

PROJECT REPORT

On

A Study of Modernization of Indian Ports- Prospects & Challenges

Submitted for the partial fulfilment of the requirement of the degree of

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In

International Transportation and Logistics Management

By

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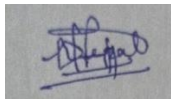
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DECLARATION

The project work titled **A Study of Modernization of Indian Ports- Prospects & Challenges** has been carried out by me under the direction of Dr Lekha Ravi in partial fulfilment of the requirements for the award of the degree of Master of Business Administration in International Transportation and Logistics Management to be submitted to the School of Maritime Management, Indian Maritime University, Chennai Campus. This work is my own and due references have been quoted.



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Executive Summary

India has a 7,500-kilometer coastline that spans 13 states and union territories, as well as a strategic location on vital international commerce routes and 14,500 kilometers of navigable and potentially navigable waterways. Maritime logistics has long been a vital part of the Indian economy, accounting for 90% of EXIM trade volume and 72% of EXIM trade value. In FY 2015, more than 1 billion tons of cargo was handled over more than 200 ports.

As per the studies conducted under the Sagarmala Program, it is expected that by 2025, cargo traffic at Indian ports will be approximately 2500 MMTPA while the current cargo handling capacity of Indian ports is only 1500 MMTPA. A roadmap has been prepared for increasing the Indian port capacity to 3300+ MMTPA by 2025 to cater to the growing traffic. This includes port operational efficiency improvement, capacity expansion of existing ports and new port development. This study considers modernization challenges and future prospects of modernization of port.

CHAPTER I. INTRODUCTION

1.1 India Port Industry

In India, there are 12 major ports and over 200 minor ports. Major Indian ports handled 704.82 million tons (MT) of cargo volume in FY20, representing a 2.74 percent CAGR from FY16 to FY20. In FY20, cargo traffic at non-major ports totaled 447.21 MT in Dec. 2009.

The capacity of India's major ports was 1,534.91 million tons per annum (MTPA) in FY20. In FY21, till now India's major ports handled 672.61 million tons of cargo.

Even though countries like India not evolving like smart ports, they are developing from the past decade with the efficient manner. Looking back around two decades even the communication between the internal port stakeholders as well as external stakeholders like shipping companies, customs. But nowadays with the help of proper ICT (Information and Communication Technology) and network operators plays a vital role in processing a data anywhere around the world. Information technology invented the several software applications to support the secured way of communication between all the stakeholders of the port. Likewise, there are several measures taken by the various port in-orders to increase the efficiency of port.

1.2 MODERNIZATION OF PORT

Growing trade and the globalization of production and consumption have contributed to the increased importance of seaports. Bulk cargo transportation by sea is cost-effective. General cargo transportation is also increasing, thanks to the extensive usage of containers. Seaports in developing countries have seen a particularly large increase in cargo throughput. Maritime policy strives to boost the efficiency of maritime transportation in Europe and around the world while maintaining its long-term competitiveness. This can be accomplished through disseminating technology that boost productivity, reduce negative environmental consequences, and create conditions for efficient port operations and transportation chain integration.

TOP 10 PORTS IN WORLD BY MOREDENAIISATION

1	Shanghai	China
2	Singapore	Singapore
3	Ningbo-Zhoushan	China
4	Shenzhen	China
5	Guangzhou (Nansha)	China
6	Busan	South Korea
7	Qingdao	China
8	Hong Kong	China
9	Tianjin	China
10	Rotterdam	Netherlands

Table.1

1.3 Automation at port

The use of integrated technology to produce intelligent solutions for effective regulation of traffic and commerce flows on the port, hence enhancing port capacity and efficiency, is known as port automation.

Smart ports (also known as automated ports) use cloud-based technologies to help create the operational routines that keep the port running properly. Most ports across the world now have technology incorporated to some degree, if not for whole management. However, thanks to worldwide government initiatives and the exponential rise of marine trade, the number of smart ports has gradually increased.

The Scope of Port Automation

❖ Port gates are automated.

The port gates serve as a vital checkpoint for recognising and registering all entities entering and exiting the port. Additional security procedures, verification, customs, immigration, and quarantine are all included for ships. These are critical duties that must be completed in order to safeguard the port's integrity and need the deployment of strong security measures.

Due to manual restrictions, these processes take a lot more time as the volume of container transit through the port grows. Basic operations like entry/exit logs, verification, and docking payments may all be automated with the right technology. As a result, the entire process runs considerably more smoothly.

