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(IJMRD)

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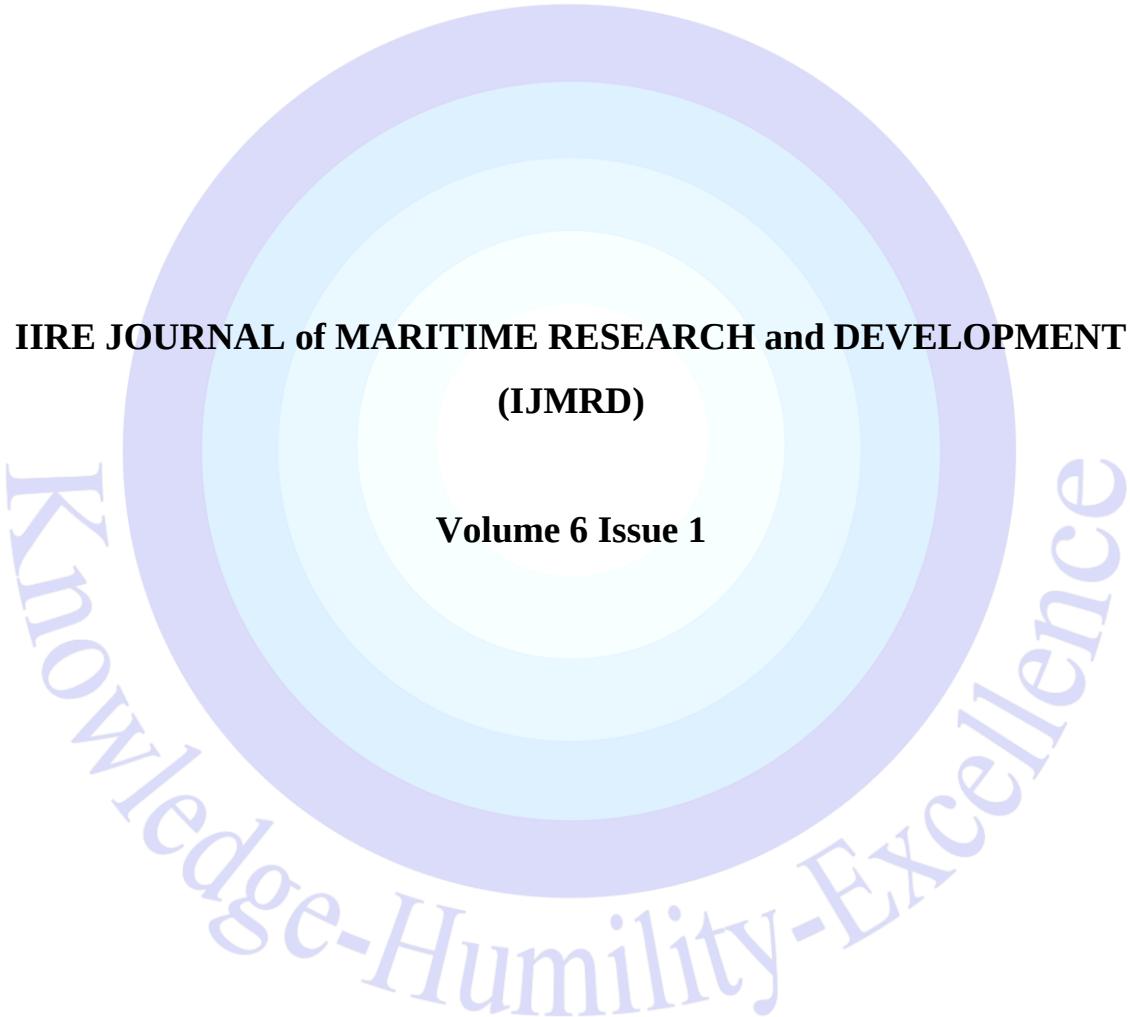

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Maritime sector has always been influencing the global economy. Shipping facilitates the bulk transportation of raw material, oil and gas products, food and manufactured goods across international borders. Shipping is truly global in nature and it can easily be said that without shipping, the intercontinental trade of commodities would come to a standstill.

Recognizing the importance of research in various aspects of maritime and logistic sector, IIRE through its Journal of Maritime Research and Development (IJMRD) encourages research work and provides a platform for publication of articles, manuscripts, technical notes, papers, etc. on a wide range of relevant topics listed below:

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EVOLUTION OF PORTS AND LOGISTICS

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Mr Ennarasu Karunesan[4], Capt Kapildev Bahl[5] & Mr. Abdullah Siddique[6].

