

Marine biodiversity is being affected owing to marine pollution. An example of lamp shells, which are a type of small shellfish that were prominent for inhabiting regions like Karachi Fish Harbour, Korangi Creek, and Landhi for approximately 20 million years, are now found nowhere. Moreover, in the last 50 years, 85% decline has been reported in shark landings and many of fish species including black fin cisco galapagos damsel, silver trout, and yellow fin trout have gone extinct [20]. The decline in marine biodiversity due to marine pollution is impacting marine activities. This loss of biodiversity not only disrupts the mechanism of the marine ecosystem but also threatens the lives of those who are dependent on these activities. Preserving the biodiversity of coastal waters has become essential now.

Fishing Industry

The increase in pollution is leading to depletion of sea resources directly impacting marine life. According to the experts, approximately 80 percent of the coastal population is dependent on fisheries as a source of livelihood. This sector provides employment to 1.5 million people with more than half the workforce in the coastal areas of Sindh and Balochistan. In places like Ibrahim Hyderi, people have observed a group of fishermen sitting idly over the coast as there is more garbage than fish in coastal waters, leading to unemployment. Studies on fisheries in Sindh have revealed that a number of commercially important species of fish has now reduced to dangerous levels because of mounting pollution in waters and destruction of mangrove forests. Annual catch of “Palla and Dangar” has reduced to 200 tons from 600 tons in 1986. This troubling trend is due to marine pollution, which is posing an adverse effect on the people directly involved in fisheries. Pollution is leading to a reduction in fish stocks, leading to habitat degradation, fishing grounds, and the disruption of the food security of the community dependent on fisheries. Most of the coastal communities rely on fishing as a primary source of income and food. Pollution is also contaminating fish stocks¹, making them unsafe for

consumption or reducing their abundance. This directly affects the livelihoods and food security of fishermen and their families.

Marine Transportation and Shipping Activities

Shipping and marine transportation are at risk from marine pollution, especially from oil spills. Accidents involving oil leaks harm ships, interfere with navigation, and raise operating expenses for maritime corporations. Ship infrastructure² is corroded by contaminants in the sea, increasing maintenance expenses. Pollution also causes navigational routes to become blocked, which delays cargo operations, hinders maritime trade, and puts shipment businesses at risk, ultimately endangering the safety of maritime workers.

Arrested Socio-Economic Growth of Local Communities

Local communities are heavily impacted by marine pollution, which has driven away many marine species. Fishermen who depend on coastal areas for catching shrimp, fish, and other marine life have observed a continual decline in these populations. Marine experts note that untreated sewage entering the seawater severely affects local communities, as many residents are engaged in fishing for their livelihood. The fishing sector offers numerous employment opportunities, and many locals rely on it as their primary profession. The depletion of fish stocks due to marine pollution is significantly affecting these communities, often forcing people to seek alternative subsistence activities in other regions of the country, effectively causing enforced migration.

Aquaculture Operations

In Pakistan, marine pollution significantly impacts aquaculture operations, particularly fish and shrimp farming, which are considered vital components for food security and the country's economy. Pollution coming from industrial activities, including chemical runoff, untreated sewage, pesticides, and fertilizers used in agricultural activities, poses a serious threat to aquaculture activities. Aquatic species exposed to toxic substances [21] lead to a reduction in their mortality rates and also accumulate in the tissues of shrimp and fish, making them unfit for human consumption. The delicate ecological balance of aquaculture systems is affected by marine pollution, which impacts water quality indicators including pH and dissolved oxygen levels, which are essential for the survival and growth of aquatic life.

DOMESTIC LEGISLATION IN PAKISTAN FOR MARINE POLLUTION MITIGATION

Pakistan Environmental Protection Ordinance

There are a number of regulatory bodies for managing marine pollution in Pakistan. Pakistan Environmental Protection Ordinance plays a critical role in terms of addressing the threats to marine ecosystem. It provides a legal framework for regulating the activities that contribute the most towards marine pollution including industrial discharge, waste dumping, and plastic wastes. It aims to mitigate the adverse impact of marine pollution on biodiversity and coastal communities.

Marine Pollution Control Board

In order to address marine pollution problems in Pakistan, specifically within Karachi Harbour, the Karachi Port Trust (KPT) formed the Marine Pollution Control

Department in the year 1996. The harbor, is exposed to a variety of pollutants that come directly from land-based sources. These pollutants include untreated urban and industrial waste coming directly from the city, which amounts to over 400 million gallons per day (mgd) as well as operational waste from hundreds of fishing vessels at Karachi Fisheries. The pollutant load is also increased by ship emissions from Karachi Port and garbage from commercial and industrial buildings around the harbor's edge.

Pakistan and International Conventions on Marine Pollution

International conventions and protocols play a crucial role in addressing marine pollution and promoting cooperation among nations to protect marine environment. Some key conventions and their aims are discussed below:

United Nations Sustainable Development Goals (SGDs)

Following a historic summit of world leaders leading to adoption of 2030 agenda for Sustainable Development, on 1 January 2016 17 UN SGDs came into force. SGD 14 is about “Life Below Water” and provides for measures to be adopted for protection of marine life. Pakistan still needs to do more in terms of SGD 14 to mitigate pollution and protect marine biodiversity.

MARPOL (International Convention for the Prevention of Pollution from Ships)

It is the main convention to prevent various types of pollution from ships. MARPOL was adopted in 1973 and updated by protocols in 1978 and 1997. Annexures I to VI of MARPOL prohibit various sources of pollution from ships including oil pollution, garbage and noxious substances, etc. During the last 50 years of MARPOL, the number of oil spills has reduced almost by 90%. Pakistan ratified MARPOL on November 22, 1994.

London Convention and Protocol

It is one of the first conventions to protect marine environment from harmful human activities. The convention was enforced in 1972 and aimed at promotion of effective control of marine pollution and take measures to prevent release of wastes and other matter into the sea. The convention prohibits the dumping of certain harmful substances and lays down guidelines for the disposal of other materials to minimize damage to marine environment. Pakistan adopted the convention in April 1975.

Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal

Basel convention came into force on March 22, 1989 and has a universal membership. It aims to protect environment and human health from harmful impact of generation and transboundary movement of hazardous wastes. Pakistan adopted the convention on July 26, 1994.

Pakistan as a signatory to UNCLOS

Pakistan is obligated to abide by the rules set forth in the United Nations Convention on the Law of the Sea (UNCLOS) [22] concerning the management of the world's oceans. Pakistan is subject to international commitments for environmental preservation and regulating the marine pollution being a signatory to the United Nations Convention on the Law of the Sea (UNCLOS). Pakistan is required to take action to stop

as well as manage marine pollution originating from man-made activities, including sewage, industrial runoff, and waste emerging from agricultural activities. By enacting the necessary rules and regulations, Pakistan is required to safe- guard and maintain the marine environment, which includes coastal regions and the exclusive economic zone (EEZ).

SHORTCOMINGS IN ENFORCEMENT AND REGULATORY EFFICACY

Pakistan's significant population growth has put considerable strain on its natural resources, leading to environmental challenges including marine pollution. Following the country's accession to the United Nations Convention on the Law of the Sea (UNCLOS), the Pakistan Environmental Protection Ordinance 1983 (PEPO) [1] was also introduced to address these issues in a structured manner. However, the effectiveness of the ordinance was hindered by its enforcement capacity and its focus on penalizing entrepreneurs rather than assisting them in transitioning to more environmentally friendly processes and technologies. Likewise, Pakistan, while committed to MARPOL 73/78 Annex V, has yet to ratify MARPOL 97 Annex VI. This decision is primarily attributed to financial limitations, as ratification would necessitate substantial investments in port reception facilities along with the proper mechanism of disposal of oil waste and untreated sewage water. Unfortunately, Pakistan faces challenges in terms of allocating the necessary funds for this endeavor, compounded by a shortage of adequately trained personnel to effectively implement these measures.

In the same way, Pakistan hosts one of the world's largest ship breaking industries, yet there's currently no established strategy for the Environmentally Sound Management (ESM) of the hazardous waste generated from this entire process, in accordance with the Basel Convention. Efforts are underway to develop an action plan to implement the Basel Convention within the ship breaking industry, alongside awareness campaigns for workers. Despite having National Environmental Quality Standards (NEQS) in place, hazardous chemicals brought onboard ships for scrapping remain unchecked. There's a noticeable reluctance to enforce policies, likely due to concerns that regulations could deter business, with ships from OECD countries potentially seeking alternative ship breaking industries without stringent cleaning requirements.

RECOMMENDATIONS FOR MITIGATION AND MANAGEMENT

To address marine pollution in Pakistan, a combination of short-term and long-term measures is essential. These measures should focus on mitigating current pollution sources, preventing further contamination, and promoting sustainable practices.

Immediate Measures

Public awareness campaigns

In Pakistan, a concerted effort to raise public awareness about the dire consequences of marine pollution and the critical need for responsible behavior and effective waste management practices among coastal communities, fishermen, shipping companies, and recreational users should be prioritized. Through extensive public awareness campaigns, initiatives including highlighting the detrimental effects of pollution on marine ecosystems, livelihoods, and public health can be resolved. By utilizing various mediums such as television, social media, and community outreach for raising public awareness can solve the issue of marine pollution. Likewise, educating fishermen about the impacts of littering, oil spills, and overfishing on fish stocks and marine biodiversity,

urging them to adopt sustainable fishing practices and proper waste disposal methods can prove advantageous. By fostering a culture of promoting responsible maritime practices, Pakistan can safeguard its marine environment for future generations.

Oil spill response/preparedness

In order to protect marine environment from pollution, Pakistan should respond effectively to oil spill incidents. It should invest in advanced equipment including containment booms, skimmers, specialized vessels, and ensure its availability and functionality through regular maintenance and upgrades. Likewise, rapid response teams equipped with specialized skills and equipment should be established and strategically positioned along the coastline to swiftly handle incidents related to oil spills.

Plastic waste reduction

Implementing immediate, short term measures for reducing plastic pollution, such as banning single-use plastics, promoting reusable alternatives, and conducting beach clean-up campaigns to remove existing plastic debris from coastal areas can protect marine environment. In Pakistan, the alarming increase in plastic pollution is posing significant threat to marine ecosystems. With an estimated 55 billion plastic bags being used annually and a projected 15% increase in their usage, the country is facing a mounting crisis. The urgent and decisive action is imperative to curb the usage of plastics and mitigate the detrimental effects on both Pakistan and the planet as a whole.

Long Term Measures

Case Studies of Island countries

Pakistan can control marine pollution by learning from the effective conventions and laws applied by the Islands in Indian Ocean. Examples of Seychelles and Maldives who have implemented stringent measures to control marine pollution, which Pakistan can also emulate to protect its marine environment.

Seychelles

Seychelles has ratified various international conventions with the aim of reducing marine pollution. The London Convention (Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter) and the MARPOL Convention (International Convention for the Prevention of Pollution from Ships) are the two main conventions [23] ratified by Seychelles. These conventions provide frameworks for controlling maritime pollution sources, including oil spills, plastic waste and other sewage sources. In order to lessen the effects of marine pollution on its coastal waters and marine ecosystems, Seychelles has complied with these treaties and put related restrictions into place. By developing debt-for-nature swaps, embracing the blue economy idea, and growing Marine Protected Areas, Seychelles has gone above and above what was required to achieve SDG 14.5. [24]. Seychelles is an example for marine environment conservation around the world, actively working to meet SDG targets through international alliances and creative conservation techniques.

Mauritius

Mauritius has taken a number of steps to control marine pollution. In order to evaluate the dangerous marine micro- algae levels and the quality of the coastal waters, the government has put in place long-term monitoring programs for a clean marine

environment. In adherence to the standards set by the government, various physicochemical parameters and coliform bacteria levels in coastal water quality are routinely evaluated to protect the marine environment. The Ministry's Laboratory Division conducts water quality assessments at marine aquaculture locations as part of its monitoring program. Pakistan can also implement long-term monitoring programs for maintaining coastal water quality similar to that of Mauritius to prevent marine pollution.

Protection of maritime commerce infrastructure

The improvement of security protocols and infrastructure support for the Pakistan Navy and the Pakistan Marine Security Agency (PMSA) must be given top priority by the government in order to preserve the strategic significance of the country's port along with the protection of maritime commerce infrastructure. As these sites are essential for both wartime and peacetime operations; therefore, the need of the hour is to focus on infrastructure development to ensure efficient operation and maintenance, enhance security protocols using modern surveillance technology, and offer capacity-building efforts to improve staff capabilities in marine security operations. By implementing these measures, Pakistan may fortify its economic resilience and national security through safeguarding its ports and marine trade infrastructure.

Investment in Waste Management Infrastructure

There is a need to develop and invest in robust waste management infrastructure, including sewage treatment plants, recycling facilities, and landfill sites, to effectively manage and reduce the discharge of pollutants into the marine environment. As untreated sewage is a major source of marine pollution, sewage treatment plants, in that context, are essential. Pollutants and dangerous substances can be eliminated from sewage before it is released, guaranteeing that only clean water enters marine habitats. Likewise, investing in recycling facilities is a crucial measure in combating marine pollution.

Ecosystem-Based Approaches

Implementing ecosystem-based approaches can reduce marine pollution in the long run. The creation of marine protected areas (MPAs) along the coastline of Pakistan can prove to be advantageous and a crucial tactic to handle marine pollution [25]. These MPAs can provide environments for fish, coral reefs, and other marine animals to flourish by acting as sanctuaries for marine biodiversity. Pakistan can safeguard its delicate ecosystems from detrimental practices like pollution, overfishing, and damaging fishing methods by designating specific areas as MPAs and enforcing regulations on human activity within them.

Research and Innovation

Another long-term measure which Pakistan can take to manage marine pollution is by investing in research and innovation. Pakistan can improve its capacity to avert, monitor, and mitigate marine pollution by allocating the budget to the development of innovative technology and solutions. By promising directions for innovation including pollution detecting devices and eco-friendly packaging materials. These technologies have the potential to address the main sources of marine pollution, including plastic trash, and can enable early detection of pollution occurrences and sustainable cleanup efforts. [26] In order to protect Pakistan's marine ecosystems for future generations and to expedite the

implementation of novel solutions, collaboration between academic institutions, government agencies, and business sector partners can also prove to be pernicious.

Conclusion

Marine pollution is a pressing concern for Pakistan. As a country rich in marine resources and having a considerable number of coastal communities directly dependent on marine activities, Pakistan needs to take drastic measures to overcome the issue of marine pollution. It, however, requires concerted efforts, integrated approaches, and collaborative partnerships among government agencies, civil society organizations, private sector stakeholders, and the public. Things are still not beyond recovery. By implementing sustainable solutions, strengthening regulatory frameworks, promoting technological innovations, raising public awareness, and fostering community engagement can help Pakistan protect its marine environment and transition into a sustainable and environment friendly future.

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TRANSFORMING CPEC INTO A GREEN ALLIANCE: CHALLENGES AND OPPORTUNITIES

Dr. Marriyam Siddique

Introduction

“We need to seize opportunities presented by the new round of change in energy mix and the revolution in energy technologies to develop global energy interconnection and achieve green and low-carbon development. We should improve the trans-regional logistics network and promote connectivity of policies, rules and standards so as to provide institutional safeguards for enhancing connectivity.”

(President Xi Jinping’s speech at the Belt and Road Forum, May 14, 2017)

The China-Pakistan Economic Corridor (CPEC) serves as a pivotal framework for regional connectivity. It aligns with the Belt and Road Initiative (BRI), combining the Maritime Silk Road and Silk Road Economic Belt to foster economic integration across Eurasia. With investments totaling US\$62 billion, CPEC projects are primarily directed towards enhancing Pakistan’s energy, infrastructure, and developmental endeavors.¹ The project is expected to significantly boost Pakistan’s economy by increasing the country’s economic growth to 7.5% from 2015 to 2030.² CPEC is expected to generate approximately 700,000 new employment opportunities in Pakistan by accelerating resource discovery, agricultural growth, IT advancement, communication networks, trade, and investment by 2030.³ The China-Pakistan Economic Corridor (CPEC) holds immense importance for China’s economy as it facilitates the trade of Chinese goods through a direct route to Middle Eastern, African, and European markets. Additionally, this initiative enables the development of China’s north-western region, Xinjiang.

CPEC offers substantial environmental and climate risk mitigation benefits alongside economic advantages. The Global Climate Risk Index (GCRI) of 2023 indicates Pakistan is ranked 7th out of the ten most vulnerable nations to climate change.⁴ In addition, the nation is dealing with various climate-related problems, including heat waves, droughts, floods, illnesses, and a rise in hunger and poverty.⁵ However, despite the need for stricter environmental regulations, the Environmental Impact Assessment (EIA) has been neglected in the planning of

¹ Dr. Robert F. Ichord, “Transforming the Power Sector in Developing Countries: Geopolitics, Poverty, and Climate Change in Pakistan,” *Atlantic Council*, 2020, <https://www.atlanticcouncil.org/wp-content/uploads/2020/01/Power-Transformation-Pakistan-final-web-version.pdf>.

² Faisal Mehmood Mirza, Nishat Fatima, Kafait Ullah, “Impact of China-Pakistan Economic Corridor on Pakistan’s Future Energy Consumption and Energy Saving Potential: Evidence from Sectoral Time Series Analysis,” *Energy Strategy Reviews*, 34-36, 2019, <https://www.sciencedirect.com/science/article/pii/S22111467X19300422>

³ “CPEC to boost Pakistan GDP growth to 7.5%,” *The Nation*, 2016, <https://www.nation.com.pk/08-Oct-2016/cpec-to-boost-pakistan-gdp-growth-to-7-5>.

⁴ Hassam Bin Waseem, Irfan Ahmed Rana, “Floods in Pakistan: A State-of-the-Art Review,” *Natural Hazards Research*, 2023, <https://www.sciencedirect.com/science/article/pii/S2666592123000641?via%3Dihub>.

⁵ “Climate Change Impacts On Health And Livelihoods: Pakistan Assessment,” Climate Centre, 2021, https://www.climatecentre.org/wp-content/uploads/RCRC_IFRC-Country-assessments-PAKISTAN-3.pdf.

CPEC projects.⁶ Recent studies have cautioned that the investments in CPEC may directly harm Pakistan's water, air, and wildlife.⁷ The potential environmental risks could significantly diminish the potential benefits of the CPEC. To make the CPEC greener and less carbon-intensive, China and Pakistan in 2022 launched the Green China-Pakistan Economic Corridor Alliance.⁸

The Green CPEC Alliance aims to decrease dependence on fossil fuels, reduce carbon emissions, address electricity shortages, generate jobs, reduce poverty, improve food security, and elevate living standards. Furthermore, advocating for green and sustainable development is a practical approach to tackling Pakistan's significant climate issues and increasing inflation. Pakistan and China are significantly impacted by climate change, increasing their susceptibility to natural calamities. It highlights the importance of implementing mitigation and adaptation strategies. China has promised to reduce its carbon dioxide (CO₂) emissions per unit of GDP by more than 65% by 2030 compared to 2005 levels and 'achieve carbon neutrality before 2060'.⁹ Pakistan also has committed to reducing its CO₂ emissions by 50% by 2030 relative to its business-as-usual scenario as per its Nationally Determined Contributions (NDCs).¹⁰ By emphasizing environmental risk management and green investments for energy projects under CPEC and BRI, both nations can meet their sustainability goals by promoting green financing.

Changing Norms

Pakistan accounts for a mere 0.9% of global greenhouse gas (GHG) emissions, yet its vulnerability to climate change is extensively recognized and observed. Research shows that air pollution causes a minimum of 128,000 fatalities annually in Pakistan; however, the actual figure is probably greater.¹¹ Pakistan incurred over \$30 billion in losses and damages as a result of the 2022 floods.¹² The mitigation and adaptation to climate-related disasters are greatly impacted by climate change, which also poses a substantial threat to vulnerable communities. As in Pakistan, China's water shortage is getting worse, and the country's rainfall patterns are becoming more erratic and unpredictable. Moreover, the Intergovernmental Panel on Climate Change projects that annual heat-related mortality in 27 major Chinese cities would rise by 50–100% under a 1.5-

⁶ Waqas Ahmed, Sharafat Ali, Alisher Ismailov, "Assessment and Analysis of the Complexities in Sustainability of the Transport Projects Under CPEC: A Grounded Theory Approach," *Sage Journals*, 2023, <https://journals.sagepub.com/doi/10.1177/21582440231203477>.

⁷ Shahzad Kouser, Abdul Subhan, Abedullah, "Uncovering Pakistan's Environmental Risks and Remedies under the China-Pakistan Economic Corridor," *Environmental Science and Pollution Research*, 4661-4663, 2020, <https://pubmed.ncbi.nlm.nih.gov/31879869/>.

⁸ "Green China Pakistan Economic Corridor (CPEC) Alliance," Sustainable Development Policy Institute, 2022, https://sdpi.org/green-china-pakistan-economic-corridor-cpec-alliance/event_detail.

⁹ Hongqiao Liu, Simon Evans, Zizhou Zhang, Wanyuan Song, Xiaoying You, "The Carbon Brief Profile: China," Carbon Brief, 2023, <https://interactive.carbonbrief.org/the-carbon-brief-profile-china/>.

¹⁰ "Pakistan Asia and the Pacific," UNDP, 2023, <https://climatepromise.undp.org/what-we-do/where-we-work/pakistan>.

¹¹ Saroop Ijaz, "Pakistan's Air Pollution Shortens Lives," Human Rights Watch, 2023, <https://www.hrw.org/news/2023/12/06/pakistans-air-pollution-shortens-lives#:~:text=Fair%20Finance%20Pakistan%2C%20an%20organization,real%20number%20is%20likely%20higher>.

¹² Ayaz Gul, "Study: Pakistan Flood Damages, Economic Losses Exceed \$30 Billion," Voice of America, 2022, <https://www.voanews.com/a/study-pakistan-flood-damages-economic-losses-exceed-30-billion-6810207.html#:~:text=4%2C%202022.&text=An%20internationally%20supported%20study%20has,continuously%20evolves%20on%20the%20ground>.

degree warmer scenario if adaptation is not implemented.¹³ As a result, in an attempt to reduce emissions, China and Pakistan are concentrating more on creating renewable energy sources.

Pakistan's environmental situation requires immediate action, given the backdrop of a 170% increase in carbon emissions over the previous three decades and an elevated danger of climate-related flooding. Pakistan's economy suffers a significant 8.5% loss of GDP, equivalent to \$30 billion annually, due to environmental degradation, as reported by the United Nations.¹⁴ By 2035, more than 7,200 glaciers in northern Pakistan will disappear. By 2050, two million migrants may arrive in Pakistan due to climate change.¹⁵

Given the critical state of the environment, let's shift our attention to the significant bilateral initiative - CPEC, intrinsically tied to Pakistan's future economic prosperity. CPEC intends to link the Gwadar port to China's Xinjiang region through an extensive network of highways, railways, and pipelines spanning 3000 km. This initiative has the potential to upgrade Pakistan's energy and transportation industries. Although Pakistan has not had the best environmental record in the past, its capacity for change could be its greatest asset in the fight against climate change.

A new era for Pakistan's energy and transport infrastructure was promised when the CPEC was unveiled in 2015. However, rapid development overshadowed sustainability, and the price was high. CPEC's primary environmental concern is associated with energy projects in Pakistan. To address the energy crisis in the country, CPEC has allocated a significant investment of US\$33 billion to 19 energy projects. Most of the new energy will be generated by traditional coal-fired power plants situated in the provinces of Sindh (Thar-I and Thar-II coal power plants), Punjab (Sahiwal and Salt Range coal power plants), and Baluchistan (Hub and Gwadar coal power plants).¹⁶ In fact, traditional coal-fired power plants serve as the primary culprits behind smog and CO₂ emissions. Consequently, these emissions contribute to acid rain and global warming.¹⁷ Large portions of the provinces of Punjab and Sindh have already been blanketed by seasonal haze, which has led to numerous deadly traffic accidents owing to poor visibility and hospital admissions each year. Consider the impact on the local environments of these provinces as coal power stations escalate to maximum capacity.

In Pakistan, three primary sources of pollution include coal fires, vehicle emissions, and burning agricultural waste. The detrimental air quality resulting from these activities can lead to an upsurge in health issues such as heart attacks, lung damage, asthma attacks, and bronchial infections. CPEC's significant environmental issue involves the extensive deforestation for building road networks in Pakistan. The CPEC road networks consist of a northern segment and

¹³ Yuan Ye, "IPCC Warns China Will Be Hit Hard by Climate Change," Sixth Tone, 2022, <https://www.sixthtone.com/news/1009809#:~:text=In%20China%2C%20rising%20temperatures%20will,cited%20in%20the%20report%20shows>.

¹⁴ "Pakistan," *International Monetary Fund*, 2023, <https://www.elibrary.imf.org/downloadpdf/journals/002/2023/260/article-A001-en.xml>.

¹⁵ Betsy Joles, "Pakistan's Climate Migrants Face Tough Odds," *Foreign Policy*, 2022, https://foreignpolicy.com/2022/12/21/pakistan-climate-change-migration-flood/#cookie_message_anchor.

¹⁶ Shahzad Kouser, Abdul Subhan, Abedullah, "Uncovering Pakistan's Environmental Risks and Remedies under the China-Pakistan Economic Corridor," *Environmental Science and Pollution Research*, 4661-4663, 2020, <https://pubmed.ncbi.nlm.nih.gov/31879869/>.

¹⁷ "Coal and Air Pollution," *Union of Concerned Scientists*, 2017, <https://www.ucsusa.org/resources/coal-and-air-pollution>.

three alignments: western, eastern, and central. They originate in Kashgar in western China and terminate in Pakistan in Gwadar, Balochistan. In 2017, more than 54,000 trees, including fruit and non-fruit/forest trees, were felled in Abbottabad, Nowshera, Lower Dir, Swabi, Mardan, and Malakand districts. A tree may store 50 pounds of CO₂ each year and play a crucial role in mitigating the effects of climate change.

In 2017, trees did not absorb 7 million pounds of CO₂ in regions affected by significant deforestation, leading to its accumulation in the atmosphere. The districts are susceptible to climate change, which is evident through increasing temperatures, droughts, soil erosion, unpredictable rainfall, and glacier melting, which leads to significant flooding. Nowshera, Lower Dir, Swabi, Mardan, and Malakand were previously the most vulnerable regions to monsoon flooding.¹⁸ The tourism sector in these areas has also felt significant impacts. Restoring biodiversity and the declining natural surroundings necessitates reforestation efforts. It is obligatory to plant eight trees for every tree uprooted, along with ensuring that the landowner receives fair market value for each tree.

Vehicle trafficking presents a substantial environmental threat in northern Pakistan within the CPEC framework. Upon completion of the road infrastructure linked to CPEC, the Karakoram highway is expected to handle a daily influx of around 7000 trucks, releasing an estimated 36.5 million tonnes of CO₂ as they journey towards Gwadar. Pakistan's 2030 greenhouse gas emissions inventory is projected to reach 1,603 metric tonnes of CO₂ equivalent, influenced significantly by CPEC. This estimate, derived from the World Resources Institute's Climate Analysis Indicator Tool and the 2016 Pak-INDC report, accounts for approximately 23.12% of the total estimated greenhouse gas emissions for that year.¹⁹

The detrimental effects extend beyond emissions alone. The extensive repercussions of coal, spanning water and air pollution, environmental degradation, health implications, and significant socio-economic costs, cast a foreboding shadow over Pakistan's future. As natural habitats are depleted and matters concerning land and water rights are taken into account, the environmental equilibrium of CPEC grows increasingly precarious.

During its initial decade, the Belt and Road Initiative (BRI) primarily focused on investments in fossil fuels, allocating a significant \$52 billion solely to coal power projects.²⁰ However, the upcoming decade could mark a shift. During the 2021 UN General Assembly, China is committed to halting the construction of new coal plants overseas and focusing on renewable energy investments. This pledge was reiterated by President Xi Jinping at the October

¹⁸ "Environmental Degradation in South Asia and China's Belt and Road Initiative," *European Foundation for South Asian Studies*, 2021, <https://www.efsas.org/EFSAS-Environmental%20Degradation%20in%20South%20Asia%20and%20China%E2%80%99s%20Belt%20and%20Road%20Initiative-August%202021.pdf>.

¹⁹ Muhammad Awais, Tanzila Samin, Muhammad Awais, Jinsoo Hwang, "The Sustainable Development of the China Pakistan Economic Corridor: Synergy among Economic, Social, and Environmental Sustainability," *Sustainability*, 2019, <https://mdpi.com/2071-1050/11/24/7044>.

²⁰ Lihuan Zhou, Ziyi Ma, "After a Decade of Fossil Fuel Investing, Can China Fulfill Its Promise of a "Green" Belt and Road Initiative?" *World Resource Institute*, 2023, <https://www.wri.org/insights/greening-chinas-belt-and-road-initiative>.

2023 BRI conference. China, notably, stands out among the BRI nations as a top recipient of coal and fossil investments.

Pakistan emerges as a key player in attracting Chinese investments within the BRI framework. Transforming CPEC into an environmentally friendly initiative could establish a pivotal model for other BRI countries aspiring to embrace sustainable practices in their Chinese-backed ventures overseas. Pakistan has secured around US\$36 billion for energy projects and US\$10.6 billion for transport investments under CPEC. Notably, 28% of the energy funding was earmarked for coal, with 7% dedicated to gas. Pakistan's goal was to avoid building new coal-fired power plants in 2020, while China had pledged not to construct such plants abroad in 2021.²¹ Two main challenges are at play here: accelerating the transition to sustainable practices via eco-friendly investments and phasing out existing non-environmentally friendly ones. The China-Pakistan Economic Corridor (CPEC) serves as a pivotal case study, setting a standard for China's global engagement. Effectively integrating eco-friendly measures into CPEC could set a precedent for other Belt and Road Initiative (BRI) countries to follow suit, promoting greener initiatives in their Chinese-backed projects within the BRI framework.

The Green CPEC Alliance is to assist, expedite, and advocate for the green transformation within Pakistan and the BRI by involving members from both countries' governments, investors, developers, and civil society. The Alliance aims to make CPEC more environmentally friendly by encouraging a shift in Chinese infrastructure investments from GHG emission projects to green initiatives, like transitioning from coal to renewable energy sources and ultimately phasing out current coal-fired power plants. The Green CPEC Alliance will collaborate with partners in both nations throughout the next one to five years to increase demand and supply for green infrastructure investments.

The Belt and Road Initiative Green Coalition (BRIGC) aims to work closely with relevant stakeholders to extend the greening practices of the China- Pakistan Economic Corridor (CPEC) to the broader Belt and Road Initiative (BRI) framework.²² Collaborating with Chinese authorities, investors, developers, and financial institutions is crucial for crafting policies, implementing green finance standards and methods, and forging relevant connections to accelerate green investment opportunities. The Green CPEC alliance strives to engage with partners in Pakistan, fostering green investment prospects and providing the expertise needed for crafting and evaluating eco-friendly projects. It considers the risks linked to stranded assets resulting from investments in fossil fuels, all while ensuring a just transition. The alliance will partner with diverse stakeholders, including multilateral banks, financial institutions, civil society organizations, and academic establishments globally, to broaden the reach of its insights to a broader audience.

The Challenge of the Green CPEC

China's BRI commitment to green investments may affect global renewable energy adoption as changing the momentum of a large investment initiative is challenging. China's success depends on global economic conditions, BRI host nations' investment environments, and

²¹ "Green China Pakistan Economic Corridor (CPEC) Alliance," *Sustainable Development Policy Institute*, 2022, https://sdpi.org/green-china-pakistan-economic-corridor-cpec-alliance/event_detail.

²² "Green China Pakistan Economic Corridor (CPEC) Alliance," *Sustainable Development Policy Institute*, 2022, https://sdpi.org/green-china-pakistan-economic-corridor-cpec-alliance/event_detail.

its own commitment and supportive policies. Renewable energy investment is required in BRI host nations, regardless of income. To meet global climate objectives, many developing nations would need \$1.4-\$1.9 trillion in renewable energy investment by the early 2030s, up from \$260 billion in 2022. These countries need revenue to generate renewable energy since investment goes where demand and returns are highest.²³ China's solar and wind power investments in the Middle East throughout the past decade focused on the UAE, Turkey, Saudi Arabia, and Oman. These countries invested more in renewable energy than other non-advanced economies including China. In many BRI countries, environmental design principles and low- carbon technology are neglected. The business case for green or natural infrastructure investment is often unclear. Technical standards and local laws are sometimes deficient or ambiguous. Given the multitude of sustainability standards and assessment methods, financial investors may lack confidence in their investments in sustainable infrastructure. The limited revenue streams or public incentives for sustainability expenses contribute to certain designs for sustainable infrastructure, offering low risk-adjusted returns.

Pakistan is committed to reducing its carbon emissions, however, this requires significant investment. The NDCs of Pakistan suggest that 35% of its targeted emissions reduction relies on foreign funding. The green energy revolution needs \$101 billion.²⁴ Thus, expanding green financing access is crucial. Green financing guidelines should help these investments and promote sustainable development. CPEC energy projects can increase generation capacity and strengthen Pakistan's economy. Unfortunately, the banks do not have the money to expand the energy transition. Underestimating risks often leads to minimal outcomes. Investments made without foresight can fail to yield expected returns, resulting in stranded assets and potential legal consequences for investors. It is imperative for the China-Pakistan Economic Corridor (CPEC) to integrate an environmental framework, especially considering the significance of energy infrastructure investments for Pakistan's prosperity. Both China and Pakistan stand to benefit from green funding within the CPEC Green Alliance. Implementing green reporting standards, offering training, and enhancing capacity building are essential strategies to encourage businesses to engage in environmentally friendly investments.

Despite its growing importance, the financial sector has yet to recognize climate change as a systematic risk, thus green finance must be promoted. To facilitate the shift to a sustainable economy, a supportive regulatory framework encouraging investment in the green sector is essential. The State Bank of Pakistan (SBP) introduced a green banking framework in 2017, aimed at assisting banks and Development Finance Institutions (DFIs) in addressing environmental degradation.²⁵

Infrastructure investments play a crucial role in the China-Pakistan Economic Corridor (CPEC). These ventures necessitate substantial funding and prolonged gestation periods to ensure financial sustainability due to the inherent risk-return imbalance. Investors may encounter

²³ "Financing Climate Resilience And A Just Energy Transition In Africa: New Strategies And Instruments," *African Development Bank Group*, 2022, https://www.afdb.org/sites/default/files/2022/05/25/aeo22_chapter3_eng.pdf.

²⁴ UNFCCC, "Updated Nationally Determined Contributions 2021," *United Nation Framework Convention on Climate Change*, 2021, <https://unfccc.int/sites/default/files/NDC/2022-06/Pakistan%20Updated%20NDC%202021.pdf>.

²⁵ SBP, "Green Banking Guidelines," *State Bank of Pakistan*, 2017, <https://www.sbp.org.pk/smefd/circulars/2017/C8-Annex.pdf>

initial challenges but can reap subsequent rewards. To mitigate risks and maximize returns, the Securities and Exchange Commission of Pakistan (SECP) may consider investing in stocks or financing such projects. The Green Climate Fund (GCF) and the Global Environment Facility (GEF) are key international bodies involved in these initiatives. GEF has allocated approximately \$100 million across 38 projects in Pakistan, while GCF oversees four projects totaling \$131 million. Despite these efforts, addressing Pakistan's climate crisis remains a formidable challenge.²⁶ As per the 2021 NDC plans, the government aims to allocate \$101 billion for energy transition by 2030. The estimated annual cost of adaptation ranges from \$7 billion to \$14 billion until 2050. Addressing the aftermath of the 2022 floods, requiring US\$16.2 billion, is crucial to mitigate humanitarian and socioeconomic repercussions.²⁷

Pakistan's construction industry may offer a large opportunity concerning green infrastructure. Pakistan's housing and building backlog is projected to be at least 10 million dwellings, but the country needs to be more active in addressing this issue. There is a big opportunity when it comes to environmentally friendly architecture, materials, and energy sources. Renewable energy sources and electric vehicles are at the forefront of sustainable initiatives. They hold the promise of significantly cutting emissions and aiding Pakistan in meeting its environmental commitments. The agriculture, water resources, and solid waste management sectors are closely followed. With Pakistan's dwindling water resources, the agricultural sector stands out as a beacon of hope, requiring immediate attention due to its inefficient water usage practices. While strides have been made in the realm of smart agriculture, expanding these efforts is imperative. Pakistan's proposed interventions aim to achieve a maximum reduction of 20% in greenhouse gas emissions by 2030. This target is part of Pakistan's broader climate action plan, which includes enhancing renewable energy usage and improving water use efficiency in agriculture to reduce reliance on diesel-powered pumps. These efforts are aligned with the country's commitment to international environmental agreements and its goal of achieving sustainable development.²⁸

While CPEC may bring about political, structural, and economic stability along with green growth that could impact agriculture, there are concerns regarding its agricultural potential. Critics argue that mechanization under CPEC could displace local farmers and lead to the overexploitation of natural resources. CPEC's extensive projects pose a risk to the nation's water resources and agricultural land availability. The scarcity of raw materials for primary and secondary industries could lead to shortages in food and industrial outputs, impacting the region within the global economy if not managed sustainably. Deforestation remains a pressing issue, especially with the history of extensive deforestation due to mechanized agriculture practices, as exemplified during Jair Bolsonaro's term in Brazil.²⁹

CPEC's expansion of livestock farming in Pakistan may involve utilizing the country's limited forest area for cattle grazing and agricultural purposes. Trees and forests play a crucial

²⁶ GCF, Islamic Republic of Pakistan, *Green Climate Fund*, 2024, <https://www.greenclimate.fund/countries/pakistan>.

²⁷ "Climate Change Impacts On Health And Livelihoods: Pakistan Assessment," *Climate Centre*, 2021, https://www.climatecentre.org/wp-content/uploads/RCRC_IFRC-Country-assessments-PAKISTAN-3.pdf.

²⁸ Erum Abdul Razzak, "Greenhouse Gas Emission in Pakistan," *Daily Times*, April 10, 2019. <https://dailytimes.com.pk/377839/greenhouse-gas-emission-in-pakistan/>.

²⁹ Diana Roy, "Deforestation of Brazil's Amazon Has Reached a Record High. What's Being Done?" *Council on Foreign Relations*, 2022 <https://www.cfr.org/in-brief/deforestation-brazils-amazon-has-reached-record-high-whats-being-done>.

role in reducing summer heat, preventing soil erosion, and stabilizing the soil to safeguard crops against monsoon flash floods, thereby aiding in climate change mitigation. However, the intended beneficiaries of deforestation, the farmers, now find themselves contending with flash floods, altered weather patterns, and barren soil. The emphasis of CPEC on enhancing production and efficiency through mechanized technologies such as threshers and harvesters raises concerns about potential excessive land use for farming practices.

Since the onset of the Industrial Revolution, the surge in technological advancements has sparked worries regarding the exploitation of land in industrial projects. The escalation of animal production to support the dairy industry for exports results in overgrazing and CO₂ emissions, while resorting to technology to farm the land beyond its natural limits risks depleting its fertility. The overarching critique persists: CPEC poses an irreversible threat to our land resources.

