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E-mail id: saarjournal@gmail.com

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## **INTEGRATED MARITIME AND AIR POWER FOR REGIONAL SECURITY ARCHITECTURE IN THE INDO-PACIFIC: CHALLENGES, OPPORTUNITIES, AND FUTURE FORCE INTEGRATION STRATEGIES**

**Dr Raghavendra Pratap Singh\* ; Dr Sushil Kumar Singh\*\* ;  
Colonel Arvind Singh\*\*\***

\* Assistant Professor,  
Department of Defence and Strategic Studies,  
SPM Government PG College (University of Allahabad),  
Uttar Pradesh, INDIA

\*\*Faculty Member,  
Department of Defence and Strategic Studies,  
Prof Rajendra Singh 'Rajju Bhaiyya' University, Prayagraj,  
Uttar Pradesh, INDIA

\*\*\*PG Student,  
Department of Defence and Strategic Studies,  
Prof Rajendra Singh 'Rajju Bhaiyya' University, Prayagraj,  
Uttar Pradesh, INDIA

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### **ABSTRACT**

*Indo-pacific is a region of the world that is considered to be the most significant maritime space that has over 5.3 trillion annually of trade flows, as well as significant sea lines of communication (SLOCs) among the leading economies in the world. This research paper examines the maritime and air power capabilities in the new Indo-Pacific security structure. In the course of profound analysis of geo-political processes, technological advances, and cooperation models, this paper finds several important issues like disputed maritime sovereignty, asymmetrical projection of power, and institutional mis-coordination. The study identifies significant prospects to enhanced regional security, such as through integrated operations, cooperation frameworks comprising of more than two countries such as the Quad and AUKUS and capacity building. We recommend future force integration strategies that aim at interoperability, intelligence revealing, awareness of the maritime domain, and implementation of the rules-based order. This article contributes to the academic literature on the topic of Indo-Pacific security architecture and also provides policy recommendations to the stakeholders of the region.*

**KEYWORDS:** *Indo-Pacific Security, Maritime Power, Air Power Integration, Regional Security Architecture, Quad, Force Integration, South China Sea, SLOC Protection.*

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### **1. INTRODUCTION**

The Indo-Pacific region covers almost half of the world's ocean surface and links the world's largest economies, most populous countries, and important energy trade routes[1]. The strategic

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importance of the region is due to a combination of factors: some \$5.3 trillion in annual maritime traffic, vital chokepoints such as the Malacca Strait (carrying 25-30% of the world's maritime trade), Strait of Hormuz, and Sunda Strait, and rich energy reserves[2]. The geopolitical landscape of the Indo-Pacific has changed dramatically over the past two decades with the emergence of China as a maritime power, the rebalancing of the US strategic presence and the rise of the middle powers as key players[3].

The integration of maritime and air power has become an ever-increasing component in the regional security dynamics. Historically, naval power projection had been restricted by the range and endurance of naval vessels. Contemporary military doctrine recognises that the modern concept of maritime dominance requires coordinated air sea operations, in which air power is required as reconnaissance, strike capabilities and air defense protection for the naval forces[4]. The challenge for Indo-Pacific security architecture is to build integrated capabilities that avoid the sovereignty norm, yet support freedom of navigation and multilateral responses to transnational maritime threats.

This paper considers three major research questions: (1) What are the major geopolitical and technological challenges for the integration of maritime and air forces in the Indo-Pacific? (2) Where are the possibilities for improving regional security through integrated multilateral operations? (3) What force integration strategies should be guiding military development and operational planning in the region in the future?

## **2. STRATEGIC Importance of the INDO-Pacific Maritime Domain**

### **2.1 Geographic and Economic Importance**

The Indo-Pacific region extends from the east coast of Africa to the west coast of North America[5], including the Indian Ocean and Pacific Ocean basins. This expansive maritime space is home to important sea-lanes linking Europe, Middle East, Africa and Asia-Pacific regions. The Malacca Strait alone sees passage of about 94 000 vessels per year, while more than 30% of maritime trade passes through the South China Sea (SCS). [6]

Energy security is one of the top concerns for region stakeholders. Over 80 percent of China's crude oil imports from the Middle East and Africa pass through these waters[7]. Japan, South Korea and India rely heavily on stable access to energy resources through these sea-lanes. The region also represents some 10% of global fisheries production and possesses important mineral and hydrocarbon deposits.

### **2.2 Geopolitical Players and Claims**

Indo-Pacific security environment is an environment where the various overlapping claims and strategic interests exist. China claims the South China Sea using the 9-dash line which occupies an area of approximately 90 percent of the South China sea and conflicts with Philippines, Vietnam, Malaysia, Brunei and Indonesia[8]. In 2016, the Permanent Court of Arbitration struck down a decision. China has historical claims regarding its rights, yet China has not gone by the ruling and the relationship has been strained both in legal and other areas. operational levels remain[9].

#### **The strategic interests of big powers are:**

- **United States:** Maintenance of freedom of navigation, balancing China's rise, alliance management with Japan, South Korea, and Philippines
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- **China:** Securing critical maritime passages, expanding regional influence, protecting strategic depth, pursuing "China Dream" regional hegemony
- **India:** Protecting maritime trade, ensuring energy security, maintaining regional balance, advancing "Security and Growth for All in the Region" (SAGAR) doctrine
- **ASEAN states:** Balancing major power competition, protecting territorial interests, maintaining economic opportunities, preserving strategic autonomy

**Table 1 summarizes the key maritime claims and disputed areas in the region.**

Disputed Area	Primary Claimants	Strategic Significance	Status
South China Sea	China, Vietnam, Philippines, Malaysia, Brunei, Indonesia	Trade, Energy, Fish Resources	Unresolved
Scarborough Shoal	China, Philippines	Proximity to Manila, Strategic Position	Controlled by China (2012)
Spratly Islands	China, Vietnam, Philippines, Malaysia, Brunei	Energy Reserves, Fishing Grounds	Partial Control by Multiple States
Paracel Islands	China, Vietnam	Energy Reserves	Controlled by China
Indian Ocean	India, China (minimal)	Trade Routes, Strategic Depth	Cooperation Framework (IORA)
East China Sea	China, Japan	Energy Reserves	Tensions over EEZ Boundaries

### 3. CHALLENGES TO MARITIME-AIR POWER INTEGRATION IN THE INDO-PACIFIC

#### 3.1 Geopolitical Challenges

**Contested Legal Frameworks:** The principal geopolitical issue is that China has not adhered to the United Nations Convention on the Law of the Sea (UNCLOS), namely when it comes to the nine-dash line interpretation [10]. Although China is a signatory of UNCLOS its understanding of rights over its territorial area within the nine-dash line exceeds the provisions of the convention. China has rejected the decision of the 2016 arbitral tribunal supporting the claims of Philippines, creating legal uncertainty, making it more difficult to plan logistically with regional navies [11].

**Power Asymmetries:** China has brought about huge inequalities in power capabilities due to military modernization. People Liberation Army Navy (PLAN) now has the highest number of ships in the world and it has more than 350 ships compared to approximately 300-320 ships of the US Navy[12]. The Anti-Access/ Area-Denial (A2AD) approach established China with an

integrated air and marine power that offers exclusion zones, which provoke power projection by other navies.

**Alliance Fragmentation:** Southeast Asian countries do not share the same strategic orientations even though there is the Quad (US, Japan, India, Australia) as well as AUKUS (Australia, UK, US) both of which offer multilateral frameworks to surplus countries. Vietnam and Philippines are interested in becoming close to the US and India, Malaysia and Thailand have a more balanced relations with China, which creates the difficulties with the coordination of integrated operations[13].

### 3.2 Technological and Operational Challenges

**Range and Endurance Mismatches:** The range needs of modern maritime operations are long range, whereas the air power operational radius and naval capabilities needs have differences in the range of their operations. Aircraft with this type of maritime patrol, such as P-8I Poseidon, P-8A Poseidon, and Airbus P-3C Orion, can be used to cover a big area in the combat zone, but they need the bases on the land. Planes that are carried by carriers have lower range and more mobility[14]. These complementary systems need advanced command and control infrastructures in order to integrate them.

**Anti-Access/Area Denial (A2AD) Systems:** China's deployment of advanced surface-to-air missiles (HQ-9, HQ-22), coastal defense systems and maritime combat aircraft etc create the standoff defensive capabilities that provide a challenge to target operations[15]. The combination of long-range anti-ship cruise missile (YJ-12, YJ-18) on air and naval platforms presents complex targeting problems, to which real-time intelligence fusion is required.

**Data Fusion and Interoperability:** Efficient maritime-air integration requires free and open information sharing among services, nations and platforms. Current systems use different data standards, security protocols, and classification systems which create interoperability gaps[16]. In the context of Indo-Pacific region, real-time fusion of the sensor data from ships, aircraft, submarines and satellites makes the need of standardized technical interfaces which are still there in the ballot.

### 3.3 Institutional/Coordinating Challenges

#### 3.3 Institutional and Coordination Challenges

**Institutional Fragmentation:** There is again no single institutional command structure in the Indo-Pacific security architecture of the scale of the one similar to that in the case of the case of the Organization of the North Atlantic Treaty (NATO). Instead, it consists of complex overlapping frameworks: Quad (informal dialogue), ASEAN Regional Forum (ARF), East Asia Summit (EAS), IORA (Indian Ocean Rim Association) and bilateral arrangements[17]. This multiplicity results in coordination challenges, as different nations may operate under different mandates and rules of engagement.

**Sovereignty and Operational Control:** Regional nations, especially Southeast Asian states, are jealous of operational autonomy. Joint operations require negotiated agreements regarding command structures, rules of engagement and escalation procedures.[18] The asymmetry related to major powers (US, China, India) and smaller states creates hurdles between efficiency in operation and the principle of equal partnership.

**Capacity Building Gaps:** advanced maritime surveillance, integrated air defence and advance command and control systems are unavailable in many Indo-Pacific nations. Capacity disparities

are constraining the integration of operations, as sophisticated platforms cannot be successfully integrated with less sophisticated. Capacity disparities restrict the integration of operations since sophisticated platforms cannot typically be integrated with less sophisticated systems[19]. Table 2 shows how the capabilities of key regional players vary.

**Table 2: Maritime and Air Power Capabilities: Regional Comparison (2024-2025)**

Capability	China	US	India	Japan
Total Naval Vessels	350+	300+	150+	150+
Aircraft Carriers	3 (1 additional)	11	1 (2 planned)	4 (Modified)
Modern Frigates	35+	22	13	36
Attack Submarines	40+	52	17	22
Maritime Patrol Aircraft	40+	100+	12	20+
Air Defense Range (km)	250+	200+	150+	100+

#### 4. OPPORTUNITIES FOR ENHANCED REGIONAL SECURITY THROUGH INTEGRATION

##### 4.1 Multilateral Cooperation Frameworks

**The Quad Initiative:** The Quadrilateral Security negotiation brings together US, Japan, India and Australia with same interests in a rules based order, freedom of navigation and regional stability[20]. The Quad has become a shift from informal dialogue to military exercises with "Malabar" (naval exercise since 1992), with an increasing the air power exercise. Recent quad maritime exercises illustrate increasing air and naval integration with contributions from advanced strategic strike aircraft such as the P-8A Poseidon, P-8I Poseidon and naval helicopters[21].

**AUKUS Alliance:** The Australia-UK-US alliance announced in September 2021 is focused on capability development, including for nuclear-powered submarines for Australia.[22] AUKUS offers a mechanism for technology transfer and capability strengthen with particular focus on Indo-Pacific security challenges. The combination of sophisticated submarine, surface and air forces opens the possibility of coordinated operations in disputed waters.

**IORA and Maritime Frameworks:** The Indian Ocean Rim Association includes 23 member states and focuses on maritime security cooperation, such as tackling piracy, human trafficking and illegal fishing[23]. The IORA Maritime Safety and Security (IMS) mechanism creates institutional structures for information-sharing, capacity building and concerted responses against non-traditional threats posed by the maritime environment.

##### 4.2 Technological Opportunities

**Maritime Domain Awareness (MDA) Enhancement:** Advanced surveillance systems such as satellites, long-range maritime patrol aircraft and networked sensors provide unprecedented ability to monitor large ocean expanses[24]. Integration of these systems via data fusion centers and command and control systems facilitates the quick identification of threats and coordination

of responses. India's acquisition and deployment of P-8I Poseidon in Indian Ocean allows the regional stakeholders to have increased surveillance capabilities[25].

**Network-Centric Operations:** Network-centric operations are an integral part of the modern military doctrine, where dispersed sensors and strike assets are integrated through complex information networks to produce coordinated and decisive operational effects. The Indo-Pacific context presents opportunities to build regional information sharing networks that account for sovereignty affordances for leading time in responding to maritime threats. The Information Fusion Centre at Changi (Singapore) offers operational model for maritime information integration[27].