Abstract

The aim of this article is to discuss the different challenges concerning the development and administration of major Indian ports in connection to public-private partnership (PPP) and potential for small businesses as well as enterprises looking to grow into the maritime industry. The paper will also discuss port deregulation, as well as methodological approaches for future improvements. The necessity for India's marine industry to become substantially automated and commercialized is becoming more pressing by the day. The grips of central and state governments, as well as its subsequent effects on major ports and their development, will be discussed, with the goal of transforming port operations, ensuring the industry's sustainable development, and adopting a more revolutionary theories and models that will allow the maritime industry to finally reach its greatest potential and maintain pace with market trends by 2030. India, while being the world's IT powerhouse in terms of technological developments and the usage of cutting-edge technology in other sectors, appears to be trailing behind when it comes to port and waterfront operations and administration. The article will explore the answers and future development ideas for "Smart ports" in India, as well as the realities and impact of Model Concession Agreements in Major Ports 2021. The article has been put forth after careful consideration and conversation with some of the industry's most prominent experts, as well as a thorough assessment and review of some of the research progress being made in the subject.

Keywords: Ports, Harbours, Development, Docks, MCA, MCA 2021, Blockchain, Maritime.

1. INTRODUCTION:

India possesses a 7,517-kilometer shoreline that is divided between ten marine states and union

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territory. Article 246 of the constitution grants the government sole legislative authority over the topics mentioned in the union list, which is incorporated in the seventh schedule to the constitution. Entry 27 of the union list specifies ports designated to be significant terminals by or under law passed by parliament or current legislation, including their delimitation and the constitution and powers of the port administrations, which are a duty of the Centre. All additional ports are under the control of state governments, and their individual state constituents have the authority to legislate. India at present has 12 "major ports" and 187 non-major ports, which were managed by the Major Port Trusts Act 1963 and the Indian Ports Act 1908. With the introduction of the Major Port Authorities Act 2021, the Indian port scene will take on new dimensions. Eleven main port trusts will be reconstituted as Port Authorities. One major port, Kamarajar Port (Ennore), will maintain operation as a major port under the Companies Act 2013, while all other commercially significant non-major ports under agreements to the private industry will further operate under the Companies Act (Paul, 2021).

According to trade figures from 2018, all major ports managed over 679 million tons of goods, representing a 4.77 percent boost in cargo throughput versus the previous fiscal year. Minor ports processed a total of 491.95 million tonnes of cargo. The top five main commercial ports in India are as follows:

- *Kandla Port in Gujarat*
- *Paradip Port Trust in Odisha*
- *Jawaharlal Port Trust in Maharashtra*
- *Mumbai Port Trust in Maharashtra*
- *Vishakhapatnam Port Trust in Andhra Pradesh* (Exim, 2019)

With such a vast coastline, India's shipping industry plays a critical role in maintaining development in trade and commerce, with ports processing nearly 95 percent of import and export flow rates. In Fiscal year 2020, India's 12 major ports handled 704.82 million tons of shipment throughput, representing a 2.74 percent CAGR (Compound Annual Growth Rate) from FY16 to FY20. This is constantly on the significant rise as India moves step closer to achieving the government's ambition of becoming an international manufacturing powerhouse, as seen by the latest declaration of a $82 billion investment in port developments by 2035 (Bansal, 2021).