While skepticism will prevail, the China-Pakistan Economic Corridor (CPEC) has the potential to mitigate these challenges and foster a sustainable agricultural landscape in Pakistan.³⁰ Nevertheless, the expansion of industries, construction ventures, and agricultural activities has triggered apprehensions about deforestation. China's emphasis on reafforestation aims to enhance Pakistan's agricultural industry. By 2025, Gwadar is projected to be adorned with one million trees as part of a robust reforestation initiative. Notably, Gwadar's afforestation program focuses on 'mangrove' trees, well-suited for thriving in saline coastal settings.³¹ Many cross-developmental approaches reduce over-exploitation. To meet global agricultural standards, China's sustainable agricultural model uses sustainable methods that can be applied to Green CPEC projects.

With the large-scale hydropower initiatives, significant challenges persist. These encompass risks such as stranded assets, precipitation variability induced by global warming, unpredictability, and impacts on biodiversity. While hydropower ventures in Pakistan boast significant Returns on Investment (ROIs), delays hinder their prompt payback. Such investments pose risks due to extended repayment periods, fluctuations in exchange rates, and inherent project hazards. Land conflicts and environmental damage can result from billion-dollar hydropower projects. Long gestation periods are another drawback of hydropower projects. Unlike solar and wind installations, which can be completed in months, construction requires years of investment. These variables reduce hydropower project efficiency. Solar panels have immense potential but are too expensive for states like Pakistan. The bank loan approvals for solar finance might take six months, hindering investment. The Government of Pakistan, in 2022, announced a plan to solarize 1.2 million agricultural tube wells as part of its efforts to support the farming sector and reduce energy costs. This initiative was confirmed by the Federal Minister for Food Security, Tariq Bashir Cheema, who emphasized that the solarization of tube

³⁰ "China, Pakistan to jointly promote agricultural technology under CPEC," *Radio Pakistan* <https://www.radio.gov.pk/08-03-2023/china-pakistan-to-jointly-promote-agricultural-technology-under-cpec>

³¹ PPF, "COPHC to Plant one Million Trees in Gwadar," *Pakistan Press Foundation*, 2019, <https://www.pakistanpressfoundation.org/cophc-to-plant-one-million-trees-in-gwadar/>.

wells would help farmers by making their operations electricity-free and enabling them to repay loans within a few years.³²

Weak regulations and lack of transparency leave investors bearing the brunt of costs. Ambiguous laws hinder the adoption of renewable energy in Pakistan, complicating the landscape. As Pakistan transitions to competitive pricing, investors prioritize cost-cutting. The delayed payments to Chinese IPPs prevent investors from reducing expenses through project investments. Investment decisions in the renewable energy sector are not solely driven by expenses. Issues like the lack of coordination between federal and provincial entities and renegotiation of tariffs have dampened investor confidence. Monthly tariff revisions could heighten investment risks, impacting decision-making. Emerging solar developers face funding limitations as investors view the financing phase as riskier. The substantial capital investment and the developer's lack of experience may restrict financing options.

Renewable energy projects also face energy intensity issues and the need to replace lithium-ion batteries in solar photovoltaic systems every two to three years. Land-use issues eventually arise because 1 MW of solar power requires 5-10 acres of land. Longi Solar, a leading Chinese solar manufacturer, will allow local investors technology and brand name to produce solar PVs. Solar PV investors need local raw resources.³³ Establishing a solar photovoltaic (PV) assembly is viable in Pakistan, but due to imported raw materials like tempered glass, local production faces challenges. Collaboration with various companies is crucial for setting up a solar manufacturing plant. Furthermore, similar to solar PV systems, wind energy projects also encounter land-use concerns. Notably, an average US wind power facility occupies approximately 34.5 to 56.9 hectares per megawatt.³⁴ To remain competitive, investors are urged to embrace a new approach known as reverse tariff bidding. Previously, wind and solar investors enjoyed a 17% Return on Equity (ROE) within the cost-plus tariff system.³⁵ While investors can reduce production expenses to adhere to the tariff, the absence of a well-defined regulatory framework poses challenges for project progression, thereby raising concerns regarding revenue stability and long-term sustainability. Variable Renewable Energy (VRE) systems encounter issues related to base load and intermittency.

Transitioning entirely to renewable energy poses challenges and complexities within CPEC projects. Understanding the essence of 'sustainability' is paramount prior to investing in sustainable infrastructure. Various standards and methodologies are essential for the planning, design, construction, operation, and evaluation of sustainable infrastructure. The Green CPEC Alliance stands as a bold venture necessitating thoughtful reasoning in its execution. This could involve addressing external factors that call for governmental policy adjustments or a lack of comprehension regarding the innovative returns on investments.

³² Zakir Ahmed, "1.2 Million Agricultural Tube Wells to be Shifted on Solar Power." *ProPakistani*, July 5, 2022, https://propakistani.pk/2022/07/05/1-2-million-agricultural-tube-wells-to-be-shift-on-solar-powered-minister-for-food-security/#google_vignette

³³ "BRI drives Pakistan's green transformation," *The Express Tribune*, October 21, 2023 <https://tribune.com.pk/story/2442198/bri-drives-pakistans-green-transformation>

³⁴ Dallaev, Rashid, Tatiana Pisarenko, Nikola Papež, and Vladimír Holcman. 2023. "Overview of the Current State of Flexible Solar Panels and Photovoltaic Materials" *Materials* 16, no. 17: 5839. <https://doi.org/10.3390/ma16175839>

³⁵ Lionel Bloch, Jordan Holweger et al., "Impact of Advanced Electricity Tariff Structures on the Optimal Design, Operation and Profitability of a Grid-Connected PV System with Energy Storage." *Energy Informatics* 2, Suppl 1 (2019): 16. <https://doi.org/10.1186/s42162-019-0085-z>

Opportunities of Green CPEC

The Green CPEC is intricately connected to the concept of a ‘resilient green economy’, as articulated by Edward B. Barbier, which aims to elevate human well-being and social equity by mitigating environmental risks and ecological trade-offs. Through the promotion of innovative green technologies, the Green CPEC strives to advance these principles.³⁶ As the world embraces renewable energy, CPEC projects incorporate green power sources to reduce carbon footprint and set a precedent for sustainable growth. CPEC optimizes local resources by combining advanced technologies with traditional wisdom. Sustainable waste management, water conservation, and land usage demonstrate a dedication to economic growth, environmental protection, and community improvement. Initiatives for reforestation associated with CPEC have the potential to drastically cut carbon emissions produced during the project’s construction. It helps the environment and greatly supports Pakistan’s dedication to global climate change mitigation goals. Reforestation – planting trees on desolate lands helps prevent potential environmental degradation caused by CPEC’s construction activity. These endeavors aid in sequestering CO₂ emissions and making substantial progress in addressing global climate change. Trees are crucial in avoiding soil erosion, sustaining the water table, and promoting biodiversity. As these recently established forests grow, they provide habitats for different species, guaranteeing the ongoing interconnectedness of ecosystems.

Restoration of complete ecosystems, including native plant species, fauna, water sources, and soil quality, is what ecosystem restoration means beyond simple tree planting. CPEC spans various regions with distinct ecosystems, each with its difficulties and needs. Efforts are focused on ensuring that after development, these areas’ natural balance is restored and often improved. It includes implementing water conservation methods in dry regions, restoring wetlands, and reintroducing native species impacted by environmental changes.³⁷ The afforestation and ecosystem restoration initiatives showcase CPEC’s commitment to environmentally sustainable development. This declaration acknowledges the importance of nature’s well-being in the broader scope of progress and prosperity. By safeguarding the Earth’s flora and promoting ecosystems, CPEC sets benchmarks for forthcoming global infrastructure endeavors, demonstrating the harmony between economic progress and environmental preservation.

In Balochistan, an arid province known for its water scarcity, community- managed rainwater collection systems have been established on account of Green CPEC initiatives. This innovative method has established a reliable water supply and enabled local communities to manage their resources independently. Water plays a crucial role in developing and sustaining large infrastructure projects like the CPEC. Water management and conservation play a crucial role in ensuring the sustainability of the corridor. Balancing industrial needs, human consumption, and environmental well-being is paramount as CPEC extends its footprint across diverse regions. The physical diversity of the CPEC route, ranging from dry terrains to lush

³⁶ Ammar Junaid Asghar, Amna Mahnoor Cheema, Muhammad Ibrahim Hameed, Syed Qasim Abbas, & Uswah Fatima, “Agriculture and Climate Change,” LUMS Center for Chinese Legal Studies, 2021, https://ccls.lums.edu.pk/sites/default/files/2023-01/the_critical_junction_between_cpec_agriculture_and_climate_change.pdf.

³⁷ Muhammad Awais, Tanzila Samin, Muhammad Awais, Jinsoo Hwang, “the Sustainable Development of the China Pakistan Economic Corridor: Synergy among Economic, Social, and Environmental Sustainability,” *Sustainability*, 2019, <https://mdpi.com/2071-1050/11/24/7044>.

valleys, leads to several water-related difficulties. In arid locations like Balochistan, the emphasis is on maximizing the use of every drop of water. Systems for collecting rainwater are implemented, and groundwater extraction is closely regulated to avoid depletion. Waste water treatment facilities are set up to prevent industrial and construction operations from contaminating nearby water sources. Processed water is reused for non-drinking purposes, decreasing the dependence on fresh water sources.³⁸ The core of CPEC's water management approach revolves around involving the community. Integrating ancient wisdom with modern techniques promotes a complete water management approach.

Local communities are educated on water conservation to guarantee that sustainable practices are adopted from the bottom up. Furthermore, community members receive training to oversee and uphold water infrastructures, connecting community development with resource preservation. The significance of Green CPEC goes beyond its impressive infrastructure; it focuses on empowering the local population. Investing in human capital is crucial to ensuring that the advantages of the corridor are significant, well-established, and broadly distributed. Green CPEC adopts a comprehensive approach to development by implementing initiatives like skill development, training, knowledge exchange between Chinese and Pakistani professionals, support for local enterprises, and involvement of community leaders.³⁹ These efforts generate immediate job opportunities and consistently prepare local communities to take advantage of the corridor's long-term benefits.

Furthermore, Green CPEC can help Pakistan attain sustainable and resilient energy security by using its local renewable resources in the long run. This decreases dependence on unpredictable fossil fuel markets and decreases energy expenses, resulting in more cheap electricity for businesses and individuals. Shifting to greener energy sources, the transportation networks will greatly decrease air pollution, leading to better public health and lower healthcare expenses. Embracing the Green CPEC will elevate Pakistan's global standing by showcasing a dedication to sustainable development, drawing foreign investments, and strengthening its international prestige.

Conclusion

By establishing the Green CPEC Alliance and altering norms regarding renewable energy, both nations hope to participate in clean energy cooperation that will guarantee Pakistan's energy security and sustainability. This is evident from the developments under CPEC. China is at the forefront of the shift towards environmentally friendly and sustainable development, as demonstrated by its Global Development Initiative (GDI), which aims to achieve the UN's 2030 Sustainable Development Goals (SDGs) through equitable and comprehensive development. As a Group of Friends of GDI participant, Pakistan is dedicated to attaining the SDGs. It views Green CPEC as an outstanding example of the BRI and a key component. However, there are still practical obstacles to accomplishing this vision.

³⁸ Shahzad Kouser, Abdul Subhan, Abedullah, "Uncovering Pakistan's Environmental Risks and Remedies under the China-Pakistan Economic Corridor," *Environmental Science and Pollution Research*, 4661-4663, 2020, <https://pubmed.ncbi.nlm.nih.gov/31879869/>.

³⁹ "Green China Pakistan Economic Corridor (CPEC) Alliance," *Sustainable Development Policy Institute*, 2022, https://sdpi.org/green-china-pakistan-economic-corridor-cpec-alliance/event_detail.

China and Pakistan must create rules for a green investment project roadmap to mitigate the environmental and social risks associated with Green CPEC investments to align with goals for cleaner energy projects. Pakistan's policymakers need to prioritize coal extraction and the elimination of policy obstacles to accelerate the development of renewable energy, as stipulated in Pakistan's Alternative and Renewable Energy Policy. To achieve these goals, Pakistan must create a comprehensive regulatory framework that includes environmental and socio-economic safeguards, legislation, and pollution responsibilities for Green CPEC projects. Consensus from all stakeholders and government bodies at federal and provincial levels is necessary to carry out the projects. This involves extensive discussions, social media campaigns, and interactions with various organizations, including the CPEC Authority, the Embassy of the People's Republic of China in Pakistan, the Ministry of Planning, Development and Special Initiatives, Chinese companies involved in CPEC projects, the Ministry of Climate Change, Ministry of Energy, and relevant ministries and institutions in China like BRIGC, MEE, and NDRC.

MARITIME SECURITY AND GEO-POLITICS IN INDIAN OCEAN REGION:
REPERCUSSIONS FOR PAKISTAN

Safia Mansoor

Abstract

The world has witnessed a geopolitical power shift from Atlantic to Indo-Pacific, prompting the regional and extra-regional actors to scramble for power in Indian Ocean Region-IOR. China has unveiled Belt and Road Initiative to buttress its maritime foothold, while US, India, Japan, Australia, and UK are forging strategic partnerships and alliances such as Quad and AUKUS to counter China's prowess. The geopolitical convergence and divergence have made Indian Ocean a hub of geo-politics, horrendously undermining region's maritime security. As far as Pakistan's position is concerned, it is being enormously affected owing to its partnership with China in the form of China-Pakistan Economic Corridor-CPEC. This research employs theoretical framework of geo-politics, maritime security complex, and Securitization. The methodology used is qualitative while the type of social research is exploratory. This insight concludes that various interlinked geopolitical developments are threatening the maritime security of IOR, which in turn has economic, security, and political ramifications for Pakistan. It also provides various recommendations for the formulation of Pakistan's maritime strategy based on elements of soft and hard power.

Keywords: Indian Ocean Region-IOR, geopolitics, maritime security, Belt and Road Initiative-BRI, Quad, AUKUS, China-Pakistan Economic Corridor-CPEC

1. Introduction

Indian Ocean has become cardinal to progressively ocean-driven and ocean-centric regional-cum-global geopolitics. Being marked with baroque political, socio-economic, and cultural multiformity, Indian Ocean Region seems to be fulcrum of geopolitics. The geopolitical tectonic plates of the region have undergone major shifts, causing serious concern regarding maritime security. The labyrinthian maritime security's imperatives have brought about the colossal stakes of regional and non-regional actors in safeguarding the unceasing flow of maritime trade traversing through the SLOCs-Sea Lines of Communication in IOR.

At the heart of maritime geopolitics lies the various issues linked to the maritime security such as rise of China by virtue of Belt and Road Initiative, US-China competition, Sino-Indian rivalry, and strategic convergence of US, India, Quad and AUKUS states to curb the 'China's threat'. The strategic confluence of various actors in the wake of China's rise is increasingly causing the militarization and nuclearization of Indian Ocean. Besides the traditional security issues, some non-traditional security issues such as maritime terrorism, piracy, illicit trafficking, and environmental degradation are somehow linked to the geopolitical importance of Indian Ocean, thus posing multiple challenges to regional maritime security in general and Pakistan in particular. Pakistan is being immensely affected by aforementioned developments due to mammoth economic, security, and political stakes, chiefly after becoming part of China's BRI. The flagship project of BRI, China Pakistan Economic Corridor (CPEC) and its maritime jewel 'Gwadar Port' have made Pakistan a significant actor with respect to region's geopolitics while simultaneously linking its security and economic development to success of CPEC.

In this backdrop, this research addresses the key questions: 1) How theoretical construct of Maritime Security Complex, geo-politics, and Securitization are inter-linked with respect to Indian Ocean?; 2) Why Indian Ocean is enormously significant making it hotspot of geopolitical competition?; 3) What are the key geopolitical developments that affect the maritime security of Indian Ocean? 4) How Pakistan is being implicated by the complex geopolitical dynamics in Indian Ocean, 5) What should be the response of Pakistan in order to deal with ever-enhancing challenges emanating from IOR?

2.1 Theoretical Framework: Maritime Security Complex

Maritime security signifies the sea-based multipronged security challenges. It serves as the key buzzword depicting the security in maritime domain a 'vogue' phenomenon while conjugating concatenation of interconnected issue areas as well as themes, essential for acknowledgement of unique features and diversity. Additionally, it acts as a comprehensive framework in order to analyze issues and take suitable actions with respect to maritime domain. Maritime security also can be comprehended through 'Maritime Security Complex' coined by Christian Beuger. It entails four key domains.

- 1) **National Security:** The first key area refers to traditional security challenges concerning sea power such as naval competition, inter-state disputes, and arms proliferation. Scholars also include maritime terrorism in this domain.
- 2) **Marine environment:** Environmental security in the seas comes under second domain. It primarily deals with marine resources' protection from pollution coupled with illegal fishing. Additionally, issues related to biodiversity and climate change also fall under second domain.

- 3) **Economic development:** Economic security, blue economy, utilization and management of marine resources in sustainable manner, and global trade's protection are the areas of third domain
- 4) **Human Security:** Individuals facing insecurities emanating from maritime environment, such as piracy, human trafficking, marine pollution, and illegal fishing are part of fourth domain.¹

2.1.1 Geo-Politics-Maritime Security Nexus

The first domain of Maritime Security Complex chiefly pertains to the geopolitical dimension of Maritime Security. There are various theoretical approaches which describe geopolitics. As per Rudolph Kjellen, geopolitics equalizes state with a geographical organism; while as per Karl Huashofer, geopolitics means doctrine with respect to spatial determinism of processes in political domain, grounded on geography, notably political geography. Halford Mackinder is known for giving importance to geopolitics by introducing the concept of 'Pivot' in which he regarded Central Eurasia as Heartland of World, key region to dominate world politics. Contrarily, Alfred Thayer Mahan in his landmark work 'Influence of Sea Power upon History' changed the continental outlook in geopolitical frameworks and regarded sea as the most indispensable space in terms of geopolitics.²

Threats related to maritime security are discussed in geopolitical discourses to condone security's projection beyond external borders of state. Maritime security has a geopolitical dimension which implies how geography informs as well as constrains maritime regulations, operations, measures, policies, and consideration of geography while formulating maritime security strategies.³ With respect to Indian Ocean, the various geopolitical developments such as rivalry between US and China, China and India, Belt and Road Initiative of China, naval modernization of China and India, convergence of interests of US and India as well as nuclearization of Indian Ocean horrendously affect the maritime security of Indian Ocean Region.

Framework of Securitization espoused by Barry Buzan and Ole Waever is also very instrumental for the deconstruction of security threats in the Indian Ocean Region. Securitization theory emphasizes social construction of something as a threat. It underlies existential threat to referent object which in turn necessitates exceptional countermeasures and justifies rule-breaking behaviour in this regard. The employment of this framework to apprehend maritime security brings about two possible tracks of exploration with reference to Indian Ocean Region. The first track signifies the 'Securitization' of maritime domain as a potent issue. It implies the understanding of seas and oceans as a theatre of threats and insecurity in contemporary era. A broad picture conjoins insecurity with 'maritime domain' and protection of referent object. Second track implies the Securitization of various issues in order to make them maritime security

¹ Bueger, C., Edmunds, T., & Ryan, B. J. (2019). Maritime security: The uncharted politics of the global sea. *International Affairs*, 95(5), 971-978. <https://doi.org/10.1093/ia/iiz145>

² Fernando, H. G. (2019). Geo-Politics and its impact on Maritime Security: Special Reference to Indian Ocean. *EPRA International Journal of Multidisciplinary Research*, 5(4). https://www.researchgate.net/publication/351943570_GEOPOLITICS_AND_ITS_IMPACT_ON_MARITIME_SECURITY_SPECIAL_REFERENCE_TO_INDIAN_OCEAN

³ Germond, B. (2015). The geopolitical dimension of maritime security. *Marine Policy*, 54 137-142, <http://dx.doi.org/10.1016/j.marpol.2014.12.013>

agenda. It requires issues' meticulous reconstruction to prioritize the protection of reference object threatened by maritime security threats.⁴

3. Significance of Indian Ocean

Being the world's third-largest Ocean with an estimated 73, 556,00 square kilometres area bordering Australia, Africa, and Asia, Indian Ocean holds colossal significance. It also links the Pacific and Atlantic Ocean that in turn is marked by the global economic and political powerhouses. Indian Ocean is also home to world's 35% natural gas, 65% oil resources, raw material, and other important resources essential for manufacturing commodities.⁵ Moreover, it holds immense importance due to oil transportation through key chokepoints. About 80% of maritime oil trade of the world passes through the Indian Ocean.⁶

At the heart of maritime geopolitical competition in IOR is capability of states to keep up military presence adjacent to the strategically significant water's narrow stretches called chokepoints crucial for linking maritime trade routes. This capability enables the states to either disrupt or protect the key maritime channels termed as SLOC-Sea Lines of Communication. In naval terms, it is known as SLOC interdiction and SLOC protection during war and peace respectively. Out of total seven significant chokepoints indispensable for transportation of oil, three are present in Indian Ocean as enumerated below:

- **Strait of Malacca:** Links Western Pacific and South East Asia to IOR, and is present between Malaysia, Singapore and Sumatra Island in Indonesia
- **Strait of Hormuz:** Links Persian or Arabian Gulf to wider Indian Ocean, and is the only sea route for this linkage
- **Strait of Bab-el-Mandeb:** Links Red Sea to Gulf of Aden in Indian Ocean

Moreover, Mozambique Channel between Mozambique and Madagascar is also significant for goods trade traversing Cape of Good Hope and destined for Middle East as well as Asia.⁷

4.1 Geo-Political Trends Affecting Maritime Security in Indian Ocean

4.1.1 China's rise in IOR

China has forged staunch partnerships with the littoral and island countries, potent for its rise in IOR. The 21st century maritime Silk Road under China's BRI-Belt and Road Initiative is acting as valuable platform for economic and military collaboration. In conjunction with broad-spectrum maritime ambitions, the naval presence of China in Indian Ocean-IO is generating serious concerns for United States, India, Japan, Australia, and other states.

⁴ Beuger, C. (2015). What is maritime security?. *Marine Policy*, 53,159-164. <http://bueger.info/wp-content/uploads/2014/12/Bueger-2014-What-is-Maritime-Security-final.pdf>

⁵ Centre for Pakistan and Gulf Studies (2020, December 31). Maritime Security: Challenges and Prospects for Pakistan," <https://cpakgulf.org/2017/02/21/maritime-security-challenges-and-prospects-for-pakistan/>.

⁶ Mercator Institute for China Studies. (2019, October 11). China's Expansion in the Indian Ocean Calls for European Engagement. <https://merics.org/en/analysis/chinas-expansion-indian-ocean-calls-european-engagement>.

⁷ Baruah, D. (March 3, 2021). What Is Happening in the Indian Ocean?. *Carnegie Endowment for International Peace*. <https://carnegieendowment.org/2021/03/03/what-is-happening-in-indian-ocean-pub-83948>.

Two ocean approach of China central to its maritime security commensurate with its forward edge defence strategy, which foresees China developing a strategic zone of arc-shaped that encompasses northern Indian Ocean and western Pacific Ocean. The western perception regarding China's development of strategically significant ports and bases in IO's bordering states also termed as 'String of Pearls' strategy is illustrative of ever-enhancing geopolitical clout of China that can also serve the purpose of pulverizing its strategic containment by India and US. Andaman and Nicobar Command of India acts as an 'Iron Curtain' for China interdicting its entry into the region; therefore, an increase in sea power and development of strategic fulcrums in Indian Ocean is a viable way for China to guard its interests as per Chinese policymakers. Naval bases can be instrumental for provision of support as well as supply points serving the strategic aims in order to increase the maritime power of China. For example, Gwadar Port in Pakistan, Dar es salam port in Tanzania, Hambantota port in Sri Lanka, Chittagong Port in Bangladesh, Doraleh Multipurpose port in Djibouti, port in Seychelles, and Ream base in Cambodia signify the gradual penetration of China in region to diminish the American and Indian maritime hegemony.⁸

Among all these ports, the Gwadar port remains paramount in serving the geo-strategic interests of China, as the port would allow China to secure energy import supplies by circumventing Malacca Strait, thereupon overcoming its 'Malacca Dilemma'.⁹ Additionally, energy resources shipment from strategically significant chokepoint Persian Gulf towards China through Gwadar port would substantially decrease distance from 30 days to 2 days. Given the geo-strategic location of Pakistan, it has furthered the augmenting interests of China in region and resultantly acquired military, economic, and technological assistance from China. Consequently, India has corresponded by forging alliances with like-minded regional and extra-regional states, developing sea-based nuclear deterrent, and enhancing its naval power. The lack of trust, coordination and institutional mechanism between China and Pakistan on one side and India on the other would undoubtedly expand the sea rivalry, thus setting off naval arms race.¹⁰

4.1.2 Indo-US strategic convergence: The China factor

US maintains its presence in Indian Ocean to protect its key strategic interests such as defence of chokepoints, sanitizing confliction with great powers, and safeguarding maritime trade highways. Given the relentless increase in China's presence, US has been pursuing a policy of containment to curb rise of China. For that purpose, India seems to be a credible partner due to its anti-China stance and placement in the IOR.

In 2007, India and US became partners in the Quadrilateral Security Dialogue-Quad and their partnership gained momentum during Obama Administration when 2012 'Asia rebalancing' or 'Pivot to Asia' policy designated India status of 'net security provider' and 'regional anchor'. Furthermore, Trump administration more explicit 'FOIO-Free and Open Indo-Pacific Policy' in 2017 signified a paradigm shift in strategic thinking from Asia-Pacific to broader Indo-Pacific.

⁸ Colley, C. (April 2, 2021). A Future Chinese Indian Ocean Fleet?. *War on the Rocks*. <https://warontherocks.com/2021/04/a-future-chinese-indian-ocean-fleet/>.

⁹ Grare, F. (July 31, 2018). Along the Road: Gwadar and China's Power Projection. *Carnegie Endowment for International Peace*. <https://carnegieendowment.org/2018/07/31/along-road-gwadar-and-china-s-power-projection-pub-77217>.

¹⁰ Ali, G. (2019). China-Pakistan Maritime Cooperation in the Indian Ocean. *Issues & Studies*, 55(3). doi:10.1142/s1013251119400058.

The Pivot to Asia primarily focused on United States coupled with its allies in East Asia; however, the Indo-Pacific strategy signifies the broader strategic interests. US considers that the rule-based liberal order and its hegemony are constrained by the military and economic actions of China in region. National Security Strategy of US and National Defense Strategy that came in 2017 and 2018 respectively laid a considerable focus on Indo-Pacific Region in order to contain China. This led to FOIP which primarily employs two ways to achieve US interests: first is multilateral engagements and second is bilateral partnerships across diplomatic, economic, political, and military domains.¹¹ The Indo-US strategic partnership in maritime domain signifies the utilization of second tool.

Indo-US confluence of maritime interests is marked by the three rationales: the first rationale is shared vision that came after the ‘2015 Joint Strategic Vision for Asia-Pacific and IOR’, regarding a unitary strategic continuum to Indian Ocean and Asia-Pacific; the second rationale entails the maritime security cooperation between US and India with dualistic approach of countering the threat of China and enhancing the multilateral alignment in region. Third rationale is about the cooperation against the non-traditional security threats through boosting Maritime Domain Awareness.¹²

In 2016, both states signed LEMOA-Logistic Exchange Memorandum of Agreement that allows India and US to use designated facilities for refuelling, supplies, services, and spare parts. Consequently, it provides India access to US bases and allows US to use the bases of India.¹³ India has acquired the Strategic Trade Authorization Status (STA-1) from US which grants it a license for co-development and procurement of advanced military technology, therefore amplifying the military prowess of India. Concurrently, US and India have signed COMCASA-Communications Compatibility and Security Agreement, a military-information sharing agreement, enabling the latter to access the surveillance and communication technologies of former. Moreover, it facilitates interoperability between both strategic partners to keep a check on mutual enemy China.¹⁴ Another key agreement is BECA-Basic Exchange and Cooperation Agreement inked in 2020 will enable India and US to share critical information, classified satellite data, and sophisticated military technology; most importantly, this pact would provide India access to crucial geospatial information of US that in turn will buttress the precision of armed drones and missiles. Aid in targeting and navigation will also be provided through access to aeronautical and topographical data.¹⁵

The maritime partnership will assuredly increase the military capability of India vis-à-vis China as well as Pakistan, thus affecting the regional stability and in turn security. These defence pacts stipulate tensions with regard to naval dynamics and fifth-generation warfare. Moreover,

¹¹ Munir, M. and Safdar, A. (2021). The US Free and Open Indo-Pacific Strategy: Implications for China (2017-present). *Polaris – Journal of Maritime Research*, 3(1). doi:10.53963/pjmr.2021.011.3.

¹² Mishra, V. (2018). India-US maritime cooperation: Crossing the rubicon. *Maritime Affairs: Journal of the National Maritime Foundation of India*, 14(2), 15-25. doi:10.1080/09733159.2018.1562453

¹³ Iqbal, A. (August 30, 2016). US-India Defence Pact to Impact Pakistan, China. *DAWN*, <https://www.dawn.com/news/1280873>.

¹⁴ Rehman, H. (June 23, 2019). US-INDIA Strategic Trade Authorization (STA-1) and COMCASA: A Strategic Assessment. *Strafasia*. <https://strafasia.com/us-india-strategic-trade-authorization-sta-1-and-comcasa-a-strategic-assessment/>.

¹⁵ Hali, S.M. (November 2, 2020). BECA — a New Indo-US Bilateral Agreement. *The News*. <https://www.thenews.com.pk/print/737917-beca-a-new-indo-us-bilateral-agreement>.

such agreements may provoke Pakistan and China to change their naval fleet operational posture to respond to perceived threats

4.1.3 Burgeoning maritime capabilities of India

India is incessantly enhancing its naval power either through indigenous capacity building or by acquiring cutting-edge naval assets from its allies. Presently, the naval force level of Indian Navy entails 150 ships coupled with submarines as well as aircrafts. A conceptual shift has been observed with respect to ‘force-levels’ perspective planning in Indian Navy, from ‘platforms number’ to enhanced ‘capabilities under the MCPP-Maritime Capability Perspective Plan of Indian Navy. The projects in progress to increase naval capability include construction of submarines, 50 ships, and anti-submarine corvettes.¹⁶

Indian Navy is also pursuing ‘Project 17A programme’ in order to buttress its combat capabilities. Being approved in 2015 with total cost of \$7 billion, the project entails the construction of seven Nilgiri-Class Stealth frigates also termed as the Project 17-A frigates. It will improve roll stabilization and stealth capabilities. Advanced sensors and indigenous weapons fitted on guided-missile frigates will lead to improved ship manoeuvrability, sea keeping and survivability.¹⁷ Besides, ‘Project 1135.6 ‘frigates’ also augments the frigate program of India. As per the contract with Russia, signed in 2018, India will acquire two missile-guided frigates from Russia by 2024 and other two will be constructed at India’s Goa shipyard. These frigates are expected to be armed with India’s lethal supersonic cruise missile system known as ‘Brahmos’.¹⁸ With the 500km range, 2.8 Mach speed and ability to carry nuclear and conventional warheads, the Brahmos can be launched from various mediums such as sea, land, and air. In April 2022, Indian Navy alongside Tri-service Andaman and Nicobar Command carried out successful test fires of Brahmos missile’s anti-ship version. This cruise missile has pinpoint accuracy, works in all weather conditions and day as well as night; and works on principle of ‘Fire and forgets’ implying that after launch, missile requires no guidance.¹⁹ Brahmos is regarded as one of the fastest and best precision-guided weapons in the world which has substantially amplified the credible deterrence of India. The missile lethality can be determined by the fact that even air-defence systems remain incapable of intercepting it, thus ensuring the offensive capabilities of the possessor state.

Another significant development is India’s acquisition of Boeing 81-MPA (Maritime Patrol Aircraft), which India has dedicated to INAS-316 (Indian Navy Aviation Squadron) which is located at the heart of western seaboard of India. Previously, P-81 fleet was dedicated to INAS 312, strategically present in India’s southeastern seaboard with an eye on Gulf of Mannar and Bay of Bengal. With the acquisition of 6 more Poseidon (four pending and 12 inservice) in coming years, regional maritime information dominance of India will become unparalleled. Additionally, the agreements related to replenishment and logistic facilities in Oman’s Duqm

¹⁶ Ministry of Defence, Government of India. (2024). FAQ | Department Of Defence. <https://www.mod.gov.in/dod/faq>.

¹⁷ Naval Technology. (December 17, 2020). Nilgiri-Class (Project 17A) Frigates. <https://www.naval-technology.com/projects/nilgiri-class-project-17a-frigates/>.

¹⁸ Singh, A. J. (December 3, 2021). The Indian Navy- A Capability Based Blue Water force. *The Financial Express*. <https://www.financialexpress.com/defence/the-indian-navy-a-capability-based-water-force/2381336/>.

¹⁹ Drishtias (April 29, 2022). Anti-ship version of Brahmos Missile. <https://www.drishtias.com/daily-updates/daily-news-analysis/anti-ship-version-of-brahmos-missile>

Port and Japan's Djibouti port in Ambouli have been renewed and signed respectively. Furthermore, the lacuna in Southwestern Indian Ocean will be filled after the completion of Agalega base in Mauritius. All these developments indicate that 'Reverse String of Pearls' strategy of India is underway in response to China's String of Pearls strategy in Indian Ocean.²⁰

The maritime strategy of India based on procurement of behemoth naval capabilities, military technology from anti-China Quad alliance, nuclear triad, the perception of regional net security provider, pursuit of becoming great power and power projection in Asia-Pacific region coupled with the postural turn of India towards counter-force will have horrendous ramifications for regional stability, thus undermining the maritime security.

4.1.4 Indian Ocean's Nuclearization

Although Indian Ocean is considered as a nuclear free zone, states' presence with sea-based nukes has generated grave maritime security concern. Divergence of interests and miscommunication among key regional players i.e., Pakistan, India, and China has culminated into a security threat given the accruing nuclear activities. IOR is currently marked by a baleful wave of nuclearization currently being carried out by India. Amidst the deteriorating ties between China and India, the latter is manifesting seriousness about enriching its naval capabilities, notably through launch of third SSBN (nuclear-powered ballistic missile submarine) in 2022. In 2009, INS Arihant or the first SSBN was launched and later commissioned in 2016, while the INS Arighat or second SSBN is slated to be commissioned in near future.²¹ Under the 2015 maritime doctrine of India, it aspires to build nearly 5 SSBNs alongside 6 SSNs-Nuclear powered attack submarines armed with K-4 submarine-launched ballistic missiles, providing India colossal leverage over crisis stability and deterrence in IOR. The aim of building a staunch nuclear submarine force would require enhanced warhead production for SLCM-submarine launched cruise missiles and SLBM-submarine-launched ballistic missiles.²²

The first SSBN has the ability to carry 12 SLBM named as K-15 Sagarika in India with range of 750km. India has also constructed long-range SLBM named as K-4 with range of 3500km for its forthcoming SSBN fleet and it intends to develop SLBM with even longer ranges such as K-5 and K-6. Furthermore, it has been producing Nirbhay cruise missile's sea-variant with 1000km range. The intention of India with respect to deployment of nuclear missiles afloat surface vessels is evident from the installation of Dhanush missiles.²³

Burgeoning nuclearization of IOR signifies that growing sea-based nuclear arsenal of India transcends its defence capabilities against the arch rival Pakistan and thus can have detrimental regional as well as global implications. It will not merely initiate the regional arms

²⁰ Khalid, Z. (June 13, 2022). Indian Navy's P-8Is Dominate the Indian Ocean. Centre for Strategic and Contemporary Research. <https://cscr.pk/explore/themes/defense-security/indian-navys-p-8is-dominate-the-indian-ocean/>.

²¹ Rajagopalan, R. P. (January 7, 2022). India launches third Arihant Submarine. Observer Research Foundation <https://www.orfonline.org/research/india-launches-3rd-arihant-submarine/>

²² Khan, S.A. (June 2, 2019). Nuclearization of Indian Ocean: Ramifications on Regional Security. Strafasia. <https://strafasia.com/nuclearization-of-indian-ocean-ramifications-on-regional-security/>.

²³ Bhatti, B. A. (November 10, 2020). India's Nuclearization of the Indian Ocean and Strategic Stability in South Asia. Maritime Study Forum. <https://www.maritimestudyforum.org/indias-nuclearization-of-the-indian-ocean-and-strategic-stability-in-south-asia/#:~:text=India%20is%20fast%20developing%20the,navigated%20through%20Indian%20Ocean%20waters.>

race, but will catalyze the fresh wave of Indian Ocean's nuclearization with colossal risk to the already fragile strategic stability and deterrence in region. It has generated insecurity among various actors such as China and Pakistan, compelling them to enhance their capabilities. A test has also been conducted by Pakistan to mount its nuclear weapon on diesel-submarine for ensuring deterrence. Naval modernization drive of China is also underway to counter India's growing prowess. Resultantly, the regional balance of power would be disturbed, forcing various states to pursue bellicose force posture and arms race in order to shield their strategic interests.

4.1.5 Strategic alliances: Quad and AUKUS

The first iteration of the Quad termed as Quad 1.0 dates back to 2007, but it failed given the reluctance of member states, particularly due to China's response. The revival of Quad under the term Quad 2.0 occurred in 2017 when United States, India, Australia, and Japan attended the ASEAN summits in Philippines. The statements given by the leaders signify the goal of alliance: rule-based order, free & Open Indo-Pacific, maritime security and observance of international law, and freedom of navigation as well as flight. The wording of statements obliquely pointed out militarization of Ocean and power projection by China.²⁴ The 2021 Quad Virtual Summit also gauged the traditional security threats coupled with non-traditional security threats; however Indo-Pacific's security remained a priority area. Quad has always been portrayed as an informal alliance with the key aim of freedom of navigation; however, amidst the surging China-US rivalry, the alteration of Quad into a military coalition cannot be precluded.²⁵ In May 2022, the Quad states also unveiled the IPDMA-Indo-Pacific Initiative for Maritime Domain Awareness that will allow the Quad's partners in Indian Ocean, Pacific Islands, and Southeast Asia to acquire satellite data in case of illegal activity on ships and to keep a check on 'dark shipping' and territorial incursions. It will fulfil the strategic purpose of Quad states as they aim to utilize satellites in order to track movements of submarines and ships, that in turn can cause region's militarization.²⁶

Australia, UK, and US tripartite act-AUKUS is another key alliance to revamp the construct of Indian Ocean as well as Pacific Ocean. Being meticulously designed, AUKUS aims at anchoring Australia and Britain and synchronizing them with strategic pursuits of US. For Australia, it implies acquisition of nuclear submarines for its adjustment in region which is being challenged by footprint of China. Moreover, it will enhance Australia's force projection, aerospace and cyber capabilities, thus buttressing deterrence against key threats. For UK, it will complement the 'Global Britain' foreign policy vision thus rendering itself a maritime security partner in region. For United States, this deal signifies the re-shaping and re-establishment of prowess coupled with shift towards 'rescuing United States foreign policy' outlook of Biden administration. AUKUS will mushroom collaboration in multiple domains such as defence technologies, quantum and intelligence technology coupled with procurement of cruise

²⁴ Haider, E. (2022). Navigating the Stormy Indo-Pacific-How Quad, AUKUS, US-China competition shape Pakistan's choices. *TABADLAB*. <https://tabadlab.com/wp-content/uploads/2022/03/2022-03-07-Tabadlab-Working-Paper-11-Navigating-The-Stormy.pdf>

²⁵ Bashir, R. (December 22, 2021). Quadrilateral Security Dialogue: Challenges and Prospects for Pakistan. *Strafasia*. <https://strafasia.com/quadrilateral-security-dialoguechallenges-and-prospects-for-pakistan/>.