**Autonomous and Unmanned Systems:** There is new technology available like unmanned aerials (UAVs), unmanned and autonomous underwater vehicles (AUVs) and surface (USVs) vehicles offer the possibility of carrying out extended durations of surveillance, without putting manned platforms at risk[27]. These systems can be used in a contested environment, environment, and continuous examination, and they minimize the risks to the crew members. Integration of unmanned maned platform systems result in scalable and flexible operational architecture.

#### 4.3 Operational Opportunities

**SLOC Protection Operations:** Coordinated maritime air patrols of key sea lanes, to place deterrence to piracy, terrorism and unlawful maritime activities[28]. The success of anti-piracy operations off Somalia shows capacity for multinational coordination in the protection of important trade routes. Extending similar mechanisms for coordination to Indo-Pacific chokepoints provides opportunities for burden-sharing whilst safeguarding collective interests[29].

**Humanitarian Assistance and Disaster Relief (HADR):** Maritime-air integrated operations offer outstanding capability in dealing with natural disasters, maritime accidents, and humanitarian crises[30]. Coordination mechanisms developed for HADR operations build trust and operational familiarity between HADR operation participants and create foundations for response to security challenges. Annual Quad exercises have often had a focus on HADR components in addition to security operations.

**Anti-Piracy and Counter-Terrorism:** Distributed maritime threats such as piracy, maritime terrorism and human trafficking need cooperative surveillance and response capabilities over large areas of the seas[31]. Air power provides the long-range surveillance and rapid response over large areas while the naval platforms provide the sustained presence at sea as well as the ability to interdict, board and inspect vessels. Integrated maritimeair operations have been successful in tackling Somali piracy and can be adapted for use in the Indo-Pacific[32].

### 5. RULES-BASED ORDER AND LEGAL FRAMEWORKS

#### 5.1 The UNCLOS and Freedom of Navigation

The law of the marine department in the Indo-Pacific is established in the 1982 United Nations Convention on the Law of the Sea (UNCLOS) of the Department of Maritime affairs[33]. UNCLOS defines exclusive economic zones (EEZs), the territorial seas, and the international waters which organize the rights and responsibilities of the sea. The convention guarantees the freedom of shipping via international straits and at the high seas, as well as allows military ships

and airplanes to pass[34]. The claim by China of 9 dash lines is against the UNCLOS principles in that it claims historical rights over the waters which are not in conformity with the provisions in the convention concerning the EEZs and continental shelves[35]. The case was secured through the 2016 arbitral award in favor of the case of Philippines and enforced the UNCLOS to act as a binding legal framework, yet the non-compliance of China shows that rules-based order can face hardship in force. The cooperation of the region shaped by UNCLOS offers a chance to engage in the concerted defense of the rules-based maritime order. Position coordination in negotiations of Code of Conduct is required by the five Southeast Asian claimants (Vietnam, Philippines, Indonesia, Malaysia and Brunei) in order to maintain UNCLOS safeguards[36].

## 5.2 Freedom of Navigation Operations

The right to freedom of navigation should be available to every country without discrimination (however, geopolitics have until now restricted such freedom). US and Indian and allied naval explicit activities in exercising freedom of navigation can be seen as an expression of rules-based order[37]. These activities include a passage close to disputed territories and through narrow passages to claim or demonstrate a right of navigation and contravening invalid claims. International law is facilitated by the fact that the Indian Navy is involved in freedom of navigation operations and even in exercises with Philippine and Vietnam in South China Sea[38].

**Table 3 summarizes major rules-based order frameworks relevant to Indo-Pacific security.**

Framework	Year	Key Provisions
UNCLOS	1982	Maritime rights, EEZ, continental shelf, freedom of navigation
UN Convention on Maritime Safety	1988 (IMO)	Anti-terrorism, maritime security, safety protocols
ASEAN Charter	2008	Regional cooperation, peaceful dispute resolution, non-interference
SCS Code of Conduct	Negotiating (2024+)	Rules for state behavior in SCS, non-militarization principles
BIMCO Standard Clauses	Various	Industry standards for maritime operations and safety
IORA MOU	2009 (Renewed)	Regional maritime cooperation, information sharing

## 6. FUTURE FORCE INTEGRATION STRATEGIES

### 6.1 Concepts of operation concerning integrated maritime-air operations.

**Joint Operations Planning:** Future planning This must develop joint doctrine that focuses on integrated maritime and air operations. This entails normal operating guidelines on:

- Unified air defense in anti-access/area-denial response.

- The fusion of maritime domain awareness: ship sensors, aircraft sensors, and satellite sensors.
- Quick decision-making process that allows decision targeting and engagement in real-time.
- Escalation management averting unintentional increase in discord in the conflicted regions[39].

**Expeditionary Force Structures:** Instead of the fixed bases that can be targeted by concentrated attacks, expeditionary task forces that integrate surface combatants, submarines, and supply ships as well as embark assets aids and embarked air are flexible as they can respond to regional challenges[40]. Periodical redeployment of these integrated forces by forward rotating presence increases regional presence, but does not create permanent forward bases which are controversial with the ASEAN countries.

**The integration of Layered Defense:** Future operations see layered defensive architecture, with outer perimeter patrol planes able to provide long-range coverage, carrier or land-based fighter aircraft able to provide area coverage, surface combatants able to provide medium range air coverage and guided-missile ships able to provide point coverage[41]. Cohistent defense against sophisticated attackers is made possible by integration of these layers in terms of information networks.

## 6.2 Intelligence, Surveillance, and Reconnaissance (ISR) Architecture

**Maritime Surveillance Networks:** Regional maritime surveillance architecture to be developed requires integration of:

- Long-range naval aircrafts (P-8 variants) of several countries.
- Intelligence satellites that would give round-the-clock surveillance.
- Extended range maritime radar HFSWR.
- Representative replenishment networks allowing long patrols.
- Information fusion centers coordination of sensor inputs[42].

The use of P-8I Poseidon maritime patrol aircraft by India in the Indian Ocean is a set to be emulated as a model of maritime surveillance in the region. Their extension to Pacific regions would require transfer of technology to the area partners and the development of interoperable systems.

**Data Sharing Protocols:** Multilateral data-sharing protocols, which are to be set up on the basis of secure technologies, will permit the dissemination of maritime intelligence in the most rapid manner, yet without neglecting the issues of national security[43]. Institutional controls in sharing intelligence are offered by the ASEAN Regional Forum and Information Fusion Centre. The growth and development of these systems through bilateral intelligence-sharing arrangements forms unnecessary avenues of information.

## 6.3 Capacity Building and Training Programs

**Professional Development:** Increased interoperability of forces due to improved officer exchange program, combined training base, and standardized maritime curricula[44]. Regional training centers may be hosted in countries like Japan, Australia and India and concentrate on:

- State-of-the-art maritime surveillance.
- Combined command and control processes.
- Training on rules of engagement.
- Maritime safety and damage control.
- Counter-piracy and maritime terror strategy[45].

**Technology Transfer and Acquisition:** The development of increased capacity in the region involves selective technology transfer allowing the smaller countries to procure:

- Contemporary coastal observation radars.
- Maritime patrol (manned or unmanned) aircraft.
- 6 fast attack craft, patrol vessels.
- Combined command and control systems.
- Unmanned systems are extended surveillance[46].

The Indian Navy capacity building among Southeast Asian partners, the Japanese Official Development Assistance (ODA) towards maritime infrastructure and the Australian Defence Cooperation programs all promote capacity building in the region.

#### **6.4 Building an Institutional Framework**

**Regional Maritime Cooperation Center:** Regional maritime coordination center should be established permanently which would offer:

- Combined input on Maritime situation awareness to the center.
- Maritime security (piracy, terrorism, SAR) response.
- Intelligence dissemination and analysis.
- Training and professional development.
- Operation coordinating forum[47].

Information fusion centre in Singapore has partial model, which needs expansion and institutional authority.

**Bilateral and Minilateral Agreements:** In lieu of trying to establish unified command set-ups which have proven offensive to independent states, bilateral and even minilateral operational agreements allows the timely collaboration[48]. Such contracts can make clear:

- Coordinated operation procedures in the international waters.
- Procedures in the operation of the disputed territories.
- Escalation procedures and rules of engagement.
- Communication standards and emergency practices.
- Arrangements and classifications of information sharing and security[49].

## 6.5 Strategic Communication and Deterrence

**Presence and Signaling:** Consistent maritime-air exercises that exhibit competency and will give the effect of deterrence but develop familiarity with operations[50]. Malabar fleet operations series now incorporate air power, and they extend geographically. Clear communication of adherence to the order based on rules strengthens the prevention of revisionist actions.

**Crisis Communication Mechanisms:** Hotlines and communication protocols will decrease the threat of the unintentional escalation in wake of crisis[51]. The bilateral communication patterns between the great powers (US-China, India-China) give partial simulation that may be extended to the multilateral situation.

## 7. DISCUSSION: BALANCING COOPERATION AND COMPETITION

### 7.1 The Sovereignty- Cooperation Dilemma.

The main contradiction of the Indo-Pacific security architecture is the challenge to find a balance between the national sovereignty and the necessity to cooperate within frameworks of the functional cooperation[52]. Small and medium powers in Southeast Asia hesitate that the involvement in the multilateral military structures may make them lose their strategic autonomy or form the impression of going against the major powers. The reason behind this concern has been based on the experience of the Cold War whereby regional countries were compelled to make decisions between super power blocks[53].

The solution needs the structures that focus on:

- Non-exclusionary (not applied to a certain country) participation.
- Flexibility of operations (desire to engage in cooperation without the open-ended alliances)
- Capacity building orientation (placing more emphasis on technical assistance, as opposed to strategic alignment)
- Incremental institutionalization (no permanent command structures)

### 7.2 Technology Access and Capability Disparities

There exists a great difference in technological capabilities limiting successful integration. Enhanced maritime patrol aircraft systems, combined air defense systems and network centric operations demand high level of technical sophistication[54]. Although this gap can be taken care of under capacity building programs, there still exist realistic discrepancies in the medium-term period (5-10 years).

Strategic approach entails:

- Tiered integration in which less developed partners bring with them specialized capabilities.
- Training focus on compatibility with the current systems, as opposed to acquiring new ones.
- Target the non-conventional threats (piracy, SAR, environmental protection) where the aspect of capability difference is not as important[55].

### **7.3 Legitimacy of Enforcement Mechanisms**

Although it is true that maritime-air integrated forces could be used to impose freedom of navigation and deliver security to critical sea routes, the legal basis of enforcement measures should be established in the UNCLOS and approved by the concerned countries[56]. Unilateral actions on enforcement could lead to the escalation and opposition by other nations. To be seen as legitimately regional, there must be:

- Measures based on definite UNCLOS stipulations.
- The backing of the regional stakeholders such as the affected Southeast Asian countries.
- Open communication on goals of operation.
- Shunning of apparent dominance-seeking behaviors[57].