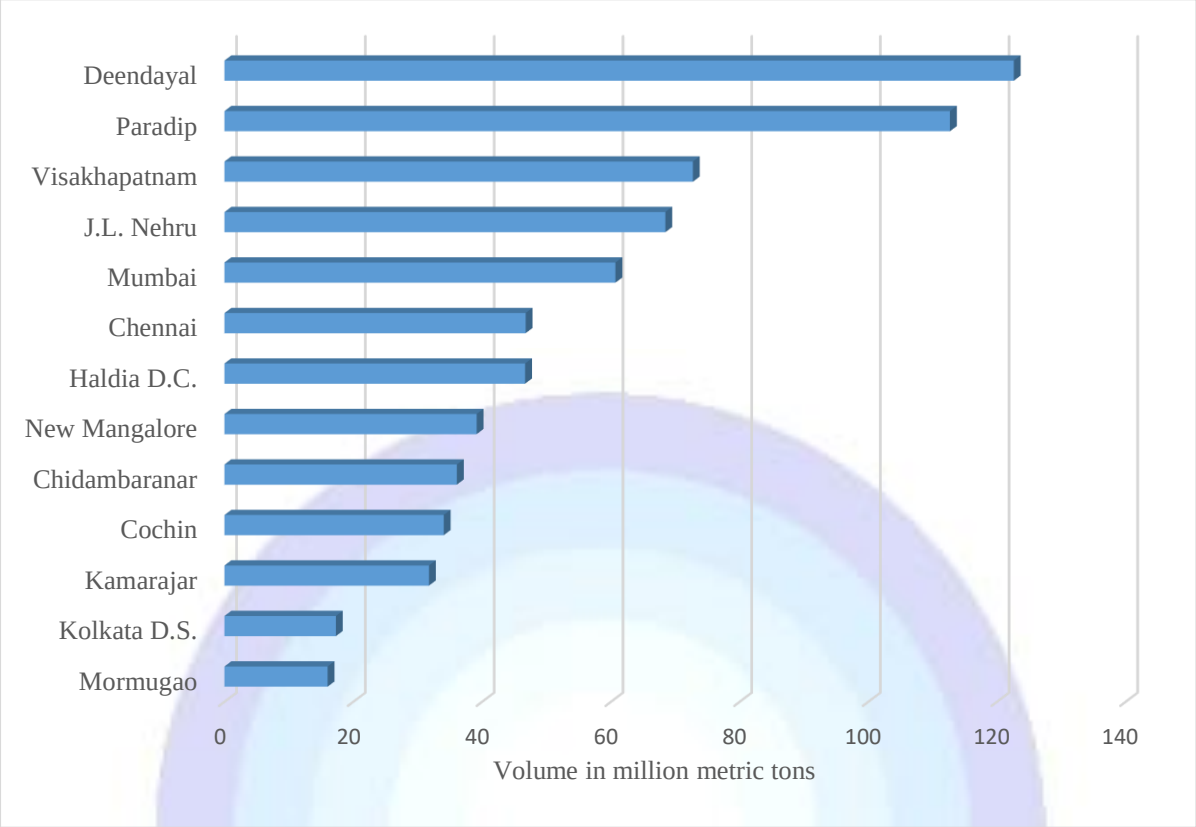

Figure 1 - Volume of total cargo handled across India in financial year 2020, by major port. Source - (Ministry of Ports, 2021).

With the promise of further expansion, there is increased demand on ports to be more productive and commercially viable, as well as to offer higher competitive pricing in order to retain big transport segments. Ports in India and throughout the world confront some significant issues. One of them is a lack of dock capacity due to an increase in the amount of maritime activity and the size of boats. According to Port Technology, improving fleet and terminal operations is the number one objective, and problem for 76 percent of shipping companies. Another issue is a lack of port controllers, which leads to lengthier wait times of up to one and a half day for vessels at the port to be emptied and reloaded. Finally, regulatory authorities are continually urging ports to minimize their greenhouse gas emissions.

These issues are causing port owners to see the underpinning necessity for automation supported by reliable connection. The numerous advantages of digitization to port authorities in terms of enhancing task and workflow, overall performance, expenditures, controlling and supervising, and security are becoming abundantly evident. All of this contributes to increased

efficiency, stable and secure operations, and, most importantly, tougher bottom lines. It is also evident that older technologies such as Wi-Fi, Bluetooth, and physical cords are not the solution. There is an urgent need for much better accessibility. The fundamental instrument required to construct a smart port and lay the groundwork for employing IoT in industrial automation is 5G cellular technology. The network infrastructure of a smart port must be capable of handling the huge quantities of information material created by cranes, automobiles, machinery, and personnel. Implementing state-of-the-art technologies to reshape ports into smart ports would also help turn India's aim of being an international manufacturing powerhouse further into reality.

2. BREAKING THE CHAINS OF CENTRALISED ADMINISTRATION:

In the United States, there is no demarcation between large, non-major, and minor ports. The United States has a shoreline of 19,924 km and 361 ports, all of which are under state or local authority and governance. As for Canada, there are four types of ports: corporate ports, the ports of Canada federal system, commission ports with a high degree of independence, and a significant number of public ports regulated by the department of transportation.

Shipping terminals are a governmental responsibility in Australia. Seaport administrative systems differ from one region to the other, and the federal government plays only a minor role in waterfront management. In Japan, shipping ports are classified according to their importance as major ports, minor ports, local ports, and ports of refuge.