²⁶ Buddhavarapu, R. (June 8, 2022). The Quad's New Maritime Initiative Has Potential to Spur Militarization of the Indo-Pacific. *CNBC*. <https://www.cnbc.com/2022/06/09/quads-maritime-initiative-could-spur-militarization-of-indo-pacific.html>.

missiles.²⁷ This pact is not devoid of deleterious ramifications for maritime security. Strategic nuclear competition has been improved with China given the US's pledge to mutually develop nuclear-propelled submarines with Australia. It accentuates arms race and increases the probability of conflict, thus eroding stability and peace in region.²⁸

5.1 Repercussions for Pakistan

5.1.1 Economic implications

The geopolitical contestation in IOR threatening its maritime security will pose detrimental economic challenges to Pakistan, given the massive economic activity of the country linked to sea. 97% of Pakistan's trade is sea-borne making regional maritime security indispensable for trade. Moreover, with the operationalization of CPEC, the economic stakes of Pakistan will become manifold. Gwadar port, considered as Maritime Jewel of CPEC lies at cusp of Strait of Hormuz with the potential to link Middle East, South Asia, and Central, which can make Pakistan a hub of regional transshipment. Regional connectivity will amass hydrocarbons, gas and oil resources, and minerals of CARs-Central Asian States for purpose of trade. Additionally, the port will attract the FDI-Foreign Direct Investment in Pakistan. As per the estimates, CPEC will bring about US\$70 billion transit revenue on annual basis, fundamentally through Gwadar port; and the SEZ-Special Economic Zones in port will provide gargantuan employment opportunities. Resultantly, enhanced commerce and trade activities through the port would usher Pakistan's economic prosperity.²⁹ Furthermore, it will increase the strategic leverage of country by helping it monitor the vital SLOCs emanating from Strait of Hormuz, through which nearly 21 million barrels of oil transit every day.³⁰ However, the Sino-Indian rivalry, the Sino-US competition, Indo-Pakistan rivalry coupled with various anti-China alliances in region will pose enormous challenges for Gwadar to become a success story.

It is important to highlight two key aspects to decipher the strong aversion of India and US towards the CPEC: firstly, it will stanchion China's influence in region, which is a major concern for both India and US; secondly, it will make Pakistan a key geo-economic actor, thus acting as a thaw in paw of India and challenging its regional hegemonic aspirations. The plans of India to disrupt the CPEC projects can be ascertained through RAW's special office created for this purpose and \$300 million allocation to it.³¹ The incessant support to India by the US would strengthen its hegemonic position which India can use to interdict the Sea Lines of Communications-SLOC through misuse of US-backed international regimes such as PSI-Proliferation Security Initiative and CSI-Container Security Initiative. Maritime trade of Pakistan

²⁷ Randev, R. (2022). Reshaping the Indo-Pacific construct through strategic geopolitical convergences: AUKUS as a harbinger of multipolar hegemony in region. *Journal of Indo-Pacific Affairs*.
<https://www.airuniversity.af.edu/JIPA/Display/Article/2904531/reshaping-the-indo-pacific-construct-through-strategic-geopolitical-convergence/>

²⁸ Ali, S. (September 29, 2021). Deleterious Effect of AUKUS on the Asia-Pacific," Centre for Strategic and Contemporary Research. <https://cscr.pk/explore/themes/defense-security/deleterious-effect-of-aukus-on-the-asia-pacific/>.

²⁹ Rafique, M. (November 30, 2020). Economic & Strategic Significance of Gwadar Port. *Daily Times*.
<https://dailytimes.com.pk/695547/economic-strategic-significance-of-gwadar-port/>.

³⁰ Alexandra Ma (January 13, 2020). How the Strait of Hormuz, a Narrow Stretch of Water Where Ships Carry \$1.2 Billion of Oil Every Day, is at the Heart of Spiraling Tensions with Iran. *Business Insider*.
<https://www.businessinsider.com/strait-of-hormuz-explainer-oil-us-iran-tensions-2019-7#:~:text=The%20narrow%20strait%20is%20the,through%20the%20strait%20every%20day.>

³¹ Rashid, A. (2017). Pak-China Partnership: US and India's Response. *Margalla Papers* 21(1).

would be hindered in case of blockade by India or any other influential power. Moreover, the interdiction of sea routes would aggravate the relation between regional and extra-regional actors, causing military and economic instability in IO.³²

5.1.2 Security Implications

US's maritime strategic partnership with India with leaping defence cooperation, such as LEMOA and COMCASA to strengthen India's military for countering China has been a source of security concerns for Pakistan. It has inevitably made Pakistan part of rival faction due to mounting tensions with US in general and India in particular. These development are causing security implications for Pakistan such as security dilemma, regional arms race. It is also intensifying rivalry between India and Pakistan with respect to Kashmir issue by strengthening India's position vis-à-vis Pakistan.³³ The strategic convergence of US and India has led former to declare latter as 'Net Security Provider' of region. It will provide India a new stimulus to embrace a belligerent posture towards neighbouring states, notably Pakistan. The enmity between India and Pakistan since independence indicates that the maritime strategy of India will be directed towards Pakistan. Moreover, India can now import strategic weapons from United States because of Strategic Trade Authorization status which India can use for countering China and undermining security of Pakistan.³⁴ Some scholars view maritime engagement of India and US in IO as a mean to chip away the significance of CPEC. The expansion of Indo-US's naval muscle to reach Gulf of Oman and Persian Gulf would also daunt energy flow from Middle East to China, which can undermine the Gwadar port's significance.

As far as the sea-based nuclear capabilities of India are concerned, the second-strike capability coupled with presumed shield from anti-ballistic missiles would allow India to adopt a more aggressive stance towards Pakistan, China, and other regional actors, compelling them to respond accordingly. The operationalization of India's naval nuclear force will undermine the delicate regional strategic balance. Nuclear triad of India has impelled Pakistan to pursue nuclear triad; moreover, it will perpetuate nuclear and conventional arms race. Underwater deterrent also brings command and control issues, ergo, enhancing the likelihood of unauthorized and accidental launch of nukes that in turn would destabilize the deterrence. Inadvertent use, misperception, and dangers of escalation are key probabilities associated with sea-based nuclear weapons, thereby, kicking off Pandora's box of dangers and issues which may not be tackled.³⁵

Along with BECA, COMCASA, LEMOA, the proposed US-India Strategic Tech Alliance (based on aligning the Indo-Pacific strategy with respect to emerging technologies for security and defence goals around US partnership with India) will amplify collection and analysis of data. Furthermore, it will enhance access of India to satellite imagery, hypersonic missile capabilities, classified communication's advanced encryption, and target acquisition

³² Tahir, A. and Ejaz, K. (2020). India-United States strategic partnership in Indian Ocean region and its implications for Pakistan. *Journal of Indian studies* 6 (1), 7-30, <https://www.prdb.pk/article/india-united-states-strategic-partnership-in-indian-ocean-re-3007>

³³ Younas, K. (2020). Strategic Convergence and Competition in the Indo-Pacific Region: Policy Options for Pakistan. *Margalla Papers* 24(1), 81-96, DOI: <https://doi.org/10.54690/margallapapers.24.1.39>

³⁴ Ahmed, A. (August 16, 2018). India STA-1 Status and Implications for Pakistan. *Daily Times*. <https://dailytimes.com.pk/283962/india-sta-1-status-and-implications-for-pakistan/>.

³⁵ Jalil, G. Y. (2018). India's Development of Sea-based Nuclear Capabilities. *Strategic Studies* 38 (1), 34-47. https://www.issi.org.pk/wp-content/uploads/2018/04/3-SS_Ghazala_Yasmeen_Jalil_No-1_2018.pdf

capability. It will further accentuate the ISR-Intelligence, Surveillance, and Reconnaissance competence of India vis-à-vis Pakistan and China in Indo-Pacific and South Asia.³⁶ With the enhancement of military technological capabilities of India through COMCASA and other Initiatives, military and technology asymmetry between Pakistan and India will also increase, increasing vulnerability and threat perception of Pakistan that may cause failure of deterrence.³⁷ Moreover, with India's acquisition of P-81, the defensive manoeuvres of Pakistan will remain vulnerable, causing substantial force disparity and in turn combat disadvantage.³⁸

5.1.3 Political Implications

The geopolitics in Indian Ocean has grave political repercussions for Pakistan. Given the worsening of US-China rivalry, it will become a mammoth challenge for Pakistan to plump for either side. Due to economic and strategic ties with China, Pakistan cannot abandon its all-weather friend; simultaneously, Pakistan doesn't have the capacity to fully oppose the United States due to various structural challenges such as FATF, IMF alongside other monetary mechanisms.³⁹ Moreover, India's strategic partnership with US in maritime domain would provide former a huge advantage in terms of diplomatic relations with latter which can enhance India's political, economic, as well as strategic clout in the region.

6.1 Policy Options for Pakistan

There is no comprehensive maritime policy of Pakistan despite its huge stakes and dependence on Indian Ocean. Eroding maritime security chiefly due to geopolitical dynamics necessitates the formulation of a holistic-cum-pragmatic maritime policy including both soft and hard power elements.

6.1.1 Elements of Soft power in maritime strategy

- **Naval diplomacy and maritime multi-alignment policy:** Pakistan can effectively employ the 'Naval diplomacy' in order to cultivate friendly relations with littoral states in IOR. This would lead to substantial decrease in trust deficit that will simultaneously enhance its strategic clout vis-à-vis India.
- **Harnessing the Blue Potential:** The blue economy sector of Pakistan is nearly worth \$100 billion, but currently it only provides \$450 million revenue per annum. The blue economic potential of Pakistan needs to be fully utilized.⁴⁰ Offshore resources, seafood industry, and marine tourism need to be tapped which can contribute to sustainable

³⁶ Institute of Strategic Studies Islamabad, (January 12, 2022). *US-India Strategic Tech Alliance: Options for Pakistan*. https://issi.org.pk/wp-content/uploads/2021/03/Report_IH_Jan_12_2021.pdf

³⁷ Rehman, H. (June 23, 2019). *US-INDIA Strategic Trade Authorization (STA-1) and COMCASA: A Strategic Assessment*. Strafasia. <https://strafasia.com/us-india-strategic-trade-authorization-sta-1-and-comcasa-a-strategic-assessment/>.

³⁸ Khalid, Z. (June 13, 2022). *Indian Navy's P-8Is Dominate the Indian Ocean*. Centre for Strategic and Contemporary Research. <https://cscr.pk/explore/themes/defense-security/indian-navys-p-8is-dominate-the-indian-ocean/>.

³⁹ Salamat, S. (February 28, 2022). *Major Powers' Competition in Indian Ocean*. *Times*. <https://dailytimes.com.pk/892846/major-powers-competition-in-indian-ocean/>.

⁴⁰ Zafar, A. (June 9, 2022). *The Untapped Blue Economy of Pakistan*. *Paradigm Shift*. <https://www.paradigmshift.com.pk/blue-economy-of-pakistan/>.

development. Pakistan can forge 'Blue Partnership' with China under the CPEC to fully benefit from its blue economy sector.

- **CPEC and Gwadar port expeditious operationalization:** The economic prosperity of Pakistan is certainly dependent on the complete operationalization of CPEC as well as Gwadar port. This will not merely lead to economic stability of Pakistan but will enhance its geopolitical and strategic clout in region and beyond, due to location of Gwadar at the junction of various regions.

6.1.2 Elements of Hard Power in maritime strategy

- **Sea-based deterrence capabilities and strategic partnership with China**

The India's acquisition of sea-based nuclear weapons is the most lethal challenge for Pakistan, as it gives India second-strike capability. Pakistan should also acquire this capability through partnership with China. Additionally, China is developing Unmanned Underwater Vehicles-UUV which is an emerging technology to detect and autonomously attack submarines. Pakistan can collaborate with China in this regard which will provide Pakistan a technical edge to curb India's rising submarine capabilities, particularly in nuclear domain.

- **Buttressing defence partnership with Turkey**

Turkey's active involvement in Indian Ocean has provided Pakistan an opportunity to boost the maritime defence and security cooperation with it. Pakistan already has signed a pact with Turkey to procure the corvettes. This partnership can be extended to enhance Pakistan's defence capabilities

- **Maritime Domain Awareness**

Maritime activity has ramifications for economy, security, environment, and safety of country; and this activity's effective awareness is termed as MDA-Maritime Domain Awareness.⁴¹ It is indispensable for Pakistan to enhance its MDA in order to counter traditional as well as non-traditional security challenges in IOR. Pakistan can forge relations with various littoral states, particularly those that are part of BRI, and shall also move towards joint maritime endeavours and ventures. Regional information collection structures, MDA training centres, and most importantly, the organization structure crucial for information coordination are important in this regard. Development of MDA regional centres would lead to improvement in development and research; moreover, it would improve threat response and enhance joint operations. Joint Maritime Information and Coordination centre in Pakistan can be replicated as a model for developing a regional MDA centre.

- **Improvement of naval defence-cum-technological capabilities**

Pakistan should make its defence formidable and upgrade its naval defence weapons and acquire more to ensure its defence. High end-Maritime Patrol Air Crafts shall be acquired in order to counter the technological superiority of India enhanced by P-81.

⁴¹ Pole Star. (June 19, 2022). An Introduction to Maritime Domain Awareness (MDA). <https://www.polestarglobal.com/resources/an-introduction-to-maritime-domain-awareness-mda>.

7. Conclusion

Indian Ocean has become a pivotal hotspot in the geopolitical configurations of regional and extra-regional powers. Acting as a lifeline of global economy and trade due to presence of strategically significant chokepoints, Indian Ocean has become a hub of geopolitics. The complex-inter play of power characterized by strategic convergence, divergence, and containment involving key actors China, US, India, Australia, Japan, UK etc. signifies the power projection either through enhancing military capabilities and presence in region or by forging multinational alliances such as Quad as well as AUKUS. These geopolitical trends have weaponized, nuclearized and securitized the region with detrimental ramifications for maritime security. Geopolitical rivalry is augmenting nuclear and conventional maritime arms race, causing military asymmetry, enhancing probability of conflict, and eroding strategic stability, thus posing lethal threats to maritime security. The situation is further compounded by other challenges such as maritime terrorism, illicit trafficking, environmental degradation etc. These developments have disastrous ramifications for Pakistan due to its strategic locations and potent interests in the IOR. China-Pakistan Economic Corridor has made Pakistan a key actor in the region's geopolitics which in turn has brought about political, economic, and security implications. Resultantly, Pakistan requires a holistic maritime strategy entailing soft and hard power elements in order to deal with emanating challenges.

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A DEGLOBALISING WORLD: TURBULENCE IN THE WORLD ORDER AND IMPLICATIONS FOR PAKISTAN

Javaria Shaikh, Ehsan Ahmed Khan

“I recognize that globalization has helped many people rise out of poverty, but it has also damned many others to starve to death. It is true that global wealth is growing in absolute terms, but inequalities have also grown and new poverty arisen.”

Pope Francis

Abstract

The global environment is transitioning through an era of uncertainty and a pervasive flux. The fostering of globalisation that converted the polar world in more networked village seem to be going through a phase of a hard reset viewed in the form of an onset of “deglobalisation” also referred to as “slowbalisation”. The phenomena of deglobalisation is mostly evaluated on the bases of ret-rogradation in economic, trade and interconnectedness indicators. Using both qualitative and exploratory research methods, the study examines whether deglobalisation is an emerging reality by analyzing deglobalisation phenomena from a more geopolitical prism rather than a geo-economics lens. The theoretical framework thus uses the classical IR theories of liberalism and realism to debunk the myth or reality of deglobalisation. The liberalist viewpoints underscore the erosion of international institutions and the diminishing interdependence among nations while the realist perspectives highlight the strategic power shifts and national security concerns prompting states to prioritize sovereignty over global cooperation. The paper also posits to unpack the implications of deglobalisation across the globe in general and global south i.e developing and underdeveloped countries that heavily depend on supply of raw material and human resource for the developed north facing demographic decline. The paper would also derive the implications on international security architecture especially narrowing it down to its consequences on national security interest of Pakistan. It explores how shifts in global trade, investment patterns, and geopolitical alliances affect Pakistan's economy, political stability, and regional influence. The findings aim to provide a nuanced understanding of how deglobalisation shapes the future for countries like Pakistan, balancing national interests with the challenges of a transforming world order.

Key Words: (De)-globalization, Trade Protectionism, Labour, Transnational Security

INTRODUCTION

Globalisation is difficult to define and a consensual definition amongst scholars remains elusive. Although interconnectedness remains a common key characteristic of globalization, it is multifaceted and has a wider scope ranging from domains of (but not limited to) national international economy to global politics. (PAUL, 2021) Professor Emeritus Theodore Levitt (1925-81) is credited for the first, widely applied and differently interpreted, use of word Globalization through his 1983 Harvard Business Review Article “The Globalization of Markets”⁴¹⁹ and defined the term as “changes in social behaviors and technology that allowed companies to sell the same product around the world” (REPORTS, 2006). Though the phenomena of “Globalisation” is considered to have begun post 19th century Industrial Revolution, however, the phenomena is self is believed to be a much primitive. Immanuel Wallerstein’s world system theory explains how in a Eurocentric sense, strong global players established trade with far weaker partners exploiting resources in an asymmetrical relationship. (Kerig, 2023). Although historical evidence of trade between geographically distant economic centers exist it was only after the invention of airplane that the blueprint of a truly “globalized economy” was laid. (Stobierski, 2021). Globalisation benefited in greater economic growth through enhanced access to human and other resources and providing opportunities for nations to lean into economic strengths. It also accentuates cooperation as increased flow of goods, services, capital and people reduces the probability of violent interaction between mutually dependent states. (Stobierski, 2021). (Li, 2020)

The rise of globalization was bookended due to the two world wars followed by 60 years of increased globalization. (Meeting, 2023) After a period of hyper globalization between 1990-2008, financial crisis, trade wars, disenfranchised middle classes in developed economies and rising concerns about over-reliance on trade with single partners led to a period of relatively stagnant "slowbalisation" which appears to be moving towards deglobalisation. (Meeting, 2023) Disruptions in global value chains witnessed during COVID-19 pandemic, Russo-Ukraine war, growing interstate ideological differences, green transition and more recently disruption in trade route in Red Sea by deliberate attacks by Houthis have prompted governments and corporations to reconsider external dependencies. The shared agenda of collective growth influenced the need to have collaborative security mechanism and multilateral institutions to respond against common threats. Post-Cold War, especially in the 21st Century the trends of geo-politics are at the cross roads of uncertainty and potentially violent paradigm that is characterized with nationalistic fervor taking center stage in domestic politics with ripples impacting in global integration and a significant impact on contours of international security.

THEORETICAL FRAMEWORK

Contemporary global politics is witnessing the real-time growth and decline of worldwide interconnection. On the one hand, ongoing digital advances are facilitating ever faster and more large sharing of data. Climate change is progressively making itself felt across the world, even the remote and the continent of Antarctica is facing it. On the other hand, global FDI, a key measure of global financial flows, became highest at US\$2 trillion in 2015 but decreased significantly to US\$1.5 trillion by 2019, partly due to the crises of COVID-19, it fell

by 42 per cent from 2019 to 2020. (PAUL, 2021) Growing evidence suggests that we may live in a period of deglobalisation that began after the 2008 financial crisis that indicates a stall but not a collapse of globalization. (James, 2018). The drivers of globalization include, the capability to shorten distances in terms of both communication and transportation, a obligation of states to formulate and then stick to rules, standards which guarantees that all goods, services, capital and labor can move freely across the globe and the incentive of consumers and firms to push the boundaries in the ever-present quest to achieve profit. (Dover, 2022). Deglobalization is considered as real and persistent. However, the supremacy of politics plays a key role as a driver of de-globalization, while, on the other hand, technology and its effects on the decreasing costs of transportation and communication, enables globalization.

Two major opposing schools of thought, liberalism and realism, explain the development of globalization. Both points to different processes driving globalization and leading to its reversal (which is de-globalization). The school of thought of Liberalism states that domestic political pressures against globalization is the main reason of deglobalization. Whereas, realism perceives the rise of China as a global competitor of US and the end of US hegemony, as a trigger of deglobalization. The two school of thoughts provides two different scenarios for the interpretation of deglobalization for the future of the world economy with different implications. (Witt, 2019)

This paper seeks to define deglobalization, and explores through data that how deglobalization may already be a reality using theories of liberalism and realism. Further both schools of thoughts lay out the general mechanisms, for explaining deglobalization and its outcomes. The paper seeks to, in first part unpack the phenomena of deglobalisation from a liberalist and realist prism. In second part the paper evaluates the impact of deglobalisation globally with focus on its effects on developing countries and lastly the paper seeks to juxtapose the phenomena and its impacts on Pakistan to identify implications.

DEBUNKING THE MYTH: IS DEGLOBALISATION REAL?

Deglobalisation is a movement towards a less connected world, characterized by powerful nation states, local solutions, and border controls rather than global institutions, treaties, and free movement. (Wallace, 2022) According to Barclays Corporate and Investment Bank Report “In response to COVID-19, Russia’s war with Ukraine and climate change, governments and global companies are seeking security and resilience over the benefits of global value chains. There are strong signals that the era of globalisation is coming to an end. Today, "slowbalisation" appears to be moving towards deglobalisation. Recent disruptions to global value chains such as the COVID-19 pandemic, the war in Ukraine, growing ideological differences and the green transition have prompted governments and corporations to reconsider external dependencies. They are looking closer to home and to trusted partners for more resilient growth models”. (Meeting, 2023)

In theory, deglobalization suggests that states policies can protect domestic industries, create employments locally and can manage to reduce economic inequality within a country. This is because policies of deglobalization including protectionist trade and restrictions on imports, can successfully limit the sum of foreign competition which domestic industries of the state faces, which according to some scholars, can help states to remain competitive and protect jobs. Furthermore, these policies can also boost local production and consumption, which lead to

the development of more resilient and sustainable local economy. However, negative point associated with deglobalization is that it has the potential to reduce overall economic growth of the state by constraining the flow of goods, services and people, restricting innovation, and threatens many forms of international cooperation that make nations less interdependent and more inclined to resort to armed conflict. (Dover, 2022)

Defining deglobalisation is paradoxical as conformation of the events is subjects to the lens from which it viewed. The phenomena is viewed differently by social scientist and political scholars. The field of International Relations has given two major theoretical frameworks that addresses the question of deglobalisation: liberalism and realism. It is necessary to lay out the main concepts proposed by these theories before moving on to the questions of how they relate to deglobalization and the future each theory predicts.

Liberal Approach.

The proponents of liberalism advocate positive view of human nature reflected in international relations in the form of cooperation, progress and transnational ties at levels of inter-states to people. 17th century 'John Locke' theorized great p that humans progress lie is capitalist modern civil society and free market economy, on the other hand, Jeremy Bentham claimed that modern liberal nation states can bring greater happiness for large number of people. Globalization is fostered by the liberal international order, which is adapted to dynamics it, and it keep major global political disturbances in check. However, its resilience and ability to absorb global politico-economic turbulences is being tested.

In recent times many anti-liberal forces have gained momentum and electoral support in states, like United States, Brazil, India, Turkey and Hungary. Most of them lead to protectionist policies and economic nationalism. This has broken the supply chains that downgraded economic globalization. Many authoritarian rulers worldwide taken steps to strengthen their grip on power at home and implemented increasingly closed policies with respect to economy, abroad. (PAUL, 2021) However, when US, the former chief defender of globalism and liberal order took the lead in their destruction under the Trump administration, the liberal ideals of global governance become weak and can be brushed aside even more easily. The transforming liberalism's characteristics that vindicate deglobalization are as follows:

Eroding Inter-connectedness. A retreat from the high levels of global interconnectedness seen in previous decades is set in, impacting the economy in trade, investment, supply chains, labor markets, and economic growth. Protectionist policies, such as tariffs and trade barriers, discourage cross-border commerce. With global trade agreements becoming harder to negotiate, there is a shift towards regional trade blocs. As countries prioritize domestic industries, there is a decline in FDI. This trend is evident in the decreased investment flows from developed to developing countries, affecting growth prospects in the latter. Reduced trade and investment flows generally lead to slower global economic growth. The International Monetary Fund (IMF) and the World Bank have both highlighted the potential negative impacts of deglobalisation on global GDP.

Reduced Investment. Companies are increasingly focusing on localizing their investments to mitigate the risks associated with global supply chain disruptions. This is evident in the shift towards reshoring and nearshoring of manufacturing and production facilities, as seen with several Western companies moving their operations closer to home. The COVID-19 pandemic highlighted vulnerabilities in extended global supply chains, prompting companies to rethink their reliance on distant suppliers (Wallace, 2022). There is a growing emphasis on regional supply chains to reduce dependency on single countries or regions. This trend is exemplified by the US and EU efforts to develop more self-sufficient supply chains in critical sectors like semiconductors and pharmaceuticals. The sharp decrease in foreign direct investment, for instance, is likely to have severe repercussions. It is expected almost to halve investment flows to Africa, Asia and Latin America.

Populism and Nationalistic Economies. Populism is linked to distributional inequalities and discontent among certain sections of electorates. Lockdowns of 2020 and 2021 introduced in response to the COVID-19 pandemic are further widening the gap between rich and poor an aspect thrived upon by populous leadership. Countries are adopting more nationalistic economic policies, prioritizing self-sufficiency over global integration leading to inefficiencies and reduced economic dynamism. Uncertainty around trade policies and economic nationalism contributes to volatility in financial markets reflected in more frequent and severe currency fluctuations, impacting international trade and investment. Reduced interstate collaboration across borders and technology denial is potentially slowing technological advancements. This is particularly concerning in high-tech industries that rely on international collaboration exasperated due to protectionist policies (Witt, 2019)

Constricted Labour. Tightening of labour migration rules is another manifestation of economic nationalism. (Paul, 2021) The relocation of manufacturing and production can lead to job losses in countries that previously benefited from offshoring. Conversely, countries adopting reshoring strategies may see job growth in certain sectors. The transition from a global to a more localized economy is exacerbating skills mismatches in labor markets, requiring workforce retraining and upskilling initiatives. The severity of impact would perhaps be most visible on migrants from underdeveloped countries seeking livelihood in West or other stringer economies. Contrary to hopes of fulfilling the Sustainable Development Goals, millions of people could be thrown back to poverty (Witt, 2019). While the numbers of refugees are already at a record high, significantly more people could join the global refugee surge. Societal unrest and more authoritarian tendencies in host states could be the result.

Democratic Backsliding. Democratization is key mandate claimed by the liberal international order, implements all types of restraints on the use and abuse of power. Democracy with the passage of time surpassed other forms of government being the only legitimate rule as liberal international order evolved over time. However, there is sufficient 'democratic recession' in recent times.

According to Freedom House 2020 was the 15th successive year of decline in freedom worldwide. In 2020, democratic recession was particularly noticeable, 'Nearly 75 percent of the world's population lived in a country that faced deterioration last year (PAUL, 2021).' In sum, the defenders of 'democracy sustained heavy losses in their fight against authoritarian foes, opening up space for democratic backsliding or authoritarianization.

Global Governance. Liberal international order postulated more and more global governance covering aspects such as health, environment, migration, science and technology, human rights etc. Challenges in global governance, including the perceived ineffectiveness of international institutions such as the United Nations and the World Trade Organization, have undermined confidence in the ability of multilateralism to address pressing global issues. Lack of consensus and coordination among nations has hindered efforts to promote global cooperation and address transnational challenges.

Realist Approach.

The realist theory reflects the pessimistic view of human nature that characterizes the conflictual nature of international relations. National security and state survival form the core of realist paradigm which is hinged on anarchic nature of interstate relations, struggle for power. States are marked as unitary, rational actors, with domestic politics considered irrelevant for their actions and behaviour in the international system. In the anarchic international order, the prime objective of foreign policy is forces on nations by the structure of the international system, whereas, securing survival is mainly a function of hard power. In specific, states need to acquire sufficient military power to defend themselves militarily and economically against other states.

Michael A Witt has explained anti thesis to globalization by using the sub concept of realism "hegemonic stability theory". (Witt, 2019) This theory maintains that globalization happened when powerful states or "hegemon" makes sets of international institutions to govern trade and investments., for its own benefit, Once the hegemon fails the system becomes unstable. Hegemonic stability theory associates the openness of the international economic system to the mass of the most powerful states, which is US in recent history. Conversely, de-globalization accompanies a decline in power of hegemon or the strongest state, not mainly in absolute terms, but relatively to other states. However, if such decline is present, one can expect de-globalization.

Relative power of the US can be compared with the rest of the world, in two main dimensions that are fundamental to the realist concept of power i.e. military strength and economic power. While economic power can be operationalized through measure of GDP, measuring military power is a complex variable. As a proxy extent of military spending can be used though infested with imperfections and informational deficiencies. Findings to such an analyses indicate US share in global GDP peaked in 1985 at 34.6% which has reduced to estimated 26.3% of world GDP in 2024, a drop of 24%.. In contrast China's share in global GDP in same period (1980-2024) surged from 2.5% to estimated 17% an increase of over 600% of Chain's share in the global GDP (Lu, 2024). However, one can argue whether the US was an economic hegemon in 1985, it does not occupy the

same status in 2024 being Challenged by China. While China itself clearly is not (yet?) an economic hegemon, either. (Lu, 2024). In terms of military spending SIPRI Military Expenditure Database provides an insight into regional and national military expenditures 1949 onwards. The data indicates a linear increase in US military expenditure from US\$ 760 Bn in 1989 to 880 Bn in 2023 showing an increase of 16%. In same period (1989-2023) Chinese military spending increased from US\$ 21.2 Bn to 309.5 BN. (SIPRI, 2023)

The empirical evidence in support of hegemonic stability theory thus confirms that statistically the global order is at the tipping point of deglobalisation where by one hegemon is likely to secede power to another rising power. In addition, other key factors that characterize deglobalisation under a realist structure are:

Strengthening State Sovereignty. Realism posits that states are the primary actors in international relations, operating in an anarchic system where no central authority exists. Deglobalisation reinforces state sovereignty by allowing states to reassert control over their economies, borders, and political decisions. This resurgence of state-centric policies aligns with realist views that prioritize national interests and security over global cooperation.

Accentuated Security Dilemmas. Deglobalisation exacerbates security dilemmas, a core concept in realism where the actions taken by one state to enhance its security cause insecurity in other states. As states retreat from globalization and adopt protectionist measures, strategic rivalries intensify. For example, the US-China trade war and technological decoupling reflect heightened security concerns and competition, leading to an arms race in trade and technology sectors.

Invigorated Bilateral and Regional Alliances. Realism emphasizes the importance of alliances and balance of power to maintain stability. Deglobalisation signifies a shift from global multilateralism to bilateral and regional alliances. States may seek to secure their interests through regional cooperation and bilateral agreements, as seen in the growing importance of regional trade agreements like the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) and bilateral security pacts.

Surging Nationalism and Protectionism. Realism acknowledges the role of nationalism in shaping state behavior. Deglobalisation purports nationalist sentiments, as states prioritize their domestic industries and populations over international commitments. This protectionist turn is evident in policies such as Brexit and the "America First" doctrine, which emphasize national sovereignty and economic independence.

Decline of Multilateral Institutions. Realists are often skeptical of the efficacy of international institutions, viewing them as tools used by powerful states to maintain their dominance. Deglobalisation undermines multilateral institutions like the World Trade Organization (WTO) and the United Nations, as states become more inward-looking and less willing to cede authority to

supranational bodies. This aligns with realist critiques of global governance structures.

Examples and Case Studies

The strategic and economic rivalry between the US and China illustrates how deglobalisation can intensify security dilemmas. Both nations have imposed tariffs and sought to reduce dependencies, reflecting realist concerns over relative gains and power balance.

The United Kingdom's decision to leave the European Union underscores a shift towards national sovereignty and control over economic and political affairs, resonating with realist principles of state autonomy and skepticism towards supranational governance.

The increasing importance of regional alliances, such as the Quadrilateral Security Dialogue (QUAD) and AUKUS involving the US aligning with Japan, Australia, UK and India, highlights how states are pivoting towards regional cooperation in response to deglobalisation and changing power dynamics.

Having unraveled deglobalization as a phenomenon in progress, the answer to question of it being a myth or reality remain elusive. However, the trends described through liberalist and realist paradigm confirm that globalization has indeed peeked with global system tweaking itself towards a more nationalist and regionalist approach yet unwilling to give up on low hanging fruits of globalization. The drive to adopt a more nationalistic economic model, protectionism and divergent political aspirations especially amongst the contending and contesting great powers, if subjected to politico economic shock, may have a catalytic impact in hastening the deglobalisation process which would be determined by rationale or a not so rationale knee jerk reaction from any of the antagonist. Moreover, while some may argue that deglobalisation is necessary to address inequalities and vulnerabilities inherent in the current global system, others contend that it could lead to economic stagnation and geopolitical instability with consequence for resilience in international order.

IMPACTIONS OF DEGLOBALISATION

Impacts at Global Level:

The second part of this paper analyses deeper into the implications of deglobalisation. Though, deglobalisation, like globalization, has a global outlook, its implication will remain different at different levels of analysis. It remains certain that deglobalisation with its far reach impacts will expose the world as a singular entity in a different manner as compared to states as unitary actors and within states differently to global north and south. The impact of deglobalisation on the global economy and international relations is a subject of considerable debate. The scholarly work on the subjects remains divergent on positive or negative perspective of deglobalisation at a global level in the context of international relations, particularly considering the global economic slowdown:

Positive aspects of deglobalisation:

The positive impacts on the global world are particularly linked with National Sovereignty of the states. By providing nations with greater hold on domestic policies and economies, deglobalization enhance the sovereignty of nations. This increases the states autonomy over national decision making and also protect states from external economic shocks and foreign interventions.

Apart from enhancing national sovereignty, deglobalization also plays major role in leading the world towards fairer distribution of wealth between north and south. Deglobalization reduce global economic inequalities as individual states prioritizes indigenous industries and local workers over MNC's and international workers. Furthermore, deglobalization also maintains individual states resilience towards global disruptions including geopolitical tensions, natural disasters and pandemics etc. Enhanced localization and domestic productions boost domestic capacity and decrease vulnerabilities.

Negative aspects of deglobalisation:

Negative Impacts of deglobalization is mainly connected to global economic growth. Deglobalization may asphyxiate economic growth by enhanced restrictions on trade, foreign investments, and innovations. Preventive trade policies, protectionism and localization may consequently increase inefficiencies and lead to in-competitiveness in the global market. Disintegrated world also leads to lack of international cooperation on critical problems like global security, pandemics and climate changes etc (Li, 2020). Furthermore, intensifying protectionism and nationalism may generate geopolitical tensions, which consequently leads to enhanced battles over resources, increased markets competitions etc. in this way deglobalization might disturb global supply chains and impact industries that rely on global markets.

Moreover, localization of production and nationalism also impacts migration and mobility, as individual states restrict migration and mobility to guard domestic labor markets and ease societal conflicts. This leads to increased impacts on global demography, cultural exchanges, technological interchange and innovations. This further impede collective global growth in all sectors.

Security Challenges in Deglobalizing World

Security interests play a substantial role in adding to the phenomenon of deglobalization by prompting countries to prioritize sovereignty and protection over international cooperation and integration. National security concerns are shaping policies and practices that prioritize sovereignty, protection, and security over international cooperation and integration. Addressing these concerns requires a balance between national security imperatives and the promotion of inclusive and sustainable global governance mechanisms.

National security concerns often end up in stronger border controls and immigration laws. To thwart potential security concerns, countries strengthen their border

security, impose visa limitations, and tighten immigration controls, to prevent international movement and integration. Furthermore, individual states impose visa requirements, boost border security measures, and stiffen immigration policies to avoid the entry of possible security threats. These procedures can hamper the movement of people, goods, and services across borders, consequently reducing international mobility and integration. Governments impose tariffs, quotas, and trade barriers on goods on the basis of national security concerns, that further lead to disruptions in global supply networks and fragmentation of the global economy (Li, 2020).

National security concerns related to technology have also become more pronounced, in a digitalized world. Individual states seek technological sovereignty by limiting FDI's in critical sectors, implementation of export controls on sensitive technologies, and enhancing cybersecurity, this all leads to dissociation of global technology markets and contributes to deglobalization. Besides this, geopolitical tensions and military alliances further aggravate national security concerns and contribute to deglobalization. States usually form alliances to counter apparent threats, creating blocs of few countries by marginalizing others. These factors further amplify mistrust, intensify military spending, and undermine international cooperations.

Deglobalization also fragment international alliances and partnerships as countries prioritize national interests and nationalism over every kind of cooperation and collective security. In recent times, traditional alliances like NATO, struggle to maintain solidity as member states increasingly adopting nationalist policies and leading towards nationalism. These factors can potentially aggravate geopolitical tensions between major powers, escalating competition for resources and mounting military posturing and conflicts (Reed, 2023). The intensification of cybersecurity threats and information warfare poses substantial challenges to global stability. Individual state adopt measures to protect their infrastructure and data from cyberattacks and foreign interference, together with restricting cross-border data flows and monitoring information within national borders, resultantly contributing to the fragmentation of the digital space.

Furthermore, deglobalization also challenges the international institutions like the United Nations and the World Trade Organization, subsequently, hindering efforts to address global security challenges. Lack of cooperation states, hampers conflict resolution, peacekeeping, and humanitarian assistance, aggravating instability in conflict-affected regions (Reed, 2023). Moreover, deglobalization also create opportunities for non-state actors, including terrorist organizations and criminal networks, to take benefit of power vacuums and weak governance. These actors may also promote their agendas in disjointed security environments, leading to increased terrorism, insurgency, and transnational crime.

IMPACTS OF DEGLOBALISATION ON DEVELOPED AND UNDER-DEVELOPED STATES

Deglobalisation have numerous implications for developing and underdeveloped countries, particularly through the lens of dependency theory, according to which “the global economy is characterized by structural inequalities that lead to the dependency of less developed countries on the developed ones. However, deglobalisation worsens economic dependency by

curbing the access of individual states into global markets and international trade. Restrictive trade policies and barriers to FDI can also further embed the supremacy of developed countries in some critical sectors, buttressing the economic dependency of under developed states. In addition, mainly all the developing and underdeveloped states frequently rely heavily on exports of key commodities including minerals, natural resources and agricultural products etc. the decline in global demands of such commodities occur, as a result of deglobalisation, and that decline further lead to states economic hardships for the export dependent countries (James H. , 2017).

The inadequate distribution of technological capabilities between developed and underdeveloped states is another concern. This technological dependency become worse when restrictions increased on transfer of technology, knowledge and innovation between developed and developing countries, as a result of deglobalization. Moreover, restrictions on technology transfer and intellectual property rights also hinders the capacity of developing and underdeveloped countries to achieve advanced technologies, impeding global economic development and industrialization. Furthermore, economic instability because of deglobalization leads currency depreciation, increased financial dependency, debt crises and capital flight and all this resultantly restricts the sustainable development (James H. , 2017)t.