## **8. IMPLICATIONS AND RECOMMENDATIONS**

### **8.1 For Regional Powers**

#### **For India:**

1. Expand P-8I Poseidon maritime patrol aircraft operations to cover extended regions, developing interoperable standards with allied navies
2. Establish dedicated maritime-air integration cells within Naval Headquarters and Air Headquarters for joint planning
3. Accelerate capacity building in Southeast Asia through training programs and technology transfer for naval and air force modernization
4. Strengthen bilateral operational agreements with Vietnam, Philippines, Singapore, Indonesia specifying procedures for coordinated maritime-air operations
5. Develop indigenous maritime surveillance systems and share non-sensitive data through IORA and bilateral arrangements[58]

#### **For Japan:**

1. Leverage advanced naval and air capabilities as foundation for regional leadership in maritime-air integration standards
2. Expand Quad exercises to explicitly include coordinated maritime-air operations beyond current scope
3. Develop interoperable systems with US, India, Australia enabling seamless operation integration
4. Establish training facilities for regional officers on advanced maritime surveillance and network-centric operations
5. Provide official development assistance for maritime infrastructure in Southeast Asia with interoperability standards[59]

#### **For ASEAN States (Vietnam, Philippines, Indonesia, Malaysia):**

1. Develop indigenous maritime surveillance capabilities through capacity-building partnerships with larger powers

2. Establish multilateral maritime patrols and information-sharing through ASEAN Coordinated Patrol arrangements
3. Formalize bilateral operational agreements specifying procedures for joint operations in contested areas
4. Develop officers through training programs emphasizing UNCLOS-based law enforcement and maritime security
5. Assert leadership in Code of Conduct negotiations preserving UNCLOS principles and maintaining strategic autonomy[60]

## 8.2 For International Community

1. **UNCLOS Reinforcement:** Strengthen arbitration mechanisms and establish compliance monitoring bodies with enforcement authority for maritime disputes
2. **Technology Transfer Facilitation:** Establish international mechanisms enabling selective technology transfer for maritime surveillance and air defense systems to developing nations
3. **Training and Professional Development:** Expand international maritime security training programs through IMO and regional organizations
4. **Environmental Cooperation:** Link maritime security cooperation with environmental protection and sustainable development, increasing legitimacy and appeal to regional stakeholders[61]
5. **Conflict Prevention:** Establish multilateral hotlines, crisis communication mechanisms, and regular dialogue forums preventing inadvertent escalation

## 8.3 Implementation Timeline

### Short-term (1-2 years):

- Establish bilateral operational agreements and joint planning procedures
- Conduct coordinated maritime exercises including explicit air power integration
- Expand capacity building and training programs

### Medium-term (3-5 years):

- Develop interoperable command-and-control systems
- Establish regional maritime coordination center
- Implement systematic intelligence-sharing protocols

### Long-term (5-10 years):

- Develop indigenous surveillance and defense capabilities in regional nations
- Establish institutionalized multilateral coordination mechanisms
- Achieve standardized interoperability across maritime-air platforms

## 9. CONCLUSION

The Indo-Pacific maritime space is the strategic region of great power rivalry and the important trade route in the world. The maritime and air power capabilities need to be built in effective security architecture that balances between national sovereigns and functional cooperation imperatives in multilateral frameworks. The present issues encompass a challenged legal regime in the context of UNCLOS, unequal balance of power in favor of modernization of Chinese military, lack of technological interoperability, and inefficiency in the institutions in the context of multiple overlapping cooperation regimes. Nevertheless, there are great prospects with further Quad cooperation, AUKUS partnership, IORA maritime systems, and bilateral agreements with ASEAN countries. The future force integration policies should focus on the network centric operations, the development of the maritime domain awareness, capacity building to the regional partners and the institutional structures that consider the sovereignty, but allow the partners to coordinate their responses to threats. It will have to be implemented on a long-term basis based on rules-based order, open communication on strategic goals and awareness of legitimate security interests of all the stakeholders in the region. The effective implementation of Indo-Pacific security architecture is not going to be based on the superiority of military capabilities but the commitment to the rules-based order, adherence to international law, and the readiness to distribute burdens and benefits of regional stability fairly across the stakeholders. With increasing geopolitical rivalry, combined maritime-air force is necessary to offer fundamental support to the freedom of navigation, securing key sea passages, and prosperity to the 4.6 billion people in the region.

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## SCREEN EXPOSURE, TECHNO STRESS, GRATITUDE AND SUBJECTIVE WELL-BEING AMONG PROFESSIONALS

Dr. Manish Kant\*; Dr. Lav Kumar Singh\*\*

\*Assistant Professor,  
Department of Psychology,  
VSJ College, Rajnagar, Madhubani, INDIA

\*\*Assistant Professor,  
Department of Psychology,  
APSM College, Barauni, Begusarai, INDIA  
EmailId: lkumarsingh@gmail.com

DOI: **10.5958/2249-7137.2026.00014.8**

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### ABSTRACT

*In the contemporary digital era, professionals are increasingly exposed to prolonged screen time due to the widespread use of computers, smartphones and other digital devices. While these technologies enhance efficiency and connectivity, they also contribute to psychological strain, often referred to as technostress. At the same time, positive psychological constructs such as gratitude may play a protective role in maintaining subjective well-being. Therefore, the present study examined the relationship between screen exposure, technostress, gratitude and subjective well-being among professionals, with a particular focus on the buffering role of gratitude.*

*The study was conducted on a sample of 123 professionals, including doctors, physiotherapists, lawyers and other working individuals from Darbhanga and Madhubani districts of Bihar. Participants were selected using purposive sampling. Screen exposure was measured through self-reported daily screen time, technostress using the Technostress Scale (Tarafdar et al., 2007), gratitude using the Gratitude Questionnaire (GQ-6), and subjective well-being using the Satisfaction with Life Scale (SWLS).*

*The results indicated that screen exposure was positively related to technostress ( $r = .48, p < .001$ ) and negatively related to subjective well-being ( $r = -.41, p < .001$ ). Gratitude was positively associated with subjective well-being ( $r = .46, p < .001$ ) and negatively related to technostress ( $r = -.36, p < .01$ ). Regression and moderation analyses suggested that gratitude significantly reduced the negative effect of technostress on well-being. The findings highlight the importance of managing digital exposure and promoting gratitude for enhancing well-being among professionals.*

**KEYWORDS:** *Screen Exposure, Technostress, Gratitude And Subjective Well-Being.*

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### INTRODUCTION

The rapid advancement of digital technologies has significantly transformed the nature of professional work. In recent years, professionals across various fields such as healthcare, law and education have become increasingly dependent on digital devices for communication,

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documentation and service delivery. As a result, screen exposure has become an unavoidable part of daily life.

Screen exposure refers to the amount of time individuals spend interacting with digital screens such as computers, smartphones and tablets. While moderate use of digital devices can improve efficiency and accessibility, excessive screen exposure has been associated with negative psychological and physical outcomes. Research suggests that prolonged screen time may lead to mental fatigue, reduced concentration, sleep disturbances and increased stress levels (OECD, 2024).

One of the key psychological outcomes associated with excessive screen exposure is technostress. The term technostress was introduced to describe the stress experienced by individuals due to their inability to cope with technological demands. According to Tarafdar et al. (2007), technostress includes multiple dimensions such as techno-overload (feeling overwhelmed by technology), techno-invasion (feeling constantly connected) and techno-complexity (difficulty in understanding technology).

Technostress has been found to negatively affect both professional performance and personal well-being. Studies indicate that individuals experiencing high levels of technostress are more likely to report burnout, job dissatisfaction and emotional exhaustion. Continuous digital connectivity, frequent notifications and increasing expectations for rapid responses may create pressure and reduce work-life balance.

At the same time, the field of positive psychology has emphasized the importance of personal strengths and positive emotions in maintaining well-being. One such construct is **gratitude**, which refers to the tendency to recognize and appreciate positive aspects of life. Gratitude has been found to enhance psychological well-being by promoting positive emotions and reducing negative affect (Emmons & McCullough, 2003).

Research suggests that gratitude is strongly associated with subjective well-being. Individuals with higher levels of gratitude tend to experience greater life satisfaction, happiness and emotional stability (Wood et al., 2010). Gratitude also encourages individuals to focus on positive experiences rather than negative ones, which may help in coping with stress.

Subjective well-being refers to an individual's overall evaluation of their life, including both cognitive judgments (life satisfaction) and emotional experiences (positive and negative affect) (Diener et al., 1985). It is influenced by various factors including work conditions, stress levels and personal coping mechanisms.

The relationship between screen exposure, technostress and subjective well-being can be understood through the **stress-buffering model**, which suggests that positive psychological resources may reduce the negative effects of stress on well-being. In this context, gratitude may act as a protective factor that reduces the impact of technostress on subjective well-being.

Despite the growing importance of these variables, relatively limited research has examined their combined relationship among professionals in semi-urban regions such as Darbhanga and Madhubani. Therefore, the present study aimed to explore the relationship between screen exposure, technostress, gratitude and subjective well-being among professionals.

## Objectives

1. To assess levels of screen exposure among professionals

2. To examine the relationship between screen exposure and technostress
3. To examine the relationship between technostress and subjective well-being
4. To examine the relationship between gratitude and subjective well-being
5. To examine whether gratitude moderates the relationship between technostress and well-being

### **Hypotheses**

H1: Screen exposure will be positively related to technostress

H2: Technostress will be negatively related to subjective well-being

H3: Gratitude will be positively related to subjective well-being

H4: Gratitude will be negatively related to technostress

H5: Gratitude will moderate the relationship between technostress and subjective well-being

### **Method**

#### **Sample**

The sample consisted of **123 professionals**, including doctors, physiotherapists, lawyers and other working individuals from Darbhanga and Madhubani districts of Bihar. Participants were selected using purposive sampling. The age of participants ranged from 26 to 55 years ( $M = 36.8$ ,  $SD = 7.4$ ).

#### **Tools**

##### **1. Screen Exposure Measure**

Screen exposure was assessed using a self-report measure of average daily screen time. Participants were asked to estimate the number of hours they spend interacting with digital devices such as smartphones, computers, laptops and tablets for both professional and personal purposes.

In addition to total screen time, participants were also asked to indicate the primary purpose of screen usage, such as work-related activities, communication or entertainment. This helped in understanding the nature of screen engagement.

For the purpose of analysis, total daily screen time (in hours) was used as a continuous variable. Higher values indicated greater screen exposure. Self-report measures of screen time have been widely used in psychological research and have shown acceptable validity for estimating digital engagement patterns.

##### **2. Technostress Scale**

Technostress was measured using the Technostress Scale developed by Tarafdar et al. (2007). The scale is widely used to assess stress arising from the use of information and communication technologies.

The scale consists of items measuring different dimensions of technostress, including:

- Techno-overload (feeling overwhelmed by excessive information and workload)
- Techno-invasion (feeling constantly connected and unable to disconnect)

- Techno-complexity (difficulty in understanding and using technology)

### 3. Gratitude Questionnaire (GQ-6)

Gratitude was assessed using the Gratitude Questionnaire–Six Item Form (GQ-6) developed by McCullough et al. (2002). This scale measures the dispositional tendency to experience gratitude in daily life.

The GQ-6 consists of 6 items designed to assess appreciation, thankfulness and recognition of positive aspects of life. Sample items include:

- “I have so much in life to be thankful for.”
- “I am grateful to a wide variety of people.”

### 4. Satisfaction with Life Scale (SWLS)

Subjective well-being was measured using the Satisfaction with Life Scale (SWLS) developed by Diener et al. (1985). The SWLS is one of the most widely used measures of life satisfaction.

The scale consists of 5 items that assess individuals’ overall evaluation of their life. Sample items include:

- “In most ways my life is close to my ideal.”
- “I am satisfied with my life.”

### Data Collection

Data were collected using structured questionnaires administered individually. Participants were informed about the purpose of the study and confidentiality was maintained.

### Statistical Analysis

- Descriptive statistics
- Pearson correlation
- Multiple regression
- Moderation analysis

### Results

**Table 1: Descriptive Statistics**

Variable	Mean	SD
Screen Exposure	6.82	1.94
Technostress	58.34	10.21
Gratitude	28.45	5.67
Subjective Well-Being	21.78	6.12

**Table 2: Correlation Matrix**

Variable	1	2	3	4
Screen Exposure	—			
Technostress	.48**	—		
Gratitude	-.22*	-.36**	—	
Well-Being	-.41**	-.52**	.46**	—

**Table 3: Regression Analysis**

$R^2 = .38$ ,  $F(2,120) = 36.84$ ,  $p < .001$

Predictor	$\beta$	t	p
Technostress	-.44	-5.21	<.001
Gratitude	.39	4.63	<.001

**Table 4: Moderation Analysis**

Interaction term (Technostress  $\times$  Gratitude):  
 $\beta = .18$ ,  $p = .021$

## Discussion

The present study aimed to examine the relationship between screen exposure, technostress, gratitude and subjective well-being among professionals. The findings of the study indicated that screen exposure was significantly positively related to technostress and negatively related to subjective well-being. Additionally, gratitude was found to be positively associated with subjective well-being and negatively related to technostress. The moderation analysis further suggested that gratitude reduced the negative impact of technostress on subjective well-being.

The positive relationship between screen exposure and technostress suggests that increased use of digital devices may contribute to higher levels of psychological strain among professionals. This finding is consistent with earlier research which has shown that excessive interaction with technology can lead to information overload, constant connectivity and pressure to respond quickly (Tarafdar et al., 2007). In professional settings, individuals are often required to remain available through digital platforms, which may create a sense of continuous engagement and reduce opportunities for psychological recovery.

Another possible explanation for this relationship is that prolonged screen exposure may reduce physical activity and increase cognitive fatigue, which in turn may contribute to stress. Continuous engagement with digital screens may also interfere with sleep patterns, further increasing stress levels. Therefore, the findings suggest that screen exposure is not only a behavioral factor but also a psychological risk factor for technostress.

The study also found a significant negative relationship between technostress and subjective well-being. Professionals experiencing higher levels of technostress reported lower levels of life satisfaction. This finding is supported by previous research indicating that technostress is associated with burnout, emotional exhaustion and reduced job satisfaction. When individuals feel overwhelmed by technological demands, their ability to experience positive emotions and satisfaction may be reduced.

The positive relationship between gratitude and subjective well-being observed in the study is consistent with the findings of Robert Emmons and Michael McCullough (2003), who suggested that gratitude enhances well-being by promoting positive emotions and reducing negative affect. Individuals with higher levels of gratitude tend to focus on positive aspects of life, which may increase their sense of satisfaction and happiness.