❖ **Ship-to-shore cranes**

During the ship-to-shore delivery of commodities transported by ships, logistics management using IoT comes into play. Cranes, both manned and unmanned, are commonly used for offloading. When it comes to container transportation, just 30 terminals around the world can be called totally automated.

❖ **Stacks and Inventory**

It's time for the robots to take over once the cargo has been offloaded at the dock. Containers are stacked according to the category given using cargo handlers and stacking cranes. The inventory is frequently controlled by the date of inland departure. When the container is ready to be dispatched for further transportation, robots are utilized to transfer it to the appropriate station and prepare it for the journey ahead.

When constructing robotic equipment to help in freight transportation, one of the most important considerations is safety. The level of human-machine interaction is taken into account in smart design.

The way ports operate nowadays has changed dramatically as a result of technological advancements. Port efficiency has been improved because to automated systems, superior navigation software, remotely operated cranes, and massive robotic cargo handlers. But there's also the opposite side of the coin to consider.

Following are the advantages of automation:

❖ **Emissions from ports can be better controlled**

Automation of boring operations boosts process efficiency, as we've observed before. Manual errors and delays are minimised, allowing the port to handle a greater number of ships. Increased efficiency aids in the maintenance of the port emissions cap, ensuring compliance with environmental standards.

❖ **Time and resource savings**

Operational efficiency guarantees that each operation is optimised to consume the least amount of time possible. As a result, process automation saves a significant amount of time. According to statistics, automation can save ports up to 30% of the time spent on ship management, resulting in significant resource savings.

❖ **Stability will improve**

Sensors and other electronic devices utilised in port operations planning result in excellent process stability. Automated processes are cleaner than traditional process flows since speed and safety are prioritized.

❖ **Extended Benefits**

Automated systems do not require constant monitoring once they have been installed. The port is free of operator intervention and can operate reliably for many years. The processes' flexibility guarantees that any necessary adjustments may be made and implemented quickly.

Digitalization: It is a process of moving a paper works towards the digital format which will in-turn reduces the theft or risks. Digitization in a port sector will connect all the stakeholders of the port industry together to form a chain network which makes the communication easier and more reliable to the data transformations.

Automation: Automation generally describes ‘unmanned’ with the use of disruptive technology in the port operations that will automate everything with the reduced time with the increased efficiency. It is mainly used for developing intelligent solutions for efficient control of traffic and trade flow of the ports

1.4 Digitalization in Indian Port

India has had a considerable increase in the World Bank's Ease of Doing Business Index under the "Trading across Border" heading during the last two years. The country has increased its position from 146 in 2017 to 68 in 2019. This can be ascribed to several port modernization, mechanization, and digitization projects.

Some of the major initiatives include the implementation of direct port delivery/direct port entry, the installation of container scanners and RFID-based systems for gate automation, the promotion of paperless transactions, the digitization of land records, the automation of delivery order issuance, and the launch of a single-window interface for facilitating trade (SWIFT) and ICEDASH. Several more customs-related actions are being considered. Sagarmala, the government's flagship program, was launched in 2015 and priorities modernization and ease of doing business. In total, 208 projects costing Rs 790 billion have been identified for implementation under the program's port modernization component.

PCS1x, an improved version, was released as an open platform in December 2018. It is turning into a National Logistics Portal (NLP-Marine), a safe, impartial, and open electronic/Internet-based platform for all maritime trade stakeholders and Indian seaport communities. Through a single data input, it will optimize, control, and automate logistics-efficient procedures,

connecting the entire maritime transport and logistics chain and enabling real-time information interchange and commercial transactions.

However, in comparison to the rest of the world, Indian ports are still in the early stages of technological adoption. Cloud computing, the internet of things, big data, robots, blockchain, artificial intelligence, drones, and sensor technologies are all being used extensively by foreign ports. India can benefit from global advancements in the future. The government might also take steps like standardizing technology installation at both big and minor Indian ports. Furthermore, to react to changing industry requirements, ease of doing business indicators must be assessed on a regular basis.

Issues such as a lack of qualified and skilled workers, a general aversion to technology adoption, rigid labor rules, and outdated and obsolete equipment have all hampered technology deployment in the past. Meanwhile, the operational issues brought to light by the COVID-19 pandemic are expected to lead to a larger usage of technology at Indian ports. Ports will have to move to remote operations and automated technologies in order to comply with government regulations. This reveals important opportunities for a variety of parties. Unmanned horizontal transportation or unmanned yard cranes are used to transfer containers from ships to the port using automated cranes. These are then categorised according to the type of cargo and put in the inventory accordingly.