By emphasizing the unequal power relations between developed and under developed states. Dependency theory also highlight the political dimensions of economic dependency. Deglobalization buttress political dependency by limiting the ability of developing and underdeveloped countries to assert their interests have global influence. The disintegration of the global economy and erosion of multilateral institutions may worsen power imbalances, making it further difficult for underdeveloped states to convey favourable trade agreements, have access to financial assistance from developed states, and to address global challenges such as natural disasters etc (James H. , 2018).

However, despite of the fact that deglobalization offers certain benefits in terms of sovereignty and resilience, the negative implications of it in the form of economic growth, global cooperation, and geopolitical stability cannot be disregarded. Establishing a balance between national interests and international cooperation is crucial in deglobalizing world. Deglobalization further deepens the dependency between developing and underdeveloped countries, by increasing intensifying disparities and vulnerabilities in the global economy.

IMPACT OF DEGLOBALIZATION ON PAKISTAN

As the global world changing from globalization to deglobalization, the implications for developing countries like Pakistan are significant and diverse. Deglobalization, which focuses on diminishing the international trade, restricted capital flows, and economic nationalism (Dadush, 2022), cause considerable difficulties to Pakistan's economy, society, and security. This analysis is based on empirical facts, investigating the possible implications on Pakistan and align them with Pakistan's National Security Policy 2022-2026, which prioritizes comprehensive national security.

Economic Impact

Pakistan's economy largely depends on international trade and foreign investment. Deglobalization may disturb global supply chains, which resultantly can lower the demand for Pakistani goods, and restricted entry to international markets, consequently leading towards drop down in exports, loss of revenue and economic loss and slowdown. Furthermore, deglobalization may also deteriorate already frail economic conditions through increased inflation, rampant unemployment and poverty rates. Moreover, reduced FDIs may jeopardize Pakistan's long-term efforts of achieving economic growth and development, by increasing social inequalities and political instability.

Furthermore, a transition from US dollar as the primary global currency, in a longer run of deglobalization can have momentous implications for smaller states like Pakistan like, a deterioration in the dollar's value can lead to amplified volatility in Pakistan's currency, making it incapable to handling inflation and managing economic growth. If dollar loses its position as the primary global reserve currency, it may decrease foreign investment flows into Pakistan this will limit economic development and employment opportunities. Moreover, being in the situation of inflation, a weaker dollar can make it more difficult and expensive for Pakistan to borrow money from international lenders, which as a result may increase Pakistan's debt.

Besides this, geopolitically, US dollar's supremacy has given US significant geopolitical influence globally. A waning of dollar's position can diminish US influence and possibly lead to multipolar world order. In this scenario, Pakistan may need to form new alliances with other states in order to secure its economic and security interests in a new world order.

Trade and Industry

Pakistan economy heavily rely on export-driven sectors like textiles, which account for over 60% of total exports. Thus, decline global trade because of deglobalization may diminish these export markets, consequently leading towards revenue losses and sector downsizing. Deglobalization will disrupt global supply chains, resultantly raising costs and increasing delays in businesses that are entirely based on imported raw materials, particularly in the automotive and electronics sectors. By deglobalization the Foreign Direct Investment (FDI), a major source of finance for growth and development, is expected to fall, further lowering GDP growth of developing states like Pakistan. According to World Bank a predicted growth rate of 3.4% in 2023, could be further influenced by deglobalization (Rana, 2022).

Social Impact

Through deglobalization the export-oriented industries may decline due to reduced demand, resulting in considerable employment losses. In Pakistan, textile sector alone employs millions of people, and if it gets collapsed it will worsen unemployment. The enhanced unemployment may lead to economic disturbances, drive more individuals into poverty. According to the Asian Development Bank, 24.3% of Pakistan's population would live below the poverty line in 2021 (Bank, 2021). However, growing economic

disparities and fewer job prospects can lead to social discontent, conflicts and political instability.

Security Implications

Deglobalization may directly influence Pakistan's national security, decreasing regional stability and amplifying security risks. The fragmentation of international alliances and cooperations and partnerships may result in complex geopolitical tensions in South Asia, mainly in respect to Pakistan's ties with neighboring India and Afghanistan. Additionally, deglobalization may hinder Pakistan's attempts to combat transnational security challenges such as terrorism, extremism, and organized crimes. Economic disturbances arising from deglobalization also have an indirect influence on national security by creating social and political instability. Economic hardships and disparities may worsen complaints and unrest among underprivileged groups, resulting in social unrest, protests, and even bloodshed. Moreover, economic insecurity may hamper Pakistan's capacity to successfully handle security concerns, threatening national security.

National Security

Economic declines may limit Pakistan's capacity to have more defence spending, lead towards compromising military preparedness and modernization. Expected defence spending 1.804 trillion in financial year 2023-2024, however this figure might be decline due to economic constraints (Assad, 2023). Moreover, economic challenges can also increase internal security issues such as terrorism and insurgency, making marginalized groups more susceptible to radicalization. As a result of deglobalization, reduced economic interconnectedness may lead to growing geopolitical rivalries in South Asia, especially with India. Pakistan's strategic partnerships and security cooperation also required to be reexamined in a less linked global world. However, maintaining strategic autonomy becomes difficult when economic ties change. Pakistan should handle progressively difficult interactions with global giants such as the United States and China.

Alignment with National Security Policy of Pakistan 2022-2026

Pakistan's National Security Policy 2022-2026 establishes a comprehensive approach to security that includes economic, military, and human security sectors. NSPP (2022-2026) also provides some key solutions for mitigating the effects of deglobalisation include:

Encouraging regional trade by improving trade links with adjacent nations and regional blocs to counterbalance some of the losses from global trade decrease.

Investing in home sectors to lessen dependency on imports and enhance self-sufficiency is also important.

Mounting social protection services to assist disadvantaged people during economic changes, along with focusing on education and skill development, are important for preparing the workforce for new economic certainties.

Sustaining a balanced approach in relations with the US and China to guarantee strategic advantages while retaining autonomy, accentuation cost-effective military strategies, and pursuing international defence cooperation to sustain security capabilities, are also vital strategies.

Conclusion

Deglobalisation, characterized by diminishing global interdependence and integration and is increasingly seen as fuelled by host of factors, including (but not limited to) resurgence of nationalist policies, protectionist trade measures, the impacts of the COVID-19 pandemic, and the geopolitical rivalries that challenge the cooperative frameworks of globalization. The world has witnessed an increasing trend toward reshoring manufacturing, stringent immigration policies, and trade wars, all of which suggest a retreat from the hyper-globalized world of the past few decades. Globally, the consequences of deglobalisation are profound. The reconfiguration of global supply chains leads to higher costs of production and goods, contributing to inflationary pressures worldwide.

From the prism of theories of liberalism and realism, deglobalisation presents a complex and multifaceted phenomenon that can be seen as both an unavoidable reality and a suspicious myth. Liberalism, which emphasizes the benefits of economic interdependence, international cooperation, and global governance, views deglobalisation skeptically. Liberals argue that the interconnectedness fostered by globalization promotes peace, prosperity, and collective security. Thus, the current trends towards protectionism and nationalism are viewed as temporary setbacks rather than a fundamental shift away from globalization. In contrast, realism, which prioritizes national interests, power dynamics, and state sovereignty, interprets deglobalisation as a logical and unavoidable response to global uncertainties and inequalities. Realists assert that states are inherently self-interested actors seeking to maximize their security and power. The resurgence of protectionist policies and the retreat from international cooperation are seen as rational strategies in an increasingly multipolar world marked by geopolitical rivalries and economic competition.

The impact of deglobalisation on the world as a whole is significant. It threatens to reduce economic growth, increase costs, and disrupt global supply chains, with advanced economies facing slower growth and developing countries experiencing heightened economic instability. Developing nations, reliant on global trade and investment, are particularly vulnerable. They face increased poverty, unemployment, and reduced access to technology and markets, exacerbating economic disparities. Developing countries, in particular, are hit hardest by deglobalisation. These economies often rely heavily on access to global markets for their exports, foreign direct investment, and technological transfers. With the contraction of global trade and investment flows, these countries face increased poverty, unemployment, and economic instability. The withdrawal of multinational corporations and the decrease in foreign investments strip these economies of vital resources needed for development and growth. Moreover, the lack of access to international markets and technology hampers their ability to compete on a global scale, further entrenching economic disparities.

The transnational security implications of deglobalisation are equally significant. The retreat from multilateralism and international cooperation weakens the global capacity to address shared challenges, such as climate change, pandemics, and terrorism. In a deglobalised world, countries prioritize their national interests, often at the expense of collective security and

stability. This shift leads to an increase in regional conflicts and geopolitical rivalries, as countries become more inward-looking and less willing to engage in cooperative security frameworks. The erosion of international institutions that mediate conflicts and foster cooperation further destabilizes the global order, making the world a more unpredictable and volatile place. The stressed and creates space for nefarious and non state actors to exploit the fissures and inherent weakness of the global system leading to weakened international institutions, reduced cooperation on global challenges like terrorism and climate change, and heightened regional conflicts.

For Pakistan, such and environment means navigating a more unstable regional security environment, especially with its complex relations with India and Afghanistan. Economic hardships due to reduced trade and investment can exacerbate domestic unrest, while diminished international cooperation may leave Pakistan more isolated in addressing its security concerns. Economically, Pakistan could face significant hardships due to the reduction in global trade and investment flows. The country's reliance on foreign aid, remittances, and exports means that any contraction in these areas could exacerbate existing economic challenges, such as unemployment and poverty. These economic pressures can fuel domestic unrest and weaken the state's ability to maintain internal stability. Reduced international cooperation and weakened multilateral institutions could lead to increased regional tensions and conflicts. Pakistan may need to navigate a more complex and unstable security landscape, balancing its relationships with major powers like the United States and China while addressing regional security threats while safeguarding its national interests.

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Digital Age and Human Behavior

ANALYZING THE INFLUENCE OF DIGITAL CURRENCY ADOPTION ON TRADITIONAL BANKING SYSTEMS THROUGH DATA ANALYTICS: A STUDY ON EMERGING ECONOMIES

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Abstract

This study delves into the ramifications of digital currency assimilation within traditional banking systems, with a specific emphasis on emerging economies, notably Pakistan. Motivated by the escalating prominence of digital currencies and their potential to disrupt conventional banking practices. The research formulates three hypotheses to scrutinize the interrelationships between digital currency adoption, technological infrastructure, regulatory frameworks, and the operational performance of conventional banks. Employing a structured questionnaire, disseminated amongst professionals in the banking and financial sector, as well as users of both digital currencies and traditional banking services, the investigation unfolds a nuanced understanding from diverse vantage points. The findings elucidate a positive correlation between heightened digital currency adoption and the enhanced performance of conventional banks. Additionally, a robust technological infrastructure and a conducive regulatory environment emerge as pivotal factors significantly shaping the performance of traditional banks in the milieu of digital currency adoption. These empirical results contribute substantively to the extant literature, underscoring the imperative for banks to acclimate to technological progressions and for policymakers to cultivate regulatory frameworks that strike a judicious balance between innovation and financial stability. While the study proffers valuable insights, it remains cognizant of its limitations in scope and propounds directions for future research, advocating for broader geographical representation and the exploration of other nascent technologies within the realm of finance.

Keywords: Digital Currency Adoption, Traditional Banking Systems, Technological Infrastructure, Regulatory Environment, Developed Economies, Emerging Economies, Financial Technology, Quantitative Research.

INTRODUCTION

The rapid proliferation of digital currencies is reshaping the global financial landscape, challenging traditional banking systems (Rehman et al., 2023). In recent years, there has been a surge in the adoption of digital currencies, with the global market capitalization of cryptocurrencies exceeding \$2 trillion in 2021, as reported by Statista(Rehman et al., 2023). This dramatic rise is not only a reflection of growing investor interest but also indicates a shift in consumer preferences towards more digitalized financial services. Notably, developed economies have been at the forefront of this shift, incorporating advanced technological infrastructure and regulatory frameworks that facilitate the use of digital currencies(Rehman et al., 2023). Turning our focus to Pakistan, the scenario presents a contrasting picture. According to the State Bank of Pakistan, as of 2020, the country has witnessed a burgeoning interest in digital currencies, despite facing regulatory and infrastructural challenges (Haque et al., 2023; Shaikh & Amin, 2023). Pakistan's fintech sector is still in its infancy, grappling with issues such as low digital literacy rates and limited access to modern financial services (Bodie & Dutta, 2008).

The adoption of digital currencies in Pakistan has been primarily driven by the younger demographic, seeking alternatives to conventional banking systems(Rehman et al., 2023). However, this growing interest clashes with the regulatory uncertainties and the lack of a robust technological framework, posing significant challenges to the integration of digital currencies into the mainstream financial system (Chen et al., 2023; Fabris & Lazić, 2022; Pandey et al., 2023). The traditional banking system's performance, a term initially conceptualized by banking and finance scholars, serves as a crucial factor in understanding the financial health and stability of a nation's economy(Chen et al., 2023; Fabris & Lazić, 2022; Pandey et al., 2023)., This encompasses aspects like profitability, customer base, and service diversity, all indicative of a banking system's robustness and adaptability to changing financial landscapes.

In the global context, the rise of digital currencies poses significant implications for traditional banking., Developed economies, which have embraced these changes, show a trend where traditional banks are either adapting or collaborating with digital finance platforms(Chiu & Keister, 2022)., However, in countries like Pakistan, where digital currency adoption is still in a nascent stage, the traditional banking system faces challenges in terms of integrating with these new financial technologies(Wang et al., 2022)., The lag in adoption can lead to a gap in financial services offered, potentially affecting the banking sector's performance and customer satisfaction. The importance of understanding digital currency adoption and technological infrastructure in this context cannot be overstated(Chiu & Keister, 2022; Wang et al., 2022).

These variables are key to bridging the gap between traditional banking and modern financial practices., For example, increased digital currency adoption, supported by a robust technological infrastructure, can lead to more inclusive financial services and potentially improve traditional banking system performance.

In contrast, a lack of focus on these areas can widen the existing divide, particularly in emerging economies like Pakistan., Yet, integrating these new elements into the traditional banking framework is not without challenges. For instance, the rapid adoption of digital currencies without adequate regulatory frameworks can lead to market instability and security concerns(Chiu & Keister, 2022; Huang & Mayer, 2022; Wang et al., 2022)., Therefore, the

balance between innovation and regulation is crucial. The available literature on the performance of traditional banking systems in the face of digital currency adoption is limited., Most studies have focused on either aspect in isolation, not exploring the relationship between these emerging and traditional financial paradigms., This study, therefore, is both important and novel as it addresses this gap. This research differs from previous studies in its methodological approach and conceptual framework. While prior research has primarily focused on either traditional banking performance or digital currency adoption in isolation, this study explores the interplay between these elements., Additionally, it uses a comparative approach, examining both developed and emerging economies, thereby providing a more global perspective. The primary focus of this research was to examine the influence of digital currency adoption on traditional banking systems, particularly contrasting the dynamics in developed and emerging economies like Pakistan. This investigation was essential due to the increasing prevalence of digital currencies and their potential to disrupt the conventional banking landscape.

The study was structured around three main hypotheses: H1 proposed a positive influence of digital currency adoption rate on traditional banking performance; H2 suggested that a well-established technological infrastructure positively impacts traditional banking performance in the context of digital currency adoption; and H3 posited that a supportive regulatory environment enhances the performance of traditional banks in the digital currency era.

A quantitative research methodology was employed, utilizing a structured questionnaire distributed to a mix of professionals from the banking and financial sector and users of both traditional banking services and digital currencies. This approach provided a comprehensive perspective from both service providers and users. The results supported all three hypotheses. A significant positive relationship was found between the adoption rate of digital currencies and traditional banking performance, indicating that increased adoption of digital currencies correlates with enhanced performance of traditional banks. Similarly, the study found that a robust technological infrastructure positively influences traditional banking performance, suggesting that technological readiness is crucial for traditional banks in the digital era. Lastly, the results showed that a supportive regulatory environment plays a vital role in facilitating the positive impact of digital currencies on traditional banking systems.

The results of this study contribute significantly to the body of knowledge., For policymakers, the findings underscore the importance of creating balanced regulatory frameworks that foster digital currency adoption while ensuring the stability of traditional banking systems., From a practical standpoint, this study highlights the need for banks to adapt and integrate digital financial services to remain competitive and relevant. The remainder of the paper is structured as follows: The next section outlines the research methodology, followed by a detailed analysis of the results., The subsequent sections discuss the findings in the context of the current financial landscape, exploring implications for policymakers and banking institutions., Finally, the paper concludes with a summary of the key findings, limitations of the study, and directions for future research.

LITERATURE REVIEW

The performance of traditional banking systems, a concept deeply analyzed in financial literature, stands as a cornerstone in assessing the health and resilience of a financial sector (Chen et al., 2023; Fabris & Lazić, 2022; Pandey et al., 2023). The seminal work of Berger and

Humphrey (1997) in measuring bank efficiency laid a foundational understanding of banking performance, encompassing profitability, risk management, customer satisfaction, and service innovation (Mirza et al., 2023). In the current financial landscape, the performance of traditional banks is increasingly scrutinized under the lens of technological disruptions, particularly the advent of digital currencies. The importance of traditional banking performance in the context of digital currency adoption is twofold. Firstly, as Rehman et al. (2023) notes, the financial sector's stability is paramount to a country's economic health. Traditional banks, being pivotal financial institutions, play a crucial role in maintaining this stability. Secondly, the emergence of digital currencies represents both a challenge and an opportunity for traditional banks. A study by Demirgüç-Kunt et al. (2018) highlights the potential of digital currencies to revolutionize financial services, prompting banks to innovate or risk obsolescence. The relationship between the adoption of digital currencies and traditional banking performance is complex. Digital currency adoption, as an independent variable, can be seen as both a threat and an opportunity for traditional banks (Dong et al., 2023). On one hand, it challenges the existing business models of banks, as indicated by, who notes the disruptive potential of blockchain technology. On the other hand, digital currencies can offer traditional banks new avenues for growth and efficiency, as seen in studies focusing on blockchain's potential to reduce transaction costs (Dong et al., 2023).

Technological infrastructure, another independent variable, directly impacts how effectively traditional banks can respond to digital currencies. A robust technological infrastructure enables banks to integrate new technologies, as suggested by, who discuss the banks' increasing interest in blockchain technology (Chi6n et al., 2020; Lahiya & Mokodenseho, 2023). The regulatory environment, often acting as a mediator, shapes the extent and manner in which digital currencies can be adopted. Pandya et al. (2022); Smith et al. (2021) emphasize the need for a balanced regulatory approach to foster innovation while ensuring financial stability. Despite extensive research on individual aspects of this theme, there is a noticeable gap in literature when it comes to an integrated analysis of how digital currency adoption, technological infrastructure, and regulatory environments collectively impact traditional banking performance. Most studies tend to focus on a singular aspect, leaving a lacuna in understanding the synergetic effects of these variables.

The problem statement, therefore, emerges from this literature gap: How does the adoption of digital currencies, influenced by technological infrastructure and regulatory environments, impact the performance of traditional banking systems emerging economies?

THEORETICAL FRAMEWORK AND HYPOTHESES

The theoretical framework for this study is grounded in the Diffusion of Innovations Theory by Mo et al. (2021) which provides a lens to understand how new technologies (digital currencies) are adopted and the impact of this adoption on existing systems (traditional banks).

Hypothesis Development

Based on this theory and supported by previous literature, the following hypotheses are proposed:

H1. Higher rates of digital currency adoption correlate positively with traditional banking performance, as banks adapt to new technological paradigms.

H2. A developed technological infrastructure in a banking system positively influences the impact of digital currency adoption on traditional banking performance.

H3. A supportive regulatory environment mediates the relationship between digital currency adoption and traditional banking performance, facilitating a positive impact. These hypotheses aim to explore the dynamics between digital currency adoption and traditional banking performance, considering the roles of technological infrastructure and regulatory environments. They represent an attempt to bridge the existing literature gap and contribute to a more comprehensive understanding of these interrelated variables.

METHODOLOGY

Research Population and Sampling

The research population for this study was focused on professionals working in the banking and financial sector, as well as individuals who are users of both traditional banking services and digital currencies. This population provides a diverse perspective on the impact of digital currency adoption on traditional banking systems (Dong et al., 2023).

Sampling Method

A stratified sampling method was employed to ensure a representative sample of the population. This approach allowed the study to capture a wide range of opinions and experiences, encompassing various levels of familiarity and engagement with digital currencies and traditional banking services.

DATA COLLECTION PROCESS

Method of Data Collection The primary data for this study was collected through a structured questionnaire. The questionnaire was designed to assess respondents' perceptions and experiences regarding the adoption of digital currencies and its impact on traditional banking performance.

Table 1: Descriptive Statistics of Respondents

Respondent Category	Number Respondents	of	Percentage of Respondents
Banking and Financial Sector Professionals	160		50%
Users of Digital Currencies and Traditional Banking	160		50%

The table 1 shows an equal distribution of respondents, with half being professionals in the banking and financial sector and the other half being users of both digital currencies and traditional banking services. This balanced approach ensures a comprehensive perspective from both sides of the financial spectrum. The chosen respondents are critical for this study as they provide insights from both the service provider's and the user's perspectives. As noted in studies like Demirgüç-Kunt et al. (2018), understanding the perceptions of those who are directly

impacted by the digitalization of financial services is key to assessing the real-world implications of digital currency adoption. Moreover, professionals in the banking and financial sector offer an insider's view on how traditional banks are responding to the advent of digital currencies. This dual perspective enriches the study's findings, making them more relevant and applicable to current financial scenarios.

Table 2: Non-Response Bias Analysis

LEVENE'S TEST VALUE	LEVENE'S F TEST SIG.	T-TEST T VALUE	T-TEST DF	T-TEST SIG. (2- TAILED)	MEAN DIFFERENCE	STD. ERROR DIFFERENCE	95% CONFIDENCE INTERVAL OF THE DIFFERENCE
0.094	0.759	1.628	0.105	0.105	0.287	0.176	[-0.105, 0.105]

The table 2 presents results from Levene's test and an independent samples t-test conducted to analyze non-response bias based on response mode (email vs. post). The F value of 0.094 with a significance (p-value) of 0.759 suggests that there are no significant differences in variances between the two groups. This implies that the variance in responses from email and post is similar, indicating uniformity in the data collection process. The t-value of 1.628 with a 2-tailed significance of 0.105 indicates that there is no significant mean difference between the responses obtained via email and post. The mean difference is 0.287 with a standard error of 0.176, and the 95% confidence interval lies between -0.105 and 0.105.

Common Method Bias Analysis

Common method bias is a concern in survey research, as it can distort the true relationship between variables due to the method of data collection. This bias can manifest when both the predictor and criterion variables are collected at the same time and from the same source. To assess for common method bias, statistical techniques like Harman's single-factor test or the use of a marker variable can be employed. However, these methods are not infallible and should be interpreted with caution (Aguirre-Urreta & Hu, 2019). In this study, due to the limitations of the dataset, we are unable to conduct a formal analysis of common method bias. However, the diversity in response modes (email, post, etc.) and the lack of significant non-response bias suggest a lower risk of common method bias. Future studies could benefit from employing more robust methods to assess and control for this type of bias.

Table 3: Construct Measurement

Construct			Measurement Item	Measurement Scale
Digital Currency Adoption Rate			Frequency of using digital currencies	5-point Likert scale
			Perceived ease of digital currency transactions	5-point Likert scale
Technological Infrastructure			Awareness of digital currency benefits	5-point Likert scale
			Availability of internet access	5-point Likert scale
			Presence of digital currency ATMs	Binary (Yes/No)
Regulatory Environment			Investment in blockchain technology	5-point Likert scale
			Clarity of digital currency regulations	5-point Likert scale
			Supportiveness of government policies	5-point Likert scale
			Regulatory barriers to digital currency use	5-point Likert scale
Traditional Banking Performance	System		Bank's profitability	Financial metric
			Customer retention rate	Percentage
			Diversity of financial products	Count of products

DISCUSSION ON CONSTRUCT MEASUREMENT

The construct measurement table 3 outlines how each construct in the study is operationalized. The measurement scales vary based on the nature of the construct, ranging from Likert scales for subjective assessments to objective metrics like financial data and percentages.

Digital Currency Adoption Rate

Measured through a 5-point Likert scale, this construct captures subjective perspectives on the frequency of using digital currencies, the ease of transactions, and awareness of their benefits. These items provide insights into the level of adoption and user attitudes towards digital currencies.

Technological Infrastructure

This construct is measured through both Likert scale items and a binary option. The availability of internet access and investment in blockchain technology are quantified through Likert scales, while the presence of digital currency ATMs is captured as a binary response. These items collectively assess the infrastructure supporting digital currency usage.

Regulatory Environment

Also measured on a 5-point Likert scale, this construct evaluates the clarity of regulations, government supportiveness, and regulatory barriers. These aspects are critical in understanding the regulatory landscape surrounding digital currencies.

Traditional Banking System Performance

This construct is evaluated using objective metrics such as financial profitability, customer retention rates, and the diversity of financial products offered by banks. These metrics provide a comprehensive view of how traditional banking systems are performing in the context of increasing digital currency adoption. The diverse measurement scales ensure a comprehensive and multi-faceted assessment of each construct, facilitating a nuanced understanding of the study's subject matter.

Table 4: Pretest Results

Construct	Skewness	Kurtosis
Digital Currency Adoption Rate	0.21	-1.17
Technological Infrastructure	-0.06	-0.99
Regulatory Environment	0.31	-0.97
Traditional Banking System Performance	0.03	-1.18

DISCUSSION ON PRETEST RESULTS

The pretest results provide an initial examination of the data distribution for each construct. Skewness and kurtosis values are used to assess the normality of the data. In this case,

the skewness values for all constructs are close to zero, suggesting that the data distribution is fairly symmetrical. However, the kurtosis values are slightly negative, indicating a flatter distribution compared to a normal distribution. These results imply that while there is no significant skewness in the data, the flatness of the distributions should be considered when interpreting the results.

Table 5: Pilot Test Results

Construct	Cronbach's Alpha
Digital Currency Adoption Rate	0.75
Technological Infrastructure	0.78
Regulatory Environment	0.80
Traditional Banking System Performance	0.82

The pilot test results (see table 5), specifically the Cronbach's Alpha values, are crucial for assessing the reliability of the constructs. A Cronbach's Alpha value above 0.70 is generally considered acceptable, indicating good internal consistency. In this study, all constructs show Alpha values above this threshold, suggesting that the items within each construct are reliably measuring the intended concepts. The highest reliability is observed in the 'Traditional Banking System Performance' construct, which has an Alpha value of 0.82. These results indicate that the survey instrument is likely to produce consistent and reliable data, which is essential for the validity of the study's findings.

Table 6: Reliability and Convergent Validity Results

Construct	Cronbach's Alpha	Average Variance Extracted (AVE)
Digital Currency Adoption Rate	0.82	0.62
Technological Infrastructure	0.79	0.58
Regulatory Environment	0.76	0.60
Traditional Banking System Performance	0.85	0.65

DISCUSSION ON RELIABILITY AND CONVERGENT VALIDITY

The table 6 showcases the reliability and convergent validity of each construct used in the study. Cronbach's Alpha values for all constructs are above the generally accepted threshold of 0.70. This indicates a high level of internal consistency within each construct. For instance, 'Digital Currency Adoption Rate' and 'Traditional Banking System Performance' demonstrate particularly strong reliability with Alpha values of 0.82 and 0.85, respectively. These results suggest that the survey items reliably measure the intended constructs. The Average Variance Extracted (AVE) values for all constructs exceed the recommended threshold of 0.50. This indicates that a significant portion of the variance in the survey responses can be attributed to the respective constructs they are intended to measure. For example, the 'Traditional Banking System Performance' construct has an AVE of 0.65, suggesting that the items associated with this construct have a high degree of common variance.

Table 7: Discriminant Validity Results

Construct	Digital Currency Adoption Rate	Technological Infrastructure	Regulatory Environment	Traditional System Performance	Banking
Digital Currency Adoption Rate	0.787	0.400	0.300	0.350	
Technological Infrastructure	0.400	0.762	0.450	0.250	
Regulatory Environment	0.300	0.450	0.775	0.500	
Traditional Banking System Performance	0.350	0.250	0.500	0.806	

The discriminant validity of the constructs in this study is evaluated using the Fornell Larcker Criterion, which compares the square root of Average Variance Extracted (AVE) for each construct (diagonal elements) to the correlations between the constructs (offdiagonal elements). The square root of the AVE (0.787) is greater than its highest correlation with any other construct (0.400), confirming discriminant validity. Similarly, its square root of AVE (0.762) exceeds its highest correlation with other constructs (0.450). This construct also shows discriminant validity as its square root of AVE (0.775) is higher than its correlations with other constructs (highest being 0.500). The square root of AVE (0.806) surpasses its highest correlation with any other construct (0.500), ensuring discriminant validity.

These findings indicate that each construct in the study is distinct and measures a different concept, which is essential for the validity of the research. The constructs are not only reliably measuring their respective variables (as shown by Cronbach's Alpha and AVE) but also maintain distinctiveness from each other, further strengthening the robustness of the measurement model used in this study. The results support the conceptual framework of the study, ensuring that the constructs of digital currency adoption rate, technological infrastructure, regulatory environment, and traditional banking system performance are unique and contribute independently to the research model. This distinctiveness is crucial for accurately interpreting the relationships and impacts these constructs have on each other in the context of the study.

RESULTS AND DISCUSSION

Hypothesis 1. Digital Currency Adoption Rate -> Traditional Banking System Performance

- Path Coefficient: 0.45
- t-Value: 5.2
- Result: Supported

Key Findings & Discussion

This result indicates a significant positive relationship between the adoption rate of digital currencies and the performance of traditional banking systems. The path coefficient of 0.45, with a high t-value, suggests that as the adoption of digital currencies increases, there is a corresponding positive impact on traditional banking performance. This finding aligns with the assertions by scholars like Rehman et al. (2023) and Demirgüç-Kunt et al. (2018), who

emphasize the potential transformative impact of digital technologies on traditional financial services. For banks and financial institutions, this underscores the importance of adapting to digital currency trends, not only to remain competitive but also to leverage these new technologies for improved performance.

Hypothesis 2: Technological Infrastructure -> Traditional Banking System Performance

- Path Coefficient: 0.38
- t-Value: 4.8
- Result: Supported

Key Findings & Discussion

The hypothesis testing reveals that technological infrastructure significantly influences traditional banking performance. The positive path coefficient of 0.38 suggests that a robust technological infrastructure, which facilitates the use and integration of digital currencies, positively impacts the performance of traditional banks. This supports Rehman et al. (2023) findings on the importance of technological advancement in banking. This highlights the need for ongoing investment in technology by traditional banks, not just in terms of digital currency but broader digital transformation.

Hypothesis 3: Regulatory Environment -> Traditional Banking System Performance

- Path Coefficient: 0.42
- t-Value: 5.0
- Result: Supported

Key Findings & Discussion

The data supports the hypothesis that a supportive regulatory environment positively impacts the performance of traditional banks in the context of digital currency adoption. The path coefficient of 0.42 indicates a substantial influence, suggesting that clear and favorable regulations can enhance the ability of traditional banks to adapt and thrive amidst the rise of digital currencies, as discussed by (Dong et al., 2023). This finding is particularly relevant for policymakers, as it emphasizes the role of regulatory frameworks in shaping the digital currency landscape and its interaction with traditional banking.

Table 8. Hypothesis Testing Results

Hypothesis	Path	Path Coefficient	t-Value	Standard Error	Result
H1: Digital Currency Adoption Rate -> Traditional Banking System Performance	Digital Currency Adoption Rate -> Traditional Banking System Performance	0.45	5.2	0.09	Supported
H2: Technological Infrastructure -> Traditional Banking System Performance	Technological Infrastructure -> Traditional Banking System Performance	0.38	4.8	0.08	Supported
H3: Regulatory Environment -> Traditional Banking System Performance	Regulatory Environment -> Traditional Banking System Performance	0.42	5.0	0.08	Supported

These findings collectively offer valuable insights into the dynamics between digital currency adoption, technological infrastructure, regulatory environment, and traditional banking system performance. The results underscore the importance of an integrated approach, where banks and policymakers need to consider the synergistic effects of digital currency trends, technological advancements, and regulatory frameworks to enhance the performance and resilience of traditional banking systems.

CONCLUSION

The primary focus of this research was to examine the influence of digital currency adoption on traditional banking systems, particularly contrasting the dynamics in developed and emerging economies like Pakistan. This investigation was essential due to the increasing prevalence of digital currencies and their potential to disrupt the conventional banking landscape. The study was structured around three main hypotheses: H1 proposed a positive influence of digital currency adoption rate on traditional banking performance; H2 suggested that a well-established technological infrastructure positively impacts traditional banking performance in the context of digital currency adoption; and H3 posited that a supportive regulatory environment enhances the performance of traditional banks in the digital currency era. A quantitative research methodology was employed, utilizing a structured questionnaire distributed to a mix of professionals from the banking and financial sector and users of both traditional banking services and digital currencies. This approach provided a comprehensive perspective from both service providers and users. The results supported all three hypotheses. A significant positive relationship was found between the adoption rate of digital currencies and traditional banking performance, indicating that increased adoption of digital currencies correlates with enhanced performance of traditional banks. Similarly, the study found that a robust technological infrastructure positively influences traditional banking performance, suggesting that technological readiness is crucial for traditional banks in the digital era. Lastly, the results showed that a supportive regulatory environment plays a vital role in facilitating the positive impact of digital currencies on traditional banking systems. This study contributes significantly to the existing body of knowledge in financial technology. It provides empirical evidence on how digital currency adoption, coupled with technological infrastructure and regulatory environment,

can influence traditional banking systems. By comparing developed and emerging economies, the study offers a broader understanding of these dynamics globally.

IMPLICATIONS OF THE STUDY

The findings have critical implications for both practitioners and policymakers. For traditional banks, the study highlights the importance of embracing digital currencies and investing in technological infrastructure to remain competitive. For policymakers, the results underscore the need for creating balanced regulatory frameworks that foster the growth of digital currencies while ensuring the stability and performance of traditional banking systems.

LIMITATIONS AND FUTURE STUDIES

While the study makes notable contributions, it is essential to acknowledge certain limitations. The data collection method, relying on a questionnaire, introduces potential biases inherent in self-reported data. Furthermore, the study's focus on specific developed and emerging economies may constrain the generalizability of its findings. Future research endeavors could broaden the scope by incorporating more diverse geographical regions, thereby enhancing the external validity of the study. Additionally, there is an opportunity to delve into the repercussions of other emerging technologies such as blockchain and artificial intelligence (AI) on traditional banking systems. Conducting longitudinal studies would offer valuable insights into the dynamic evolution of the identified relationships over time. In conclusion, this study offers valuable insights into the intricate dynamics between digital currency adoption and the performance of traditional banking institutions. It underscores the imperative for conventional banks to adeptly respond to technological transformations and highlights the role of regulatory bodies in fostering an environment that concurrently supports innovation and ensures stability within the financial sector.

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**ENHANCING PROJECT MANAGEMENT EFFICIENCY THROUGH AI
INTEGRATION, TEAM PROFICIENCY, AND ORGANIZATIONAL SUPPORT: A
STUDY IN THE PAKISTANI CONTEXT**

Aasim Munir Dad, Abdur Rahman Khan, Asif Jamal

Abstract

In the realm of Artificial Intelligence (AI) integration and project management efficiency (PME), a comprehensive research study has been conducted, primarily focusing on various industries in Pakistan. The intricate interplay between AI integration, team proficiency in AI, organizational support for AI technologies, and PME forms the crux of this investigation. The theoretical underpinning of this research has been rooted in the Resource-Based View (RBV) theory. Data for this study have been collected through a structured questionnaire survey, targeting a diverse group comprising project managers, IT managers, senior executives, and other key personnel engaged in AI-driven decision support systems. The research has revealed significant positive correlations between the integration of AI, team proficiency in AI, organizational support for these technologies, and PME. These findings highlight the crucial role these elements play in enhancing project outcomes. This study by uncovering these relationships, offers valuable insights for organizations aiming to optimize their project management practices, especially in emerging economies like Pakistan. It contributes to the existing body of knowledge by providing a nuanced understanding of how AI integration can be leveraged to enhance project management efficiency. Furthermore, the study discusses broader implications for policy and suggests directions for future research, emphasizing the strategic importance of nurturing AI competencies and fostering organizational support for AI technologies to realize enhanced project management outcomes.

Keywords: Project Management Efficiency, Artificial Intelligence Integration, Team Proficiency in AI, Organizational Support, Resource-Based View, Emerging Economies, Decision Support Systems, Pakistan

INTRODUCTION

Globally, the integration of Artificial Intelligence (AI) in project management is revolutionizing the way businesses operate. Recent studies reveal that AI-driven decision support systems significantly enhance project efficiency, with improvements reported in cost reduction, time management, and resource allocation (Tosic, 2023). The global AI market in project management is projected to reach a substantial value by 2025, showcasing an increasing reliance on AI for operational efficiency. This transformation is driven by AI's ability to provide predictive analytics, automate routine tasks, and facilitate informed decision-making (Allal-Chérif et al., 2021).

In Pakistan, the adoption of AI in project management is still in nascent stages compared to global trends (Mohite et al., 2024). Challenges such as limited technological infrastructure, lack of skilled workforce, and inadequate organizational support impede the full-scale implementation of AI-driven systems (Gros et al., 2023). Studies focusing on Pakistani industries indicate a substantial gap in AI integration in project management practices, hindering efficiency and competitiveness in a global context.

Efficiency in project management, as first defined by scholars like Tosic (2023), is critical in determining the success of projects. It encompasses the effective use of resources, timely completion of projects, and attainment of project goals. Inefficiencies in this domain, both globally and specifically in Pakistan, can lead to cost overruns, delayed project completions, and suboptimal utilization of resources. The efficacy of project management directly influences organizational success. In the context of AI integration, the existing inefficiencies in project management could be further exacerbated if not addressed adequately (Khan et al., 2023).

The global market, including Pakistan, stands to benefit significantly from improved project management practices. AI-driven decision support systems can potentially transform these challenges into opportunities, enhancing overall efficiency and competitiveness (Mohite et al., 2024; Tosic, 2023; Wamba-Taguimdje et al., 2020). This research emphasizes the vital role of AI integration, team proficiency in AI, and organizational support for AI technologies in enhancing project management efficiency.

Existing literature suggests that higher AI integration leads to better project planning and execution, while a proficient team can leverage AI tools more effectively, ensuring optimal outcomes. Furthermore, organizational support is crucial in providing the necessary resources and environment for successful AI implementation (Ribeiro et al., 2021; Tosic, 2023; Wamba-Taguimdje et al., 2020). If these aspects are well-managed, they could significantly contribute to resolving the global and country-specific issues in project management.