The negative relationship between gratitude and technostress suggests that gratitude may help individuals cope with stress more effectively. One possible explanation is that gratitude promotes positive cognitive appraisal, allowing individuals to reinterpret stressful situations in a less threatening manner. This aligns with the broaden-and-build theory of positive emotions, which suggests that positive emotions broaden individuals' thought-action repertoires and help them build psychological resources.

The most important finding of the study is the moderating role of gratitude in the relationship between technostress and subjective well-being. The results indicated that gratitude reduced the negative impact of technostress on well-being. This finding supports the **stress-buffering model**, which suggests that personal resources such as positive emotions and coping strategies can reduce the adverse effects of stress.

In practical terms, this means that even when professionals experience high levels of technostress, those with higher levels of gratitude are less likely to experience a decline in well-being. Gratitude may help individuals maintain emotional balance, improve resilience and cope more effectively with stress.

Another important aspect to consider is the socio-cultural context of the study. The participants were drawn from semi-urban regions such as Darbhanga and Madhubani, where rapid technological changes may create additional challenges for professionals who may not have received formal training in digital adaptation. This may further increase technostress levels. At the same time, cultural values emphasizing social support and appreciation may enhance gratitude, which may help in coping with stress.

Overall, the findings of the study highlight the dual nature of technology. While digital tools provide numerous benefits, excessive use may create psychological challenges. At the same time, positive psychological factors such as gratitude can play a significant role in maintaining well-being.

Future research may explore additional variables such as emotional intelligence, coping strategies and work-life balance in order to better understand the relationship between technology use and well-being. Longitudinal studies may also provide deeper insights into how these relationships evolve over time.

## CONCLUSION

The present study provides important insights into the relationship between screen exposure, technostress, gratitude and subjective well-being among professionals. The findings indicate that increased screen exposure is associated with higher levels of technostress and lower levels of subjective well-being. Technostress, in turn, negatively affects life satisfaction, highlighting the psychological cost of excessive digital engagement.

At the same time, the study demonstrates that gratitude plays a significant role in enhancing subjective well-being and reducing technostress. More importantly, gratitude was found to buffer

the negative effects of technostress on well-being, suggesting that it serves as an important protective psychological resource.

These findings have important practical implications. Professionals need to be aware of the potential negative effects of excessive screen exposure and adopt strategies to manage their digital usage. Organizations may also consider implementing interventions such as digital detox programs, time management strategies and training programs to reduce technostress.

Furthermore, promoting gratitude through simple interventions such as gratitude journaling, reflection exercises and positive communication may help individuals improve their well-being and cope more effectively with stress.

In conclusion, while technology is an essential part of modern professional life, maintaining a balance between digital engagement and psychological well-being is crucial. Developing positive psychological resources such as gratitude may help individuals navigate the challenges of the digital age and lead to a more satisfying and balanced life.

### Limitations

The study used self-report measures and a limited sample size, which may affect generalizability. Future research may include larger samples and longitudinal designs.

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## FROM TRADITION TO TRANSFORMATION: THE ROLE OF ODOP IN RESHAPING UTTAR PRADESH'S ECONOMY

Dr. Surender Singh Yadav\*; Dr. Laxmi Narayan\*\*

\*Assistant Professor,  
Department of Economics,  
Govt. College Kanina, INDIA  
Email Id: surender14371@gmail.com

\*\*Professor,  
Department of Economics  
Govt. College Mahendergarh, INDIA  
Email Id: proflnyadav@gmail.com

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### ABSTRACT

*The aim of this scheme was to correct regional imbalances, importance to skill based employment in order to reduce rural unemployment and to revive dying crafts by stimulating sustainable local economic growth by focusing investment in rural areas. The state has a strong rural based socio- economic landscape but there are various challenges faced by the traditional industries in the state resulting in extinction of many artisanal craft and increase in rural migration. ODOP has tried to balance the economic growth of the state by generating employment and production at local level and in rural areas in order to transform the regional economy and eradicate the problem of unemployment and migration. In the year 2018-19 only 57.69% budget was sanctioned out of the budget provision and 42.28% was utilized out of the sanctioned budget. This ration doubled in the year 2022-23 98.10% budget was sanctioned out of the budget provision and 98.25% was utilized out of the sanctioned amount of the budget which shows the fast progress of the scheme in the state. Training to the local people has also increased many folds from 5944 in 2018-19 to 21000 in 2022-23. The annual growth rate of all products under ODOP also has a substantial growth of 5.77% from the period of inception 2017-18 to 2024-25. The product wise annual growth rate in export shows highest growth of Sports Good and Equipment at the rate of 15.85% and export of Wood Crafts at the rate of 12.70%. The lowest annual growth rate of export of Meat and Edible Meat Offal is at the rate of 4.87% and for Glass and Glass ware 4.88%. The highest employment generation under ODOP was 146.36% in 2020-21 over the previous year 2019-20. The study shows that the scheme a steady progress in the state providing employment opportunities to the local artisans and has made a substantial growth in the economy of the state.*

**KEYWORDS:** Artisans, Employment, Sports Goods And Wood Crafts.

## 1. INTRODUCTION:

UP government launched this scheme on 14th January 2018 with the aim to accelerate economic development through product and area based specialization. It identifies and promote traditional and district-specific product by adapting globally acclaimed OVOP concept for decentralizing production.<sup>1</sup> The aim of this scheme was to correct regional imbalances, importance to skill based employment in order to reduce rural unemployment and to revive dying crafts. The underlying principle was to stimulate sustainable local economic growth by focusing investment in rural areas to strengthen marketing strategies, reviving policy and branding.<sup>2</sup>

Uttar Pradesh being the largest state and have contribution of approximately 8.3% towards National GDP.<sup>3</sup> It is the highly populous state but it has strong rural based socio-economic landscape. The traditional industries also facing various issues i.e. absence of modern technology, sufficient market reach, weak access to credit and lack of standardization. This was resulting in extinction of many artisanal craft and increase in rural migration.<sup>4</sup>

State government integrated the scheme with the various program of the central government to handle the various difficulties faced at different stages of operation. This integration with the various schemes of the central government have enhanced the capacity building, skill development and helped in increasing the export of the commodity.<sup>5</sup> The decentralization of industrial policy in UP, made ODOP scheme as a flagship program of the state.

## 2. Rationale of the study:

The role of the ODOP is engaging local artisans and creating employment which leads to reduction in the migration of workers to other states. The unemployment and migration of labourers to other state are the crucial problem of the state. ODOP has tried to balance the economy of the state by transforming the regional economy and eradicate the problem of unemployment and migration. The major problem of every economy is equal distribution of wealth and production activities. ODOP provides opportunities to reduce these imbalances. Promotion of traditional industries and extending their reach to the markets made ODOP economically rationale also. ODOP products have made growth in revenue of the state by 37.3%. The total output in the financial year 2019-20 was Rs. 2950.9 crores and in the financial year 2020-21 it was Rs. 4052.4 crores.<sup>6</sup> Various state of art facility of packaging, branding, online selling through portal and better linkages between buyers and sellers are behind this sharp growth. ODOP has made many products i.e. leather goods, locks and sports items which are top performing. Therefore, it becomes imperative to have detailed study of ODOP which has shaped the economy of the state.

## 3. Objectives of the Study:

1. To assess progress of ODOP in the state.
2. To study the policy decisions, institutional mechanism and branding strategies.
3. To study the effect of ODOP on traditional income generation and employment in the state.
4. To study impact of ODOP on the economy of the state.
5. To find out the complexities in front of ODOP Scheme in the state.
6. To give suggestions to improve ODOP scheme in the state.

#### **4. Research Methodology:**

This is a descriptive type of research uses secondary data. Various government reports, documents, published articles and websites were referred for collection of data and their analysis. It focuses on to understand the progress of ODOP scheme towards employment generation, opportunities to local artisans and entrepreneurs and finally its role in the Regional Economic Revitalization of economy of Uttar Pradesh. To find out the product wise growth in export of ODOP products from the state, Compound Annual Growth Rate (CAGR) has been used. The formula to measure the CAGR change is  $Y=ab^t$ . The trend rates have been found using the semi-log function of the form  $\text{Ln}Y = a+ rt$  (where  $r=\text{Ln}(b)$ ). The annual trend rate of growth is calculated as  $\% \text{ growth} = (\text{antilog of } r - 1) \times 100$ . Thus, the trend rates reported here and elsewhere denote the exponential growth rate per annum.

#### **5. Review of Literature:**

Yadav et al 2021. According to his research the ODOP scheme was launched by keeping in mind to promote the local product of each district so that these product get identification at national as well as international level. This will help in achieving the socio-cultural advancement of the people of every district through the local artisans involved in this.

Bhakuni, S.S. (2024). This research focuses on perfume industry of Kannauj. It evaluated the success story of ODOP from its inception in 2018 to 2021. The study reveals that the success story of the ODOP depends upon social, economic and traditional industrial growth. The study analysis related policies and its effects on development of the region. It also focuses on sector specific legal set up.

Natsuda 2011. This study focuses on significant role of the territorial product for the growth of the state and nation. This scheme is the step towards development of the community through regional expertise, available underutilized resources in the rural economy and local artisans.

Dr. Amiya Kumar Mohapatra Tamanna Mohapatra (2023) The ODOP Scheme's Positive Economic Impact on Rural Craft. The study focus on influence of ODOP scheme on rural industries which shows increase in employment and expansion of market. The study highlights that how the traditional craft is revitalized. It examines the relationship of the protection of traditional knowledge and intellectual property rights in economic policies.

Pandey, S (2024) ODOP Scheme and its Sustainability in Prayagraj, UP, India. It examines the challenges and long term sustainability. It studies the major factors responsible for the long term endurance of the scheme. It is also important for the legal research and policy formulation and its implementation.

Agrawal, R., & Alam, J. (2023) 'Overall Impact of the ODOP on Economy of Uttar Pradesh'. It highlights the role of the scheme in increasing revenue of the local artisans and globalization of the demand. It shows the creation of 5, 00,000 jobs, its role in community development by providing employment and boosting local crafts. The study is important for legal studies as it highlights the importance of policies for traditional industries which save our culture heritage in consultation with legal frameworks and economic development.

#### **1. Overview of Economy of U P:**

The economy of the state is dynamic and have diverse economic base consists of agriculture, industry and service sectors. The economy of the state is at 3<sup>rd</sup> position in respect of its share in

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Nation's economy. The state GSDP in 2023-24 was 25.48 lakhs crores. It is rapidly growing state with ambitious targets to become a trillion-dollar economy. It faces several challenges to translate the growth into equitable outcome particularly in rural areas despite its economic advantage. The contribution of service sector towards GSDP is 48.91%, industry sector (secondary sector) is 28.53% and agriculture sector is 25.6%.<sup>7</sup> Few cities like Noida and Lucknow are hub for IT, education and healthcare sector. Leather, glassware, brassware and sports goods are the dominant industrial sectors. Though the share of Agriculture sector is declining in state GSDP but it is still important for employment generation especially in eastern sector of the state. Despite so many advantages, the per capita income was Rs. 71356 in the year 2022 is significantly below the national per capita income of Rs. 150326 for the same year.<sup>8</sup> These economic disparities are there at all levels. The key purpose of this scheme was to provide equal opportunities in the rural and traditional economic activities.

## **6.1 MSME and Economy of Uttar Pradesh:**

There are 89 lakh MSME registered on Udyam till 2023 in Uttar Pradesh which makes largest concentration of the MSMEs in the State. The registered MSMEs of Uttar Pradesh are 14.2% of total MSMEs of the country. Gorakhpur, Kanpur, Meerut, Moradabad and Agra are the hub for these MSMEs and their main products are leather, bras, garments, wooden toys and agro based goods. These MSMEs provide employment to 1.9 crores peoples and it is the backbone of the economy of the state. These MSMEs also support the export. Despite the huge potential in this sector, MSMEs in UP faces major hurdles i.e. outdated machinery, issues of power supply, lack of formal credit, inadequate knowledge of certifications, technical knowhow and branding and marketing. In order to provide integrated support and to make this scheme successful various MSME facilitation centers were established.<sup>9</sup> Government has also launched portal to address the grievances. ODOP was launched to overcome the difficulties faced by the MSME. Access to various facilities was extended to make them more competitive and stand in the market. ODOP has formalized all informal enterprises by encouraging Udyam registration. This holistic approach of the government increased productivity and market reach thereby increasing income levels of the people of the rural areas.<sup>10</sup>

## **6.2 Need for localized Economic Growth:**

Unemployment is the major problem of the state. This has increased seasonal migration of the labour force to different states of the country in search of the work. This has dislocated their families also and created shortage in agricultural and craft based production of the state. Therefore there was a need of localized economic model that can absorb the labour force and reduce the migration to other state. This localized economic model of ODOP was most suitable for the state to create employment and increase in income level. The women artisans in Moonj industry in Prayagraj has earned sustainable income without migration and the Shazar stone industry in Banda employed 600 traditional skilled artisans due to ODOP only. It has strengthen people in the rural areas by providing employment and production opportunities at their door. This has led to social cohesion and sustainable regional stability.<sup>11</sup>

## **ODOP Scheme: Objectives, Origin and Evolution, Structure, Implementation Mechanism, Product Identification, Institutional Support and Financial Assistance:**

### **7.1 Objectives of the ODOP Scheme:**

1. To develop and preserve the local craft skills and promotion of arts.

2. To start district wise economic activities and promote their product.
3. To enhance the market access of the local product in order to fetch more revenue and popularity.
4. To reduce migration of labour by increasing local employments and incomes.
5. To make optimum utilization of resources in rural areas by improving their skill development.
6. To increase in export by adding local products.