RFID: FASTag, the Ministry of Road Transport and Highways' (MoRTH) major initiative for introducing electronic toll collection throughout India's national highways, is based on radio frequency identification (RFID) technology. It aims to ensure cashless transactions at toll plazas, resulting in near-constant traffic flow and, as a result, decongesting and streamlining the entire toll collection process.

AI in Ports

The port industry was one of the first in the world to digitize its operations and processes. Information sharing platforms, such as Electronic Data Interchange (EDI)-based Port Community Systems (PCS), have been developed in Europe as early as the late 1970s. 19 PCSs are now being used and optimized to improve trade facilitation, including digitized Single Window and e-Trade programs. Soft digital infrastructure has surpassed physical infrastructure as an economic priority for port ecosystems. According to a 2017 poll conducted by McKinsey with industry experts, about half of all new port projects will become partially or totally automated in the next five years. Fully automated port terminals are already a reality, as demonstrated by Rotterdam in the Netherlands. The effort to make autonomous ships a realistic option is gathering traction. The ports sector presents an ideal opportunity in terms of automation and intelligent systems application. Port ecosystems are predictable and structured environments with predictable activities and sequences. This industry's network-based nature, combined with the highly informative logistics operations process, makes it an ideal fit for the adoption and scalability of AI technology.

1.5 STATEMENT OF PROBLEM

Seaports currently represent one of the most important logistics centers for each territory due to the fact that more than 80% of worldwide freight is transported using the sea way of transportation according to figures from the World Trade Organization. In global context, smart ports play a major role in the efficiency of ports. It brings more competition in the industry by reducing costs with the least amount of risk when compared to traditional ports. So it is relevant to study Port Digitalization Indian Ports and challenges faced in the move towards Mechanization.

1.6 RESEARCH OBJECTIVE

- ❖ Identify the new innovative technologies in the Indian port sector and the hurdles and challenges faced in implementing them.
- ❖ To explore the issue by adopting a case study of Cochin port trust.
- ❖ Provide suggestions to overcome these hurdles.

1.7 RESEARCH METHODOLOGY:

- ❖ The study is conducted with the help of secondary data, as per the reviews and data got from the research papers and studies published on analyzing Digitalization and Modernization Indian ports.

1.8 SCOPE OF THE STUDY

- ❖ This study helps analyze the Pros and Cons of Mechanization and digitalization in Indian ports.
- ❖ This study helps analyze the prospects of Smart Indian ports.

1.9. LIMITATIONS OF THE STUDY

- ❖ Secondary data may not really help ports with decision making.
- ❖ The automation in the port is only at its budding stage so proper analyzing is difficult.

Reference: <https://www.ibef.org/>

CHAPTER II

LITERATURE REVIEW

1. MODERNIZATION OF PORT

Author: R. Sundaravadivelu Year :2007

The study analyzes India has a coastline spanning of 7516.6 km, forming one of the biggest peninsulas in the world. Central and relevant ministries administer the 12 major ports and 200 minor and intermediate ports. The modernization of ports needs deepening of harbor basin, up gradation of mechanical handling system, use of new type of fenders, etc. The various case studies are explained in this keynote. Behavior of berthing structure with pile sheet pile wall is analyzed through numerical and experimental investigation. The suitable rehabilitation methods adopted for the structures which are damaged due to natural causes. Artificial submerged reef is to stabilize the shore from erosion and stability of these structures proven by physical model study.

2. FEATURES OF PLANNING IT - PROJECT OF MODERNIZATION ACCESS SYSTEM OF SEA PORT

Author: Victoria Denysenko Iryna Kornieieva Year 2018

The characteristics of the creation of a data exchange model between multiple ISS, ensuring the port's reliable functioning, were investigated in this article. The need for upgrading of existing hardware and software to execute the port development plans adopted for 2018-2022 was established. A single-channel queuing system was chosen as a model for access system automation. The time constraints that the operator can spend on issuing a single pass have been computed. This computation was made using data from the loading of the port's checkpoints in 2016-2017, as well as the expected increase in traffic flow.

3. DIGITALIZATION AND NEW TECHNOLOGIES FOR SUSTAINABLE BUSINESS MODELS AT THE SHIP–PORT INTERFACE: A BIBLIOMETRIC ANALYSIS

Author: Di Vaio, Assunta Hassan, Rohail Year: 2021

The findings show that previous research on the subject has mostly focused on the environmental externalities associated with operations at the ship–port interface. The study makes theoretical and practical contributions by highlighting the fundamental topics debated in the literature on digitalization and new technologies in the shipping and seaport industries, as well as analysing the essential variables that will help achieve the SDGs.