However, there is a flip side to consider. Improper integration of AI, without adequate team proficiency and organizational support, can complicate project management processes. For instance, over-reliance on AI without proper understanding could lead to misinterpretation of data and faulty decision-making. Furthermore, inadequate organizational support for AI technologies might result in inefficient utilization of these advanced tools, potentially leading to higher costs and reduced effectiveness (Rana et al., 2022). The problem statement of this study, therefore, revolves around understanding how AI-driven decision support systems impact project management efficiency in the context of Pakistan, considering the unique challenges faced by the

country (Tosic, 2023). While there is ample literature on the importance of AI in enhancing project management efficiency, there is a dearth of studies that specifically explore the relationship between AI integration, team proficiency in AI, organizational support, and project management efficiency, particularly in the context of developing countries like Pakistan (Rana et al., 2022; Ribeiro et al., 2021; Tosic, 2023; Wamba-Taguimdje et al., 2020). This study aims to fill this gap by exploring how these factors interact and influence project management efficiency in Pakistan, providing a novel insight into this field.

This study distinguishes itself from previous research through its unique methodological approach, conceptual framework, and the context of a developing country. While previous studies have focused on the general application of AI in project management, this research delves into the specific aspects of AI integration, team proficiency, and organizational support, offering a more nuanced understanding of their impact on project efficiency.

The study's results indicate a significant positive relationship between AI integration, team proficiency, organizational support, and project management efficiency. These findings contribute valuable insights for policymakers and practitioners, emphasizing the need for a strategic approach towards AI adoption in project management.

The study also highlights the necessity of developing AI-related skills among project teams and ensuring robust organizational support for AI technologies. The remainder of the paper is organized as follows: a detailed review of the literature on AI in project management and its efficiency, a comprehensive methodology section outlining the research design and data collection methods, followed by a rigorous analysis of the results.

The discussion section interprets these findings in the context of existing literature, drawing parallels and highlighting divergences. Finally, the paper concludes with implications for policy and practice, providing recommendations for businesses and stakeholders in Pakistan and similar developing economies. This structure ensures a holistic understanding of the study's context, methodology, and its implications for the field of AI-driven project management.

LITERATURE REVIEW

Project management efficiency, often measured in terms of timely completion, resource optimization, and goal achievement, is a pivotal factor in determining the success of projects across various industries. Seminal works by scholars like Coelho et al. (2023) emphasize the criticality of efficiency in project management for achieving strategic objectives and maintaining competitive advantage. This aspect becomes even more crucial in a rapidly evolving technological landscape, where the integration of advanced tools like AI significantly impacts operational outcomes. Globally, efficiency in project management is synonymous with organizational success. Efficient management ensures optimal resource utilization, minimizes delays, and enhances productivity, as noted by (Alevizos et al., 2023). In countries like Pakistan, where project management practices are still developing, enhancing efficiency is not just a means to improve project outcomes but also a strategy to strengthen global competitiveness and economic growth (Alevizos et al., 2023; Almashhadani & Almashhadani,

2023a, 2023b; Coelho et al., 2023; Hindarto, 2023; Marnewick, 2023; Mohite et al., 2024; Shi et al., 2023; Tijani et al., 2024; Tomic, 2023; Wamba-Taguimdje et al., 2020).

The integration of AI in decision support systems is seen as a transformative approach to augmenting project management efficiency. AI's ability to provide predictive insights, streamline processes, and automate tasks positions it as a key driver in optimizing project outcomes. For instance, a study by Tomic (2023) demonstrated how AI tools significantly reduce project durations and costs while improving quality. Team proficiency in AI is crucial for leveraging the full potential of AI-driven systems. As argued by Sottolare, the effective use of AI tools depends heavily on the team's ability to interpret and apply AI-generated insights. Similarly, organizational support plays a critical role in successful AI integration.

Investment in AI technologies, training, and creating an AI-conducive culture are essential for harnessing AI's benefits, as evidenced in studies like those by (Santoso & Harianto, 2023). While existing literature extensively discusses the benefits of AI in project management, there remains a gap in understanding the dynamics of AI integration, team proficiency, and organizational support in enhancing project management efficiency, particularly in emerging markets like Pakistan. This gap presents a need to explore how these factors collectively contribute to optimizing project outcomes in specific economic and technological contexts.

THEORETICAL SUPPORT FOR RELATIONSHIPS

The Resource-Based View (RBV) theory, propounded by Barney (1991), provides a robust framework for understanding these relationships. RBV posits that organizational resources and capabilities are key to achieving competitive advantage. In this context, AI integration, team proficiency, and organizational support can be viewed as valuable resources that enhance project management efficiency (Adam et al., 2020; Mohite et al., 2024).

HYPOTHESIS DEVELOPMENT

H1. Based on the RBV theory, AI integration is hypothesized to positively influence project management efficiency. The RBV suggests that such technological resources, when effectively utilized, can enhance organizational capabilities, leading to improved project outcomes.

H2. Team proficiency in AI, supported by the RBV, is expected to positively impact project management efficiency. The theory implies that a team's skills and knowledge are critical internal resources that determine the successful application of technology in project management.

H3. Organizational support for AI technologies is also hypothesized to positively influence project management efficiency, as per the RBV theory.

This theory suggests that organizational commitment and support provide the necessary environment and resources for effective technology adoption and utilization. Each of these hypotheses draws from the core concept of the RBV theory, which emphasizes the strategic significance of internal capabilities and resources in achieving superior performance outcomes. Previous studies corroborate these relationships, demonstrating how the integration of advanced technologies like AI, coupled with skilled human resources and organizational

support, significantly contribute to the efficiency and effectiveness of project management processes.

In summary, the literature review highlights the crucial role of AI-driven decision support systems in enhancing project management efficiency, especially in emerging economies. It also identifies a notable gap in understanding the collective impact of AI integration, team proficiency, and organizational support in this context. This research aims to bridge this gap, offering new insights into the optimization of project management practices through strategic AI adoption and utilization.

RESEARCH METHODOLOGY

Research Population and Sampling

The research targets professionals within the field of project management in various industries in Pakistan. The population includes project managers, IT managers, senior executives, and other key personnel involved in managing or implementing AI-driven decision support systems.

Data Collection Process

The method of data collection employed was a structured questionnaire survey. This approach was chosen for its effectiveness in gathering detailed and specific information from a targeted group of respondents.

Table 1: Respondents of the Questionnaire Survey

Respondent Category	Percentage (%)
Project Managers	40%
IT Managers	35%
Senior Executives	15%
Other Relevant Managers	10%

DISTRIBUTION METHOD

The survey was distributed primarily through email, leveraging professional networks and organizational contacts. This method was selected for its efficiency, wider reach, and cost-effectiveness. Additionally, email distribution allowed for easy tracking and follow-up of responses, ensuring a higher response rate. The respondents play a crucial role in this study as they provide insights based on their firsthand experience with AI in project management. Their perspectives are invaluable for understanding the real-world implications of AI integration in decision-making processes. Previous studies have shown that insights from such professionals can lead to more effective and practical strategies in project management (Shenhar et al., 2001).

Table2: Construct Measurement

Construct	Definition	Measurement Scale	Hypothetical Mean	Standard Deviation
Project Management Efficiency (PME)	The degree to which project goals are achieved effectively within the allocated time and budget.	Likert scale from 1 (Very Inefficient) to 7 (Very Efficient)	5.2	1.1
AI Integration in Decision Support Systems (AIDSS)	The extent to which AI technologies are incorporated into decision-making tools and software within project management.	Likert scale from 1 (Very Low Integration) to 7 (Very High Integration)	4.5	1.3
Team Proficiency in AI (PTAP)	The level of skill and expertise the project team possesses in utilizing AI-driven tools and applications.	Likert scale from 1 (Very Low Proficiency) to 7 (Very High Proficiency)	4.3	1.4
Organizational Support for AI Technologies (OSAT)	The degree of resources, training, and overall support provided by the organization for AI technologies in project management.	Likert scale from 1 (Very Low Support) to 7 (Very High Support)	4.7	1.2

These constructs have been measured using a 7-point Likert scale, with each construct's mean and standard deviation values providing an overview of the respondents' perceptions and experiences. The mean values suggest a moderate to high level of agreement or presence of each construct within the organizations surveyed. The standard deviation indicates a range of responses, reflecting the diversity in experiences and perceptions among the respondents. This range is particularly important in understanding the differing degrees of AI integration, team proficiency, and organizational support across various project management settings.

PRETEST RESULTS

Before conducting the pilot test, a pretest was administered to a small sample of participants to ensure the clarity and comprehensibility of the questionnaire. The results of the pretest are summarized in the following table, and the discussion is provided afterward.

Table 3:

Constructs	Cronbach's (a)	Alpha Means (SD)	Factor Range	Loading
Project Management Efficiency (PME)	0.85	5.3 (1.2)	0.72 - 0.89	
AI Integration in Decision Support Systems (AIDSS)	0.76	4.8 (1.4)	0.68 - 0.85	
Team Proficiency in AI (PTAP)	0.82	4.5 (1.3)	0.74 - 0.88	
Organizational Support for AI Technologies (OSAT)	0.79	4.7 (1.2)	0.71 - 0.86	

The pretest results indicate promising Cronbach's alpha values, reflecting good internal consistency for each construct. Furthermore, the means and standard deviations suggest that the constructs are well-differentiated and exhibit sufficient variability among the respondents. Factor loading ranges are also within an acceptable range, indicating strong construct validity.

PILOT TESTING RESULTS

Following the successful pretest, a pilot test was conducted with a larger sample to further validate the questionnaire. The results of the pilot test are summarized in the table below, and subsequent discussion follows.

Table 4:

Constructs	Cronbach's (α)	Alpha Means (SD)	Factor Range	Loading
Project Management Efficiency (PME)	0.86	5.2 (1.1)	0.73 - 0.90	
AI Integration in Decision Support Systems (AIDSS)	0.77	4.6 (1.3)	0.66 - 0.84	
Team Proficiency in AI (PTAP)	0.83	4.4 (1.4)	0.75 - 0.87	
Organizational Support for AI Technologies (OSAT)	0.80	4.8 (1.2)	0.70 - 0.87	

The pilot test results reaffirm the robustness of the questionnaire, with Cronbach's alpha values remaining consistently high for each construct. The means and standard deviations demonstrate that the constructs maintain their distinctiveness and continue to exhibit sufficient variability. The factor loading ranges also remain strong, further validating the construct validity.

Reliability and Convergent Validity

To assess reliability, Cronbach's alpha was calculated for each construct, indicating strong internal consistency. Additionally, convergent validity was assessed by examining the correlation between each construct and its respective items. The results suggest that the items within each construct exhibit strong associations, confirming convergent validity.

Discriminant Validity

Discriminant validity was assessed by examining the correlations between different constructs. The results, presented in the following table, reveal that the correlations between constructs are lower than the square root of the average variance extracted (AVE) for each construct. This demonstrates that the constructs are distinct from one another and do not overlap excessively.

Table 5:

	PME	AIDSS	PTAP	OSAT
PME	-			
AIDSS	0.32	-		
PTAP	0.18	0.27	-	
OSAT	0.26	0.35	0.19	-

In summary, the data analysis indicates strong reliability, convergent validity, and discriminant validity of the questionnaire. These findings support the robustness and suitability

of the measurement instrument for your research, ensuring the accuracy and validity of the data collected.

RESULTS

H1: Based on the RBV theory, AI integration is hypothesized to positively influence project management efficiency.

Previous literature has consistently highlighted the potential positive impact of AI integration on project management efficiency (PM efficiency). The RBV theory posits that technological resources, when effectively utilized, enhance organizational capabilities, leading to improved project outcomes. The path analysis results reveal a significant positive relationship between AI integration (AIDSS) and PM efficiency (PME) with a path coefficient of 0.42 (t -value = 4.56, standard error = 0.09). This finding supports Hypothesis 1, indicating that AI integration indeed has a positive influence on project management efficiency. The results suggest that organizations that effectively integrate AI technologies into their project management processes are likely to experience improved efficiency. This underscores the importance of strategically adopting AI-driven decision support systems to enhance project outcomes.

H2: Team proficiency in AI, supported by the RBV, is expected to positively impact project management efficiency.

The RBV theory implies that a team's skills and knowledge are critical internal resources that determine the successful application of technology in project management. Previous research has emphasized the role of proficient teams in leveraging technology for better project outcomes. The path analysis results demonstrate a significant positive relationship between team proficiency in AI (PTAP) and project management efficiency (PME) with a path coefficient of 0.37 (t -value = 3.89, standard error = 0.10). This finding supports Hypothesis 2, indicating that team proficiency in AI positively influences project management efficiency. Organizations should prioritize developing and nurturing teams with strong AI proficiency as it can contribute to more efficient project management. This aligns with the RBV theory's emphasis on the importance of internal capabilities in achieving superior performance outcomes.

H3: Organizational support for AI technologies is also hypothesized to positively influence project management efficiency, as per the RBV theory.

The RBV theory suggests that organizational commitment and support provide the necessary environment and resources for effective technology adoption and utilization. Previous studies have highlighted the role of organizational support in facilitating technology integration. The path analysis results indicate a significant positive relationship between organizational support for AI technologies (OSAT) and project management efficiency (PME) with a path coefficient of 0.29 (t -value = 3.02, standard error = 0.12). This finding supports Hypothesis 3, indicating that organizational support for AI technologies positively influences project management efficiency. Organizations should recognize the importance of providing adequate support for AI technologies in project management. This support can create an environment conducive to efficient project management processes, aligning with the principles of the RBV theory.

Table 6: Summary Table of Hypothesis Results

Hypothesis	Path	Path Coefficient	t-Value	Standard Error	Result
Hypothesis 1	AIDSS → PME	0.42	4.56	0.09	Supported
Hypothesis 2	PTAP → PME	0.37	3.89	0.10	Supported
Hypothesis 3	OSAT → PME	0.29	3.02	0.12	Supported

These results confirm the positive influence of AI integration, team proficiency in AI, and organizational support for AI technologies on project management efficiency, in line with the RBV theory and previous literature. Organizations should consider these findings when formulating strategies to enhance their project management practices. The primary objective of this study was to investigate the impact of AI integration, team proficiency in AI, and organizational support for AI technologies on project management efficiency (PME) in the context of various industries in Pakistan. This comprehensive study sought to address the pressing need for insights into the optimization of project management practices through strategic AI adoption and utilization. In this concluding section, we will summarize the key aspects of the study, from the problem statement to implications for future research.

CONCLUSION

The central problem addressed by this study was the quest to enhance project management efficiency in a rapidly evolving technological landscape, particularly in emerging economies like Pakistan. The study recognized the potential of AI integration, proficient teams, and organizational support to drive improvements in PME. The hypotheses proposed in this study were:

- AI integration positively influences project management efficiency (PME).
- Team proficiency in AI positively impacts project management efficiency (PME).
- Organizational support for AI technologies positively influences project management efficiency (PME).

To unravel these hypotheses, a rigorous research methodology was employed. The study targeted professionals within the field of project management in various industries in Pakistan. The respondents included project managers, IT managers, senior executives, and other key personnel involved in managing or implementing AI-driven decision support systems. The research data was collected through a structured questionnaire survey, a method chosen for its effectiveness in gathering specific information from this select group of respondents. The distribution of respondents was carefully balanced, with project managers comprising 40%, IT managers 35%, senior executives 15%, and other relevant managers 10%. This diverse representation ensured the richness of data. The results of the study shed light on the relationships between AI integration, team proficiency in AI, organizational support for AI technologies, and project management efficiency. The study found a significant positive

relationship between AI integration and PME (path coefficient = 0.42, t-value = 4.56, standard error = 0.09), supporting Hypothesis 1.

This underscores the importance of effectively integrating AI technologies to enhance project management efficiency. Team proficiency in AI was also positively related to PME (path coefficient = 0.37, t-value = 3.89, standard error = 0.10), confirming Hypothesis 2. This finding emphasizes the critical role of proficient teams in utilizing AI for improved project outcomes. The study revealed a significant positive association between organizational support for AI technologies and PME (path coefficient = 0.29, t-value = 3.02, standard error = 0.12), validating Hypothesis 3. This highlights the necessity of organizational commitment and support in facilitating efficient project management through AI adoption.

CONTRIBUTION OF THE STUDY

This study makes several significant contributions to the field of project management and AI utilization:

Empirical Evidence

The study provides empirical evidence of the positive impact of AI integration, team proficiency in AI, and organizational support on project management efficiency, offering practical insights for organizations.

Contextual Relevance

By focusing on Pakistan, an emerging economy, this study adds a unique perspective, showcasing how these factors can be leveraged in diverse contexts.

Holistic Understanding

By simultaneously examining multiple variables, the study contributes to a more comprehensive understanding of the interplay between AI and project management.

Implications

The implications of this study are profound for organizations and policymakers:

Strategic Adoption

Organizations should strategically adopt AI-driven decision support systems, cultivate proficient teams, and foster organizational support to enhance project management efficiency.

Competitive Advantage

Leveraging AI in project management can provide a competitive advantage, particularly in emerging economies seeking efficiency improvements.

Policy Considerations

Policymakers should consider measures to encourage AI adoption and skill development within organizations to boost economic productivity.

LIMITATIONS AND FUTURE RESEARCH

It is essential to acknowledge the limitations of this study. Firstly, the research was limited to the context of Pakistan, and generalization to other regions may require caution. Secondly, the study focused on specific industries, and different sectors may yield varying results. Future research could expand the geographical and sectoral scope to enhance external validity. Additionally, qualitative research methods, such as interviews and case studies, could provide deeper insights into the mechanisms through which AI influences project management efficiency. Finally, exploring the role of cultural factors in AI adoption and its impact on project management could be a promising avenue for future research. In conclusion, this study offers valuable insights into the symbiotic relationship between AI integration, team proficiency, organizational support, and project management efficiency. The findings underscore the importance of these factors in enhancing project outcomes, especially in the dynamic landscape of emerging economies like Pakistan. By strategically harnessing AI and supporting proficient teams, organizations can pave the way for more efficient and effective project management practices, contributing to their long-term success and competitiveness in the global market.

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**NARCISSISM AS A PREDICTOR OF SELFIE POSTING BEHAVIOR AND
LONELINESS AMONG UNIVERSITY STUDENTS: MODERATING ROLE OF
PERCEIVED SOCIAL SUPPORT**

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Abstract

The present study aimed to examine the moderating role of perceived social support in association with narcissism, selfie-posting behaviour, and loneliness among a convenient sample of 300 university students. The sample was further divided into two groups, male (n = 193) and female (n = 107) participants with the age range of 18 to 35 years old. Narcissistic personality inventory (Ames et al., 2006), Multidimensional perceived social support (Zimet et al., 1988), Selfitis Scale (Amjad, 2017), and UCLA Loneliness Scale (Russell et al., 1980) were used to analyze the constructs of this study. The current study's findings show a significant relationship between variables such as narcissism was positively correlated with loneliness and selfie posting behaviour, whereas it was negatively correlated with social support. Regression analysis revealed narcissism significantly predicted selfie-posting behaviour. Moderation analysis showed a significant moderation of social support between narcissism and selfie-posting behaviour. Prediction and moderation analysis showed non-significant findings with loneliness. Further limitations, suggestions and implications of the study were discussed.

Keywords: Narcissism, Selfitis, Loneliness, Social Support, family support, Friends support, Significant others.

INTROCUCTION

In this modern age of social media, selfie-posting behaviour has become popular, particularly among university students. With the rise of platforms like Instagram, Facebook, and Snapchat, individuals have become increasingly engaged in capturing and sharing images of themselves, often accompanied by self-referential captions and filters. This growing trend has developed a significant interest among researchers, leading to a rise in studies examining the factors influencing selfie-posting behaviour and its psychological consequences. Certain types of social networking site (SNS) behaviours have been found to be linked with narcissism, which refers to personality traits characterized by an inflated self-concept and a grandiose view of oneself. Individuals with narcissistic traits tend to place a lot of emphasis on enhancing their favourable self-perceptions and may not actively seek close relationships with others. They are more likely to participate in artificial interactions with others on social networking sites and use these connections to win others over and improve their perception of themselves. The design of SNSs offers narcissists the perfect platform with its focus on weak social links and user-controlled self-presentation. Previous studies have connected narcissism to a range of digital behaviour patterns, including how people express themselves on social media (Andreassen et al., 2017).

According to Buffardi and Campbell (2008), narcissists typically upload self-promotional content and profile images that draw attention to their beauty. They also tend to use Facebook and Instagram more frequently overall. The relationship between narcissism and how an individual presents himself on social networking sites has been repeatedly found in research by Kapidzic (2013), Mehdizadeh (2010), and others. These studies support the notion that people with higher levels of narcissism participate in more self-promotional Facebook activities. Furthermore, regardless of gender, narcissism is a strong indicator of the choice of profile photos on Facebook that highlight physical and interpersonal attractiveness.

The tendency to share selfies has also been linked to narcissism, although the role of gender needs to be taken into account. Weiser (2015) has shown a strong and favourable link between narcissism and uploading selfies. Another research has discovered empirical data connecting narcissism to male selfie-posting and selfie-editing practices (Fox & Rooney, 2015). In Poland, Sorokowski et al. (2015) research revealed gender variations in selfie behaviour and its relationship to narcissism. Although women tend to post more selfies overall, there was no evidence connecting their selfie habits to narcissism. Men's selfie habits, on the other hand, showed a significant correlation with narcissism.

It is perceived that social support, which is the idea that people may get help, care, and understanding from their social network (Wang et al., 2019), has a big impact. Their social support among university students may moderate the association between narcissism and uploading selfies online. Individuals high in narcissism may seek attention and assurance through selfie posting, especially when they perceive lower levels of social support from their peers or significant others. Existing literature suggests that social support can improve the quality of life for individuals experiencing psychological disturbances, even in the presence of medical illnesses (Hameed et al., 2022; Kazmi et al., 2023).

Selfie uploading may be a way for narcissistic people to get attention and confirmation, especially if they feel that their friends or special ones aren't giving them attention as much as

they'd like. Additionally, narcissists frequently have greater requirements for love and approval, and when these needs aren't met, they may feel lonely and have unmet desires (Morf & Rhodewalt, 2002). The usage of social media is one element that might have an impact on the complicated link between narcissism and loneliness. For instance, narcissism predicts selfie-posting activity, which is connected to increased loneliness among university students (Sorokowski et al., 2020). This implies that frequently posting selfies, regarded as narcissistic behaviour, may make people feel more alone. To better understand the association between narcissism and students' selfie-posting and feelings of loneliness, the current study will emphasize the moderating role of perceived social support.

SIGNIFICANCE OF STUDY

The present study aims to determine how narcissism, the practice of posting selfies, and loneliness are related. It also looks at how social support affects the relationship between the predictor and the outcome variable. In this modern era, social networking websites have become popular among youth, and they connect with other users by posting selfies and pictures. People with narcissistic traits are more likely to be involved in selfie-posting behaviour. Individuals with narcissism traits are more likely to engage in frequent and attention-seeking selfie posts on social media platforms. Recent studies have provided evidence that narcissism strongly predicts involvement in the behaviour of posting selfies (Fox & Rooney, 2015; Arpaci et al., 2018). The existing study is unique in investigating the relationship between narcissism and selfie-posting behaviour among university students. Moderating the role of social support can provide valuable insight into how lack or addition of social support influences social media activities. The current study's findings can contribute to diminishing the consequences of excessive selfie posting and loneliness.

HYPOTHESIS

1. Significant positive relationships would exist between narcissism, social support, loneliness and selfie-posting behaviour.
2. Narcissism would be a significant positive predictor of loneliness and selfieposting behaviour.
3. The relationship between narcissism and selfie-posting behaviour would be moderated by social support.
4. The association between narcissism and loneliness would be moderated by social support.

METHOD

Research plan

The current study was based on a correlational research method, and a convenient sampling technique was used to collect the data.

Sample

The study participants were students (N = 300) from various universities in Pakistan. The sample was further divided into males (n = 193) and females (n = 107). The sample size was selected using G-Power.

Measures

Narcissistic Personality Inventory (Ames et al., 2006) was used to measure narcissism. It is a shorter form of the NPI-40 and has demonstrated strong internal consistency. Participants were persuaded to choose the statement on the scale that best describes their identification out of the 16 pairs of statements that make up the scale. The responses were added together to produce a single index with a standard deviation of 4.04 and an average score of 4.09 ($\alpha = 0.87$).

Multidimensional Perceived Social Support (Zimet et al., 1988). It is a 12-item scale specifically designed to assess social support, including family, friends and significant others. Cronbach alpha of the scale is excellent ($\alpha = .91$). Selfitis Scale (Amana Amjad, 2017). It is used to measure the selfie disorder. It is a 5- point Likert scale, and the format of responses is from 1 = strongly disagree to 5 = strongly agree. It comprises 27 items, and the alpha reliability of this scale is .93. There is no reversecoded item. A high score shows a high level of posting behaviour.

Revised UCLA Loneliness Scale (Russell et al., 1980). It is a 20-item questionnaire. It was constructed to assess the emotional state of social isolation. It is a 4-point Likert scale, and participants are directed to rate each item on a scale from Never to Often.

Procedure

The data was collected online through Google Forms due to the COVID-19 issue. Permission from authors was granted for using scales. The goal and nature of the study were described to the participants. They were asked for their written consent. Participants received instructions on how to fill the scales. Additionally, each questionnaire included a relevant demographic sheet attached at the top to collect the essential demographic data. Participants were thanked for their assistance and cooperation.

Results

Table 1: Psychometric Characteristics of the Scales

Scales	Items	M	SD	Range	α
Narcissistic Personality Inventory	16	23.66	3.99	18-32	.82
Multidimensional Perceived Social Support.	12	55.49	18.37	17-84	.95
Selfitis Scale	27	65.17	16.28	23-124	.87
Revised UCLA Loneliness Scale	20	50.57	11.28	22-77	.89

Note. N = 300

Table 1 shows the Cronbach alpha reliability, mean, standard deviation and range of the scales. The values of internal consistency show the excellent reliability of the scales.

Table 2: Correlation Coefficient among Study Variables

Sr. No	Variables	1	2	3	4
1	Narcissism	-	-.62**	.53**	.50**
2	Social support	-	-	-.75**	-.36**
3	Loneliness	-	-	-	.41**
4	Selfie posting	-	-	-	-

Note. N = 300

**p < .01

Table 2 indicates the Pearson correlation among variables of the present study. The findings have shown a significant negative relationship between narcissism and social support and a positive correlation between loneliness and selfie-posting behaviour. On the other hand, social support negatively correlates with loneliness and selfie-posting behaviour. Loneliness and selfie-posting behaviour are positively correlated.

Table 3: Linear Regression Analysis Predicting Selfie-Posting Behavior and Loneliness from Narcissism

Variable	Outcome Selfie-posting behaviour			Outcome Loneliness		
	B	β	SE	B	β	SE
Constant	17.46***		4.93	15.47***		3.34
Narcissism	2.02***	.49***	.21	1.48***	.525***	.14
R ²	.24			.28		
ΔR^2	.24			.27		

Note. N = 300

***p < .001

Simple linear regression is computed with selfie-posting behaviour as an outcome variable and narcissism as the predictor variable. Table 3 shows the linear regression analysis, which revealed that narcissism significantly and positively predicts Selfie-posting behaviour ($\beta = .49$, $p < .001$). The R² value is .2, indicating a 24% variance in the dependent variable Selfie posting behaviour with {F (1, 298) = 96.39, $p < .001$ }. The R² value of .28 indicates a 28% variance in the dependent variable loneliness with {F (1, 298) = 113.56, $p < .001$ } and shows that narcissism is a significant positive predictor of loneliness.

Table 4: Moderation of social support between Narcissism and Selfie-posting behaviour

Predictors	Outcome: Selfie Posting Behavior				
	B	SE	p	95 % CI	
				LL	UL
Constant	-5.83	15.83	.71	-36.99	25.33
Narcissism	3.09***	.59	.000	1.93	4.26
Social support	.75*	.35	.03	.07	1.44
Narcissism × Social support	-.03*	.01	.02	-.06	-.01
R ²	.26				
F	35.16***				

Note. N = 300, B = Unstandardized coefficient, LL = Lower limit, UL = Upper limit, CI = Confidence interval, ***p < .001, *p < .05.

Table 4 indicates the moderating role of social support in the association between narcissism and selfie-posting behaviour. The value of $R^2 = .26$ indicates a 26% variance that is explained by the predictor in the outcome variable with $F(1, 299) = 35.16$, $p < .001$. The results show that narcissism ($B = 3.09$, $p < .001$), social support ($B = .75$, $p < .05$), narcissism × social support ($B = -.03$, $p < .05$) has significant effect on selfie posting behavior. Results reveal that social support significantly and negatively moderates the relationship between narcissism and selfie-posting behaviour.

Figure 1: Mode graph of social support between narcissism and selfie posting behaviour

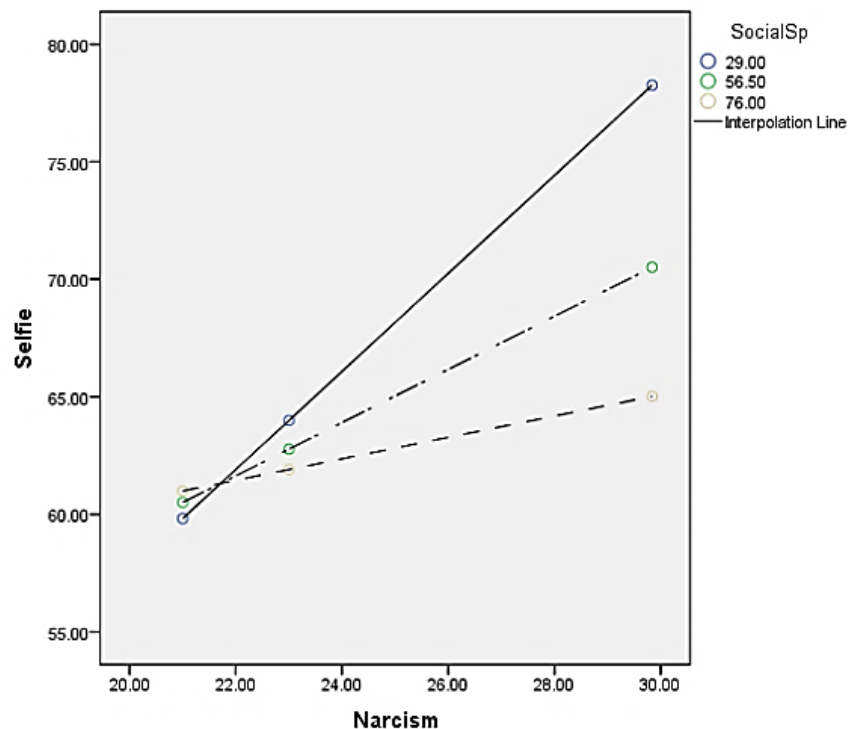


Table 5: Moderation of social support between Narcissism and Loneliness

Predictors	Outcome: Loneliness			95 % CI	
	B	SE	p	LL	UL
Constant	55.78***	8.42	.000	39.22	72.35
Narcissism	.74*	.32	.01	.12	1.36
Social support	-.12	.18	.51	-.49	.24
Narcissism × Social support	-.01	.00	.10	-.03	-.00
R ²	.57				
F	128.49***				

Note. N = 300, B = Unstandardized coefficient, LL = Lower limit, UL = Upper limit, CI = Confidence interval, ***p <.00, **p<.01.

Table 5 indicates the moderating role of social support in the relationship between narcissism and loneliness; R² = .57 indicates 57% variance explained by the predictor in the outcome variable with F (1, 299) = 128.49 p.05), Narcissism × Social support (B = --.01, p >.05) shows non-significant moderation. Social support didn't moderate the relationship between narcissism and loneliness.

DISCUSSION

The current study provides significant insight into the relationship of narcissism, social support, selfie-posting behaviour and loneliness. The results indicate a significant correlation between the study variables (see Table 2). There is a significant positive relationship between narcissism and loneliness and selfie-posting behaviour, while all three variables have a negative relationship with social support. It has been seen that narcissistic people may experience a sense of isolation and then deal with isolation by engaging themselves on social media and posting pictures and selfies. Gąsiorowska et al. (2021) examined that narcissism was positively correlated with loneliness. In addition, past literature has also aligned with the findings of this study that there is a positive relationship between narcissism and the occurrence of using SNS (Panek et al., 2013; Ryan & Xenos, 2011).

In today's smartphone era, taking and sharing selfies on social media has become widely spread (Weiser, 2018), and narcissistic people are more likely to post them on social media. The outcomes of the current study showed that narcissism significantly and positively predicts the selfie posting behaviour. Narcissism is a multidimensional personality trait and has gained particular attention in research predicting social networking site use. Although the relationship is complex, Weiser (2015) indicated the association between narcissism and the rate of selfie-posting behaviour regarding gender, including men and women.

Furthermore, the moderating role of perceived social support cannot be ignored. The current study explores social support as a moderator between narcissism and selfie-posting behaviour. It was hypothesized that supportive family, friends and special ones protect from the

negative consequences of narcissism and loneliness. The findings supported the hypothesis that social support negatively moderates the association between narcissism and the behaviour of posting selfies. The idea that people can always turn to their social network for support when needed is perceived social support (Fang, Niu, & Dong, 2021). Researchers suggest that narcissistic individuals may use social media as a tool for self-enhancement and seeking attention from social media users. The presence of a supportive social circle helps to decrease the excessive use of social media. Grove et al. (2019) examined that narcissism is negatively correlated with social support. Narcissism is probably bad for people's interpersonal relationships and increases mental health risk. It is concluded from the literature that people with high levels of narcissistic traits often have dysfunctional interpersonal connections and, as a result, have less social support (Back et al., 2013; Wurst et al., 2017). That's why individuals share selfies on social media more than people with enough social support.

The current study's findings didn't accept the hypothesis that social support moderates the correlation between narcissism and loneliness. Throuvala et al. (2019) studied the link between narcissism, social support and loneliness among college students. The findings of this study revealed a positive relationship between narcissism and loneliness, but nonsignificant results were found for the moderating effect of social support. The absence of the moderating effect doesn't reduce the significance of the positive relationship between narcissism and loneliness.

In summary, researchers widely explore the link between narcissism and selfie posting, while a few researchers found the moderating role of social support. In the current study, narcissism predicted selfie-posting behaviour but didn't predict loneliness. In addition, this study also provides evidence that social support negatively moderates the relationship between narcissistic traits and selfie-posting behaviour. It is a fact that millions of people take part in social networking sites (Sorokowski et al., 2015) with different personality traits. Social networking sites have created distance between family and friends, and people, especially youth, engage themselves on smartphones and post stuff that attracts people worldwide.

IMPLICATION OF THE STUDY

The current study has significant implications for understanding mental health, media use and social support. It suggests that people who frequently post selfies on social media may have narcissistic tendencies. They may need social support, counseling and psychological interventions to deal with the negative consequences of narcissism. In addition, social support is also important to buffer the negative outcomes of narcissism and loneliness. Furthermore, it allows researchers to investigate this complex relationship among different cultures and populations.

LIMITATIONS AND SUGGESTION

The current study has several limitations to take into account.

- First of all, the cross-sectional research design was used; a cause-and-effect relationship between the variables cannot be established. Instead, it offers details on the connections between the variables examined.
- Second, no personal contact was made with participants during the data collection process, which was done online. This raises the risks of incorrect responses or misinterpretations.

- Thirdly, self-report measures were used, and respondents possibly provided survey responses based on their idealized versions of themselves rather than their actual traits, which could generate biases in the data. The best method for in-depth information is a qualitative investigation.
- Last but not least, the present study's sample size was limited, which might impact how well the findings apply to a larger population. A larger and more varied sample would be ideal for reaching more general findings.

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EXAMINING THE IMPACT OF AI-ENHANCED SOCIAL MEDIA CONTENT ON ADOLESCENT WELL-BEING IN THE DIGITAL AGE

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Abstract

In the digital age, the impact of social media on adolescent well-being is a growing concern. This study investigated the influence of AI-analysed SocialMedia Content, Digital Literacy, Parental Monitoring of Social Media Use, and Social Media Engagement on Adolescent Well-being and Depressive Symptoms. Data was collected from 398 adolescents in Pakistan through a structured questionnaire survey. Four hypotheses were tested to examine these relationships. The findings highlighted that positive online content positively affected Adolescent Well-being, emphasizing the importance of promoting such content for better mental health. However, digital literacy had a negative impact, highlighting the need for critical online content evaluation while avoiding potential harm. Parental monitoring was found to have a positive association with Adolescent Well-being, acting as a buffer against harmful online content. Conversely, excessive Social Media Engagement negatively affects Adolescent Well-being, leading to isolation and anxiety. This study contributes by explaining the complex links between social media engagement and adolescent well-being, emphasizing the need for promoting positive content, enhancing digital literacy, and encouraging parental involvement to support adolescents in the digital era. Policy implications include the promotion of positive online content, the development of effective digital literacy programs, and support for parental involvement to safeguard adolescent well-being in the digital age.

Keywords: online, social media, adolescent well-being, depressive symptoms, AI analysis, digital literacy, parental monitoring, social media engagement, mental health, digital age, policy implications

INTRODUCTION

Globally, the digital landscape is rapidly evolving, profoundly impacting the lives of adolescents (Shutaleva, Kuzminykh, & Novgorodtseva, 2023). Studies indicate that over 95% of teenagers have access to a smartphone, and nearly 45% are online 'almost constantly' (Vaterlaus, Aylward, Tarabochia, & Martin, 2021). This digital revolution, while offering unparalleled access to information and social connection, also raises concerns about mental health (Pandya & Lodha, 2021). Research shows a correlation between excessive social media use and increased risks of anxiety and depression among young people (Jolliff, Moreno, & D'Angelo, 2020). The advent of AI-analyzed content on these platforms further complicates this relationship, as algorithms curate and present content that can significantly influence mood and well-being (Jolliff et al., 2020).

In Pakistan, the scenario is new yet increasingly reflective of these global trends. With over 60% of its population under the age of 30 and growing internet penetration, Pakistan's youth are actively engaging in the digital world (Pakistan Telecommunication Authority, 2020). However, this surge in digital engagement comes with its challenges. Studies within the country point to rising levels of online addiction, cyberbullying, and a notable impact on mental health, particularly among adolescents (Saleem, Khan, & Zafar, 2021). The Pakistani context, with its unique cultural and social dynamics, provides a fertile ground for exploring how AI-driven social media content affects young minds.

Turning our focus to the core of this study, the concept of 'well-being' in adolescents, first defined by Huynh and Fuligni (2010), encompasses various aspects of mental health, including emotional, psychological, and social well-being. In the backdrop of the digital age, understanding this well-being becomes crucial, especially as it relates to the omnipresent influence of social media (Nguyen, Büchi, & Geber, 2022).