### **7.2 Rise of ODOP Scheme:**

This scheme was launched in the state in 2018 in all the districts of the state by selecting one unique product for each district. The policy was framed to provide the institutional support to each district. The main objective of the scheme was to provide the growing opportunities and platform to the local artisans to make their product economically viable. While selecting the product under ODOP importance was given to its historical, cultural and employment generating potential.<sup>12</sup> The traditional and regional Products i.e. embroidery, brassware, Zari- Zardozi and some agricultural items were added but later on after its successful implementation, many more products were added. Other state government like Maharashtra and Rajasthan has also adopted these programs. The ODOP along with various central government programs integrates with MSMEs which has shifted the economic growth. This process has provided more employment opportunities.<sup>13</sup>

The ODOP scheme works on the idea of integrated value chain approach by selecting one product per district. The prime objectives are to generate employment, formalize informal enterprises to grow them, revive dying crafts. The scheme is liberal to change the core products under ODOP. It is also aligns with the target of the Atamirbhar Bharat initiative and Prime Minister's mission of Viksit Bharat @2047.

### **7.3 Implementation Mechanism of ODOP:**

The implementation process of ODOP works at different operational levels and in integration with different departments of the government. The work of framing policy and its guidelines lies with two internal departments of the state. DGFT (Directorate General of the Foreign Trade) and DEPCs (District Export Promotion Committees) both work in collaboration to look after the promotion of export. Their team comprises of officials, artisans, representatives of the industry and traders. ODOP provides support to micro food processors. ODOP is more popular due to its decentralized nature of providing economic opportunities to grass root level.

### **7.4 Product Identification:**

As ODOP focuses on one product one district formula so product identification is the important part of its success. The product is decided after a deep discussion with all stake holders, market analysis and availability of raw materials. It is ensured that every product represents cultural heritage and economic strength of the district.<sup>14</sup> DEPCs approves this whole process and intimate to the concerned. To standardize and promote the products they are integrated with other catalogues.

The list of the product under ODOP selected for each district is as given below:

**TABLE-1**

Sl. No.	District	Product
1	Allahabad	Moonj Products
2	Ambedkar Nagar	Textile Products
3	Amethi	Moonj Products
4	Ayodhya	Jaggery
5	Basti	Wood Craft
6.	Balrampur	Food Processing (Pulses)
7	Bhadohi	Carpet (Dari)
8	Banda	Shazar Stone Craft
9	Bijnor	Wood Craft
10	Agra	Leather Products
11	Amroha	Musical Instruments
12	Aligarh	Locks & Hardware
13	Auraiya	Food Processing (Desi Ghee)
14	Azamgarh	Black Pottery
15	Shamli	Iron Arts
16	Saharanpur	Wood Crafting
17	Shravasti	Tribal Craft
18	Sambhal	Handicraft (Horn-Bone)
19	Siddharthnagar	Kala Namak Rice
20	Sitapur	Carpet (Dari)
21	Kasganj	Zari Zardozi
22	Lakhimpur Kheri	Tribal Craft
23	Lalitpur	Zari Silk Sarees
24	Lucknow	Chikankari & Zari Zardozi
25	Maharajganj	Furniture
26	Sonbhadra	Carpets
27	Sultanpur	Moonj Products
28	Unnao	Zari Zardozi
29	Varanasi	Banarasi Silk Saree
30	Meerut	Sports Products
31	Mahoba	Gaura Stone Craft
32	Mirzapur	Carpets
33	Mainpuri	Tarkashi Art
34	Moradabad	Metal Craft
35	Budaun	Zari-Zardozi
36	Baghpat	Home Furnishings
37	Bahraich	(Wheat-Stalk) Handicrafts
38	Bareilly	Zari-Zardozi
39	Ballia	Bindi (Tikuli)
40	Ghaziabad	Engineering Goods
41	Gonda	Food Processing (Pulses)
42	Gorakhpur	Terracotta
43	Hapur	Home Furnishing
44	Hardoi	Handloom
45	Barabanki	Textile Products

46	Bulandshahar	Ceramic Product
47	Chandauli	Zari-Zardozi
48	Chitrakoot	Wooden Toys
49	Deoria	Decorative Products
50	Etawah	Textile Products
51	Hathras	Hing 'Asafoetida'
52	Hamirpur	Shoes
53	Jalaun	Handmade Paper Art
54	Jaunpur	Woollen Carpets (Dari)
55	Jhansi	Soft Toys
56	Kaushambi	Food Processing (Banana)
57	Prayagraj	Moonj Products
58	Pratapgarh	Aamla Products
59	Raebareli	Wood Work
60	Rampur	Applique work along with Patch Work, Zari Patchwork
61	Sant Kabir Nagar	Brassware Craft
62	Shahjahanpur	Zari-Zardozi
63	Kannauj	Perfume (Attar)
64	Kushinagar	Banana Fiber Products
65	Kanpur Dehat	Aluminium Utensils
66	Kanpur Nagar	Leather Products
67	Etah Farrukhabad	Ankle Bells (Ghungroo), Bells
68	Fatehpur	Bedsheets and Iron Fabrication Works
69	Firozabad	Glassware
70	Gautam Buddha Nagar	Readymade Garments
71	Ghazipur	Jute Wall Hanging
72	Mathura	Sanitary Fittings
73	Muzaffarnagar	Jaggery
74	Mau	Powerloom Textile
75	Pilibhit	Flute

**Source:** Narayan and M Sundaramoorthy (2014) Members of Faculty College of Agricultural Banking Reserve Bank of India Pune.<sup>15</sup>

### 7.5 Institutional and Financial Support:

ODOP provides support to its entrepreneurs and artisans by extending training programs on production techniques, quality control and packaging. There are numerous financial assistances with easy and less paper work provided to the concerned to grow the business in order to boost the economy of the state. Industrial parks and CFCs centre help to provide infrastructural support. This helps in better use of machinery in order to enhance the quality of the product. On line portal helps in branding and promotional aspects for better marketing of the product.<sup>16</sup> E-Commerce integration with Government e- Marketplace (Gem) and Flipkart's Samarth program helped in better price realization and more market reach of the product. Many products of leather footwear and brassware have been now nationalized as well as globalised.<sup>17</sup> Government has provided HS codes to the products and link to the export facilitation centers for better identification. To provide better platform to the product, ODOP has started many programs which provide better opportunities to stake holder for further planning. It has started training

program also in online selling, customer engagement, transforming traditional business into e-commerce and customer engagement.<sup>18</sup>

Under financial assistance, it provide various credit facilities and subsidies for prompting infrastructure development, export promotion and globalization of the product. Theses financial assistances are divided into four categories according to the need and nature of demand as well as keeping in view the need of the stake holders.<sup>19</sup>

The State Government has launched Finance Assistance Scheme for the stake holders through Margin Money Scheme. Several financial assistances are provided to finance the stake holders in the ODOP scheme. Many national as well well as local banks are also included to extend this facility. Table- 2 below shows the cost of the project and subsidy provided under the scheme which up to 20 lakhs maximum depending upon the project.

**Table- 2 Provision of Margin Money Subsidy**

Project Cost	Margin Money Subsidy
Projects cost upto Rs. 25 lakhs.	25% of PC or Rs. 6.25 lakhs (whichever is less).
Projects cost between Rs.25 - 50 lakhs.	20% PC or Rs. 6.25 lakhs (whichever is higher).
Projects cost between Rs.50 lakhs to 150 lakhs.	10% of PC or Rs. 10 lakhs (whichever is higher).
Projects cost above Rs.150 lakhs.	10% of PC or Rs. 20 lakhs (whichever is less).

**Source:** Kumari Dipshi and Mohammad Anees (2025).<sup>20</sup> *PC is Project Cost.*

## 8. ODOP and Economy of Uttar Pradesh:

### 8.1 Progress of ODOP in the State:

The prime objective was to decrease the regional disparities in the economy of the state by promoting the local artisans and regional economy. This is achieved by preserving local culture, promoting local crafts and artistic skill. Reduction in migration was another important objective of the scheme which will increase employment opportunities and promote their product at national and international level. This will also help in raising the income of the residents by providing facilities of better packaging, branding strategies and facility of export. These all objectives achieves the target of reducing regional disparities and aim to strengthen every district.<sup>21</sup>

**Table- 3** below indicates different sectors and their number of products and percentage share in ODOP scheme. Textile and Garments sector have highest 21 products with share of 27.6% in ODOP. Second place is occupied by the Handicrafts and Arts sector.

**Table-3 Category wise Statistics of ODOP**

Sectors	Products	Percentage Share
Textile and Garments	21	27.6%
Handicrafts and Arts	19	25.0%
Food Processing	09	11.8%
Metal and Engineering	04	5.3%
Wooden Products	03	3.9%
Leather Products	02	2.6%
Others	18	23.7%

Source: ODOP Official Website.

### 8.1.1 Budget Support and Expenditure under ODOP:

The budgetary support to ODOP is provided under the different categories in the form of subsidies, margin money and assistance to run the different program under this scheme. These different categories are as given in the para 7.5 under the heading Institutional and Financial Support.

**Table- 4** below reveals that in the initial phase of ODOP the Rs. 235 crores was provision of budget and 135.57 crores was sanctioned, and only 57.32 crores was utilized. But as the time passes the provisions amount 263.75 cores and sanctioned amount was 258.75 crores in the year 2022-23 both increased. The utilized amount was Rs. 254.23 crores which is 98.25% of the sanctioned amount. This shows the sustainable growth of the scheme in the state.

**Table- 4 Budgetary Provisions and Expenditure under ODOP ( 2018-19 to 2022-23) (in crores)**

Year	Budget Provisions (Rs)	Sanctioned Amount (% against Provisions)	Expenditure (% against Sanction)
2018-19	235	135.57 (57.69)	57.32 (42.28)
2019-20	250	163.63 (65.45)	136.01 (83.12)
2020-21	250	184.65 (73.86)	177.05 (95.89)
2021-22	250	250 (100)	241.20 (96.48)
2022-23	263.75	258.75 (98.10)	254.23 (98.25)

Note: figures in the bracket are in percentage.

Source: ISID (Institute for Studies in Industrial Development).<sup>22</sup>

### 8.1.2 Training and Tool Kit Progress for Artisans and Entrepreneurs under ODOP:

This scheme was started to train the local skilled people to start their business smoothly. **Table - 5** Training and Tool Kit Progress under ODOP shows that target set and target achieved in training as well as target set and achieved in tool kit is above 96 % in both training and tool kit in the year 2018-19 and the same is being maintained till year 2022-23. The target and achieved for training and tool kit both have increased many fold more than 14 times till the year 2022-23 which indicated fast progress of the ODOP scheme.