4. PREPARATION OF A SMART PORT INDICATOR AND CALCULATION OF A RANKING FOR THE SPANISH PORT SYSTEM YEAR: 2020

Author: Alberto Rodrigo González, Nicoletta González-Cancelas, Beatriz Molina Serrano.

The study analyzes trend is consolidated in the port environment, too. The ports' need to become more intelligent is modifying their own operations. Therefore, this paper includes an analysis of Spanish Port System, in order to evaluate its ports, considering the new concept called “Smart Port”. Some indicators and measure variables are defined, to allow for quantifying technical items. These items—both quantitative and qualitative ones—which reflect, in the most objective and complete way possible, the adaptation and achievement of characteristics and objectives associated with the Smart Port concept in all ports were studied, in order to obtain an index of Smart Ports that allows us to calculate the ranking of the Spanish Smart Ports. Considering the analysis of the Smart Port concept and its current and future trends, it has been determined that the development of a port must be based on the digitalization, on use of ICT and on automation of port processes.

5. COVID-19 PANDEMIC DIGITIZATION LESSONS FOR SUSTAINABLE DEVELOPMENT OF MICRO-AND SMALL- ENTERPRISES

Author: Chunguang Bai, Joseph Sarkis, Matthew Quayson YEAR:2021

This paper employs a literature review and personal insights to provide COVID-19 pandemic digitization lessons for sustainable development of MSEs from a technology for social good perspective. The study develop a framework to support post COVID-19 digital transformation for sustainable development of MSEs. Researcher fined that digital payments, especially mobile money, should be a critical digital transformation priority for MSEs. Also, institutions must support MSE resources and capabilities to adopt digital transformation for business continuity, and sustainable production and consumption. Our study suggests that MSE managers and other stakeholders rethink their business strategies, incorporating crisis scenarios and business continuity plans to sustain customers virtually to enhance sustainable development. Study also propose further research areas to improve the successful digital transformation of MSEs post COVID-19.

6. MODERNIZATION OF PORT FACILITIES IN RELATION TO HINTERLAND

Author: S KONNO Year :2020

The study states Japan's seaports have been known for the insufficiency of facilities accommodating marine cargoes which are on the rapid increase. Especially, there is a sharp increase in the bulk transportation of the grain. This gives rise to the need for modernization of grain landing facilities at seaports, requiring the construction of wharves closer to siloes. One of the typical examples is the completion of the Suzuki Wharf at Hakata Port in 1966. The grain handled there is mostly wheat, other sorts of the grain going to Moji Port nearby. Hakata Port came to deal with more wheat than Moji for the first time in 1967. Up to then, the entire wheat landing in the region had been handled at Moji.

7. ORGANIZATIONAL STUDY AT COCHIN PORT

Author: Libu Thomas Year :2015

All diversification at the Cochin Port Trust is determined by the study. According to the report, the Cochin Port Trust primarily deals with the export and import of cargo and merchandise via waterways. In terms of containerization, Cochin port has a promising future. It is one of the country's major ports, and if properly developed, it may compete with foreign ports such as Dubai, Singapore, and Colombo. The organisational study at CPT provided an opportunity to learn about the practical application of management theory. This research aided in the comprehension of the functions performed by the Port Trust's several departments.

8. STUDIES ON EVALUATION OF MODERNIZATION OF THE INLAND PORT AND SHIPPING MANAGEMENT BASED ON DPSIR MODEL AND GRAY CORRELATION EVALUATION MODEL

Author: Xiaofeng Wen Ning Chen Year 2013

The researcher states that According to the ambiguity and uncertainty for evaluation on Modernization of the Inland Port and Shipping Management (MIPSM) as well as the deficiency of objectivity and accuracy for traditional evaluation methods, the paper establishes the index system for the evaluation based on DPSIR model. Moreover, the paper determines the index weight based on Entropy Weight. Thus, the stage of development of MIPSM is determined according to the gray correlation degree between the evaluated objective and the stage of development. Credible results are obtained from the case application. Therefore, this research can provide a new way to evaluate the modernization of the inland port and shipping management.