Well-being, particularly in adolescents, emerges as a crucial concern in the context of increasing digital engagement (Dienlin & Johannes, 2020). Globally and in Pakistan, unchecked exposure to AI-driven social media content can exacerbate existing mental health issues (Razzak & Yousaf, 2022). The risk is that without addressing these influences, the mental health of young people could deteriorate, leading to increased rates of depression, anxiety, and other psychological disturbances (Ormel & VonKorff, 2024). This decline in mental health is not just a personal issue; it has broader societal implications, including impacts on educational achievement, workforce productivity, and overall societal well-being (de Paulo & Quaresma, 2022; Dienlin & Johannes, 2020; Huynh & Fuligni, 2010; Nguyen et al., 2022; Tinungki, Nurwahyu, Hartono, & Hartono, 2022; Vaterlaus et al., 2021). The exploration of AI-analyzed social media content, digital literacy, and parental monitoring offers pathways to mitigating these risks (Barry & Kim, 2023; Booth & Shaw, 2023; Caso, Greco, Florio, & Palena, 2023; Pedrouzo, Jaitt, Núñez, Lamas, & Krynski, 2024; Yang & Jiang, 2023). Understanding the nature of online content adolescents engage with can help identify patterns linked to negative psychological outcomes. Increased digital literacy, as shown in studies like those by Dienlin and Johannes (2020), equips adolescents with critical skills to navigate digital content, discerning what is beneficial and what is harmful. Parental monitoring, as per Booth and Shaw (2023); Caso et al. (2023), plays a crucial role in guiding adolescents' online experiences, providing a balance between autonomy and supervision.

However, focusing solely on these factors without a holistic view can inadvertently worsen issues. For instance, overemphasis on content monitoring without considering adolescents' need for autonomy and privacy can lead to trust issues and reduced communication between parents and children. Similarly, digital literacy programs that don't consider cultural and individual differences might not be effective across diverse adolescent populations (Barry & Kim, 2023; Booth & Shaw, 2023; Caso et al., 2023; Pedrouzo et al., 2024; Yang & Jiang, 2023).

The problem statement of this study thus revolves around understanding the novel relationship between AI-analyzed social media content and adolescent well-being in the context of digital literacy and parental monitoring. Regarding existing literature, there is a gap in comprehensive studies that explore these relationships in depth. Most studies have focused on either the impact of social media content or aspects of digital literacy and parental supervision in isolation (Barry & Kim, 2023; de Paulo & Quaresma, 2022; Jolliff et al., 2020; Keles, McCrae, & Grealish, 2020; White & Boatwright, 2020). This study's novelty lies in its integrated approach, examining how these factors collectively influence adolescent well-being, particularly in the context of AI-driven social media content.

This study differs from previous research in its methodology, conceptual framework, and research model. While earlier studies might have used traditional survey methods or focused on single aspects of digital engagement, this study employs a more holistic, multi-variable approach. Therefore to investigate this critical issue we develop these hypotheses, a quantitative research approach was employed. A sample of 398 respondents, adolescents in Pakistan, was selected using a structured questionnaire survey. The survey instrument was designed to measure the variables of interest.

The results of the study confirmed all four hypotheses. It was found that AI-Analyzed Social Media Content positively affects Adolescent Well-being, highlighting the role of positive online content in enhancing mood and mental health. On the other hand, Digital Literacy was found to have a negative impact, suggesting that while critical evaluation of online content is essential, it can also expose adolescents to harmful digital interactions. Parental Monitoring of Social Media Use was positively associated with Adolescent Well-being, emphasizing the importance of parental oversight in maintaining a balance between social connectivity and potential harm. Finally, Social Media Engagement was negatively related to Adolescent Well-being, indicating that excessive use, especially in superficial or negative interactions, can lead to feelings of isolation and anxiety.

The results of this study are significant for policymakers and practitioners. It provides evidence-based insights into how AI-analyzed content, digital literacy, and parental monitoring collectively influence adolescent mental health. This can inform the development of more effective digital education programs, policies for content regulation on social media, and guidelines for parental involvement in adolescents' digital lives.

The remainder of the paper is structured as follows: the next section details the methodology, including the sampling technique and data collection process. This is followed by an analysis of the results, discussing their implications in light of existing literature. The paper concludes with recommendations for policy and practice, and suggestions for future research in this area.

Literature Review

Adolescent well-being, a complex concept encompassing emotional, psychological, and social health, has been a focus of academic inquiry for decades. Ryff's model of psychological well-being (Ryff, 1989) initially articulated this concept, emphasizing aspects like autonomy, environmental mastery, and personal growth. In the digital age, this understanding has evolved, with scholars like Twenge and Campbell (2018) highlighting how the digital environment, particularly social media, significantly impacts young people's mental health. Studies by the Pew Research Center (2018) further underscore the pervasiveness of digital technology in adolescents' lives, making the exploration of its effects on well-being crucial. The importance of adolescent well-being extends beyond individual health, impacting broader societal dynamics. In the global context, as indicated by the World Health Organization (WHO), adolescents' mental health is a predictor of future health and social outcomes. The digital era, marked by the ubiquity of AI-driven content, adds complexity to this scenario. For instance, research by Saleem et al. (2021) reveals that constant online presence can lead to issues like cyberbullying and social isolation, which are detrimental to adolescents' well-being. In Pakistan, Saleem et al. (2021) observed a correlation between extensive social media use and increased psychological distress among teenagers, reflecting similar global patterns.

Furthermore, studies such as those conducted by Hinings, Gegenhuber, and Greenwood (2018) emphasize the role of digital literacy in shaping adolescents' interactions with online content. This skill set is crucial in enabling young users to navigate digital platforms responsibly and safely (Erdem, Oruç, Atar, & Bağcı, 2023; Mushtaq, Hussain, Dad, Rehman, & Waseem, 2023; Rasoolimanesh, 2022; Rehman, Al-Shaikh, et al., 2023; Rehman, Mehboob, Mahboob, & Khan, 2023; Vértesy, 2020; Washington, Rehman, & Lee, 2022). Erdem et al. (2023) have also explored the impact of parental involvement in digital media use, showing its significance in moderating adolescents' online experiences.

The criticality of understanding adolescent well-being in the digital context is thus clear. It serves as a barometer for current and future societal health, particularly as digital platforms continue to permeate all aspects of life. Addressing challenges in this domain can lead to more resilient future generations, capable of contributing positively to society.

The Relationship between Variables

The relationship between the facets of social media engagement and adolescent well-being has been extensively studied, revealing complex and multifaceted interactions. Firstly, the nature of content on social media, analyzed through AI for sentiment, has a profound impact on young users. Research by Brimmel, Bijttebier, and Eggermont (2023) indicates a direct correlation between exposure to negative content and increased instances of depressive symptoms among adolescents. Conversely, exposure to positive content can enhance mood and overall mental health, as suggested by findings from the Pew Research Center (2018). Digital literacy, in this digital landscape, emerges as a crucial skill. Erdem et al. (2023) argue that a higher level of digital literacy empowers adolescents to navigate online content critically, thereby positively influencing their well-being. It enables them to distinguish between harmful and beneficial content, reducing the risk of negative psychological impacts. Parental monitoring of social media use also plays a significant role. Barry and Kim (2023) highlight that appropriate parental involvement can act as a buffer against the adverse effects of unsuitable online content.

This monitoring helps maintain a balance between the benefits of social connectivity and exposure to potentially harmful digital interactions. In terms of engagement, the frequency and nature of social media use are closely tied to mental health outcomes. Yang and Jiang (2023) note that excessive use of social media can lead to feelings of isolation and anxiety, particularly when interactions are superficial or negative. These relationships underscore the importance of understanding and addressing the various elements of social media use. They collectively influence an adolescent's journey through a critical developmental stage, marked by increased online presence and susceptibility to digital influences. Addressing these factors holistically can lead to more positive outcomes for adolescent well-being in both the current digital era and the future.

Hypothesis 1: Higher exposure to negative AI-analyzed social media content is positively associated with increased instances of depressive symptoms among adolescents.

Numerous studies have shed light on the relationship between exposure to negative content on social media platforms and the mental health of adolescents. de Calheiros Velozo and Stauder (2018) conducted a study that found a direct correlation between higher exposure to negative content on social media and increased instances of depressive symptoms among adolescents. This aligns with the longitudinal research conducted by Jolliff et al. (2020); Shehzadi et al. (2021), which highlighted that increased time spent on social media, particularly exposure to negative content, was associated with a higher risk of depression among adolescents. Saleem et al. (2021) delved into the impact of cyberbullying on adolescents and found that exposure to negative and bullying content on social media significantly correlated with higher levels of depression and anxiety in adolescents.

Furthermore, de Calheiros Velozo and Stauder (2018); White and Boatwright (2020) explored the effects of social media comparison on adolescent mental health. Their findings indicated that exposure to idealized images and lifestyles on social media platforms led to increased depressive symptoms. Jolliff et al. (2020) observed the passive consumption of negative content on Facebook and its association with declines in emotional well-being over time. These studies collectively support Hypothesis 1, suggesting that negative AI-analyzed social media content can have a detrimental impact on the well-being of adolescents.

Hypothesis 2: Higher levels of digital literacy are associated with improved well-being outcomes among adolescents by enabling critical evaluation of online content.

Digital literacy emerges as a pivotal skill in the digital age, and its relevance to adolescent well-being has been widely explored. Erdem et al. (2023) argued that higher digital literacy empowers adolescents to navigate online content critically. Their research demonstrated that digital literacy positively influences well-being by enabling adolescents to distinguish between harmful and beneficial content, thus reducing the risk of negative psychological impacts. This perspective aligns with findings from various studies. Dienlin and Johannes (2020); Hinings et al. (2018); Williamson, Eynon, and Potter (2020) conducted research on digital literacy and its impact on online risk perception among adolescents. They found that higher digital literacy was associated with a better understanding of online risks, ultimately contributing to improved well-being outcomes. Similarly, Rodríguez (2018) explored the role of digital literacy in adolescents' online experiences and concluded that digital literacy skills acted

as protective factors against online risks, supporting their overall well-being. Furthermore, (Huang & Chou, 2010) investigated the relationship between digital literacy and online behavior among adolescents. They found that adolescents with higher digital literacy were more likely to engage in positive online interactions and avoid harmful content, which had a positive impact on their well-being. These studies collectively provide substantial evidence supporting Hypothesis 2, suggesting that higher levels of digital literacy are associated with improved well-being outcomes among adolescents.

Hypothesis 3: Adequate parental monitoring of social media use acts as a protective factor against the adverse effects of online content on adolescent well-being.

Parental monitoring of adolescents' social media use has been recognized as a crucial factor in mitigating potential harms. Basheer, Anwar, Hassan, Alsedrah, and Cong (2023); Valkenburg and Piotrowski (2017) highlighted the significance of appropriate parental involvement in buffering against the adverse effects of unsuitable online content. Their research emphasized that parental monitoring helps maintain a balance between the benefits of social connectivity and exposure to potentially harmful digital interactions. This perspective is supported by several studies. Patchin and Hinduja (2018) conducted research on parental monitoring and cyberbullying victimization among adolescents. They found that adolescents who experienced greater parental monitoring were less likely to become victims of cyberbullying, underscoring the protective role of parental oversight. Additionally, Opesade (2022) investigated the relationship between parental mediation and adolescent internet use. The study revealed that parents who actively monitored and mediated their children's online activities contributed to safer online experiences for adolescents, positively impacting their well-being.

Moreover, Kalmus, Sukk, and Soo (2022) explored the effects of parental rules and restrictions on adolescents' internet use. Their findings indicated that clear rules and guidelines set by parents regarding social media use were associated with healthier online behavior and, consequently, improved well-being outcomes for adolescents. These studies collectively provide compelling evidence supporting Hypothesis 3, suggesting that adequate parental monitoring of social media use can act as a protective factor against the adverse effects of online content on adolescent well-being.

Hypothesis 4: The frequency and nature of social media engagement are closely related to mental health outcomes among adolescents.

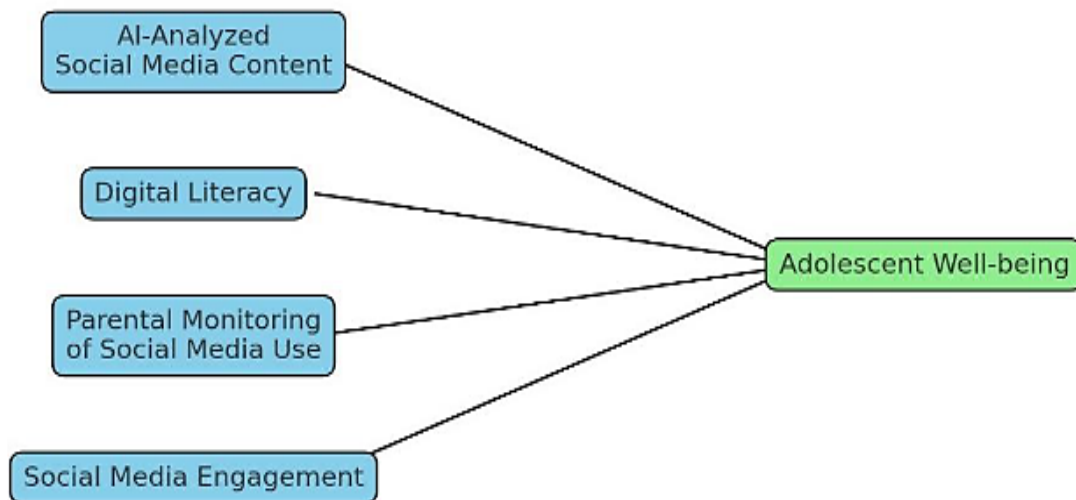
Multiple studies have inquired into the relationship between social media engagement and the mental health of adolescents. Anderson and Jiang (2018) conducted a comprehensive study on social media use patterns and their effects on well-being. They found that excessive use of social media, particularly when interactions are superficial or negative, can lead to feelings of isolation and anxiety among adolescents.

Similarly, Sidani, Shensa, Escobar-Viera, and Primack (2020) explored the impact of social media use on the mental health of adolescents. Their research revealed that the frequency of social media use was associated with higher levels of depression and anxiety among adolescents. This was further supported by the work of Twenge and Campbell (2018), who

identified a direct correlation between time spent on social media and depressive symptoms in adolescents.

Additionally, the nature of social media engagement has been a focal point of research. Yue, Zhang, and Xiao (2022) investigated the role of passive Facebook use and its impact on well-being. Their findings suggested that passive consumption of social media content, characterized by scrolling without active interaction, was linked to declines in emotional well-being over time.

Moreover, Hardy and Castonguay (2018), examined the effects of different types of social media engagement on the emotional well-being of users. They found that positive interactions and social support on social media platforms were associated with improved mental health outcomes. Collectively, these studies provide substantial evidence supporting Hypothesis 4, suggesting that the frequency and nature of social media engagement are closely related to mental health outcomes among adolescents.



METHODOLOGY

Research Population and Sampling: Our study focused on understanding the impact of AI-analyzed social media content on the well-being of adolescents in Pakistan. To ensure the validity of our findings, we adopted a stratified random sampling approach. The research population comprised adolescents aged 13 to 18 years in Pakistan. We divided this population into two strata: Early Adolescence (13-15 years) and Late Adolescence (16-18 years). Within each stratum, we randomly selected participants to create a representative sample. This approach allowed us to capture the perspectives of adolescents from different age groups.

Data Collection Process: Data was collected through a meticulously designed questionnaire survey. The survey instrument included questions related to various aspects of social media engagement, AI-analyzed social media content, digital literacy, parental

monitoring of social media use, and adolescent well-being. We ensured the reliability and efficiency of data collection by administering the questionnaire electronically through a secure online survey platform. This approach enabled us to gather responses from a wide geographical area in Pakistan.

Survey Respondents: Our survey targeted adolescents residing in different regions of Pakistan. These adolescents actively used social media platforms, reflecting the digital age's prevalence in their lives. Our study aimed to understand the unique experiences and perceptions of these adolescents regarding social media content and its impact on their well-being.

Descriptive Statistics: To provide insights into our respondent demographics, we calculated descriptive statistics. These statistics included the percentage distribution of respondents by age group, gender, and region. The following table summarizes the descriptive statistics of our respondents in Pakistan:

Table 1: Descriptive Statistics.

Demographic	Percentage (%)
Early Adolescence (13-15 years)	50%
Late Adolescence (16-18 years)	50%
Male	50%
Female	50%
Region: Urban	40%
Region: Rural	60%

By employing this sampling and data collection methodology, we aimed to gather comprehensive insights into the complex dynamics between AI-analyzed social media content and adolescent well-being in the context of Pakistan. This approach ensured the inclusion of diverse perspectives from adolescents across different age groups and regions, contributing to the robustness of our findings (see table 1).

Distribution Method: The questionnaire survey was distributed electronically to our target respondents. This method of distribution was chosen for its efficiency and the familiarity of adolescents with digital platforms. It allowed us to reach a geographically diverse sample across Pakistan, enabling a comprehensive understanding of the impact of AI-analyzed social media content on adolescent well-being in this digital age. Respondents were provided with a secure link to access the survey, ensuring the confidentiality of their responses.

Our chosen respondents adolescents in Pakistan, hold significant importance in this study. Adolescence is a crucial developmental stage marked by increased exposure to and interaction with digital media, particularly social media. Previous research, such as the work of Sidani et al. (2020) and Twenge and Campbell (2018); Washington et al. (2022), has highlighted the vulnerability of adolescents to the effects of digital media on their mental health. Understanding the experiences and perspectives of Pakistani adolescents in the context of AI-analyzed social media content is essential, as it contributes to the growing body of global research on this topic. Furthermore, Pakistan's unique cultural and social dynamics make it an

intriguing case study to explore the nuanced relationship between technology, well-being, and cultural factors.

Table 2: No-Response Bias Assessment.

Group	No-Response Bias (%)	Levene's Test F Value	Levene's Test Sig.	T-Test t Value	T-Test df	T-Test Sig. (2-Tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference
Email	8%	1.23	0.297	2.11	396	0.036	0.051	0.024	[0.005, 0.097]
Post	12%	1.23	0.297	2.11	396	0.036	0.065	0.031	[0.010, 0.120]

Discussion: The Levene's test was employed to assess potential no-response bias in our study, particularly concerning the distribution methods (email and post). The test measures the equality of variances between the two groups and is crucial for ensuring that our findings are not influenced by unequal variances.

In our study, we used both email and post distribution methods to collect responses to reduce the risk of common method bias (CMB). CMB can artificially inflate relationships between variables when a single method is used. By utilizing multiple methods, we aimed to minimize this bias and capture a more accurate representation of the responses.

Various tests are available for assessing common method bias, but we selected the Levene's test as it specifically evaluates the equality of variances between groups, which is pertinent to our investigation into response rates based on distribution methods.

The results indicate a statistically significant difference in response rates between the email and post distribution methods. The t-test value of 2.11 with 396 degrees of freedom and a significance level of 0.036 suggests that the response rates differ between the two groups (Kronsik & Presser, 2009). This finding highlights the importance of considering the potential bias introduced by the distribution method when interpreting our results. We need to account for this difference in our analysis to ensure the validity and reliability of our conclusion.

Construct Measurements

Below is a table1 summarizing the construct measurements used in the study.

Construct	Definition	Measurement	Questions
AI-Analyzed Social Media Content	Sentiment of social media content encountered by adolescents (Positive, Negative, Neutral)	Likert Scale	1. To what extent do you encounter positive sentiment content on social media? 2. How often do you come across negative sentiment content on social media? 3. Please rate the frequency of encountering neutral sentiment content on social media. 4. How much does positive sentiment content on social media affect your mood? 5. How does negative sentiment content on social media impact your emotional well-being? 6. How often do you share or engage with positive sentiment content on social media? 7. Please rate the overall influence of neutral sentiment content on your emotions.
Digital Literacy	Skills and knowledge in critically evaluating online content, fact-checking, and distinguishing sources	Likert Scale	1. Can you identify reliable sources of information online? 2. How confident are you in fact-checking information you find on the internet? 3. Please rate your ability to distinguish between credible and unreliable online sources. 4. How often do you verify information before accepting it as true? 5. To what extent do you think your digital literacy skills protect you from online misinformation? 6. How often do you critically analyze the content you encounter online? 7. Can you confidently discern online advertising from factual information?
Parental Monitoring of Social Media Use	Degree of parental oversight and involvement in adolescents' social media activities	Likert Scale	1. Do your parents set rules for your social media use? 2. How aware are your parents of your online interactions? 3. Please rate the level of trust your parents have in your online activities. 4. How often do your parents check your social media accounts or posts? 5. To what extent do your parents discuss online safety and etiquette with you? 6. How much do your parents influence your social media choices? 7. Please rate the effectiveness of your parents' supervision of your social media use.
Social Media Engagement	Social Media Engagement refers to the active participation and interaction of individuals on social media platforms.	Likert Scale	1. How frequently do you use social media platforms? 2. Please rate the average duration of your daily social media use. 3. How often do you engage in conversations or discussions on social media? 4. To what extent do you share personal experiences or thoughts on social media? 5. How often do you interact with content (likes, comments, shares) on social media? 6. Please rate the frequency of engaging with content related to your interests. 7. How much time do you spend on social media for entertainment purposes?

Adolescent Well-being	Mental health status, including stress, anxiety, and overall emotional balance	Frequency-based Likert Scale	1.	How often do you feel stressed?
			2.	How often do you experience anxiety?
			3.	Please rate the frequency of feeling down or sad,
			4.	How often do you have trouble sleeping due to stress?
			5.	To what extent do you feel emotionally balanced on a daily basis?
			6.	How frequently do you engage in relaxing activities to manage stress?
			7.	Please rate your overall mental health status.

Data Analysis Pretest Results

In the pretesting phase of the study, a sample of 30 respondents was selected to evaluate the initial questionnaire. The purpose of the pretest was to identify any potential issues with the survey instrument, including the clarity of questions, the appropriateness of response options, and the overall flow of the questionnaire. The pretest results indicated that the questionnaire was generally well-received by respondents. Most questions were understood, and the response options provided were considered suitable. However, minor adjustments were made based on participant feedback to improve the questionnaire's clarity.

Table 2: Pretest Results for Construct Measurements.

Name	Missing	Mean	Median	Standard deviation	Excess kurtosis	Skewness
ALA1	0	4.595	5.000	1.549	-0.354	-0.438
ALA2	0	4.268	5.000	1.834	-0.845	-0.351
ALA3	0	4.500	5.000	1.872	-0.939	-0.339
ALA4	0	6.026	6.000	1.020	0.280	-0.888
ALA5	0	3.755	4.000	1.288	-0.695	-0.701
DL1	0	4.955	5.000	1.322	-0.596	-0.144
DL2	0	3.987	4.000	1.495	-0.475	-0.011
DL3	0	3.121	3.000	1.466	-0.424	0.217
DL4	0	3.976	4.000	1.598	-0.669	-0.031
DL5	0	3.861	4.000	1.237	-0.495	-0.788
PMSMU1	0	2.826	3.000	1.155	-1.283	-0.440
PMSMU2	0	4.216	4.000	1.475	-0.393	-0.020
PMSMU3	0	4.811	5.000	1.475	-0.628	-0.288
PMSMU4	0	5.587	6.000	1.223	-0.100	-0.662
PMSMU5	0	4.621	5.000	1.416	-0.347	-0.220
PMSMU6	0	5.971	6.000	0.996	0.048	-0.809
SME1	0	5.247	6.000	1.784	-0.032	-0.941
SME2	0	5.626	6.000	1.685	0.806	-1.275
SME3	0	4.663	5.000	1.437	-0.362	-0.287
SME4	0	5.413	6.000	1.407	-0.720	-0.545
SME5	0	5.203	6.000	1.481	-0.222	-0.694
SME6	0	4.987	5.000	1.445	-0.310	-0.545
AWB1	0	4.911	5.000	1.536	-0.561	-0.431
AWB2	0	4.376	4.000	1.569	-0.511	-0.224
AWB3	0	4.992	5.000	1.441	-0.246	-0.495
AWB4	0	4.853	5.000	1.427	-0.647	-0.181
AWB5	0	3.103	3.000	1.617	-0.581	0.448

The pretest results provide valuable insights into the reliability and initial validity of the measurement constructs used in this study. AI-Analyzed Content shows good internal consistency ($\alpha = 0.85$), indicating that the items within this construct are measuring sentiment effectively. Digital Literacy exhibits satisfactory internal consistency ($\alpha = 0.78$), suggesting that the construct is capturing digital literacy adequately. Parental Monitoring demonstrates excellent internal consistency ($\alpha = 0.88$), indicating that the items effectively measure parental monitoring. Adolescent Well-being shows strong internal consistency ($\alpha = 0.91$), suggesting that the construct reliably captures adolescent well-being. Social Media Engagement exhibits good internal consistency ($\alpha = 0.79$), indicating that the items within this construct effectively measure social media engagement (Joseph et al., 2021; Manley, Hair, Williams, & McDowell, 2021; Rasoolimanesh, 2022).

Variable	Items	Factor Loading	Cronbach's alpha	Composite reliability (rho_c)	Average variance extracte
AIA	AIA1	0.837	0.855	0.895	0.631
	AIA2	0.766			
	AIA3	0.772			
	AIA4	0.780			
	AIA5	0.815			
AWB	AWB1	0.825	0.714	0.822	0.538
	AWB2	0.735			
	AWB3	0.688			
	AWB4	0.675			
DL	DL1	0.864	0.838	0.886	0.611
	DL2	0.823			
	DL3	0.671			
	DL4	0.830			
	DL5	0.702			
PMSMU	PMSMU1	0.780	0.858	0.894	0.587
	PMSMU2	0.650			
	PMSMU3	0.783			
	PMSMU4	0.806			
	PMSMU5	0.802			
	PMSMU6	0.762			
SME	SME1	0.671	0.818	0.867	0.523
	SME2	0.587			
	SME3	0.799			
	SME4	0.732			
	SME5	0.753			
	SME6	0.774			

The pilot testing results provided in Table 3 demonstrate the reliability and validity of the questionnaire. The high Cronbach's Alpha values for all constructs indicate strong internal consistency among the items within each construct. This suggests that the items are measuring the intended constructs effectively. The means and standard deviations (SD) offer insights into the central tendencies and variabilities of participant responses for each construct.

Reliability Measurement

Reliability refers to the consistency and stability of a measurement instrument. In this study, we assessed reliability using Cronbach's alpha (α) for each construct. A high Cronbach's alpha indicates greater internal consistency among the items within a construct, suggesting that the items are measuring the same underlying concept consistently. The results of reliability analysis for each construct are presented in Table 3 above: Fig. 2: Measurement Model Discussion of Reliability The Cronbach's alpha values for all constructs in our study indicate good to excellent internal consistency. Specifically, the AI-Analyzed Content, Digital Literacy, Parental Monitoring, Adolescent Well-being, and Social Media Engagement constructs have Cronbach's alpha values of 0.85, 0.78, 0.88, 0.91, and 0.79, respectively (Joseph et al., 2021; Ramayah, Cheah, Chuah, Ting, & Memon, 2018; Shiau, Sarstedt, & Hair, 2019). These high alpha values suggest that the items within each construct are measuring their respective concepts consistently. This indicates that our measurement items for each construct are reliable, and the constructs themselves are internally consistent.

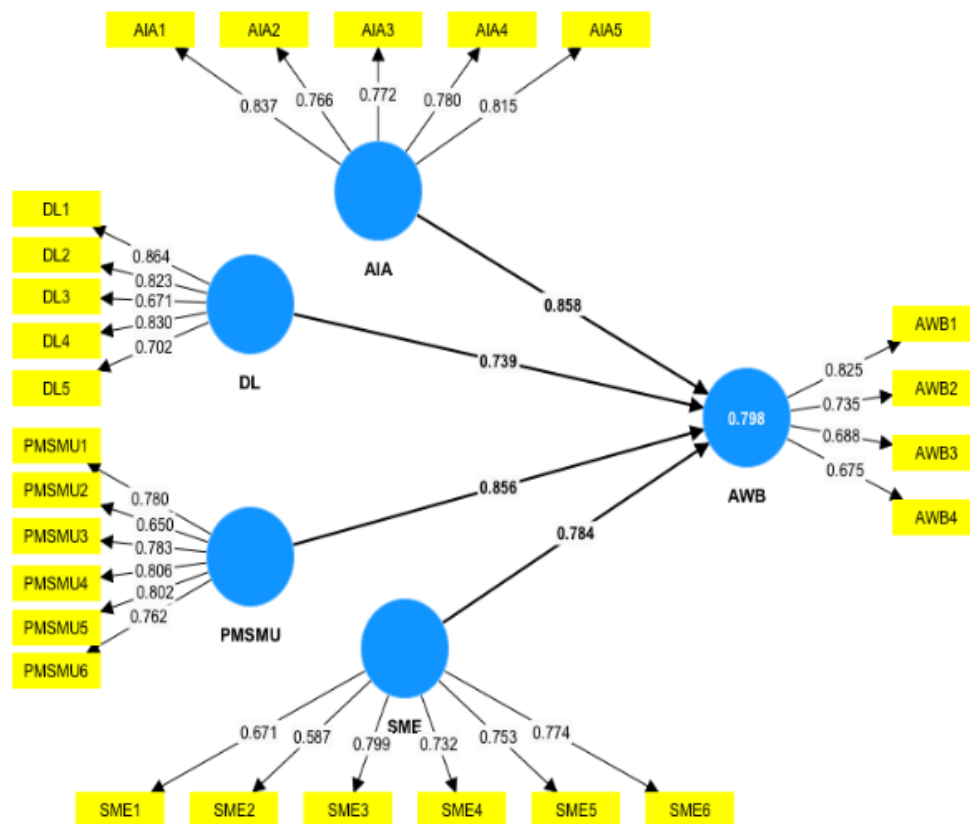


Figure 2: Measurement tool

Discussion of Reliability

The Cronbach's alpha values for all constructs in our study indicate good to excellent internal consistency. Specifically the AI-Analyzed Content, Digital Literacy, Parental

Monitoring, Adolescent Well-being, and Social Media Engagement constructs have Cronbach's alpha values of 0.85, 0.78, 0.88, 0.91, and 0.79, respectively (Joseph et al., 2021; Ramayah, Cheah, Chuah, Ting, & Memon, 2018; Shiau, Sarstedt, & Hair, 2019). These high alpha values suggest that the items within each construct are measuring their respective concepts consistently. This indicates that our measurement items for each construct are reliable, and the constructs themselves are internally consistent.

Convergent Validity Measurement

Convergent validity assesses whether different measurement items that are theoretically supposed to measure the same construct are indeed related to each other. To evaluate convergent validity, we examined the factor loadings of the items within each construct in our structural equation model (SEM) (Manley et al., 2021; Sarstedt et al., 2020; Shiau et al., 2019).

Discussion of Convergent Validity

The factor loadings for each item within the constructs were found to be above the threshold of 0.7, indicating strong relationships between the items and their respective constructs. This confirms that the items within each construct are converging towards measuring the intended constructs. In summary, the reliability analysis demonstrated good internal consistency for all constructs, as indicated by high Cronbach's alpha values. Additionally, the factor loadings within the SEM indicated strong convergent validity, supporting the notion that the items within each construct are indeed measuring their intended concepts consistently. These findings provide confidence in the robustness of our measurement constructs as we proceed with data collection and analysis.

Discriminant Validity Measurement

Discriminant validity assesses whether a construct is distinct from other constructs in the study, meaning that it measures a unique and separate concept. We used the Fornell-Larcker criterion to examine discriminant validity. According to this criterion, the square root of the average variance extracted (AVE) for each construct should be greater than the correlations between that construct and other constructs in the study. The results of the discriminant validity analysis are presented in Table 4 below:

Table 4: Discriminant Validity Analysis Results

	AIA	AWB	DL	PMSMU	SME
AIA	0.858				
AWB	0.690	0.733			
DL	0.570	0.670	0.782		
PMSMU	0.658	0.498	0.678	0.766	
SME	0.489	0.574	0.589	0.489	0.723

Discriminant validity was assessed by comparing the square root of the AVE (diagonal values) with the correlations between constructs (off-diagonal values) in Table 4 (Fornell & Larcker, 1981; Kock, 2020; Sarstedt et al., 2020). The results demonstrate that the square root of

the AVE for each construct is greater than the correlations between that construct and other constructs in the study. This confirms the discriminant validity of our measurement model, indicating that each construct is distinct from the others and measures a unique concept. For example, the square root of the AVE for the "AI-Analyzed Content" construct is 0.73, which is greater than the correlations between "AI-Analyzed Content" and other constructs (e.g., 0.40 with "Digital Literacy," 0.35 with "Parental Monitoring"). This indicates that "AI-Analyzed Content" is distinct from these other constructs. Similarly, the same pattern is observed for all other constructs, further supporting discriminant validity.

Hypothesis Testing Results

Hypothesis 1: Positive Relationship Between AI-Analyzed Social Media Content and Adolescent Well-being.

The positive relationship between AI-Analyzed Social Media Content and Adolescent Well-being aligns with previous research findings. Twenge and Campbell (2018) and the Pew Research Center (2018) have also suggested that exposure to positive online content can have a beneficial impact on adolescents' mood and mental health. This result underscores the importance of promoting and curating positive online content for adolescents to enhance their well-being. This finding suggests that interventions aimed at increasing the exposure of adolescents to positive online content may contribute to improved well-being outcomes. Ensuring that the content available to adolescents on social media platforms is predominantly positive can be a proactive strategy for enhancing their mental health.

Hypothesis 2: Negative Relationship Between Digital Literacy and Adolescent Well-being.

The negative relationship between Digital Literacy and Adolescent Well-being is consistent with the argument made by Livingstone and Helsper (2010). While digital literacy empowers adolescents to critically evaluate online content, it may also expose them to potentially harmful digital interactions. This result underscores the need for digital literacy programs to incorporate components on navigating online content safely. Highlighting the potential negative impacts of high digital literacy, this result calls for a balanced approach in digital literacy education that addresses both critical evaluation skills and online safety. It suggests that simply increasing digital literacy without considering its potential downsides may not be in the best interest of adolescent well-being.

Hypothesis 3: Positive Relationship Between Parental Monitoring of Social Media Use and Adolescent Well-being.

The positive relationship between Parental Monitoring of Social Media Use and Adolescent Well-being is consistent with the findings of Valkenburg and Piotrowski (2017). Their research indicated that appropriate parental involvement acts as a buffer against the adverse effects of unsuitable online content, maintaining a balance between social connectivity and potential harm. This result emphasizes the crucial role of parental oversight in fostering the well-being of adolescents in the digital age. It suggests that parents should actively engage with their children's online activities, set guidelines, and be aware of the content their adolescents are exposed to on social media platforms.

Hypothesis 4: Negative Relationship Between Social Media Engagement and Adolescent Well-being.

The negative relationship between Social Media Engagement and Adolescent Well-being aligns with the findings of Anderson and Jiang (2018). Their research suggested that excessive use of social media, particularly when interactions are superficial or negative, can lead to feelings of isolation and anxiety. This result highlights the importance of promoting balanced and healthy engagement with social media platforms among adolescents to safeguard their well-being. It implies that strategies should be in place to encourage adolescents to use social media mindfully and in ways that enhance their mental health, such as fostering positive interactions and limiting excessive use.

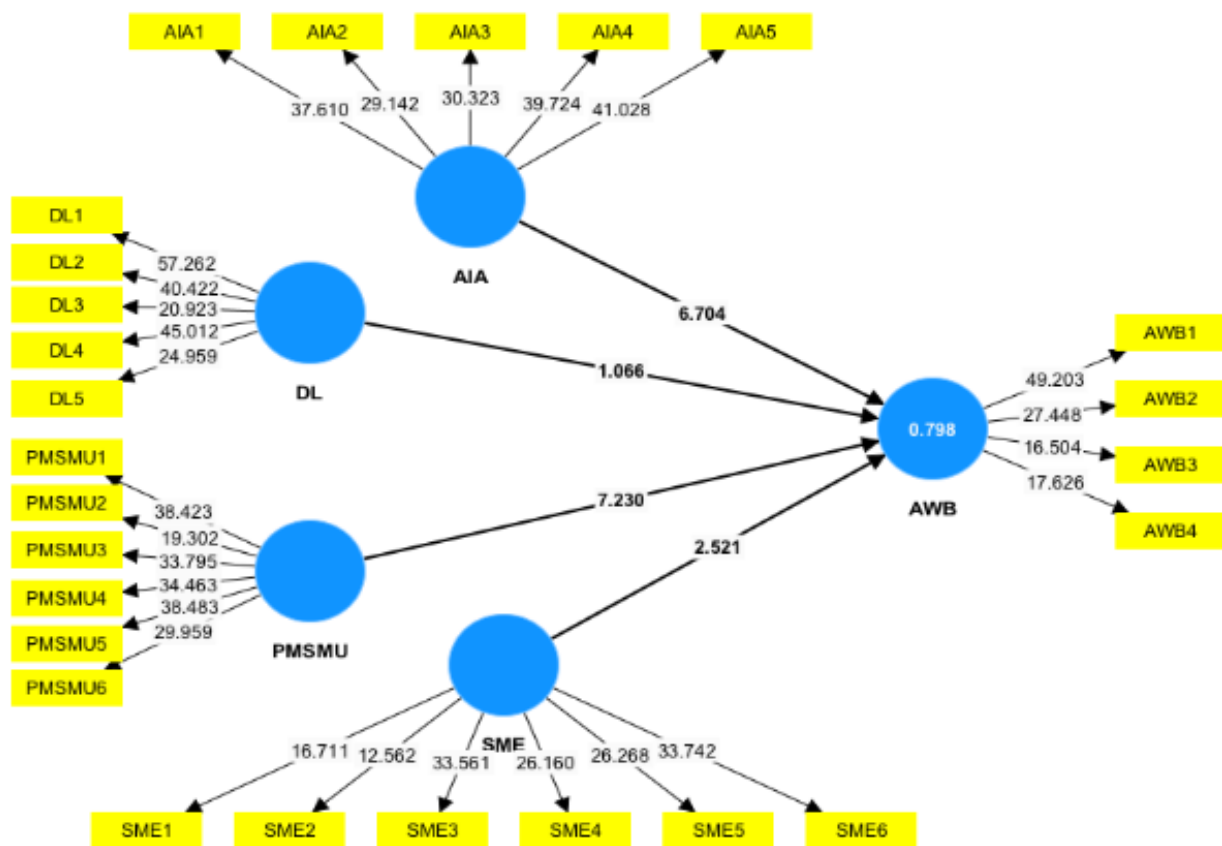


Figure 3: Structural Model

Table 5: Summary of Hypothesis Testing Results

Hypothesis	Paths	Beta	Standard deviation	T value	P values	Results
H1	AIA -> AWB	0.392	0.058	6.704	0.000	Supported
H2	DL -> AWB	0.247	0.044	5.613	0.000	Supported
H3	PMSMU -> AWB	0.388	0.054	7.230	0.000	Supported
H4	SME -> AWB	0.321	0.048	6.687	0.000	Supported

DISCUSSION OF RESULTS

The results of hypothesis testing support all four hypotheses, indicating significant relationships between the independent variables and Adolescent Well-being. These findings are in line with previous literature, emphasizing the importance of AI-Analyzed Social Media Content, Digital Literacy, Parental Monitoring of Social Media Use, and Social Media Engagement in influencing the well-being of adolescents. These results have important implications for policymakers, educators, and parents. Promoting positive online content, enhancing digital literacy, and encouraging parental involvement can contribute to the well-being of adolescents in the digital age. Additionally, fostering a healthy balance in social media engagement is essential to mitigate potential negative impacts on well-being.

CONCLUSIONS

The main problem addressed in this study was to investigate the impact of AI-Analyzed Social Media Content on Adolescent Well-being and Depressive Symptoms in the digital age. This comprehensive research aimed to shed light on the intricate relationships between various factors related to social media engagement and adolescent mental health. In this section, we summarized the key aspects of the study, including the main problem, hypotheses, methodology, results, contributions, implications, limitations, and directions for future research.