Docks in France are classified as autonomous, non-autonomous, or local, based on their prominence and involvement in the country's economic development. The United Kingdom has a shoreline of 12,429 kilometres, with around 300 ports, just 44 of which are economically prominent. In the United Kingdom, there is no classification of ports, and port ownership patterns range from municipal, private, joint sector to public trust ports.

This is critical for recognizing the regulatory control and authority that regulates ports across the world. With its centralized authoritarian control over major ports, India stifles the development and progress that these ports require in order to contend with other nations' ever-increasing technical developments, capacity to accommodate large modern vessels, while enhancing efficiency and productivity.

2.1 Opportunities in Model Concession Agreement, 2021 & Public-Private-Partnership

Ports are key gateway facilities that connect a whole area and its interior transportation network (i.e., highways, railroads, interior waterways) to the worldwide market, with the large percentage of worldwide trade handled by sea. As a result, establishing robust, well-functioning coastal transportation system is a critical component of socioeconomic prosperity for many developing and emerging countries. Public-private partnerships ("PPPs") at docks are becoming a way of improving port operations and developing new port infrastructure, both of which were formerly solely government tasks.

Commercial prosperity and trade growth in past few years have increased the maritime sector's importance as a crucial component in the Indian economy's internationalization. Considering the Government of India's policy measures to encourage Public Private Partnerships (PPP) on a Design, Build, Finance, Operate, and Transfer (DBFOT) basis, this industry has been receiving tremendous attention from both domestic and foreign investors. A detailed legislative and administrative structure is described in this Model Concession Agreement (MCA) for the construction and operation of a terminal on a DBFOT basis.

This structure highlights the problems that are typically important for limited recourse financing of infrastructure projects, such as risk prevention and consolidation; risk- return provision; homogeneity of undertakings between the principal parties; accuracy and controllability of expenses and obligations; transaction expense minimization; force majeure; and termination. It also tackles other critical issues such as client protection, objective monitoring, conflict settlement, and government's monetary aid.

The MCA also establishes a paradigm for commercializing docks in a scheduled and systematic way, on one hand via optimum application of available resources and, on the other, by the incorporation of greatest global practices. The goal is to deliver efficient and cost-effective services to customers while guaranteeing merit for government funds. Owing to the capacity complexities that major ports are now experiencing, there is sufficient opportunity for state governments to give concessions for future ports that would not only offer extra capacity but also improve competitiveness and efficiency. Over time, port-level investments would lead to improvements in efficiency across rival ports, although this may not achieve its full potential until adequate capacity is created at the individual ports.

Given the current lack of competitiveness among ports, the administration would continue to set the rate, but it would be capped in accordance with the tariffs in the sector. A foreordained tariff system would also increase the dependability of Concessionaires' revenue streams, in addition to incentivizing productivity and cost minimization. Tariffs should determine their own levels through competition in the longer run, but this can only transpire if appropriate capacity is produced. Unlike the normal practice of focussing on construction specifications, the technical parameters proposed in the MCA are based mainly on output specifications, as these have a direct bearing on the level of service for users. Only the core requirements of design, construction, operation and maintenance of the port are to be specified, and enough room would be left for the Concessionaire to innovate and add value. Nevertheless, the modified and improved MCA does not come without its drawbacks and cha llenges. Unlike conventional practise, that primarily focuses on construction requirements, the specialised criteria recommended in the MCA are primarily focused on output standards, as the latter seems to have a direct impact on the level of service provided to customers. Only the essential needs of terminal design, building, operation, and maintenance have to be defined, leaving enough freedom for the Concessionaire to improvise and generate value. In brief overview, the structure relies on the 'what' opposed to the overall 'how' of the Concessionaire's service delivery. Which could very well provide Concessionaire the necessary flexibility in creating and implementing cost-effective systems and procedures without jeopardizing customer service quality. Efficiency gains would arise as a result of the change to output-based requirements, which would allow the financial enterprise to reinvent and refine designs and processes in ways that were previously inaccessible to it under standard input-based procurement criteria.

2.2 Kamarajar (Ennore) Port – Possibility of a remarkable future for major ports

In March 1999, the Government of India designated Kamarajar Port as the 12th Major Port. On October 11, 1999, it was formed as Kamarajar Port Limited (KPL) under the Indian Companies Act of 1956. KPL operates the Port as a landlord port, with its functions limited to overarching innovation planning, port conservancy, quality control, sustainability management, dredging of berth spaces, port basin and approach channel, configuration of vessel traffic aids/fire-fighting facilities, and transportation and communication connectivity.