9. ENVIRONMENTAL IMPACT OF MRZEŻYNO FISHING PORT MODERNIZATION WITHIN THE NATURA 2000 AREA

Author: K. Kasprzak Year :2018

The study's findings point to a type of conduct that could lead to the economic and social ruin of a fishing and tourism-related area. It could also have a harmful impact on the environment. The predicted environmental advantages clearly outweigh the expected negative impacts, but their realisation is not certain. It necessitates additional project conditions, as well as the

implementation and subsequent use of completed refurbishment solutions. The impact of new buildings on the environment is unlikely to be significant. The majority of them will aid in the improvement of hygienic conditions in fishing ports and communities. Simultaneously, it will relieve pressure on aquatic environments. The modernization of the current port will greatly reduce the negative effects now noticed during port operations. Excessive limit values for specific environmental factors will not be found after an analysis of the environment and the impact range. As a result, there is no need to declare a protected area, impose land use limitations, or specify building and land use constraints. When looking at the impact of planned works during the modernisation of Mrzeyno port, there is a clear positive impact on the environment, natural resources, and cultural heritage.

10. INDIA - PORT OF MADRAS EXPANSION AND MODERNIZATION PROJECT

Author: Ades, Alberto F Year:2010

The Modernization and Expansion of the Port of Madras in India is the subject of this report. The initiative will minimize traffic congestion by accelerating ship turnaround times, lowering cargo handling costs in the port, and improving overall operational efficiency. It will also result in a significant increase in the port's capacity to handle general cargo, which is required to meet the predicted surge in traffic over the next 10 years. There will be enough reserve capacity in the port at the end of the construction period to prevent the fear of congestion during peak periods.

CHAPTER III-

TECHNOLOGY LEADING TO PORT MODERNISATION

The UNCTAD Three generation port model examined and researched by the European commission under the name of WORKPORT model, which describes about instead of developing in discrete steps, ports evolving continuously with the help of technologies and automation. An intelligent port has the entire infrastructure as well as info-structure of information technology and the recent technologies in telecommunications, electronic.

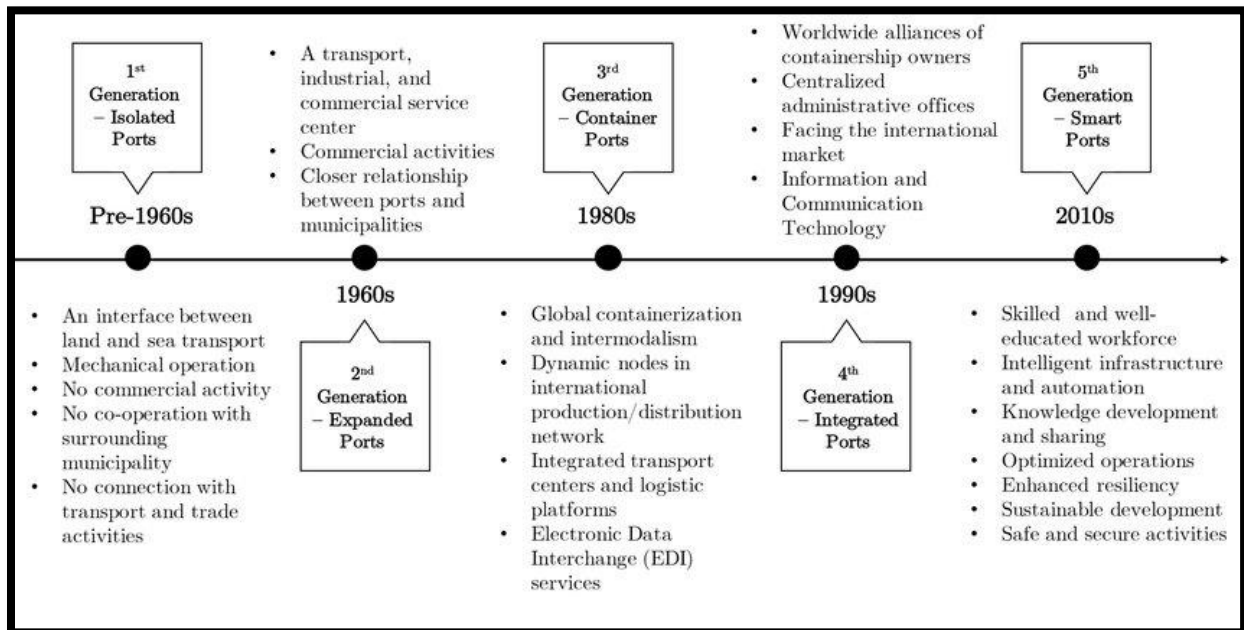


Fig 3.1 Generation of Ports (UNCTAD, 1992, 1999; Barros and Barros, 2013; The Motorways of the Sea Digital Multi-Channel Platform, 2015)

A human port has multiple opportunities to utilize its human potential and creative processes. It is effective that the term smart port has prevailed among the public and private sector to describe the trend in the current scenario of the economy.