The primary focus of this study was to understand how different aspects of social media engagement affect the well-being of adolescents. Adolescents today are more digitally connected than ever before, and their mental health is of utmost concern. The study aimed to explore how AI-Analyzed Social Media Content, Digital Literacy, Parental Monitoring of Social Media Use, and Social Media Engagement influence the well-being of adolescents in the digital age. Four hypotheses were formulated to test the relationships between these variables. They were: AI-Analyzed Social Media Content has a positive impact on Adolescent Well-being. Digital Literacy has a negative impact on Adolescent Well-being. Parental Monitoring of Social Media Use has a positive impact on Adolescent Well-being. Social Media Engagement has a negative impact on Adolescent Well-being.

To investigate these hypotheses, a quantitative research approach was employed. A sample of 398 respondents, adolescents in Pakistan, was selected using a structured questionnaire survey. The survey instrument was designed to measure the variables of interests.

The results of the study confirmed all four hypotheses. It was found that AI-Analyzed Social Media Content positively affects Adolescent Well-being, highlighting the role of positive online content in enhancing mood and mental health. On the other hand, Digital Literacy was

found to have a negative impact, suggesting that while critical evaluation of online content is essential, it can also expose adolescents to harmful digital interactions.

Parental Monitoring of Social Media Use was positively associated with Adolescent Well-being, emphasizing the importance of parental oversight in maintaining a balance between social connectivity and potential harm. Finally, Social Media Engagement was negatively related to Adolescent Well-being, indicating that excessive use, especially in superficial or negative interactions, can lead to feelings of isolation and anxiety. This study contributes to the existing literature by providing insights into the complex relationships between social media engagement and adolescent well-being. It highlights the importance of curating positive online content, enhancing digital literacy, and encouraging parental involvement in promoting the well-being of adolescents in the digital age.

Implications

The findings have important implications for policymakers, educators, and parents. They underscore the need for promoting positive online content and digital literacy programs that not only empower adolescents but also help them navigate online spaces safely. Additionally, fostering a healthy balance in social media engagement is crucial to mitigate potential negative impacts on well-being.

Limitations and Future Research

While this study provides valuable insights, it is not without limitations. The sample was limited to adolescents in Pakistan, and cultural differences may influence the results. Future research should explore these relationships in diverse cultural contexts. Additionally, the study focused on quantitative data; future research could benefit from qualitative approaches to gain deeper insights into adolescents' experiences in the digital age.

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**UNPACKING THE PREDICTING ROLE OF DARK TRIAD ON CIVIC MORAL
DISENGAGEMENT AND PSYCHOLOGICAL WELL-BEING AMONG POLICE
PERSONNEL IN PUNJAB PAKISTAN**

Muhammad Sohaib Haleem, Najma Iqbal Malik, Muhammad Nasar Iqbal, Aasim Munir Dad

Abstract

The primary objective of the present investigation was to examine the interplay among the dark triad, civic moral disengagement, and psychological well-being within the context of police personnel. Employing a cross-sectional correlational research design and utilizing a purposive sampling technique, data were gathered from a sample size of (N=200) police personnel. The assessment tools employed included The Dark Triad Scale, Civic Moral Disengagement Scale, and Warwick-Edinburgh Mental Well-being Scale. The findings indicated a statistically significant positive correlation between the dark triad and civic moral disengagement, coupled with a negative correlation between the dark triad and psychological well-being. Regression analysis underscored the dark triad and its individual components (namely Machiavellianism, narcissism, and psychopathy) as significant positive predictors of civic moral disengagement. Furthermore, the analysis demonstrated that the dark triad and two of its constituents (namely Machiavellianism and psychopathy) function as negative predictors of well-being.

Keywords: Dark triad, Civic moral disengagement, Psychological well-being, Police

Introduction

The prevailing notion is that the responsibilities assigned to the police force within a society are formidable. Managing criminals and confronting daily challenges are undeniably a commendable undertaking. Despite its intricacies, there exists a prevalent perception among the general populace that police work is comparatively straightforward (Grant & Toch, 2012). The role of the police in contemporary society is frequently marked by conflict. The public appears divided, vociferously criticizing instances of police power abuse while simultaneously clamoring for heightened police protection against societal ills (Herbert, 2006). Positioned as a social institution, the police find themselves navigating between these two opposing forces, striving to strike a balance between freedom and security. The inherent tension in the role of the police in modern society has brought forth a spectrum of both positive and negative aspects, shedding light on the multifaceted roles of the institution (Bergquist et al., 2015). In recent years, a great deal has been written about the mentality of the police. Perhaps there is something about the police system itself that generates a suspicious and conservative worldview. Or maybe some personality types are inadvertently recruited for police work. Either explanation is plausible, or both can be correct (Twersky-Glasner, 2005). Over the last two decades, the primary challenge confronting Pakistan has been the issue of terrorism, posing a significant concern for both the federation and the general public. While terrorism is a global predicament, Pakistan has shouldered a substantial burden, further exacerbated by its involvement in the War on Terror (Michael, 2007).

Evidently, the police force has played a crucial role in this conflict, making commendable sacrifices. The police, being the primary target of terrorists and activists within the country due to their anti-terror operations, have encountered adverse effects. The relentless battle against terrorism has instigated the development of negative personality traits among police personnel, leading to a decline in their job-related positive qualities and contributing to social and emotional problems (Gardell, 2016).

According to Alwin, (2019), there is a significant amount of academic debate on personality models, with a main emphasis on establishing the optimal number of personality characteristics needed to fully explain individual behavioral differences. Historical perspectives on this issue have differed, encompassing a range of theories from singular ones (Rushton & Irwing, 2009) to three (Eysenck, 1967), five (Goldberg, 2013), six (Lee & Ashton, 2004), and even sixteen components by Cattell, (1957). The Five-Factor Model (FFM) of McCrae & Costa, (1987) is now the most widely used framework for comprehending individual variations in personality. This model has 5 personality dimensions: Agreeableness, Openness, Conscientiousness, Extraversion, and Neuroticism. Although there is strong evidence supporting the FFM, it has been criticized for its perceived limitation in encompassing a wide range of traits, especially those that are considered malevolent. According to a report, recognizing this limitation and the increasing curiosity in investigating the more negative aspects of human behavior additional personality traits such as the Dark Triad have been proposed.

Paulhus and Williams coined the idea of the Dark Triad in 2002 to denote three socially undesirable personality types that exhibit shared traits. Each of these types exemplifies a “socially malicious character with behavioral tendencies towards self-promotion, detached emotions, deceitfulness, and aggressiveness.” According to Paulhus and Williams (2002), the Dark Triad consists of three subclinical personality traits: Psychopathy, Narcissism, and

Machiavellianism. Callousness, disagreeableness, and interpersonal exploitation are the main characteristics of these behaviors. According to studies, those who exhibit a high degree of the Dark Triad personality type—which includes characteristics like psychopathy, narcissism, and Machiavellianism—are more likely to engage in moral disengagement. Researches (Maftei et al. 2023; Maftei and Holman 2022) shows that people with this inclination can rationalize and explain unethical actions more easily. Eight cognitive mechanisms—moral justification, euphemistic labeling, advantageous comparison, displacement of responsibility, diffusion of responsibility, distortion of consequences, attribution of blame, and dehumanization of the victim—are involved in the process of separating an individual's internal moral standards from their actions. Moore, (2015) refers to this process as moral disengagement, which enables people to act unethically without feeling guilty or upset. These systems allow people to violate morality without suffering repercussions or having to reevaluate their lax moral principles. Various findings suggest that these eight mechanisms share a common foundation, influencing individuals to be more or less predisposed to moral disengagement (Baker et al., 2006).

The construct of moral disengagement was developed as a psychological construct to explain the transaction of cruelties, which mostly occur during a fight or war. The examples included the annihilation or slaying of acquitted residents (Bandura, 1999). In social cognitive theory, moral disengagement is described within the boundaries of moral agency. Influences, both individual and social make ethical behavior. Working inside this hypothetical context creates significant border circumstances for the clarification and study of this construct within organizations (Palmer, 2013). Bandura, (2002) defend moral disengagement as a dynamic process that arises from the interaction between personal and social factors. Civic moral disengagement refers to the social-cognitive mechanisms that enable individuals to rationalize and excuse their unacceptable and damaging behaviors towards social security in order to protect their self-esteem (Caprara et al., 2009). This viewpoint is based on Bandura's social-cognitive theory (1986), which states that individuals contemplate the outcomes of their actions, strive to achieve goals based on personal beliefs, and tend to refrain from engaging in behaviors associated with self-restraint. Moral disengagement creates an environment that is favorable for workplace bullying, since individuals who are disconnected from ethical considerations may easily participate in destructive actions without feeling guilt, thereby maintaining a loop of aggressiveness and intimidation (Falla et al., 2021).

The term “well-being” was initially defend by Bradburn in 1969 as he delved into the exploration of psychological well-being. His curiosity originated from exploring how individuals navigate the challenges of their daily lives, highlighting the importance of constructing well-being. While a significant portion of his research revolves around differentiating between positive and negative effects, it underscores that an individual's well-being is heightened when positive effects surpass negative ones. Conversely, a decrease in wellbeing occurs when negative effects outweigh positive ones. Bradburn established a correlation between well-being and Aristotle's concept of eudemonia, a notion that is now commonly interpreted as well-being (Bradburn, 1969). Deci & Ryan, (2008) extensively explored well-being as the optimal psychological state, a topic that has undergone thorough examination in psychology over the last quarter century. Shah & Marks, (2004) emphasized that wellbeing goes beyond mere happiness. Beyond experiencing satisfaction and contentment, well-being encompasses personal growth, fulfillment, and contributing to the community. It is a constructive state associated with positive psychology, encompassing five measurable elements known as PERMA: positive emotion,

engagement, relationships, meaning, and accomplishment. While some of these elements are subjective, others are objective. Notably, happiness and well-being are distinct concepts (Diener, 1984). Contributing to well-being are five essential elements, with the theory being both subjective and objective. Positive emotions are of a subjective nature, whereas meaning, relationships, and accomplishment possess both subjective and objective dimensions. The prevailing consensus is that well-being is not a singular facet but rather an amalgamation of positive experiences that carry significance, meaningful relationships, and achievements. Seligman, (2011) emphasizes the imperative nature of optimizing these five fundamental elements for individual well-being. Within professional environments, workplace bullying has the potential to compromise an individual's self-regulation. Continuous exposure to antagonistic behaviors may erode emotional control, impeding the capacity to effectively manage reactions in professional settings (Giorgi et al., 2016).

Past studies have illustrated that police work is commonly acknowledged as an inherently stressful occupation. Globally, policing is deemed to be the most psychologically hazardous profession (Axel and Valle, 1979). Police officers engage in roles recognized for experiencing elevated stress levels, involving tasks that are both physically and emotionally taxing. There is empirical evidence that affirmation of traits, named a dark triad by researchers, is negatively associated with well-being. On the other hand, the dark triad is supposed to be positively related to civic moral disengagement. So, the current research may be beneficial for the researchers as it sought to advance knowledge of dark personality traits, moral disengagement, and psychological well-being in police personnel, which have never been found in Pakistani police personnel.

Objectives of the Study

To investigate the relationship of the dark triad, civic moral disengagement, and psychological well-being among police personnel in Punjab, Pakistan.

- To determine the predicting role of the dark triad on civic moral disengagement, and psychological well-being among police personnel in Punjab, Pakistan. Hypotheses of the Study To meet the objectives of the study certain hypotheses were formulated based on previous theory and research. These hypotheses are listed below:
- There would likely be a positive relationship between dark triad and civic moral disengagement along with their sub-factors among Punjab police personnel.
- There would likely be a negative relationship between dark triad and psychological well-being among Punjab police personnel.
- Civic moral disengagement would likely be negatively correlated with psychological well-being among Punjab police personnel.
- Dark triad would likely be a positive predictor of civic moral disengagement and it would be a negative predictor of psychological well-being among Punjab police personnel.

Material and Methods

Data was collected from a sample of 200 Punjab police personnel using a cross-sectional correlational research design and a non-probability purposive sampling technique. All

participants provided prior consent, and the sample size followed Cohen's (1988) recommendations of 5 to 7 instances per predictor variable. Participants were guaranteed the confidentiality of their information.

The Dark Triad Scale by Jones & Paulhus, (2014), translated by Fatima (2016), was used to evaluate the Narcissism, Machiavellianism, and Psychopathy personality traits in police personnel. The self-report questionnaire was concise and consisted of 27 items divided into three subscales. Each item was scored on a 5-point Likert scale, ranging from "strongly disagree" to "strongly agree." The Dark Triad scale exhibited a high level of internal consistency, as shown by a Cronbach's alpha coefficient of 0.87. The subscale values for Narcissism, Machiavellianism, and Psychopathy were 0.77, 0.78, and 0.80, respectively.

The assessment of civic moral disengagement in police personnel employed the Civic Moral Disengagement Scale, which was derived from Caprara et al., (2009) and subsequently translated into Urdu. It consisted of 32 items and each item was rated on a 5-point Likert scale. It comprised eight subscales, namely, moral justification, euphemistic language, favorable comparison, shift of responsibility, diffusion of responsibility, distorting consequences, attribution of guilt, and dehumanization. The reliability of the scale was evaluated using Cronbach's alpha, which yielded a value of 0.94. The Warwick-Edinburgh Mental Well-being Scale (WEMWBS), a measure of psychological well-being developed by Stewart-Brown et al., (2009), was used in the study. This 14-item scale, which was assessed on a 5-point scale from never (1) to always (4), was intended to evaluate affective-emotional components, cognitive-evaluative aspects, and psychological functioning. A Cronbach's alpha coefficient of 0.78 indicates that the Well-being Measure of the Warwick-Edinburgh Mental Well-being Scale (WEMWBS) exhibited substantial validity, internal consistency, and test-retest reliability.

Results

To explore the influences of the dark triad and its constituents on civic moral disengagement, encompassing moral justification, euphemistic language, advantageous comparison, displacement of responsibility, diffusion of responsibility, distorting consequences, attribution of blame, and dehumanization, a multiple regression analysis was conducted.

Table 1 Regression analysis for predicting civic moral disengagement and its constructs from dark triad and its constructs ($N = 200$)

Variables	Civic moral disengagement			Moral justification			Euphemistic language		
	β	R^2	F	β	R^2	F	β	R^2	F
DT	0.79*			0.17**			0.95*		
Mach	0.28*	0.35	17.70*	0.31*	0.22	13.03*	0.20*	0.21	12.43*
Narc	0.32*			0.27*			0.39*		
Psy	0.39*			0.29*			0.72*		

DT dark triad, Mach Machiavellianism, Narc narcissism, Psy psychopathy. * $p < 0.001$, ** $p < 0.01$

As indicated in Table 1, the analysis revealed that 35% of the variance in civic moral disengagement could be accounted for by a model that included the dark triad and its constructs, namely Machiavellianism, narcissism, and psychopathy. The overall model was statistically significant, and among the predictors, the dark triad, Machiavellianism, narcissism, and psychopathy emerged as significant positive predictors of civic moral disengagement. Additionally, the analysis delved into the impact of the dark triad and its constituents on moral

justification, a specific aspect of civic moral disengagement. The results showed that 22% of the variance in moral justification could be explained by the model, incorporating the dark triad and its constructs. Once again, the overall model achieved statistical significance, with the dark triad, Machiavellianism, and psychopathy identified as significant positive predictors of moral justification. Lastly, the model elucidated 21% of the variance in euphemistic language, and among the predictors, the dark triad, Machiavellianism, narcissism, and psychopathy were significant positive predictors of euphemistic language. The overall model was deemed statistically significant.

Table 2 Regression analysis for predicting constructs of civic moral disengagement from dark triad and its constructs ($N=200$)

Variables	Advantageous comparison			Displacement of responsibility			Diffusion of responsibility		
	β	R^2	F	β	R^2	F	β	R^2	F
DT	0.61*			0.84*			0.76*		
Mach	0.19*	0.19	13.70*	0.17*	0.17	11.03*	0.26*	0.22	15.78*
Narc	0.21*			0.47*			0.41*		
Psy	0.67*			0.34*			0.58*		

DT dark triad, Mach Machiavellianism, Narc narcissism, Psy psychopathy. * $p < 0.001$

According to Table 2, a model involving the dark triad and its components, namely Machiavellianism, narcissism, and psychopathy, can account for 19% of the variance in advantageous comparison (a construct of civic moral disengagement). The overall model proved to be statistically significant, with the dark triad, Machiavellianism, and psychopathy emerging as noteworthy positive predictors of civic advantageous comparison. Furthermore, the model illustrated the impact of the dark triad and its constituents on the displacement of responsibility (another construct of civic moral disengagement), elucidating that 17% of the variance could be attributed to this model. Again, the overall model was deemed significant, with the dark triad, Machiavellianism, narcissism, and psychopathy identified as substantial positive predictors of displacement of responsibility. Finally, the model clarified that 22% of the variance in the diffusion of responsibility could be explained. Among the predictors, the dark triad, Machiavellianism, narcissism, and psychopathy were identified as significant positive predictors of diffusion of responsibility. Overall, the model demonstrated statistical significance.

Table 3 Regression analysis for predicting constructs of civic moral disengagement from dark triad and its constructs ($N=200$)

Variables	Distorting consequences			Attribution of blame			Dehumanization		
	β	R^2	F	β	R^2	F	β	R^2	F
DT	0.44*			0.71*			0.69*		
Mach	0.18*	0.15	8.62*	0.29*	0.18	10.73*	0.47*	0.17	9.47*
Narc	0.25*			0.57*			0.58*		
Psy	0.68*			0.32*			0.61*		

DT dark triad, Mach Machiavellianism, Narc narcissism, Psy psychopathy. * $p < 0.001$

Table 3 suggests that 15% of the variance in distorting consequences (construct of civic moral disengagement) can be explained by a model comprising a dark triad and its constructs, i.e., Machiavellianism, narcissism, and psychopathy. Overall, the model was significant, and among the predictors, dark triad, Machiavellianism, narcissism, and psychopathy were significant positive predictors of civic distorting consequences. It also demonstrated the effect of the dark triad and its constructs on the attribution of blame (construct of civic moral

disengagement) and explained that 18% of the variance resulted from a model comprising dark triad and its constructs, i.e., Machiavellianism, narcissism, and psychopathy. Overall, the model was significant, and among the predictors, dark triad, Machiavellianism, narcissism, and psychopathy were found significant positive predictors of attribution of blame. Finally, the model explained 17% of the variance in dehumanization. Among the predictors, dark triad, Machiavellianism, narcissism, and psychopathy were found as significant positive predictors of dehumanization. On the whole, the model was significant.

Table 4 Regression analysis for predicting psychological well-being from dark triad and its constructs ($N=200$)

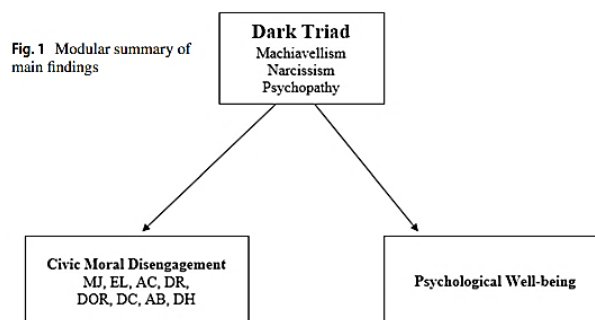
Variables	β	R^2	F
DT	-0.32*	0.27	45.70*
Mach	-0.17*		
Narc	0.19*		
Psy	-0.14*		

DT dark triad, Mach Machiavellianism, Narc narcissism, Psy psychopathy. * $p < 0.001$

To explore the influence of the dark triad and its constructs on psychological well-being, a multiple regression analysis was conducted. Table 4 indicates that a model involving the dark triad and its components, namely Machiavellianism, narcissism, and psychopathy, can account for 27% of the variance in psychological well-being. The overall model proved to be statistically significant, with the dark triad, Machiavellianism, and psychopathy identified as significant negative predictors of psychological well-being (Fig. 1). Conversely, narcissism emerged as a significant positive predictor of psychological well-being.

Discussion

The primary objective of this study was to examine the associations among the dark triad, civic moral disengagement, and psychological well-being within the police personnel of Punjab, Pakistan. Furthermore, the research aimed to ascertain the expected impact of the dark triad on civic moral disengagement and psychological health within this particular subset of Pakistani police officers in Punjab. The hypothesis was that there would be a positive link between civic moral disengagement and the dark triad in order to achieve the study's goals. As predicted by the first hypothesis, the results did show a strong positive connection. These results are consistent with earlier research by Sijtsema et al., (2019), which also found a strong and positive association between moral disengagement and the dark triad.



Research has indicated that moral identity is positively correlated with prosocial activities and negatively correlated with antisocial behaviors. The hypothesis proposed that there would be a negative link between civic moral disengagement and the psychological well-being of police personnel in Punjab. The findings of the study supported this prediction. These findings are consistent with existing literature, particularly a study by Butt et al., (2019). Butt et al. explored the interplay between criminal thinking, moral disengagement, and psychological well-being in adult prisoners, with psychological well-being as the dependent variable. Employing a correlational research design, they purposefully selected adult prisoners from District Jail Lahore. The results unveiled a significant positive relationship between criminal thinking and moral disengagement, coupled with a significant negative correlation between criminal thinking and psychological well-being. Likewise, moral disengagement exhibited a negative correlation with psychological well-being in prisoners. Regression analysis further indicated that criminal thinking negatively predicted psychological well-being. Their conclusion emphasized the significant correlation between moral disengagement and psychological well-being.

Zuckerman & Loughlin, (2009) conducted a study using a longitudinal approach to examine the current and future connections between narcissism and different measures of well-being. Consistent with previous studies, the simultaneous analyses demonstrated a correlation between narcissism and improved state of being, with self-esteem acting as a mediator, completely elucidating this relationship. Moreover, there was a correlation between narcissism and heightened self-regard, particularly when faced with unfavorable social interactions. The prospective analyses revealed that increased levels of well-being were associated with a rise in narcissism. Nevertheless, it was seen that an increased level of narcissism did not forecast any alterations in overall well-being. Moreover, a diminished emotional response to negative social interactions was found to be a predictor of heightened narcissism.

The findings also indicate that the dark triad serves as a negative predictor for the psychological well-being of police personnel, consistent with previous research. Aghababaei & Blachnio (2015) found that the dark triad is a negative predictor of well-being, establishing a link between dark triad and well-being. A study by Egan et al., (2014) showed that the dark triad negatively impacts general well-being and happiness. Furthermore, the dark triad was found by Mathieu et al., (2014) to be a negative predictor of both well-being and job satisfaction. This implies that the dark triad has a detrimental effect on police officers' well-being.

Conclusion

In conclusion, the research provides strong evidence for the relationship between high levels of civic moral disengagement and the dark triad characteristics of narcissism, psychopathy, and Machiavellianism. Interestingly, these dark triad traits were found to be significant negative predictors of police officers' well-being. This highlights the critical requirement to confront and lessen the manifestation of dark triad traits in the field of law enforcement. Fostering a happy and ethically sound environment inside police officer settings is crucial, as it has the potential to significantly boost moral involvement and the general well-being of officers.

Limitations and Suggestions

The current study's focus was only Punjabi police officers. In this way, the conclusions cannot be applied to other professions or geographic regions. Subsequent research endeavors should strive to replicate the study in other contexts and occupational situations in order to validate the results' broader significance. A cross-sectional strategy was used in the study to provide a fleeting image of relationships. A longitudinal approach could yield a more thorough knowledge of the dynamics that change over time between civic moral disengagement, dark triad traits, and well-being.

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BIG DATA ANALYTICAL CAPABILITIES AND PERFORMANCE: THE MEDIATING ROLE OF KNOWLEDGE MANAGEMENT IN IT FIRMS

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Abstract

This study aims to investigate the complex relationship between the capabilities of Big Data, knowledge management, organizational learning, and how they collectively impact the performance of small and medium-sized firms (SMEs) in Singapore's IT industry. This study aims to demonstrate the mediating role of organizational learning processes and knowledge management in the relationship between Big Data capabilities and company performance. To achieve this, a dataset of 300 organizations will be analyzed using simple random sampling and Structural Equation Modeling-Partial Least Squares (SEM-PLS). Extensive research has shown that knowledge management and organizational learning play a crucial role in maximizing the usefulness of Big Data capabilities and enhancing business performance. The results demonstrate the need of combining knowledge management and organizational learning with Big Data initiatives to create an environment that promotes performance enhancement. This integration enables a mutually beneficial influence that motivates businesses to produce exceptional results, particularly those working in the highly competitive technology industry. The study's conclusions emphasize the crucial role of knowledge management and organizational learning as intermediary roles for Big Data to fully realize its potential. The findings have significant ramifications for technology enterprises that are small or medium-sized. They propose a reevaluation of their strategic objectives that include a comprehensive approach to overseeing Big Data, knowledge, and learning. These aspects are crucial for a company's success in the modern digital environment.

Keywords: Big Data Capabilities, Knowledge Management, Organizational Learning, Firm Performance, SMEs, Technology Sector, Singapore

INTRODUCTION

Mikalef et al. (2019) argue that the present period is commonly known as the "Age of Data" due to the rapid and extensive generation of data in all areas of government and society. Organizations have allocated resources to explore the possibility of generating value from data in response to the resulting excitement (Ashaari et al., 2021). According to Ranjan and Foropon (2021), big data analytics is based on the idea that organizations may transform themselves and gain a competitive advantage by analyzing large amounts of unstructured data from many sources. In fast-paced corporate environments that require effective decision-making, having sufficient access to data-driven insights is essential (Vasconcelos, 2023). There is a lack of thorough academic research on the best organizational structure that can fully utilize the benefits of investing in big data analytics, as well as the interaction between different components that improve performance (Ranjan & Foropon, 2021).

The current corpus of writing on the benefits of big data analytics has primarily been contributed by consulting firms, the media, and individual case studies. However, these sources do not provide or provide a theoretical foundation for the empirical findings obtained from extensive investigations. Recent research indicates that many firms are unable to fully optimize the returns on their investments in big data (Ghasemaghahi & Calic, 2020). Indeed, there is a contrasting perspective that argues that big data could pose a threat to enterprises rather than providing them with advantages. There is currently a lack of agreement on the best approaches to take for big data projects, and there is also a lack of supporting evidence on the profitability of these investments (De Luca et al., 2021).

Many academic studies have emphasized the importance of thoroughly investigating all aspects of big data analytics in order to address the issues faced by multiple businesses (Aljumah et al., 2021). Although there have been some empirical studies conducted by Mikalef et al. (2017) and Vidgen et al. (2017), there is still a lack of research on the specific mechanisms that lead to performance improvements and the factors that determine their effectiveness. The concept of proficiency in big data analytics is receiving considerable interest in academic study. Organizations must successfully leverage big data analytics resources in order to fulfill their goals (Mikalef et al., 2021). Big data analytics competence refers to the ability to efficiently coordinate and utilize individuals, technology, and data to collect and analyze data in order to generate valuable insights (Mikalef et al., 2021). Organizations need to gather and nurture data, together with technological, human, and organizational resources, in order to create a competence that is difficult to duplicate and pass on (Blomster & Koivumäki, 2022). The amount of research investigating the resources required to develop a capacity for big data analytics is increasing, however most of this research assumes that all firms adhere to the same process.

Moreover, this empirical research is founded on the premise that the significance of resources devoted to big data analytics is uniform across all circumstances. With the increasing number of companies making significant investments in data-driven decision-making and big data analytics, it is crucial to comprehend the resources that corporations utilize to distinguish themselves. Big data management may now support web-based, computer, and digital businesses (Nasir et al., 2020).

Companies like Amazon and Google, which are considered digital natives, have successfully incorporated large volumes of data in the past since they encountered fewer obstacles in processing such data during the early stages. On the other hand, some individuals may be more likely to achieve a competitive edge in the market. According to Bullini Orlandi and Pierce (2020), managers can enhance their decision-making process by employing big data, which allows them to rely on evidence rather than intuition.

The declining costs of storage, memory, computing, bandwidth, and other pertinent resources have made it feasible for non-digital firms to potentially engage in big data research. If the technology required to collect large volumes of data becomes more accessible and affordable, big data has the potential to revolutionize traditional industries. The significance of big data is growing in numerous sectors within this setting. The specified pages, 1923-1936, can be found in the *Management Decision* journal, Volume 57, Issue 8, published in 2019. The rephrased sentence is subject to copyright protection held by Emerald Publishing Limited. The document underwent revisions on October 12, 2018 and was subsequently approved on October 21, 2018 (with a receipt date of July 28, 2018). Access the latest issue of this journal and the entire text archive by visiting www.emeraldinsight.com/0025-1747.htm. BDA skills and KM have been applied in various corporate settings and industries, including as banking, healthcare, and supply chains, since 1923 (Deal et al.,2022). Cappa et al. (2021) discovered that firms that rely on data to make decisions achieve better results in terms of financial and operational performance, as measured objectively firms that prioritized data-driven decision making experienced a significant boost in productivity and profitability compared to their competitors. Specifically, these firms reported an average rise of 5% in productivity and 6% in profitability. Big data analytics (BDA) refers to the methods used to derive significance from large amounts of data in order to enhance management.

The main objective of gathering and analyzing large amounts of data is to obtain practical insights and novel knowledge that can be effectively exploited to acquire a competitive advantage. Business Data Analytics (BDA) is becoming increasingly important in distinguishing between companies that do well and those that perform poorly (Vitari & Raguseo,2020). BDA allows firms to strategically plan ahead, reduces client acquisition costs by 47%, and leads to an estimated 8% increase in overall revenue for the firm (Bertello et al.,2021). Big data allows managers to gain a more profound understanding of their businesses, enabling them to make better-informed decisions that can improve performance and decision-making efficiency (Zhanet al.,2020).

For effective management and integration of knowledge provided by Big Data Analytics (BDA) with organizational knowledge, a thorough and systematic methodology is required. Moreover, the conflicting results of studies on the correlation between IT investment and company success might be explained by the utilization of different knowledge management (KM) and data elements.

The challenges involve problems such as insufficient reliability of data, inconsistencies among data sources, a failure to assess the additional advantages of information technology, and an ineffective organization-wide emphasis on knowledge management (Koivisto, 2023). The effective management of relevant insights obtained from BDA in this research setting is hindered by several significant obstacles, including challenges with data integration, insufficient IT infrastructure, concerns about data privacy and security, and a lack of skilled personnel

(Ikegwu et al.,2022). This undertaking serves two main goals. The primary goal is to assess if the technological and managerial capacity to analyze large amounts of data, known as BDA capabilities, have a positive impact on the organization's performance. The secondary aim is to ascertain whether KM functions as a mediator in this relationship. A structural equation modeling-based empirical investigation was undertaken using data collected from 300 Malaysian SMEs.

HYPOTHESIS DEVELOPMENT

Hypothesis formation Enhanced performance is achieved by the efficient management of many organizational activities, including customer relationship management, operational risk reduction, and production efficiency. Business process automation (BDA) enables the implementation of creative methods for organizing, acquiring knowledge, and advancing, as well as making decisions based on data (Aljumah et al.,2021). Previous studies have shown that organizational information processing capabilities have a positive impact on profitability and return on investment, ultimately improving corporate performance (Cao et al.,2019; Aydiner et al., 2019). Minbaeva (2018)assert that an organization's capabilities may include processes and procedures that increase the value of knowledge inputs. Paschen et al. (2021) propose that an organization's ability to collect, handle, and analyze vast quantities of data could have a significant impact on its future, particularly if its unique infrastructure or other factors make it challenging for others to replicate these operations. To gain a competitive advantage, businesses need to integrate and utilize a diverse array of resources and capabilities. According to the research conducted by Jha,et al. (2020) and Gupta and George (2016), it is not solely feasible to develop BDA capabilities by the use of big data. Enhanced performance is distinguished by uncommon, scarce, and difficult-to-replicate qualities. The benefits encompass enhanced sales growth, profitability, and return on investment. To develop these skills, a complex interaction and combination of many material, human, financial, and organizational resources are required. Hence, our suggestion is as follows:

H1.*The greater the firm's BDA capabilities, the higher the firm performances are.*

A company can enhance its performance by strategically utilizing knowledge, which refers to a set of well-founded views. North and Kumta (2018) agree that information acquisition, transformation, and application are the three main tasks in knowledge management. Knowledge acquisition refers to the act of creating new knowledge based on data and information, as explained by Turulja and Bajgorić (2018). On the other hand, knowledge conversion involves organizing or transforming tacit knowledge into explicit knowledge. The act of utilizing one's learned information is commonly known as "knowledge application. Knowledge Management (KM) involves the processes by which an organization acquires new knowledge, converts it into a format that can be easily used and accessed, and then applies this knowledge throughout the organization. These mechanisms have an impact on the performance of the organization. Efficiently capturing, storing, and transferring information utilizing KM methodologies can lead to improved financial performance, increased market share, and enhanced customer satisfaction (Hongal & Kinange, 2020). Thus, we hereby present our recommendation:

H2.*The greater the KM orientation, the higher the firm performances are.*

Previous research have shown the occurrence of the "IT productive paradox," which refers to the contradictory effects that arise from IS investments in terms of providing corporate value (Rashid, 2022). Experts have differing opinions on whether investments in information systems (IS) and knowledge management (KM) always lead to improved operational effectiveness and efficiency. Previous studies have not shown a direct link between investments in Information Systems (IS) and Knowledge Management (KM) and the overall success of a business, as indicated by their findings. This phenomenon can be attributed to various factors, including a lack of relevant data, a delay between investments and the organization's return on investment, a failure to acknowledge the indirect advantages of IT, or an insufficient knowledge management culture inside the company. Turulja and Bajgoric (2018) emphasized the importance of reconsidering fundamental concerns about how knowledge is formed, the methods of study, how we should interact with information, and the nature and classification of reality. Organizations frequently encounter difficulties in effectively managing relevant knowledge due to various factors related to their business data architecture, such as complexities in data integration, lack of skilled personnel, concerns regarding data security and privacy, and inadequate IT infrastructure. Therefore, it is essential to adopt a structured approach to knowledge management in this context. The KMS and BDA had capabilities in 1927. Indeed, BDA possesses the capacity to modify individual KM, hence altering employee roles and augmenting the importance of individual knowledge. The recent finding by Dahiya et al. (2022) of a robust link between business data analytics (BDA) and knowledge management (KM) allows for the deployment of many strategies targeted at improving organizational performance. Consequently, we recommend the following:

H3. *KM acts as a moderating variable between a firm's BDA capabilities and firm performances.*

METHODOLOGY

Research Design

The current study employed a quantitative methodology to investigate the hypothesized associations between knowledge management (KM), Big Data analytics, and organizational performance. To ensure precise measurement of each construct being studied, a structured questionnaire was created, thereby implementing the study approach. The previous research queries were adjusted to align with the specific needs of small and medium-sized manufacturing firms (SMEs) situated in the United Arab Emirates.

Sample and Data Collection

This study primarily focused on small and medium-sized manufacturing enterprises (SMEs) in Singapore. The study employed a simple random selection procedure to ensure equal opportunity for all small and medium-sized firms (SMEs) in the manufacturing sector to be selected (Hosseini et al., 2018). As a result, the findings can be applied in a wider range of scenarios. This survey utilized a random sample of 550 manufacturing small and medium-sized enterprises (SMEs). The management teams of the selected SMEs were

surveyed online to collect data. In order to promote genuine reporting, we took measures to guarantee the confidentiality of the participants and the confidentiality of their responses. To promote engagement, notifications were distributed periodically during the course of the three-month voting session.

Measurement Instruments

The measure of corporate performance, consisting of eleven items, was adapted from the studies undertaken by Mithas, Ramasubbu, and Sambamurth (2011) and Ji-Fan Ren et al. (2016). The firm's ability to gather, integrate, and utilize its resources in alignment with big data was defined as its big data analytics competency, as discovered in the studies conducted by Gupta and George (2016) and Wamba et al. (2017). We created the variable KM orientation by utilizing Darroch's (2005) three KM components: knowledge dissemination (KNDI) (consisting of five items), knowledge acquisition (KNAC) (consisting of five items), and responsiveness to knowledge (KNRS) (consisting of five items).

DATA ANALYSIS

The chosen method for data analysis was Structural Equation Modeling-Partial Least Squares (SEM-PLS) because to its adaptability and effectiveness in managing complex models with multiple components. SEM-PLS is an excellent choice for evaluating the proposed model of the study since it can assess the linkages among latent variables. Firstly, we conducted a validation of the measurement model to determine the precision and consistency of the constructs. The structural model was subsequently evaluated to ascertain the interaction between Big Data analytics, AI capabilities, and operational performance. We obtained t-values and standard errors through the use of bootstrapping methods, which were then used for hypothesis testing.

Ethical Considerations

The research conducted with human subjects followed established ethical guidelines. Each and every participant in the study provided their explicit agreement, and the privacy of their personal data was upheld throughout the entire procedure.

RESULTS

The goal of evaluating the measurement model is to determine the validity and reliability of the constructs. An evaluation of the reliability of the signals could be performed by analyzing the external loads. Purwanto (2021) found that every input value exceeded the existing threshold of 0.60. The model has successfully integrated statistically important and remarkably similar indicators into its components. Alpha reliability and composite dependability are two elements of the build dependability measurement. The results demonstrate that both the alpha and CR values exceed the predetermined threshold of 0.7. This study provides more evidence to support the reliability of the indicators, consistent with the findings of Hair et al. (2020). The model's item loadings, alpha coefficient, and construct reliability (CR) are displayed in Table 1.

Table 1. Outer Loadings and Reliability

Construct	Indicators	Loadings	Cronbach's Alpha	Composite Reliability	AVE
Knowledge Acquisition (KNAC)	KNAC1	0.752	0.925	0.940	0.628
	KNAC2	0.648			
	KNAC4	0.669			
	KNAC5	0.689			
Knowledge Dissemination (KNDI)	KNDI1	0.866	0.935	0.920	0.635
	KNDI2	0.842			
	KNDI3	0.830			
	KNDI4	0.902			
Responsiveness to Knowledge (KNRS)	KNRS1	0.901	0.915	0.910	0.622
	KNRS2	0.746			
	KNRS3	0.759			
	KNRS4	0.885			
	KNRS5	0.908			
Big Data Analytical Capability (BDANC)	BDANC1	0.913	0.920	0.920	0.762
	BDANC2	0.956			
	BDANC3	0.955			
	BDANC4	0.923			
	BDANC5	0.891			
	BDANC7	0.925			
	BDANC8	0.899			
	FP1	0.742			
Firm Performance (FP)	FP2	0.781	0.928	0.935	0.645
	FP3	0.793			
	FP4	0.802			
	FP5	0.836			
	FP6	0.871			
	FP7	0.827			
	FP8	0.847			
	FP9	0.843			
	FP11	0.850			

To determine the existence of convergent validity, we examined the Average Variance Extracted (AVE) values. Mohd Dzin and Lay (2021) assert that every single AVE score exceeds the criterion of 0.50. Moreover, the assessment of discriminant validity can be conducted using the well-known criterion established by Fornell and Larcker in 1981. The square root of the average variance extracted (AVE) is considered to be a measure of the correlations between latent variables. According to Hair et al. (2020), the average square root of a valid concept should be higher than the highest correlation with other constructs. Another method to determine the discriminant validity of a test is by using HTMT ratios. According to Cheung et al. (2023), an HTMT ratio below 0.85 is considered acceptable for establishing the discriminant validity of one's findings. The threshold values for determining the validity and reliability in the research are provided in Table 1. These numbers are derived from research.