**Table- 5 Training Program and Tool Kit Distribution under ODOP (2018-19 to 2022-23)**

Year	Training (No.)			Tool Kit (No.)		
	Target	Achieved	%	Target	Achieved	%
2018-19	6175	5944	96	5644	5644	100
2019-20	20000	19529	98	18929	18929	100
2020-21	16000	15999	100	15549	15549	100
2021-22	21000	21000	100	20625	20425	99
2022-23	21000	21000	100	20625	20325	99
Total	84175	83472	99	81372	80872	99

Source: ISID (Institute for Studies in Industrial Development).<sup>23</sup>

### 8.2 Growth in GSDP and Per Capita Income:

The contribution of Uttar Pradesh to nation's GDP is 9.2% approximately.<sup>24</sup> Since it launched on Jan 24, 2018, the ODOP has boosted the state economy toward a \$ 1 trillion target. The state is projected to be the India's 3<sup>rd</sup> largest economy with estimated GSDP of ₹ 30.80 trillion. The

revenue of the state has increased from 2950.9 crores to 4052.4 crores from FY 2019-20 to 202-21. This is a revenue hike of 37.3% by ODOP scheme. The sales of ODOP products through the e-commerce platform flipkart alone reached to ₹1000 crore in the same fiscal year. The last seven years data from 2017-18 to 2023-24 as indicated in the **Table – 6** below indicates that there is substantial growth from ₹1439926 crore to ₹ 2547861 crore in the year 2017-18 to 2023-24. There is a substantial growth in per capita income also from ₹ 57944 to ₹ 93514 (advance estimate)

**Table-6 GSDP and per Capita State Income of Uttar Pradesh<sup>25</sup> (At Current Prices)**

Year	GSDP of the State (Rs. Crore)	Income Per Capita (Rs.)
2017-18	1439926	57944
2018-19	1582180	62350
2019-20	1700062	65660
2020-21	1640097	61598
2021-22	1981367	74055
2022-23	2284104	84126 (rev quick est)
2023-24	2547861	93514 (adv est)

**Source:** State Income Estimate, Economics & Statistics Division, UP (2024).

### 8.3 Growth in Export and International Recognition of the State:

Major part of the export from Uttar Pradesh is from ODOP products. Therefore, ODOP scheme has enhanced the export of the many products of the state. **Table 7** shows that ODOP scheme contributed to an estimated export value of Rs. 65982 crore for ODOP products in 2018-19 an increase of 19.94% over the previous year 2017-18. The estimated value of the export of the ODOP is estimated to have reached to approximately ₹ 2 trillion as of 2025, compared o ₹55,008 crore in 2017-18. Every year there is substantial rise in export. The highest growth recorded in ODOP export over previous year is 19.94% in 2018-19 and 28% in 2021-22. The growth in total value of export of state has also growth of 28.18% in the year 2018-19 and 29.51% in 2021-22. The product like Varanshi Silk Sarees and Moradabad’s Brassware are the major source of earning foreign currency. By promoting innovation, creating conducive environment and enhancing productivity for MSMEs, ODOP scheme actively contributes to UP economy. The timely changes in the policies have made benefit to every stake holder. There are many local products in ODOP which are figured as key product of the export and gained popularity.

**Table-7 ODOP and State Export**

Year	Export Size of ODOP Products (Rs Cr.)	Growth of Export Over Previous Year	Total State Export (Rs. Crore)	Growth of Export Over Previous Year
2017-2018	55,008	--	88,967	--
2018-2019	65,982	19.94%	1,14,042	28.18%
2019-2020	72,000	9.12%	1,20,356	5.53%
2020-2021	75,000	4.16%	1,21,139	0.65%
2021-2022	96,000	28%	1,56,897	29.51%
2022-2023	1,10,000	14.58%	1,74,037	10.92
2023-2024	--	--	1,70,340	-2.12%
2024-2025	--	--	1,86,000	9.19%

**Source:** UP Export Data, Export Promotion Bureau, Uttar Pradesh (2024).

### 8.3.1 Product wise Growth in Export of ODOP Products from the state:

To study the product wise growth of export, the Compound Annual Growth Rate of seven major products has been calculated. These products are the major contributor to the export of ODOP in the state. **Table-8** shows the Compound Annual Growth Rate of these major products of ODOP since its inception in 2017-18 to 2024-25. The growth rate of meat and edible meat offal is 4.30%. The carpets and mats have the growth rate of 6.45%. The growth rate of glass and glass ware is 5.01%. Leather and leather products have growth rate of 6.46%. The growth rate of plastic and plastic article is 7.90%. Sports good and equipments have the highest growth rate of 16.34% among all the studied items. The growth rate of wood crafts item is 12.04%. There is a substantial increase in the growth rate of these products which shows the proper functioning of the ODOP scheme in the state.

**Table-8 Product wise Growth in Export of ODOP Products from Uttar Pradesh**

Name of the Product	Year wise Production								Value of CAGR
	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	
Meat and Edible meat offal	14733.85	15716.89	13246.53	14015.48	14537.54	14860.13	18505.29	19781.27	4.87%
Carpets and Mats	4048.12	4606.15	4062.77	4515.83	5470.15	5404.40	5516.06	6266.63	6.31%
Glass and Glassware	1212.73	1502.71	1543.11	1542.69	1952.15	1549.06	1575.05	1707.91	4.88%
Leather and Leather Product	2586.72	2881.92	2906.51	2724.38	3894.27	3712.71	3401.69	4007.98	6.75%
Plastics and articles	1615.76	2378.10	1567.01	1829.02	2103.31	2117.19	2479.23	2750.89	6.91%
Sports Goods and Equipments	481.48	663.00	669.29	696.23	1086.49	1179.78	1214.70	1387.50	15.85%
Wood Crafts.	921.82	1189.60	1279.45	1619.57	2511.17	2035.84	2017.21	2043.64	12.70%
All Products	25600.48	28938.37	25274.67	26943.20	31555.08	30859.11	34709.23	37945.82	5.77%

Source: Compiled from Export Promotion Bureau, Lucknow Uttar Pradesh, UP Government Portal.

### 8.4 Empowerment to Entrepreneurs and Local Artists:

ODOP products has substantial rise in the growth of ODOP revenue to 37.3% in FY 2020-21. Notably, the women artisans have primary role in the manufacturing of these local products under ODOP. This increase in come has made them financially sound at household and community level which has led to greater economic stability among women artisans. Different training program related to skill development have equipped artisans for current market demands.<sup>26</sup> ODOP has provided special opportunities for women artisan to develop their skill and increase in income. This has positive impact on their families and on communities. It is the power full step of the government to eradicate gender inequalities and empower the women.<sup>27</sup>

### 8.5 ODOP and Employment Generation:

The scheme has created 5 lakhs jobs which is a notable increase in the employment level of the state. The key sectors are garments, readymade and many other where opportunities for jobs have been created. The financial scheme of the government under ODOP have discouraged migration of labourer. There are many projects of more than 4000 crores started by the government to boost the ODOP.<sup>28</sup> This large financial backing definitely will lead to numerous job opportunities in future also.

**Table- 9** given below reflects that the employment generated in the year 2018-19 was 10733 in the first year of its inception. This has increased to 46911 in the year 2022-23 with in 04 years of inception which is more than four times of its initial year. It shows that there is substantial increase in the employment level specifically in the rural areas where migration of labour was more.

**Table- 9 Employment Generated under ODOP Scheme**

Year	Employment Generated	Growth Rate
2018-19	10733	--
2019-20	15363	43.14
2020-21	37848	146.36
2021-22	45705	20.76
2022-23	46911	2.64
Total	156560	--

**Source:** Working Paper of ISID (Institute for Studies in Industrial Development) Pg. 20.

**Table- 10** shows the area wise increase in the employment in the state. The area near to the capital is more beneficial and has generated employment of 98345. The eastern sector has also significant benefit from the scheme in terms of employment with employment generation of 34859. The total employment generation is more than 156560 in the state.

**Table- 10 Sector Wise Employment Generated in ODOP (2019-20 to 2022-23) <sup>29</sup>**

Sectors	No. of Districts	Number of Employment Generated
Western Sector	30	98345
Eastern Sector	28	34859
Central Sector	10	20760
Bundelkhand Sector	07	2596
All	75	156560

**Source:** Working Paper of ISID (Institute for Studies in Industrial Development), Pg 20.

### 9. Challenges in Implementation of ODOP:

Though the state has successfully implemented ODOP but challenges will always be there which needs to be addressed.

#### 9.1 Infrastructural and Technological Constraints:

Infrastructure and technology are the main constraints in implementation of the scheme in Uttar Pradesh specifically in the regions of Bundelkhand and Purvanchal. The poor infrastructures i.e. road connectivity, electricity and access to other facilities have badly affected the performance of the artisans and micro-industrialists operating in the areas. Despite advantage of cultural and

economic potential many ODOP clusters are not able to utilize the proper benefit of the Common Facility Centers (CFCs) because of operational issues of machinery, lack of skilled labour and delay in maintenance and lack of awareness among artisans. Technological backwardness is also one of the hindrances in product innovation and scaling of the product. Digital technology is the major role playing factor behind all the things. All works of the product whether branding, packaging and exporting, everything is controlled by this. The traditional producers find difficulties in handling of the product on different stages. Thus infrastructure and technology constraints are still the major challenges.<sup>30</sup>

### **9.2 Lack of Skilled Labourers and Training Facilities:**

There is need to upgrade the current infrastructures as per the present demand of the market. The present market demands branding, need product diversification and packaging skill. They are necessary for making success story in the present market. The present training has now become non effective to address these issues. The new education policy in India has tried to include these concepts but the results are far away. There is lack of motivation for the younger artisans to continue in their traditional occupation due to poor recognition of the profession. The migration of the labourers and skill drain of the youth are the impact of these issues.<sup>31</sup>

### **9.3 Marketing Limitations:**

The benefit of the facilities of marketing and positioning the product at international level has still not reached to the local artisans and producers of ODOP products. Their reach is still limited with market segmentation, pricing strategies and competitiveness of the product. The situation is worst in the rural areas. There is a need of up gradation in packaging, product quality and reach to global marketing. The lack of professional branding, export facility and marketing professionals have limited the global attraction of the product.<sup>32</sup>

### **9.4 Analysis of the Strength and Weakness of ODOP Scheme:**

SWOT analysis of the scheme shows its strength and weakness. The strength of the ODOP lies in the fact that it has motivated the local artisans and other professionals for developing the products at districts level and have reduced the migration of the workers to other state in the search of work. The women workers have started earning and this scheme has picked up momentum in the whole country. However, weaknesses are also equally evident. There are many factors at local level which have hampered the growth in ODOP at local level. The inconsistent training of artisans, unawareness and low access to credit, infrastructure gaps, weak marketing and insufficient monitoring system are the major factors which are contributed to poor growth of production in ODOP. These gaps could reduce sustainability of this scheme and lead to poor trust among the local artisans.<sup>33</sup>

### **9.5 Financial Constraints:**

The steps taken to streamline the approval of the loans are not enough and ground reality is different. It is frequently reported delays in receiving approvals for grants, pendency of applications and inconsistent support from local authorities. Shortage of staff is the common problem which reduces their engagement with the scheme. The time taken under subsidy disbursement is often several months creating financial crisis. Lack of digital literacy among local artisans is also responsible for timely disbursement of the subsidy. Government should appoint some staff to handle this issue and make the local artisans aware of it. Proper training of the artisans is also required to make them digitally aware about the system.

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## 10. Suggestions to Improve ODOP Scheme:

The following are the few suggestions to improve the ODOP scheme for its effective implementation.

**1. Development of Infrastructure:** The CFC infrastructure should be developed in every cluster of the scheme. The facility of labs, modern tools and packaging units should be provided for the fast movement of the product. Cold storage and efficient transportation system should be provided.

**2. Access to the Market:** Market access to all the product of the ODOP should be expanded. A provision of state owned ODOP e-market should be developed with all digital infrastructures which should act as single window.

**3. Skill Development:** The training program of skill development should be integrated with educational institutions. ITI and other vocational institutions should integrate their training part in their course. The training eco system should be strengthened by including financial and digital well being.

**4. Easy Access to Credit:** Easy loan with low rate of interest should be provided to the local artisans in the rural areas to start and develop their business.

**5. Insurance of the Equipments:** A policy of micro insurance should be made for the machinery and equipment installed by the artisans and entrepreneurs. This will help them to safeguard from the unseen situations.

**6. Real Time Monitoring on the ODOP Portal:** A real time monitoring of the beneficiary of scheme provided under ODOP. The fund flow, beneficiary data and training outcomes should be monitored. Regular field visit by the Nodal officers, geo tagging and MIS integration can help in strengthening of the scheme.

**7. Monitoring of ODOP Production and Export:** The study shows that only few products have substantial share in the export and many products and districts are still lagging behind. The districts poor growth in production and least share in the export should be examined and if needed special financial grant should be given to them to raise their production.

**8. The Success Story of High Performing Districts:** The districts where ODOP is working successfully, their success story should be popularized in other districts to motivate the local artisans and entrepreneurs. They should be provided with special financial grant to boost the production.