Private enterprises are in charge of the development and operation of specific container terminals.

Kamarajar Port in Ennore was well ahead of the nine main ports in India that had positive development from April to December of 2018. Kamarajar Port was grown by 18.38 percent, well outpacing its closest competitor, Cochin Port, which had grown by 8.92 percent. Kolkata (including Haldia), Paradip, Visakhapatnam, Chennai, New Mangalore, JNPT, and Deendayal are among the other ports (Kandla). "Kamarajar Port measured 30 metric tonnes in the previous year and is now aiming for 35MTS," said Raveendran.

This comes as major ports in India increased by 3.77 percent, handling 518.6 million tonnes of cargo from April to December 2018, compared to 499.7 million tonnes handled during the same period the previous year. From April to December 2018, Deendayal (Kandla) Port handled the most traffic, with 84.91 million tonnes (16.37 percent), followed by Paradip with 80.43 million tonnes (15.51pc share).

The company's track record over the previous 22 years has been so excellent that it has surfaced as a showcase major port. In 2020, Kamarajar Port handled 31.7 million tonnes with just 102 employees, a 27% operating ratio, and even a surplus margin of 249 crores.

In the near coming years, all 11 main ports would obtain an appropriate governing establishment as port authorities, but they will serve as landlord ports, leaving all cargo handling operations to private terminal operators, like in US and European ports. The next institutional shift seems to be from port operators to publicly traded firms, allowing them to function effectively as market enterprises.

As commercial organisations, prospective ports would have convenient access to capital resources, will be able to make management choices quickly and efficiently, and will be more committed and flexible in undertaking development initiatives. Further along Indian shoreline, a series of major, non-major, and small ports operating within the provisions of Companies Act would build a powerful competitive maritime services market. Such docks on India's east and west coasts would contend fiercely in the port services market on the basis of pricing, reliability, and productivity. This would result in cheaper port costs, which will assist to encourage Indian exports while also lowering the landed cost of imports at Indian ports.

3. SMART PORTS – MODERN PROBLEMS REQUIRE MODERN SOLUTIONS:

Seaport stakeholders are continuously seeking for innovative solutions to assist the expansion of corporate operations in ports and the shipping sector while mitigating negative consequences. These industries are hopeful about the possibility of emerging innovations and digital transformation to help them achieve enhanced transparency, security and productivity, ease of monitoring, and reduced risk associated with port operations.

In broad sense, ports provide as a connection among ground and water through offloading and reloading activities. Port operations are now an essential element of global logistics operations that provide value-added services and manage cargo flow in effective and efficient manner. The present revolution stresses the use of digital capabilities to regulate, monitor, and favourably measure port operations.

In recent years, the demand for technological revolution across the corporate world has grown in a variety of industries. Because of the promise of sustainable development, overall performance, cost savings, and security needs, the integration of the digital revolution is critical to maintaining competitiveness in the logistics business. To establish smart ports, federal agencies should gradually deploy information technology solutions to promote improved administration and planning across and within port facilities.

Smart ports make use of a wide variety of devices. The systems employed are determined by the characteristics of the port and the product handled. This, in turn, may be determined by the level of automation necessary. The system employed ranges from load detection to antisway, remote surveillance and operation, and blockchain technology computation. Specific examples include the employment of unmanned aerial systems in surveillance and security operations, while others employ video monitoring with advanced OCR and other recognition technology.

The accuracy of data, its analysis, and the conveyance of results back to people in need of advice are critical to the business growth of Smart Ports (on route, location and status of their cargo). The online world is the primary facilitator of collecting information and distribution, as well as the human interface to the information and the knowledge produced from all of this.

The Internet of Things (IoT) is the most recent advancement of the online platform, employing machine-to-machine (M2M) connections. IoT would be only plausible if there is stable and safe network integration (LAN, Wi-Fi, etc.), sensor arrays to capture/generate data (GPS,

RFID, etc.), and continuing to support algorithmic prowess; this facilitates Internet-connected objects to interact, share data, make decisions, and then impose course of action to increase performance and effectiveness. Various advantages of Smart Ports are as follows:

- Enhanced maritime operations: planning and steady improvement utilising IoT sensors on shore and sea to provide real-time intelligence to the maritime crew
- Energy Management: enhancing business performance, presidency, and management of all energy-consuming seaport assets and supplies across the dock and terminals.
- Equipment operations: Real-time communication to all terminal machinery for breakdown predictions, anticipatory servicing, OEE, and operational task selection. Pipeline screening and forewarn reducing vulnerability to hazards by real - time tracking of gas and fuel pipelines using IoT sensing devices and camera systems to identify leaks, detect accidents, and send alerts with advice on the needed reaction.
- Port communication: a multi-channel communication interface that connects all port decision makers to a single unified system regardless of transmission medium.
- Personnel tracking: the tracking and monitoring of patrolling personnel in order to maintain worker efficiency and compliance.
- Improved security: Regulating port accessibility and enabling intruder identification and early warning by cultivating a safe and secure physical and cyber setting
- Operational Efficiency: digitalization of critical infrastructure combined with data analytics for improved judgement call, efficiency, and cost reductions.