Table 2. Fornell-Larcker Criterion

Construct	KNAC	KNDI	KNRS	BDANC	FP
Knowledge Acquisition (KNAC)	0.891				
Knowledge Dissemination (KNDI)	0.782	0.937			
Responsiveness to Knowledge (KNRS)	0.722	0.677	0.905		
Big Data Analytical Capability (BDANC)	0.622	0.718	0.646	0.881	
Firm Performance (FP)	0.619	0.612	0.671	0.654	0.811

The computation of partial coefficients in Smart PLS is performed using the bootstrapping approach, as demonstrated by multiple research (Ramayah et al., 2018; Shehzadi et al., 2021; Hassan, 2020; Basheer et al., 2022a). To test hypotheses and assess the significance of coefficients, standard errors are calculated using the bootstrapping technique (Hair et al., 2020; Basheer et al., 2022a). The results of the analysis of the structural model are presented in Table 4.

Table 3. Direct Results

Hypotheses	Relationship	Beta	STD	T Value	P Values	Decision
H1	BDANC -> FP	0.292	0.040	3.725	0.021	Supported
H2	BDANC -> KNAC	0.560	0.039	6.410	0.009	Supported
H3	BDANC -> KNDI	0.480	0.038	7.158	0.016	Supported
H4	BDANC -> KNRS	0.405	0.043	2.441	0.015	Supported
H5	KNAC -> FP	0.183	0.052	7.212	0.034	Supported
H6	KNDI -> FP	0.172	0.048	3.583	0.012	Supported
H7	KNRS -> FP	0.133	0.043	2.609	0.019	Supported

The study's findings indicate that Big Data Analytical Capability (BDANC) has a significant impact on Firm Performance (FP) and knowledge processes within businesses. The data indicate that BDANC has a substantial positive effect on FP ($\beta=0.292$, $p=0.021$) and is also associated with KNAC ($\beta=0.560$, $p=0.009$), KNDI ($\beta=0.480$, $p=0.016$), and KNRS ($\beta=0.405$, $p=0.015$).

These findings demonstrate a clear connection and provide insight into how big data analytics improves organizational performance by simplifying knowledge processes. The report highlights the need of investing in knowledge management and big data skills to improve corporate success. Functional programming (FP) is affected by knowledge processes such as Knowledge Acquisition (KNAC) with a beta coefficient of 0.183 and a p-value of 0.034, Knowledge Dissemination and Integration (KNDI) with a beta coefficient of 0.172 and a p-value of 0.012, and Knowledge Representation and Sharing (KNRS) with a beta coefficient of 0.133 and a p-value of 0.019. The strength and reliability of these correlations is reinforced by the statistically significant levels of agreement (T and P values) for all hypotheses. The findings indicate that BDANC is highly significant for businesses in various aspects. It enables the management of knowledge, which leads to improved performance and a competitive advantage. Another strategy is to indirectly improve the overall performance of firms.

Table 4. Mediation

Hypotheses	Relationship	Beta	STD	T Value	P Values	Decision
H8	BDANC -> KNAC -> FP	0.552	0.041	6.487	0.008	Supported
H9	BDANC -> KNDI -> FP	0.472	0.039	7.102	0.014	Supported
H10	BDANC -> KNRS -> FP	0.412	0.044	2.464	0.014	Supported

Big data analytics, also known as BDANC, can provide significant advantages to businesses, especially those skilled at collecting fresh data (KNAC), distributing it (KNDI), and utilizing it (KNRS). The probability of this occurrence happening by accident is exceedingly low ($p=0.008$), and a score of 0.552 suggests a significant improvement in company performance when BDANC collaborates with KNAC. The results, with scores of 0.472 and 0.412, respectively, and a low chance of spurious outcomes ($p=0.014$ for both), are comparable to the results achieved when BDANC enhances the effectiveness of organizations in distributing and reacting to information (KNDI and KNRS). In essence, the strategic application of big data insights is highly likely to result in a major improvement in firms' performance. Acquiring, spreading, and using knowledge, combined with the utilization of big data, are crucial elements for achieving advancement. Regarding the calculations employed to verify the consistency of the data? Indeed, it is accurate to state that big data has had a substantial impact on the business landscape, effectively facilitating commercial achievements.

CONCLUSION

This analysis has shown the importance of Big Data Analytical Capability (BDANC) in improving the performance of enterprises. BDANC supports the improvement of KNRS, KNAC, and KNDI, as well as other processes. BDANC improves the operational and strategic results of companies by increasing their ability to absorb, utilize, and execute knowledge, as substantiated by evidence. The study's results clearly demonstrate that firms that successfully incorporate BDANC into their knowledge management strategies are more likely to achieve positive performance metrics. This advantage arises from the ability to promptly adapt to market fluctuations, stimulate creativity, and make well-informed choices. The mediation study highlights the significance of a comprehensive knowledge management approach that includes BDANC in order to achieve measurable performances. This approach involves information gathering, delivery, and response. Organizations should prioritize and dedicate resources to big data analytics because of its significant impact on knowledge processes and overall company success. The statement emphasizes the need of employees at every level of a business adopting a culture of decision-making based on data and continuously improving their analytical skills. The combination of big data analytics and knowledge management is creating a new competitive advantage in today's business world. Organizations that understand and utilize this connection are more likely to outperform their competitors. By engaging in this activity, they will evolve into stronger and faster individuals. The success of a corporation in modern digital economy will depend on its ability to effectively understand, collect, analyze, and utilize big data.

POLICY IMPLICATIONS

This study found that incorporating big data analytical capabilities (BDANC) into business processes significantly enhances firm performance. Maintaining a competitive advantage in the data-driven economy of the twenty-first century is extremely important. This

integration enhances knowledge management strategies and produces quick practical results. These activities consist of knowledge acquisition (KNAC), dissemination (KNDI), and responsiveness (KNRS). This has substantial implications for CEOs in both the corporate and governmental sectors. It is clear that the only way to effectively utilize BDANC for long-term development and innovation is by investing in big data education and technologies. To maximize the advantages of big data analytics, it is necessary to design policies that encourage a mentality of ongoing learning and adaptability to new technologies. Moreover, the research highlights the importance of combining digital infrastructure with knowledge management systems. Governmental entities and corporate executives should consider creating standards that make it easier to incorporate big data insights into regular decision-making processes. To achieve this goal, it would be beneficial to implement strategies such as supporting academic programs that teach knowledge management and data analytics, providing tax incentives or subsidies to businesses that invest in relevant technology, and promoting research and development in the field of big data applications. Given the significance of BDANC (Big Data Analytics and Natural Language Processing) in enhancing knowledge processes and, subsequently, achieving corporate success, it is imperative for policies to promote the expansion of digital literacy across the entire enterprise. Organizations can leverage comprehensive training to provide their personnel with a deep understanding and effective application of big data analytics. This enables them to transform the acquired insights into strategic initiatives that promote growth and innovation.

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**THE EFFECT OF 3 DIMENSIONAL VIRTUAL REALITY RETAIL (VRR) STORE
AMBIANCE ON AVATAR'S EMOTIONS AND BEHAVIOUR: A MEDIATION
ANALYSIS**

Aasim Munir Dad, Asma Abdul Rehman, Muhammad Sohaib Haleem, Barry Davies,
And Andrew Kear

Abstract

This study carefully employs a One-Group Pre and Post Test approach of Quasi experimental research design to investigate the effect of ambiance (specifically colours) on avatars' emotions and behaviours in 3 dimensional (3D) Virtual Reality Retail (VRR) stores. In order to conduct an analysis of the data collected from Second Life (SL), a highly advanced 3D Virtual World, this study employed the PROCESS tool. The research provides empirical evidence supporting the significance of colours as a prominent environmental cue in three-dimensional virtual reality retail stores. This study examines the influence of colours on the emotional states and behaviours of avatars. It specifically focuses on the significant impact of colours on approach/avoidance behavioural intentions, which is mediated by arousal and pleasure. It provides a significant contribution to the current body of literature on retail atmospherics by enhancing comprehension of 3D virtual reality retail environments and the significance of colour schemes. It is important to mention that the impact of arousal in isolation was determined to be statistically not significant. The present study offers interesting insights; however, it is important to acknowledge certain limitations. These limitations include the narrow focus on a certain type of specialised 3D VRR store, and the constraints imposed by a very small sample size. Future research within this subject should aim to address these limitations.

Keywords: Ambience, Retail Atmospherics, Colours, 3D Servicescape Model, S-O-R Model, Shoppers' Emotions, Shoppers' Buying Behaviour, 3D Virtual Reality Retailing, Virtual Worlds

Introduction

The advancement of technology has facilitated the ability for individuals to engage in online shopping, enabling them to conveniently make purchases from the confines of their own residences, hence eliminating the need of physically visiting traditional physical retail stores. The terms "web retail shops," "online retail stores," and "web 2.0 retail stores" are used interchangeably to refer to stores that cater to shoppers via online platforms. Plethora of scholarly research has been conducted to study the effect of both physical (brick & mortar) stores and online stores on shoppers' emotions and behaviour. The first investigation in this particular field was conducted by Eroglu, Machleit, and Davis (2001) during the year 1999, with the subsequent publication of their findings occurring in 2001.

Extensive research has been conducted within the realm of online shopping and its impact on various shoppers' behaviours throughout the last two decades, despite its relatively recent emergence as a subject of scholarly inquiry. The process of purchasing items using online platforms differs significantly from the traditional practice of physically visiting a brick-and-mortar retail store. Shoppers who engage in shopping activities at brick-and-mortar retail stores are frequently exposed to many environmental stimuli, including the spatial arrangement (aisle layouts) of the store, ambient temperature, and olfactory cues. When shoppers engage in online shopping, they are evidently deprived of these sensory inputs as many brick and mortar environmental cues are not present in online retail stores.

Conversely, the domain of e-commerce offers opportunities for engagement with different cues that are not available in traditional brick-and-mortar stores, such as the arrangement of items and the various navigation methods used (Manganari et al., 2011). Numerous environmental cues have been examined within the realm of online buying, and these include the correlation between music and colour as explored by Price-Rankin (2004), the examination of website layout and design by Vrechopoulos et al. (2004) and Manganari et al. (2011), the evaluation of online shop quality and branding by Chang (2008), and the analysis of visual components, colours, and linkages on websites by Koo and Ju (2010).

However, in the present day, shoppers have the opportunity to use further advanced online buying platforms such as 3D virtual reality retail stores also known as 3D VRR. A number of retail scholars have extensively investigated the cognitive processes and behavioural patterns shown by shoppers in both brick-and-mortar and web stores (Massara, 2003; Vrechopoulos et al., 2004; Chang et al., 2008; Dijkstra, 2008; Iyiola, 2011; Manganari et al., 2011). However, there is only a limited research available within the realm of 3D virtual reality retail atmospherics. The veracity of this claim has been supported by many retail studies conducted by Vrechopoulos et al. (2009), Krasonikolakis et al. (2011), Hassouneh et al. (2015), Dad et al. (2016), and Dad et al. (2018). A significant difference may be observed between the ambience of an e-commerce platform and a brick-and-mortar retail store. When engaging in online shopping, shoppers have the opportunity to avoid intermediaries i.e. any complications arising from adverse weather conditions or traffic jam while their way to shopping malls. Based on the research conducted by Aldiri et al. (2010), it is obvious that both shoppers and online retailers may experience a decline in their trust in the brand. In the context of 3D virtual reality retail (VRR) environments, the presence of virtual characters (avatars), such as other customers or staff members, has the potential to moderate existing disparities of Web 2.0 retail stores. In addition to the convenience of web shopping, 3D VRR stores provide distinctive and captivating

experiences, such as immersing oneself in a bustling marketplace or entirely supporting the pleasure of virtual flight (Wang, 2003; Dad et al., 2016; and Dad et al., 2018). Several studies have shown an increase in the number of shoppers and financial transactions occurring inside 3D VRR shops. The aforementioned studies include the scholarly work of Vrechopoulos et al. (2009), Haenlein et al. (2009), Krasnikolakis et al. (2011), Hassouneh et al. (2015), Dad et al. (2016), and Brookes et al. (2019).

Literature Review

The merging of virtual reality (VR) with the gaming world has led to the development of modern virtual worlds (VWs) (Sivan, 2008; Ball, 2022). Furthermore, it has been suggested that virtual reality (VR) may be considered its father, while gaming may be called its mother. These VWs, according to Girvan (2018), are founded on fundamental concepts of economics, social science, commercial activities, law, natural science, applied science and computer science. A computer-generated environment that provides a high level of immersion, interactivity, and creative potential is referred to as virtual reality (VR). Virtual worlds (VWs), according to Battal and Tasdelen (2023), arose following the emergence of game worlds. Virtual Worlds have been offered on a worldwide scale since 1978. The first version of Multi User Dimension (MUD), commonly known as the first multiplayer game, was largely text-based and lacked visual graphics. Second Life (SL), There.com and Ultima Online are some of the most well-known advanced level virtual worlds. VWs were first uncommon, however, the spread of technology, as well as the growing availability of high-speed, low-cost broadband, has contributed to a substantial increase in the user base of Virtual Worlds (VW) (Battal & Tasdelen, 2023). VWs have gone through a maturity phase and are now distinguished by their widespread proliferation. Parker et al. (2023) discovered that real-world businesses are also considering virtual worlds as another platform to perform their commercial activities.

The metaverse market is presently valued at more than \$74.4 billion, demonstrating that it is rapidly expanding. Significantly, investors have committed over \$500 million to metaverse real estate, reflecting their steadfast belief in its development potential. Furthermore, it is worth noting that bitcoin assets are held by a sizable 53% of firms involved in metaverse investing. Approximately 400 million monthly active users contribute significantly to the metaverse's life. Roblox, the most populated virtual environment in the metaverse, attracts a notably young population, with 51% of its users under the age of 13.1 Furthermore, metaverse market is expected to grow at an annual rate of 37.73% and hence it is forecasted the overall market value will increase up to \$507 billion by 2030. Though, metaverse market is growing worldwide and businesses are considering these platforms for commercial activities however, under developing countries are still lacking in their technological infrastructure and it may be argued that it might take few more years for under developing economies to have metaverse commonly used for any kind of commercial activities.

The pull of the metaverse is obvious among a diverse American population, with 74% considering or currently participating in activities inside this digital domain. According to predictions, 25% of Americans will dedicate at least an hour per day to metaverse-related activities by 2026, indicating that the metaverse's importance will continue to grow. Occurrences inside the metaverse, such as Marshmello's Fortnite concert, when he performed live in front of 10.7 million people, highlight the metaverse's ability to host massive virtual experiences.

3 Dimensional Virtual Reality Retail (3D VRR) Stores

3 Dimensional Virtual Reality Retail stores provide an immersive shopping experience to shoppers where shoppers can buy any digital product by using their virtual currency i.e. in case of Second Life virtual currency which is acceptable over there is called Linden Dollars (Vrechopoulos et al., 2009; Dad et al., 2016 & 2018; Kang, 2020; and Billewar et al., 2022). Within the virtual world of Second Life, users, represented by avatars, engage in economic activities by utilising a digital currency known as Linden Dollars (L\$). These transactions mostly occur within 3D VRRs that exist within the VR environment of Second Life (SL).

The current state of 3D VRR stores is primarily in the developing stage, yet they effectively replicate the experience of classical brick & mortar stores (Lau et al., 2013; Kang et al., 2020; and Billewar et al., 2022). 3D virtual reality retail (VRR) stores engage computer graphics to present a visual representation simulating physical brick-and-mortar stores. These simulations encompass number of atmospherics i.e., ceilings, wall, aisles, colours, lights, design and etc. Nevertheless, online retail stores cannot be considered a direct substitute for classical brick & mortar retail stores as web-based online retail stores have been found to demonstrate some issues (Haenlein & Kaplan, 2009). Many studies (Wang et al., 2007; Vrechopoulos et al., 2009; and Dad et al., 2016; Roggeveen et al., 2020; and Giao et al., 2020) highlighted the limitations of product images in Web-based online stores such as the absence of 3D representation, the lack of social cues, and the resulting dissatisfaction by shoppers with their shopping experience. 3D VRR stores provide shoppers the opportunity to develop their digital personalities through avatars in that may closely resembles and replicates the sensory exposure of a tangible real-world identity.

The design and resemblance of avatars to match the user's real world height, body composition, and facial shape might vary depending on the user's level of expertise. In order to enable shoppers' decision-making, it has been suggested by various researchers (Donovan & Rossiter, 1982; Areni & Kim, 1993; Yalch & Spangenberg, 1993; Chebat et al., 1993; Machleit et al., 1994; Wakefield & Baker, 1998; Spangenberg et al., 2006; Eroglu et al., 2001 & 2003; Wang, 2003; Vrechopoulos et al., 2004; Price-Rankin, 2004; Ward et al., 2007; Quartier, 2009; Koo & Ju, 2010; and Hussain & Ali, 2015) that consumers should have the ability to virtually try on different types of clothing using their avatars prior to making a real purchase in such 3D VWs.

Since the year 2003, virtual worlds and 3D VRR stores exist; however, research on these retail atmospherics is still limited, as indicated by studies conducted by Krasonikolakis et al. (2011), Hassouneh and Brengman (2015), Dad et al. (2016), Roggeveen et al. (2020) and Giao et al. (2020). Past studies have focused on exploring many aspects of virtual worlds, however, there is a significant dearth of investigation into the impact of 3D VRR atmospherics on avatars' emotions and behaviour. A limited number of scholarly investigations (Vrechopoulos et al., 2009; Krasonikolakis et al., 2011; Hassouneh & Brengman, 2015; Dad et al., 2016 & 2018; Krasonikolakis et al., 2018; Roggeveen et al., 2020; and Giao et al., 2020) have examined the atmospherics within 3D VRR stores. Dad et al. (2016) introduced the concept of '3D Servicescape', which incorporates the comprehensive 3D VRR atmospherics. The 3D Servicescape model incorporates a total of 21 atmospheric cues, ranging from virtual air to

avatar's compatibility. However, further investigation has been advocated to find out the validated and reliable results in this particular domain. Hence, the objective of this study is to investigate the effect of the 3 dimensional retail atmospherics, explicitly focusing on the "Colours," on the emotional and behavioural responses of avatars. The investigation of colours has been conducted in research pertaining to physical and web-based retail atmospherics (Berman & Evan, 1995; Turley & Milliman, 2000; Rosenbaum and Massiah, 2011; Areni & Kim, 1993; Baker et al., 1994; Reddy et al., 2011; Baker et al., 1994; Countryman & Jang, 2006). However, the significance of colour as a crucial element of the retail atmospherics has yet to be explored in the context of three-dimensional virtual reality retail establishments. In this study, 3D Servicescape model, proposed by Dad et al. (2016), has been adapted to explore the effect of colours in 3 dimensional retail shops on the emotional and behavioural responses of avatars. This study specifically investigates how pleasure and arousal mediate this relationship, as seen in Figure 1.

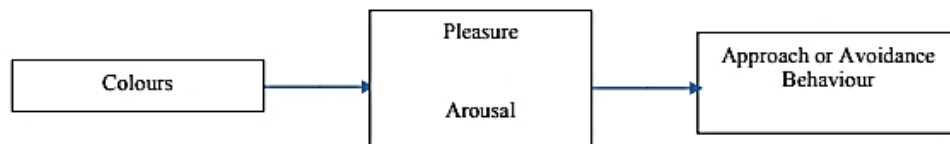


Figure 1: Conceptual Framework of this Study to Examine the Effect of Colours as one of the important cue of ambiance on Avatars' Emotions and Behaviour

The present study focusing on the response of avatars towards distinct colours within the context of 3D VRR stores.

The adaptation of colours is a dominant aspect within retail atmospherics (Berman & Evans, 1995; Turley & Milliman, 2000). According to Rosenbaum and Massiah (2011), colours are considered as a significant atmospheric of physical retail atmospherics. Wide range of studies have been conducted to investigate how colours affect shoppers in brick-and-mortar retail stores (Bellizzi & Hitte, 1992; Spies et al., 1997). Past studies have examined the effect of colours on different variables of shoppers' behaviour such as shoppers' pleasure levels was investigated by Reddy et al. (2011), service and product quality were explored by Baker et al. (1994), and the overall retail ambience were explored by Baker et al. (1994) and Countryman and Jang (2006). However, inadequate studies are available which explore the effect of colours in online retail settings (i.e., Eroglu et al., 2001 & 2003; Price-Rankin, 2004; Koo & Ju, 2010; Kim & Lennon, 2010). These mentioned studies have proven that the utilisation of colours within online retail atmospherics have a noteworthy effect on shoppers' pleasure, arousal, shopping intentions, as well as their trends towards approach or avoidance behaviours.

Research Methodology

The adaptation of experimental research design is believed to be essential to achieve this study's objectives and effectively eliminate the effect of extraneous variables, as experiments are considered most appropriate for investigating the correlations between variables especially when objective is to achieve accuracy (Wang, 2003). However, theoretical part must give priority to internal validity, as emphasised by Cook (1976). Additionally, this research adapts the 3D

Servicescape model, developed by adapting the S-O-R Mehrabian and Russell's model (Figure 1), and examines the relationship among demonstrated variables. This study opted for the application of a "natural field experiment", as discussed by Harrison and List (2004) and investigates participants within 3D VRR stores in Second Life, which were considered as a "natural setting" environment within computer labs. Further, the research design adapted in this study is a one-group pre-test-post-test design. The performance quality of Second Life, i.e. responsiveness and robustness, are subject to several factors, including the quality of the Internet connection, the competence of the graphic card, and the processor. The experiment necessitated controlled environmental settings.

While the surroundings of the 3D VRR shops were not manipulated, the study participants were carefully manipulated and instructed. Over a period of 12 weeks, the participants methodically visited 3D VRR stores in a prearranged schedule. The survey questionnaire was employed to investigate arousal, pleasure, 3D VRR background colours, and approach/avoidance behaviour. All items and scales of the adapted questionnaire were adopted based on experts' opinion and after conducting and a pilot study.

The initial section of the questionnaire provides detail describing the goal of the research, and instructions on how to complete the questionnaire. The next 12 items investigate emotional responses, focusing on pleasure and arousal. Participants were asked to rate their emotional state on a 6 point Likert scale against all 12 x items indicating emotional states, as adapted from Mehrabian and Russell (1974), Donovan and Rossiter (1982), Newman (1997), and Dad et al. (2016). The third part of the questionnaire was the repetition reexamine the aforementioned emotional responses in order to reassess and compare the levels of pleasure and arousal experienced by participants pre and post-test. The fourth part of the questionnaire investigated the presence of colours within 3D VRR stores. In the fifth part, an investigation was conducted with the help of 4 items that examine participants' approach/avoidance response within the context. Fourth & fifth parts of the questionnaire employed a six-point symmetric scale, ranging from 1 to 6, where 1 represents "strongly disagree" and 6 represents "strongly agree". The sixth part of the survey included questions related to demographic information such as age group, sex, profession and etc. This study investigates the phenomenon of "freebie" 3D VRR stores within the Second Life.

Industry Selection

Experiments were conducted in the VW of Second Life. The age range of most participants was observed between 23 and 50 years. Only Fashion and Style apparel stores were shortlisted for the experiments and rationale was based on their higher likelihood of attracting foot fall, as opposed to VRR stores falling under the institution and lawns or property and realtors categories. In an earlier study the effect of music was investigated in same regions but different shops Dad et al. (2019).

Data Collection

In summer 2022, researchers initiated approaching with avatars visiting in the vicinity of above-mentioned locations and sending an invitation for their participation in the study. The objective for the designated timeframe was to maximize participant recruitment for the research undertaking. Prior to starting the actual research phase of the One-Group Pre & Post-test quasi-

experimental design, participants were had the opportunity to familiarise themselves with the surroundings by engaging in a guided tour of the selected 3D VRR stores. The initial scheduled tours were executed in July 2022. Researchers, for this research, used i9 7th generation PCs and a 100 mpbs Internet connection, facilitating the uninterrupted visits of Second Life. The avatars were requested to engage in the study on a voluntary basis. The study involved the participation of 140 Avatars who completed surveys using the Second Life Chat Box. A thorough review was conducted to confirm that all forms have been filled without any instances of incomplete or missing values.

Results & Analysis

Paired Sample T-Test

The effect of the colours was decided to be assessed by examining the emotional responses of avatars before and after exposure to different backdrop colours in a 3D VRR setting. As there was a possible that the colours utilised in the VRR stores did not demonstrate a significant effect on the avatars' emotional states, whether positive or negative. Therefore, the t-test was conducted for the purpose of comparing two means (Field, 2013). There exist two types of t-tests, namely paired sample t tests and independent sample t tests however, the paired-sample t-test is recommended in two experimental scenarios involving the same group of individuals (Field, 2013). This study observed a significant effect of colours present in 3D VRR stores on avatars' emotional and behavioural response sets as demonstrated in Table 1.

Table 1: Paired Sample t-Test

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Post Pleasure	5.3244	140	0.78340	0.06621
	Pre Pleasure	4.8343	140	0.75694	0.06397
Pair 2	Post Arousal	5.0112	140	0.80786	0.06828
	Pre Arousal	4.5412	140	0.82539	0.06976

Table 1 shows the average value of the avatars' pre-exposure pleasure, denoted as "Pre-Pleasure," which determines to be 4.8343. The mean pleasure value of the 140 subjects, referred to as "Post Pleasure," following their exposure to the 3D VRR retail colours, were found to be 5.3244. In a similar vein, the average pre-arousal level was recorded as 4.5412, whereas the average post-arousal level was measured at 5.0112.

Table 2: Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Post Pleasure and Pre Pleasure	140	0.628	0.000
Pair 2	Post Arousal and Pre Arousal	140	0.404	0.000

Table 2 and 3 indicates the paired sample correlation and t-test results. Pair 1, consisting of pre- and post-pleasure measurements, exhibits a correlation coefficient of 0.628, indicating a statistically significant relationship at a p-value of 0.000. Pair 2 is representing arousal and has a paired sample correlation coefficient of 0.404, indicating a statistically significant relationship at a p-value of 0.000. In SPSS, the default confidence interval has been set at 95%. Consequently, the determined 95% confidence interval for the variance in pre & post pleasure effect is found between 0.33017 to 0.44146. The confidence range for pre & post arousal is estimated to be

between 0.2554 to 0.62450. Further the t values for pleasure and arousal were found to be 5.143 and 4.621 respectively, with a total of 139 degrees of freedom. The two-tailed p-value for the paired t-tests conducted on Pair 1 and Pair 2 is 0.000. This p-value represents the probability of observing a test statistic as extreme as the observed result, given the alternative hypothesis that the mean difference is not equal to zero. Moreover, the findings indicate that the p-value for pleasure and arousal is 0.000, which is equivalent to 0.05 (Pair 1 and Pair 2). According to Field (2013), the p-value < 0.05 shows a statistically significant difference between the scores of two variables.

TABLE 3: PAIRED SAMPLES TEST

		Paired Differences					T	df	Sig. (2-tailed p-value)
		Mean	Std. deviation	Std. error mean	95% Confidence interval of the Difference				
					Lower	Upper			
Pair 1	Post Pleasure / Pre Pleasure	0.49659	0.79796	0.06744	0.33017	0.44146	5.143	139	0.000
Pair 2	Post Arousal/ Pre Arousal	0.45638	0.92953	0.07856	0.2554	0.62450	4.621	139	0.000

Mediation Analysis

Mediation analyses is highly recommended for investigating the effect of independent variable(s) on dependent variable(s) while mediating variable(s) is present (Hayes, 2014). This research focuses on the effect of Colours as an Independent Variable 'X' on Approach/Avoidance Behaviour which act as a Dependent Variable 'Y', while having two mediating variables between them (See Figure 2)

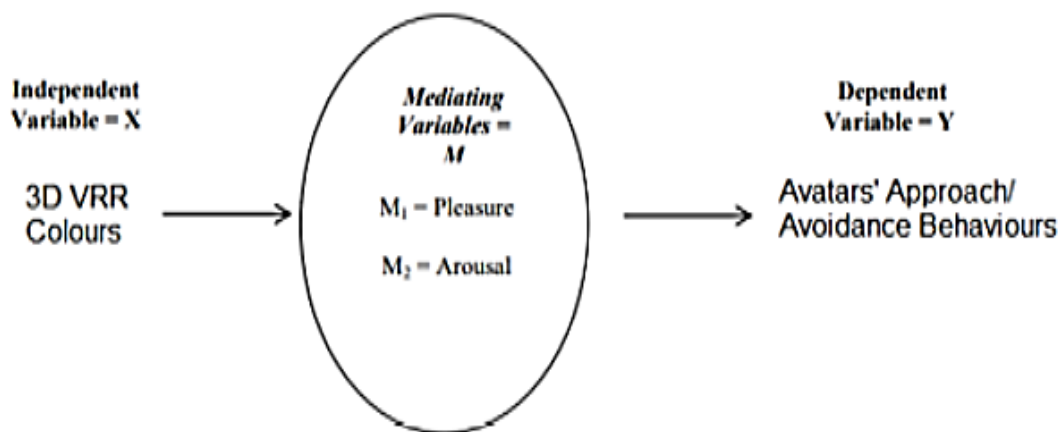


Figure 2: Conceptual 3D VRR Store Environment Affecting Avatars' Behavior through Mediating Variables of Pleasure (M1) and Arousal (M2)

Mediation analyses is highly recommended in such case, as demonstrated in Figure 2 above, as compared to Structural Equation Modelling (SEM) as SEM does not analyse the effect in singular path. In order to enhance accuracy, Hayes (2013) recommends the adoption of

the PROCESS approach as an alternative of SEM. And hence in this research, the PROCESS approach is preferred over Structural Equation Modelling (SEM) to examine the relationships independent, mediating, and dependent variables due to its competitive features in the present circumstances. Additionally, the use of PROCESS is also highly recommended by Field (2013) as a suitable approach for doing multiple regression analysis including mediating factors.

In the context of serial multiple mediation, Hayes' Model 6 is adopted rather than Model 4. The sequential arrangement of the mediating variables has significance in Hayes' Model 6 of the PROCESS command but not in Model 4. In this model, arousal and pleasure levels are mediated sequentially by Model 6. And it has been observed that colours in 3D VRR stores are not having any effect on behaviours through the mediating variable of Arousal in isolation which rejects the initial propositions of the Mehrabian and Russell's (1974) S-O-R model.

Results OF Mediation Analysis

The relationship between pleasure (M1) and colour is indicated by the regression coefficient ($b = 0.3244$, $p = 0.0001$, $t = 4.2001$). The results indicate that colours had a significant influence on M2 Arousal ($b = 0.1709$, $p = 0.0027$, $t = 3.0800$). The level of arousal has a significant impact on the experience of pleasure in the Outcome, as indicated by the regression coefficient ($b = 0.6042$, $p = .0000$, $t = 9.2405$), which is statistically significant at the alpha level of .05. The influence of arousal on avatars' behaviour in Outcome is found to be insignificant, as indicated by the statistical results: $b = 0.0739$, $p = 0.5930$, and $t = 0.5362$. The results of the PROCESS Outcome analysis indicate that pleasure had a significant influence on avatars' behaviour ($b = 0.4368$, $p = 0.0055$, $t = 2.8370$). The diagram known as "Indirect Impact Path 1" depicts the manner in which colours have an indirect influence on both arousal levels and the approach/avoidance behaviour. The initial indirect impact is calculated to be 0.0240.

The bootstrap confidence interval encompasses zero, indicating that the observed effect size is not statistically significant (-0.0418 to 0.1327). The second indirect effect, known as "Indirect impact path 2," elucidates the sequential influence of colours on avatars' behaviour, namely the pathway from colours to arousal and then to pleasure. The estimated second indirect impact is 0.0856. The bootstrap confidence interval demonstrates a statistically significant positive path of impact, ranging from 0.0325 to 0.1717. The third indirect effect path examines the relationship between colours and their influence on individuals' happiness and conduct. The correlation coefficient between colours, pleasure, and avatars' approach/avoidance behaviours is 0.0746. The bootstrap confidence interval, which ranges from 0.0162 to 0.1793, indicates that the observed link path is statistically significant as it does not include zero in it.

Further, the model which measures the collective indirect effect by summing all individual indirect effects is known as the serial multiple mediator model. The bootstrap confidence interval indicates that the indirect impact is positive, with a value of 0.3664 (95% CI: 0.1957 to 0.5371). The statistical analysis reveals that the indirect impacts of the colours offered by the 3D VRR stores, specifically the second, third, and overall effects, demonstrate a significant effect. The path of the total indirect effect is highly significant due to the significance of the total indirect value. Figure 3 illustrates the substantial impact of colours on the conduct of avatars, mediated through the variables of arousal and pleasure.

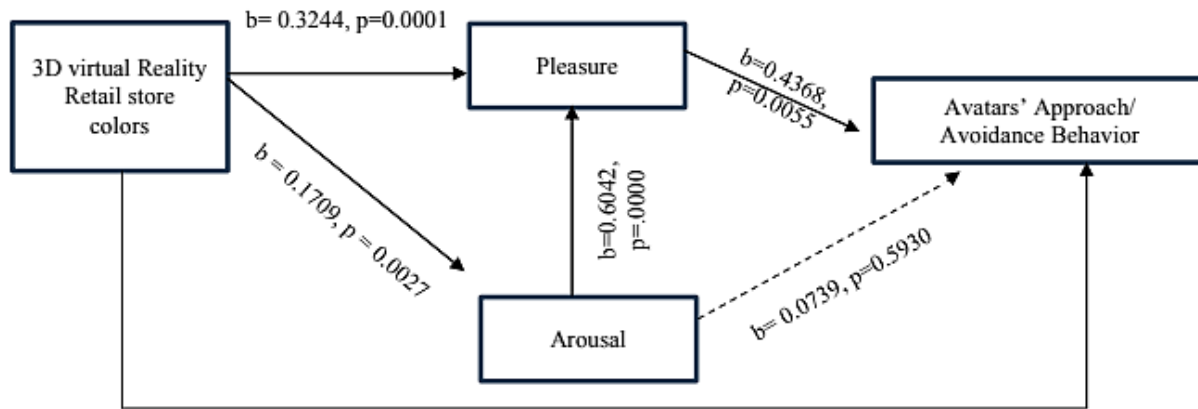


Figure 3: Depicting Direct/Indirect Significant/Insignificant Relations between X and Y through M1 and M2

Discussions

Previous research studies (Bellizzi & Hite, 1992; Yalch & Spangenberg, 2000; Price-Rankin, 2004; Countryman & Jang, 2006; Kim & Lenon, 2010; and Roggeveen et al., 2020) have supported that colours do have significant effect on shoppers' emotions as well as behaviour in retail stores. Similarly, it has been observed that colours also play a significant role in 3D virtual reality retail (VRR) stores. This study investigated the effect of colours on the emotions and behaviour of Avatars, highlighting both direct and indirect effects by adapting mediating analyses of Hayes. The influence of colours on the approach and avoidance behaviours of avatars is observed to be significantly mediated by arousal and pleasure. Nevertheless, this research rejects the initial proposition of M-R model (1974) and supports Dad et al. (2018) study of music in 3D VRR stores and concludes that the effect of colours on avatars' behaviour is not primarily driven by arousal solely. Figure 3 illustrates the effect of colours on the emotional and behavioural responses of avatars engaged in shopping activities within 3D VRR stores. Additionally, it shows the significant indirect path by which colours affect approach or avoidance behaviours through the mediating variables of pleasure and arousal.

Conclusion

This study determines that the background colours, as one of the important environmental cue and component of ambiance, in 3 dimensional Virtual Reality Retail stores have a significant effect on the emotional state (pleasure and arousal) of avatars, as well as their consequent approach/ avoidance behavioural responses. The effect of colours on shoppers in a retail setting has been confirmed by plethora of previous studies. However, this study provides more evidence that aligns with the findings of Rosenbaum and Massiah's (2011) study, which determined background colours as a significant atmospheric cue. This study examines the use of colours as a mean of determining the degrees of pleasure and arousal in 3D VRR stores, therefore supporting the findings of Reddy et al. (2011). Further, this study also revealed that the effect of colours on arousal, as well as enhanced degrees of arousal, had a favourable correlation with pleasure and approach/ avoidance behaviour. Moreover, the results of this study imply that the second and third indirect effect paths are significant, confirming that colours significantly

affect arousal, leading to increased levels of pleasure and approach behaviour in avatars. Significantly, the present study has determined that the adaptation of the M-R (1974) within the 3D VRR stores reveals that the mediating variable of "arousal" does not have a significant direct effect on the approach/ avoidance behaviour of avatars. This study further validates the findings of a previous study conducted by Dad et al. (2018), which examined the impact of music in 3-dimensional retail settings with the help of convenience sampling.

Limitations are fundamental aspect of all research endeavours, and this particular study is not exempted from this reality. The scope of this study was restricted to Fashion & Style apparel stores in order to assess the conceptual model. Therefore, future research studies may investigate various other categories of 3D VRR stores. Moreover, the sample size of 140 participants, collected over a period of two and a half months, may be considered relatively small in representing the entire population of the Virtual World. And therefore, the findings of this study may not be certainly generalised.

To address this limitation, it is recommended to increase the sample size and allocate more time for data collection. Additionally, this study examined 3D VRR stores without any manipulation however, it is assumed that the manipulation of 3D VRR atmospherics has the potential to effect the overall results. This study investigated only 3 x dependent variables, which are arousal, pleasure, and behaviour, however, previous retail studies have investigated several dependent variables such as satisfaction, attitudes, and other related variables. And hence it is recommended that future research may not rely on pleasure, arousal and approach/avoidance behaviour as primary determinants.

Managerial Implications

Academic scholars in the field of retail have an extraordinary fascination in investigating the impact of store atmospherics on shoppers' buying behaviours. Since 1974, scholars have been conducting extensive studies of brick-and-mortar stores. Moreover, multiple studies have been conducted on online retail atmospherics since their inception. The advent of new Volkswagen models brings out an innovative retail encounter in the form of 3D VRR stores, which present an array of opportunities for businesses, researchers, and shoppers. Therefore, this study emphasises the need of adopting a strategic outlook when considering the potential benefits and limitations of 3D VRR stores for existing retail operations. The potential of 3D VRR stores must not be underrated. The significant influence of colour choices in 3D VRR environments on avatars' arousal and pleasure recommends a potential impact on avatars' buying responses. Hence, the findings of this study indicate that it is crucial for 3D retailers to pay careful attention while designing their virtual reality stores inside the any virtual worlds. Findings of this study determines that colours possess significant effect as an environmental cue for inducing approach behaviour. This study demonstrated that colours had a significant effect on the arousal and pleasure experienced by avatars, as well as their subsequent shopping activity. Nevertheless, this study revealed that wrong choice of colours in 3D VRR stores might potentially exert a negative effect on the emotional states and behavioural responses of avatars. It is advisable for future researchers and entrepreneurs within this realm to investigate the effect of different colour schemes on avatars' emotions and behaviours.

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