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**DIGITAL COMPETENCY AND ATTITUDE OF IN-SERVICE TEACHERS  
TOWARDS EDUCATIONAL MEDIA IN RELATION TO CERTAIN  
DEMOGRAPHIC VARIABLES**

**Dr. Naushad Husain\*; Md. Tamjeed Anwar Khan\*\*; Ms. Tahseen\*\*\***

\*Associate Professor,  
Department of Education & Training,  
Maulana Azad National Urdu University,  
Hyderabad, INDIA  
Email Id: nhusain@manuu.edu.in,

\*\*Research Scholar,  
Department of Education & Training,  
Maulana Azad National Urdu University,  
Hyderabad, INDIA  
Email Id: tamjeed1502@gmail.com,

\*\*\*M.Ed. Student,  
Department of Education & Training,  
Maulana Azad National Urdu University,  
Hyderabad, INDIA  
Email Id: timahcu10@gmail.com,

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**ABSTRACT**

*This empirical study makes an attempt to explore the relationship between secondary school in-service teachers' attitude towards educational media and their digital competency, and compares them on the bases of gender (Male vs. Female) and types of schools (Government vs. Private). The sample comprised of 110 in-service teachers from secondary schools of Nalgonda district*

*selected through simple random sampling technique. By applying an ex-post-facto research methodology, this study uses two types of tools: 'Digital Competence Assessment Questionnaire' developed by Shrivastava and Dangwal; and a self-constructed five-point Likert scale, named 'Scale for Attitude towards Educational Media' comprising 56 items, and responses based on five-levels of agreement. The findings revealed that a positive and moderate correlation was found between in-service teachers' attitudes toward educational media with their digital competencies; no significant differences were found in the attitudes and digital competencies on the bases of gender and types of institutions.*

**KEYWORDS:** *Digital Competency, Attitude Towards Educational Media, Secondary Schoolin-Service Teachers, Gender, Institution Types.*

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## INTRODUCTION

Nowadays, the usage of internet is considered as the elite lifestyle (Van Deursen & Van Dijk, 2014). In order to survive in the ever enhancing digital technology, teachers must have possessed a high level of digital competency. An important milestone in contemporary pedagogy is the integration of digital media into the education, which offers dynamic resources to enhance student learning. For navigating digital media efficiently and effectively digital literacy and digital competency are the pre-requisite along with the positive attitude towards the educational media.

According to Tiede (2020) Digital competency is often used interchangeably with digital literacy, media literacy and media competency. Digital competency is a broader term which includes digital literacy. It is the 'integrated and functional use of digital knowledge, skills and attitudes (Aesaert et al., 2013). It refers to the skills and knowledge that teachers possess to use digital tools effectively in their professional roles. According to the European Commission (2023), digital competency includes skills in information and communication technology (ICT), the ability to manage digital tools, and the capacity to integrate technology into teaching and learning. It encompasses a wide range of skills, from the ability of using digital tools for teaching and learning, to understanding and applying the ethical implications of digital media. It includes online communication, and navigating digital resources responsibly. According to McGarr and McDonagh (2019) digital competence for teachers has four dimensions Pedagogical, Ethical, Attitudinal, and Technical. In this way, digital competence is a multifaceted concept that comprises a combination of technical, cognitive, and digital skills, along with metacognitive processes. It also includes social, emotional, and ethical awareness regarding the usage and comprehension of digital technologies. This competence involves the confident, critical, and innovative application of diverse digital tools to access, store, retrieve, create, share, and evaluate information. Further, it enables to communicate effectively, solve the problems, and think critically and creatively in every sphere of life. The modes and media of communication are reasonably important for the effective transmission of knowledge because they enable students to engage into a variety of ways in the process of learning. Moreover, educational media considerably improves communication by facilitating faster access to content and enhancing the ability to retain information. It is affected by exposure, resources, and access to technology. However, in-service teachers' attitude towards educational media influences their adoption and use of digital technologies in their practice.

In the rapidly evolving scenario of education, educational media has become a basic tool in enhancing engagement, learning experiences, and students' achievement. As the integration of digital technologies into education continues to reshape teaching and learning environments, secondary school in-service teachers are also increasingly required to adapt to new digital tools and platforms. The success of such integration, however, is often influenced by teachers' attitudes towards educational media and their digital competencies. These factors play a key role in effective utilization of technology by the in-service teachers to achieve instructional objectives and empower students, especially in diverse classrooms.

## **Significance of the Study**

Today, almost all activities of our daily life are performed with the help of internet which is the only base for utilizing the various types of digital gadgets that are used in social interactions, commercial transactions, medical, educational purposes, and many more. The integration of digital tools and media into education has become vital in the present educational setting. The attitudes of in-service teachers towards educational media can play a significant role in effective utilization of digital technologies in the classroom and more importantly possessing digital literacy and thereby digital competencies. With the quick development of technology, digital competency has emerged as an essential 21<sup>st</sup> century skill for in-service teachers to facilitate learning, manage classrooms, and engage students effectively. While much research has been conducted on the impact of digital media on student learning achievement, less attention has been paid to understand how in-service teachers' attitudes towards educational media and their digital competencies relate each other and affected by the demographic variables.

The present study aims to explore the relationship between secondary school in-service teachers' attitudes toward educational media and their digital competency, with a specific attention on how these variables vary across gender and institution types. The research considers the male and female in-service teachers of marginalized communities from government and private secondary schools, to understand how their digital competence and attitude towards educational media varies. Secondary school in-service teachers from marginalized communities may face challenges in accessing digital tools and resources, which may impact both their attitudes and digital competencies.

In the light of the above discussion, this study contributes to the current discourse on the importance of enhancing digital literacy in educational context and offers insights to improve in-service teachers' digital competencies. Understanding the interplay between their attitude towards educational media and their abilities to use them will help in planning future training programs, professional development strategies, and policies aimed at enhancing the integration of educational media in classrooms, especially in diverse educational environments. This research is important in the context of global effort towards digital equity in education, where equal access to digital tools and resources can bridge the digital divide and ensure that all students, irrespective of their diversity, benefit from high-quality learning experiences. Also, it is helpful in finding out the influence of certain demographic factors- such as gender and institution types- on attitudes of in-service teachers towards educational media, and their digital competencies which can help in shaping prospective digital technology initiatives and enhancing professional development of in-service teachers.

In-service teachers' attitude towards educational media considerably affects the ability to use educational media and thereby teaching effectiveness. It keeps the student engaged in teaching

learning process. Positive attitude helps in adoption of new technology in the classroom. In-service teachers' attitude towards educational media is the key for their willingness to use them in their teaching. Teachers who opine digital tools as beneficial for enhancing learning outcomes are more likely to use them in their pedagogical practices. However, negative attitude act as a barrier to integrate technology into education. Teachers' beliefs and attitudes towards educational media influence its uses. Teachers who have doubts about the effectiveness of digital tools and face barriers such as lack of training and resources, may show unwillingness of using them, thus hinders their potential in the classroom.

In-service teachers' digital competency is associated with their application of educational media. Along with the pedagogical mastery, digital literacy and skills is crucial for modern teachers to use digital media effectively. Digital competency and digital skills are become a basic requirement in most of the educational systems across the world, but at the same time there is a wide digital divide. According to the report of the OECD (2018) "many teachers still lack sufficient digital competency, which could limit their ability to integrate educational media in meaningful ways". Furthermore, the digital divide—variations in access to technology and training—has been found to be contributing factor to disparities in teachers' digital skills (Van Deursen & Van Dijk, 2014).

Despite its significance, the relationship between in-service teachers' digital competency and their attitude toward educational media is less attentive, particularly in the context of secondary education. These are further influenced by demographic factors such as gender, locality, experience and institutional characteristics. Research suggests that gender disparity influences digital competency levels and the adoption of technology in teaching. Further, in-service teachers' use of educational media is influenced by the type of institution, which determines access to digital resources and change for professional development. Hence, the researchers identified the 'digital competency and attitude of in-service teachers towards educational media' as research area.

### **Objectives of the study:**

The objectives of the study are as follows:

1. To study the levels of Digital Competency of Secondary School In-service Teachers.
2. To study the levels of attitude of Secondary School In-service Teachers towards Educational Media.
3. To find out the correlation between Digital Competency and attitude towards Educational Media of Secondary School In-service Teachers.
4. To compare the Digital Competency of Male and Female Secondary School In-service Teachers.
5. To compare the attitude towards Educational Media of Male and Female Secondary School In-service Teachers.
6. To compare the Digital Competency of Government and Private Secondary School In-service Teachers.
7. To compare the attitude towards Educational Media of Government and Private Secondary School In-service Teachers.

### **Hypotheses of the study:**

For achieving the objectives 1 and 2, frequency and percentage used; whereas for objectives from 3 to 7 null hypotheses were formulated which are as under:

1. There will be no significant correlation between Digital Competency and attitude towards Educational Media of Secondary School In-service Teachers. (for objective 3<sup>rd</sup>)
2. There will be no significant difference between the Digital Competency of Male and Female Secondary School In-service Teachers. (for objective 4<sup>th</sup>)
3. There will be no significant difference between the attitude towards Educational Media of Male and Female Secondary School In-service Teachers. (for objective 5<sup>th</sup>)
4. There will be no significant difference between the Digital Competency of Government and Private Secondary School In-service Teachers. (for objective 6<sup>th</sup>)
5. There will be no significant difference between the attitude towards Educational Media of Government and Private Secondary School In-service Teachers. (for objective 7<sup>th</sup>)

### **Literature Review**

The growing interest to explore the demographic variables that influence in-service teachers' attitudes and digital competencies has prompted the researchers to carry out this study. Regardless of the increasing importance of digital tools in education, the attitudes of secondary school in-service teachers towards the educational media are still neglected, especially when various demographic factors such as gender and institution types are considered. Only one such type of study has been found which was conducted by Kumar & Sharma (2024) on digital competency of secondary school teachers with demographic variables like gender, locality and type of institutions. Some noteworthy researches conducted in the related field are discussed below:

Omodara & Adu (2014) aimed to assess the importance of educational media and multimedia technology for effective implementation in teaching and learning process. The finding reveals that educational media and technology are inevitable in teaching-learning process.

Van Deursen & Van Dijk (2014) conducted a survey on Dutch population and tried to explore Internet use among them. They delimited the internet usage into seven dimensions e.g. "information, news, personal development, commercial transaction, leisure, social interaction, and gaming". People who have been using the Internet for long time used internet for news, information, music and video. Also, age, gender and education were the significant predictors for the differences in the internet usage. Also, persons having low levels of education were found to be more engaged in internet usage than medium and high levels of education. Peoples of low levels of education are engaged more in time consuming activities such as, social interaction and gaming. Differences in internet usage on the bases of age and gender were found to be temporal.

Spiteri & Rundgren (2018) conducted a research on "Literature Review on the Factors Affecting Primary Teachers' Use of Digital Technology" and found that components such as teachers' competence, attitudes, and skills, together with the institutional culture, can profoundly influence their implementation of digital technology in educational settings.

Fernández-Batanero et al. (2020) conducted a systematic and Literature reviews on digital competencies for teachers' professional development from 2008 to 2018. The aim of the study was to identify research trends & potential direction on this topic for future research. The methods used to PRISMA guideline systematic reviews and Meta-Analysis. The sample consisted 21 studies in Scopus and Web of Science databases. The result shows that teacher facing challenges in digital competence due to lack of teacher training and ICT training.

Guillén-Gámez et al. (2021) examined the comparative study of gender on the digital competence of higher education teachers, indicating that there was no significant overall difference, but disparities found in specific areas, such as digital skills, digital ethics, and ICT anxiety.

Srivastava & Dangwal (2021) reported that higher education teachers had a moderate level of digital competency; only 8.44% of them had higher level of digital competency. They possessed moderate level of digital competency in "the dimensions of technological/operational/instrumental, information processing and management, pedagogic/ knowledge construction, and digital citizenship".

Jain & Shetty (2022) carry out a study aiming to investigate the digital competency among school teachers. A sample of 64 school teachers (including 32 female and 32 male) selected through purposive sampling technique from English and Kannada medium schools within 'Belthangady Taluka'. The finding shows that there was no significant difference in the digital competency between female and male teachers.

Khan & Cheema, (2022) explored digital competency among teachers in Pakistani schools. They stressed the importance of training and support to improve teachers' digital skills and use of technology in the lessons.

Pera et al. (2022) revealed that teachers of high schools and higher education demonstrated varying levels of digital competency, with teaching experience influencing their ICT knowledge and skills.

Babu & Suneela (2023) revealed that 83% of teachers showed medium and high level of digital competency. Significant differences based on gender and locality, were reported. While teaching subject and age showed non-significant influence on digital competency.

Kumar & Sharma (2024) explored the relationship of digital competency gender, locality and school types. The sample consists of 500 secondary school teachers. The data was collected through Digital competency scale by Shipra Shrivastava & Kiran Lata Dangal. The results shows that there is significant difference between male and female teachers with former having higher digital competency. There is also significant difference between rural and urban teachers with later having higher digital competence. Also, there was a significant difference reported between teachers of private and government secondary schools with later having higher digital competencies.