3.1 Case studies

3.1.1. Port of Antwerp

Antwerp's technological development system aims to enhance architecture, logistical handling, and port traffic flows. This links all of the port's parts via a network for data and information sharing. It is critical to determine the status of the items or the trajectory they will take in order to function promptly and accurately.

3.1.2. Port of Rotterdam

To enhance efficiency and functional change, Rotterdam is deploying IoT technology integrated with AI via cloud apps. Sensors have been installed on quay walls, dolphins, and

other objects across the port area. These sensors are continually collecting and transmitting information to the network. They will gather hydrographic and meteorological statistics on topics such as water levels, salinity, wind conditions, visibility, and current flow and combine it in the freshly created interface. The gathered information will be evaluated and translated into real-time data that vessels and port managers may use to enhance pilotage and berthing while also monitoring and responding to pollution events.

3.1.3. Port of Valencia

The seaport of Valencia reportedly put a network of 'black boxes' on 200 cranes, straddle carriers, vehicles, and forklifts to capture data including position and power use. These assist terminal employees in reducing idle time. Furthermore, they have deployed smart lighting systems, which produces light only when cars are around, a step that is believed to have decreased electricity use by 80%; this also means that light pollution has been considerably reduced.

3.1.4. Long Beach Container terminal, California

Long Beach's primary terminal has now become totally automated. The machinery is also zero-emission. All diesel machinery has been substituted by electricity powered equipment. A central management centre oversees the complete procedure. The terminal's brain understands which cargos are travelling and where they are heading. This allows for several processes to be performed at the same time, maximising throughput, and saving hundreds of truck journeys.

3.1.5. TradeLens, a blockchain-enabled digital shipping platform, will welcome major ocean carriers

A.P. Moller-Maersk and IBM unveiled the development of TradeLens, a blockchain-enabled maritime system meant to encourage more seamless and secure global commerce by connecting together multiple partners to enhance information exchange and transparency, as well as drive industry-wide innovation. CMA CGM and MSC Mediterranean Shipping Company (MSC) have both indicated their intention to join TradeLens. With CMA CGM, MSC, Maersk, as well as other companies on board, TradeLens will have access to the information for over 50% of the world's ocean container shipping. This will significantly contribute to TradeLens' objective of more confidence, transparency, and collaborative effort throughout supply chains to encourage global commerce.

3.1.6. The First Bill of Lading Challenges Using Blockchain Technology

The first blockchain-based bill of lading was produced in the Port of Koper, Slovenia (EU). The Bill of Lading for such a shipment was issued wirelessly and transmitted in minutes rather than days, thanks to an ultra-secure and dependable public blockchain channel called "CargoX Smart Bill of LadingTM," and the possibilities of damage, theft, or harm to the Bill of Lading have been significantly lowered to near-zero.

3.2 Blockchain technology will aid in the digital revolution of Maritime industry

Blockchain is among the innovations that may assist organizations with digital transformation in a multitude of ways. This technological innovation may provide organisations and enterprises with a decentralised, transparent, and trustworthy framework. Blockchain has been shown in studies to be capable of being incorporated into operations such as commercial and documentation workflow. Moreover, researchers may further examine the use of blockchain in the ports and shipping industry to drive technological change.

Blockchain technology offers a good prospect for a variety of industries, including property investment, Internet of Things (IoT) technology, Supply Chain Management (SCM), healthcare, banking sectors, and many others. Essentially, blockchain technology may be thought of as a series of blocks that include a comprehensive list of the operation and tamper-resistant digital ledger that is executed in a dispersed manner (i.e., without a single repository) and typically with little or no centralized control (i.e., a bank, a company, or a government).

Blockchain technology gives the ability to the client to record their financial activities in a shared ledger together within a community, so that once a transaction is authored, it cannot be altered, and any adjustments introduced to the transactions are visible to everyone in the network, including who made them and whether or not that individual is authorised to make these adjustments. With the development of the Bitcoin cryptocurrency blockchain in 2008, this concept became well known. Blockchain technology has gained a lot of interest and academics' interest since the very first blockchain application (i.e., Bitcoin) was established.

The usage of cryptocurrencies in the business world, however, is only one functionality field for blockchain technology. Furthermore, blockchain technology may be promoted as a system that can revolutionise corporate cultures, SC management, and other sectors. In principle, blockchain technology enables the safe exchange, storage, and transfer of information between

multiple users in a distributed and decentralised digital ledger without the involvement of an intermediary. Furthermore, it has an impact on transaction costs and improves efficiency and information exchange.

Because of broad block reliance and dispersion, there is a minimal chance of falsification. Because a new block is constantly dependant on the hash of a prior block, the primary feature of blockchain technology is its editability and openness of all operations. Decentralization eliminates the need for a middleman to authorize and validate transactions and store all information; instead, the technology creates a direct connection between the parties, allowing for post-factum activities and communications.

Rapid advancements in data and networking technology have resulted in the transformation of service systems into smart systems. The fundamental cause of the rise of smart services is the remarkable technical progress made in last several years. Smart technologies have served a large and important role in strengthening the market benefits for ports and shipping operations in recent times. Smart technologies are utilised in maritime transport to boost productivity, safety procedures, vision, and effectiveness in port operations and shipping. Smart port and maritime technologies provide better operational productivity, increased transparency, traceability of supply chains, and improved ports and marine operations.

Innovative systems in docks are used to assist all activities at the dock such as warehousing, shipping terminal operations, logistics services, and transportation by utilising a specific wireless network. Smart technologies in port activities have recently been the subject of studies and research on numerous computer systems. Smart technologies are those that are new and rely on AI technology. With a growth in the volume of commodities exported via ports worldwide, cargo-handling activities at docks must be carried out effectively and employing cutting-edge machine learning and AI technology. The information system research examined data and networking technology applications utilised in ports and discovered a variety of these innovations that have lately become common in ports. These innovations are divided into the following sections (Alamadi, 2022):

3.2.1. Satellite navigation systems (GNSS)

GNSS, often known as satellite navigation or satnav, uses satellites to deliver precise time and position services. It has evolved into a pillar of modern society, as seen by the deployment of GNSS satellites to offer this service formerly produced by the United States Global Positioning

System (GPS), Russia's Glonass, China's Beidou, and Europe's Galileo system. This innovation has been embraced by the marine sector and ports, with an estimated 87 percent of merchant ships now utilising location and navigation technologies. This is due to the fact that 90% of global trade is conducted by waterways. As a result, there is growing attention in the possibilities of GNSS for rescue and search missions, coastal navigation, inland canal navigation, and luxury vessel users.

3.2.2. Electronic data interchange (EDI)

Contemporary modes of communication are critical in today's worldwide transportation and freighting businesses. Complex SCs provide a dynamic and quick responsiveness to customer requests and require a precise information exchange for command, coordination, and monitoring. Many containerizations and freighting industrial sectors recognised EDI from the start as the appropriate way for conveying important data. EDI automated the gathering, distributing, obtaining, and creation of exchange documents; increases organizational precision; improves customer service; decreases costs through process optimization; and shortens responses times. The shipping sector has been able to cut stopover and freight longer holding periods, enhance and standardise administrative operations, reduce mistakes through automation, increase traceability, tracking, and visibility, and improve warehousing efficiency. It has also facilitated the unification of all intermodal activities.

3.2.3. Radio frequency identification (RFID) (RFID)

RFID (radio frequency identification) is an information collecting and identifying system that is used in passports, access cards, and toll tags. A trackable item is labelled with a label or transponder, which independently emits its unique ID number in response to an RFID reader's instruction. The reader then sends the identification information to formatted middleware, which collects and organizes the information for interpretation. Active (battery-powered) and passive (no-battery) RFIDs are the most commonly utilised RFID technologies. It is primarily used to detect and classify inventory, assets, and personnel without requiring a direct line of sight, and it can be read at varied ranges and encoded with significant amounts of data. This is distinct from other forms of automated identification and data collecting.