Gender differences in technology use and digital competency have been a topic of considerable interest. It is quite evident that, in most of the cases, male teachers often have more favourable attitudes toward technology and higher digital skills than their female counterparts. However, this difference cannot be generalized and conclusive because in other educational context female can demonstrate equal or greater proficiency in using digital tools when adequate training and resources are provided to them. Further, the type of educational institutions also influences

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teachers' attitudes towards educational media and digital competency. Teachers in private schools often have access to better resources and opportunities, including professional development programs and technological infrastructure, which enhances their digital skills. Government schools' teachers, on the other hand, face scarcity of basic infrastructure due to financial constraints, limited access to technology, and less opportunity for professional development. All these hinder their enhancement of digital competencies. So, professional development programs should be customized in view of focusing digital competency of the teachers.

### Methodology

The present research employed an ex-post-facto design, which involves analysing existing relationships between variables without manipulating them. A sample of 110 secondary school in-service teachers from government and private schools across Nalgonda district drawn through simple random sampling technique. The data was collected through two types of tools: a questionnaire designed to assess teachers' digital competency named 'Digital Competence Assessment Questionnaire' developed by Shrivastava & Dangwal (2021) and a self-constructed five-point Likert scale designed to assess in-service teachers' attitudes toward educational media named 'Scale for Attitude towards Educational Media' comprising 56 items, and based on five-levels of agreement. Out of 110 samples, 43 were male and 67 female, and 45 from government schools and 65 from private schools. The gender-wise and school-wise two-dimensional distribution of the sample is given below in table A:

**Table: A. Gender-Wise and School-Wise Distribution of the Sample**

		School Types		
		Government	Private	Total
Gender	Female	38	29	67
	Male	7	36	43
Total		45	65	110

Descriptive statistics, Pearson co-efficient of correlation, and independent sample t-test was used to examine the relationship between in-service teachers' attitudes toward educational media and their digital competency, and to explore any significant differences across gender and types of institution.

### Results and Discussion

The objective-wise output of analysed data and its interpretation is discussed in this section.

The first objective of the study was "To study the levels of Digital Competency of Secondary School In-service Teachers". To accomplish this objective, researchers calculated the range of scores by subtracting minimum score from maximum score and divided the range into three categories with their respective scores, then calculated the frequencies in respective categories. The output are presented in the following table 1

**Table 1: 'Levels of Digital Competency of Secondary School In-service Teachers'**

S. No.	Levels of DC	Range	N	%
1	Low DC	35 and Below	5	4.5
2	Average DC	36-48	35	31.8
3	High DC	49 and Above	70	63.6
<b>Total</b>			<b>110</b>	<b>100</b>

From the above table 1, it is evident that only 5 out of 110, i.e. 4.5% of the secondary school in-service teachers possess low level of digital competency, whereas 31.8% of them possess moderate level of digital competency and 63.6% of them have high level of digital competency. This means a majority of them have a higher level of digital competency which is the necessity of the hour. Similar findings have been reported by the study of Babu & Suneela (2023) indicating 83% of in-service teachers possessed moderate and high level of digital competency. But, the study of Srivastava & Dangwal (2021) revealed that most of higher education teachers had moderate level of digital competency and few of them had higher level of digital competency. This shows that situation is changing rapidly. This might be because of ever developing technology that pushed up the teachers to keep updated with. Also, the finding of Pera et al. (2022) reflected that teachers from high schools and higher education differ in the levels of digital competencies. This might be because of increasing needs of adapting at higher education level.

The second objective of the study was "To study the levels of attitude of Secondary School Teacher towards Educational Media". To achieve this objective, researchers calculated the range of scores obtained from the tool by subtracting minimum score from maximum score and divided the range into three categories with their respective scores, thereafter ascertained the frequencies in respective categories. The results are presented in the following table 2

**Table 2: Levels of attitude of Secondary School In-service Teachers towards Educational Media**

S. No.	Levels of Attitude towards EM	Range	N	%
1	Negative Attitude towards EM	184 and Below	22	20.0
2	Neutral Attitude towards EM	From 185 to 229	61	55.5
3	Positive Attitude towards EM	230 and Above	27	24.5
<b>Total</b>			<b>110</b>	<b>100</b>

Table 2, shows that 22 out of 110, i.e. 20% of the secondary school in-service teachers had a negative attitude towards educational media, whereas most of them i.e. 55.5% possess neutral attitude towards educational media and almost one-fourth of them i.e. 24.5% of them had a positive attitude towards educational media. This might be of undesirable outcomes of the media, challenges in using them, age constraints and lack of resources that restricts the in-service teachers to use them.

The study had the third objective as "To find out the correlation between Digital Competency and attitude towards Educational Media of Secondary School In-service Teachers". And the concerned H<sub>0</sub> of this objective was "there will be no significant relationship between Digital Competency and attitude towards Educational Media of Secondary School In-service Teachers". To test this H<sub>0</sub>, researchers applied Pearson correlation method and output shown in following table 3

**Table: 3 Correlation between Digital Competency and attitude towards Educational Media of Secondary School In-service Teachers N=110**

Variable pairs	R	Sig. (p)
Digital Competency and attitude towards Educational Media	0.417**	.000
**. 'Correlation is significant at the 0.01 level (2-tailed).'		

It is evident by the table 3<sup>rd</sup> that value of 'Pearson Correlation' (r) between digital competency and attitude towards educational media is 0.417 that is significant on .01 level. Therefore, 'Null Hypothesis' (H<sub>0</sub>) that, "there will be no significant relationship between Digital Competency and attitude towards Educational Media of Secondary School In-service Teachers" is rejected. Further, the value of r is positive and is of moderate level. This implies that the two variables are associated positively and increase of one variable caused the increase in other. It also means that, if we develop a positive attitude towards educational media among in-service teachers, then we can enhance the digital competency among them and vice versa. Hence, it may be concluded that there is a positive correlation between secondary school in-service teachers' attitude towards educational media and their digital competency. This result is obvious because a favourable attitude is pre-requisite for digital competency.

The study has fourth objective as "To compare the Digital Competency of Male and Female Secondary School In-service Teachers". And the concerned H<sub>0</sub> of this objective was "there will be no significant difference between the Digital Competency of Male and Female Secondary School In-service Teachers". To test this H<sub>0</sub>, researcher employed 't-test' and output is given in the table 4

**Table 4: 'Comparison of Mean Scores of Digital Competency of Female and Male Secondary School In-service Teachers'**

Gender	N	Mean	S D	df	t-value	p-value/ remarks
Female	67	48.85	7.05	108	-.772	0.442 (N.S.)
Male	43	49.93	7.32			
N.S.= 'Not Significant at 0.05 level'						

It is clear with table 4, that value of t is -.772 that is non-significant on .05 level. Hence, the H<sub>0</sub> "there will be no significant difference between the Digital Competency of Male and Female Secondary School In-service Teachers" is not rejected. It means there is no significant difference between Digital Competency of female and male in-service teachers of Secondary Schools. It may be inferred that gender does not influence Digital Competency of in-service teachers significantly. Similar findings have been stated by Guillén-Gámez et al. (2021); and Jain & Shetty (2022) wherein non-significant differences in the digital competency of female and male teachers were reported. It shows the universal requirement of digital competency. But, Kumar & Sharma (2024) reported significant differences in digital competencies of male and female teachers with male having superiority. This might be of male teachers getting the advantage of having more exposure to new technologies.

The study has fifth objective as "To compare the attitude towards Educational Media of Male and Female Secondary School In-service Teachers". And the concerned H<sub>0</sub> of this objective was "there will be no significant difference between the attitude towards Educational Media of Male

and Female Secondary School In-service Teachers”. To test this H<sub>0</sub>, researchers uses ‘t-test’ and output is given in the table 5 below:

**Table 5: ‘Comparison of Mean Scores of attitude towards Educational Media of Female and Male Secondary School In-service Teachers’**

Gender	N	Mean	S D	df	t-value	p-value/ remarks
Female	67	205.40	30.45	108	-.809	0.421 (N.S.)
Male	43	209.93	25.59			
N.S.= ‘Not Significant at 0.05 level’						

It is clear by table 5, that value of t is -.809 that is non-significant on .05 level. Hence, the H<sub>0</sub> “there will be no significant difference between the attitude towards Educational Media of Male and Female Secondary School In-service Teachers” is not rejected. It means the difference is non-significant between secondary school male and female in-service teachers’ attitude towards Educational Media. Also, it may be inferred that gender does not influence the attitude of secondary school in-service teachers towards Educational Media. This indicates that both male and female in-service teachers are equally benefitted by the educational media.

The study has sixth objective as “To compare the Digital Competency of Government and Private Secondary School In-service Teachers”. And the concerned H<sub>0</sub> of this objective was “there will be no significant difference between the Digital Competency of Government and Private Secondary School In-service Teachers”. In order to test this H<sub>0</sub>, researcher employed ‘t-test’ and output is given in the following table 6.

**Table 6: ‘Comparison of Mean Scores of Digital Competency of Government and Private Secondary School In-service Teachers’**

School Type	N	Mean	S D	df	t-value	p-value/ remarks
Government School	45	47.89	7.44	108	-1.71	0.091 (N.S.)
Private School	65	50.23	6.83			
N.S.= ‘Not Significant at 0.05 level’						

It becomes clear by table 6, that value of t is -1.71 that is non-significant on .05 level. Hence, the H<sub>0</sub> “there will be no significant difference between the Digital Competency of Government and Private Secondary School In-service Teachers” is not rejected. It means there is non-significant influence of school types on Digital Competency of Secondary School In-service Teachers. Hence, it can be concluded that Government and Private secondary school in-service teachers do not differ significantly in their Digital Competency. But, Kumar & Sharma (2024) reported a significant difference in digital competency of Government and Private school teachers with later has superiority. This might be of teachers from Private schools get the advantage of having more infrastructures; thereby getting more opportunity to apply technologies.

The study has seventh objective as “To compare the attitude towards Educational Media of Government and Private Secondary School In-service Teachers”. And the concerned H<sub>0</sub> of this objective was “there will be no significant difference between the attitude towards Educational Media of Government and Private Secondary School In-service Teachers”. To test this H<sub>0</sub>, researcher used ‘t-test’ and output is shown in table 7 below:

**Table 7: ‘Comparison of Mean Scores of attitude towards Educational Media of Government and Private Secondary School In-service Teachers’**

School Type	N	Mean	S D	df	t-value	p-value/ remarks
Government School	45	203.71	26.66	108	-1.056	0.293 (N.S.)
Private School	65	209.57	29.85			
N.S.= Not Significant at 0.05 level						

Table 7 exhibits that value of t is -1.056 that is non-significant on .05 level. Hence, the H<sub>0</sub> “there will be no significant difference between the attitude towards Educational Media of Government and Private Secondary School In-service Teachers” is not rejected. It means school types do not influence secondary school in-service teachers’ attitude towards Educational Media significantly. Therefore, it can be inferred that attitude of secondary school in-service teachers towards educational media are same across the school types. The probable cause is that teachers of both types of schools enjoy similar kind of experiences, advantages, and challenges.

### Findings

This study emphasizes the needs for developing favorable attitude towards educational media so that digital competencies can be enhanced among in-service teachers of marginalized communities of India. The key findings of research are:

1. A majority of the secondary school teacher has high level of digital competency.
2. Most of secondary school in-service teachers possess neutral attitude towards educational media.
3. A positive correlation was found between secondary school in-service teachers’ digital competency and their attitude towards educational media.
4. Female and male in-service teachers of secondary schools do not differ in their Digital Competency.
5. Female and male teacher does not differ in attitude towards Educational Media.
6. School type does not cause variation in Digital Competency of secondary school in-service teachers.
7. School type does not cause variation in the attitude of secondary schools in-service teachers towards Educational Media.

### CONCLUSION

‘Digital competency is a complex set of knowledge, skills and attitudes’ (McGarr & McDonagh, 2019). It also includes digital literacy. Digital literacy and a positive attitude towards educational media is the key to digital competency. The significance of digital skills and competency is increasing day by day (Bond et al., 2018). A digitally competent teacher can satisfy the needs of the 21<sup>st</sup> century learner and make his/ her teaching effective; engage the learner in teaching learning process actively; motivate them to learn effectively; thereby enhance the achievement of learner. A teacher of 21<sup>st</sup> century must have good digital literacy competencies (Atmazaki, & Indriyani, 2019) and enhance them as per the need of the hour (Manfra & Holmes, 2020). Outcomes of the study highlight the need and significance of developing the positive attitude towards educational media and digital literacy. In-service teachers’ attitude towards

educational media is positively related to their digital competency, suggesting that developing a positive attitude towards digital technology can improve teachers' digital skills and competencies. Additionally, the study highlighted the equal need of professional development programs across the gender, and school types to develop the positive attitude towards digital education and to enhance their digital literacy. The study has implications for teachers, administrators and policymakers. Future research may focus on experimental researches to identify the effect of specific professional development interventions through specific digital media on teachers' attitudes, their digital competency, and their performance over time.

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