3.2.4. OCR (optical character recognition) technology

The OCR technology is an information collecting and classification method that is automated. It includes anything from home scanners and printers to toll acquisition and port safety and

control systems. OCR is used by shipping companies to digitise machinery identification, similar to how information extraction and data scanning are used in offices. During the image capture or imaging procedure, a distinctive pattern of separate components or a series of digits on an item is recorded digitally using this technique. This necessitates that the target be observable to an imaging instrument. The image's bits and bytes are then processed by specialised software to extract and locate the specified patterns. The detected patterns are then combined and utilised to distinctively classify the item. The technology could be utilized to record the state of the equipment while also making it easier to identify its marks, such as text on licence plates or number stencils. It aids in the identification of an object without the need of a gadget or tags methodologies.

3.2.5. Wireless Sensor Networks (WSNs)

WSN is a self-configured digital networking system that does not require any architecture to monitor environmental or physical factors such as pressure, sound, pollution, temperature, or motion. The data is then sent via the network to a central sink or location for analysis and observation. The sink serves as a conduit between the system and its clients, allowing users to obtain data by requesting and retrieving outcomes from the sink. This method necessitates the use of sensor devices that interact through wireless signals. WSNs have been employed by shipping businesses to track their items during transportation, and they are also utilised to regulate light. Port light source uses a significant quantity of electricity and expenditures since it operates continuously, necessitating correct control and intensity.

3.3 Sagarmala Programmes: India's Initiative towards Port Digitization

The Prime Minister, Narendra Modi's administration's Sagarmala scheme is bolstering India's maritime commerce such as never previously. Apart from constructing innovative ports, it is also renovating the country's ancient ports through a significant infrastructure revamp. According to official information, the Sagarmala initiative includes 802 projects costing Rs 5.53 lakh billion. So far, 172 initiatives have been finished, with another 235 projects in the works. A new port worth Rs 6,554 crore is being developed.

The digitalization of numerous processes under one unified framework through the Sagarmala programme has enhanced performance and production. The implementation of smart ports in India, openness, and clarity of work, improved the communication process via a web-based

network, and a paperless policy are some of the primary projects and advantages of digitalization. As per the authorities, connectivity platforms are being strengthened through multiple reforms and advantages such as the implementation of the Port Community System, a single digital framework for all communications, reduced transaction period and expenses, continuous information exchange, no more superfluous redundancy of documents, and biometric devices that make data easily accessible.

Cargo throughput has grown by 42% since 2014 because to the Sagarmala scheme. Furthermore, efficiency initiatives resulted in a capacity increase of more than 80 million metric tonnes annually. Additionally, port connection has been improved. The Modi administration believes that the Sagarmala scheme will save roughly Rs 40,000 crore each year. There will be a 2% increase in GDP. According to the government, the infrastructure transformation would provide jobs for more than one crore individuals (Nag, 2021).

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Prof Devinder Grewal is a well-renowned Ports & Transport Logistics Specialist.

Capt Suresh Amirapu is an Advisor at PSA India Pvt. Ltd.

Ennarasu Karunesan is a Maritime Transport, Ports & Logistics Expert & Founder & CEO of UMK Group.

Capt Kapil Dev Bahl is former Managing Direct of Murray Fenton India, Maritime Arbitrator (LLB) & a fellow of CMMI. He is also the President of the Nautical Institute West.

Abdullah Siddique is designated as Research Consultant at ISF Group under the Division of IIRE, Inner Search Foundation.

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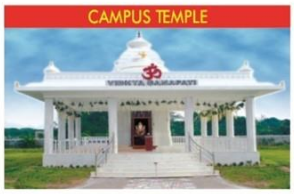

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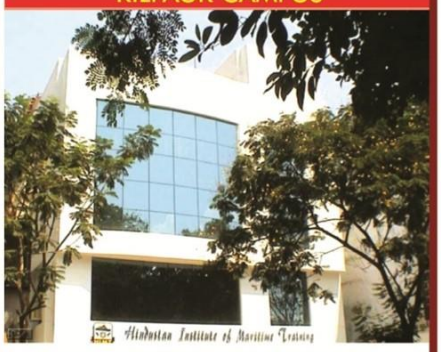
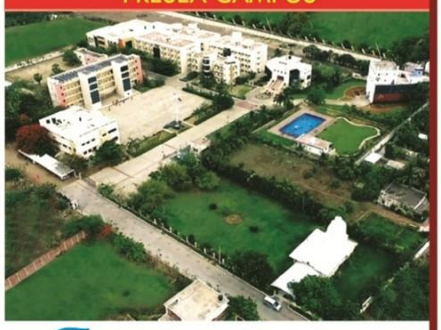


PRESEA CAMPUS



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