3.1 Smart Port Domain Activity

A smart port comprises off our main activity domain:

- Operations
- Environment
- Energy
- Safety and security.

One can assess the performance of the ports in those domains by studying measurable elements which we call it as sub-domain of a smart port and we explain them in detail. Smart port emerged based on this various activity domains.

3.1.1 Operations

Ports may have various types of vessels including containerships, cruise ships, tanker ships, Ro-Ro ships, and refrigerated vessels (reefer containers). The main operation of the port is to load and unload these containers from the vessels to the yard and vice versa. To handle the process of transportation of the cargo to warehouses or other ICD. A smart port uses technologies along with innovative and efficient management models to improve the productivity of port operations and minimize associated costs. Sub-domains of the main activity domain for bringing up the smart port operations will include the productivity, automation, and intelligent infrastructure.

Productivity

The productivity of a port operation can be computed through measuring productivity in seven areas as: berth, infrastructure, land productivity, capacity for receiving large sized vessels, size and use of maximum capacity, the level of intermodalism, and lines calling at the port.

Automated machine can replace the human work in ports and minimize the existing human errors, safety and security issues, congestions in port, and turnaround time as well as increasing the operations efficiency.

Intelligent Infrastructure

Intelligent infrastructure (applies by both the hardware and software) in ports can increase the efficiency by real-time data collection using big data, processing, and sharing the collected data with the appropriate team at the correct time. Information that received regarding traffic flow of ships and Inland Transport Vehicles as well as Hinterland Vehicles, closure times of movable bridges and other infrastructure information, anchorage times and the situation at the container terminals and other major operations and parking facilities should be available to port users. The fast and easy flow of this information facilitates wise and well-informed decision making by port authorities and port customers. At the most it brings increased productivity, fewer costs, \market competition ability for the port, lesser mission, and green logistics. With reference to the current smart port's best practices, implemented intelligent infrastructures in the ports are: sensors, GPS/DGPS,RFID/OCR/LPR,GNSS, DGNSS, TOS, Bluetooth WLAN mobile devices, the Cloud, port community systems, monitor system¹,road management system, and gate management.

3.1.2 Environment

Ports can be the source of environmental pollution by the way of both the land and sea transportation and industrial activities. For the purpose of this research, we mainly focus on the following environmental impacts of port activities :air pollution, noise pollution ,water pollution and waste generation. We can evaluate the port efficiency in this domain by investigating the port Environmental Management Systems (EMS), reduction in pollution activities, and water & waste management.

Environmental Management Systems

Environmental management systems (EMS) offer a framework for monitoring, determining, and reducing port environmental impact. The International Organization for Standardization (ISO-14001) is the most commonly used frame work for an EMS. According to ISO 14001, the main stages of an EMS are as follows: Commitment and policy, planning implementation evaluation, and review.²

The ports are large energy consumers. With the port development, demand for maritime transportation, and industrial activities in ports, the demand for energy further increases. Considering this into account the limitation of energy sources and port budget, smart port considers approaches to decrease energy consumption. It also suggests the use of renewable energies to both reduce emissions and become independent interims of energy sources. The sub-domains consist of the use and production of renewable energy and adopting Energy Management Systems.

3.1.3 Safety and Security

Ports are very much focused very much on safety and security issues, which can cause a loss in terms of benefits, port reputation, and the efficiency of operations. Smart port uses solutions such as ~~standard~~ regulation, employee training. Overall port performance in this sense port safety management systems, security management systems, and integrated monitoring and optimization systems.

Safety Management Systems

Safety Management System (SMS) is a systematic process for managing safety risks and it is composed of policy, regulations, designing, applying, assessment, and improvement. SMS is applicable to port activities, vessel operations, and Warehouse operations. Another approach to ensure safety at ports, IMO has developed the International Safety Management Code (ISM)³.

Security Management Systems

Security management systems identify the threats to the port and establish, implement, monitor, review, and maintain respective actions to effectively handle security risks. Ports needs to identify both their assets and possible external as well as internal threats, perform risk analysis as well as management, and increase the preparedness and awareness of employees. International Ship and Port Facility Security Code (ISPS) is introduced by IMO for enhancing the port security⁴.

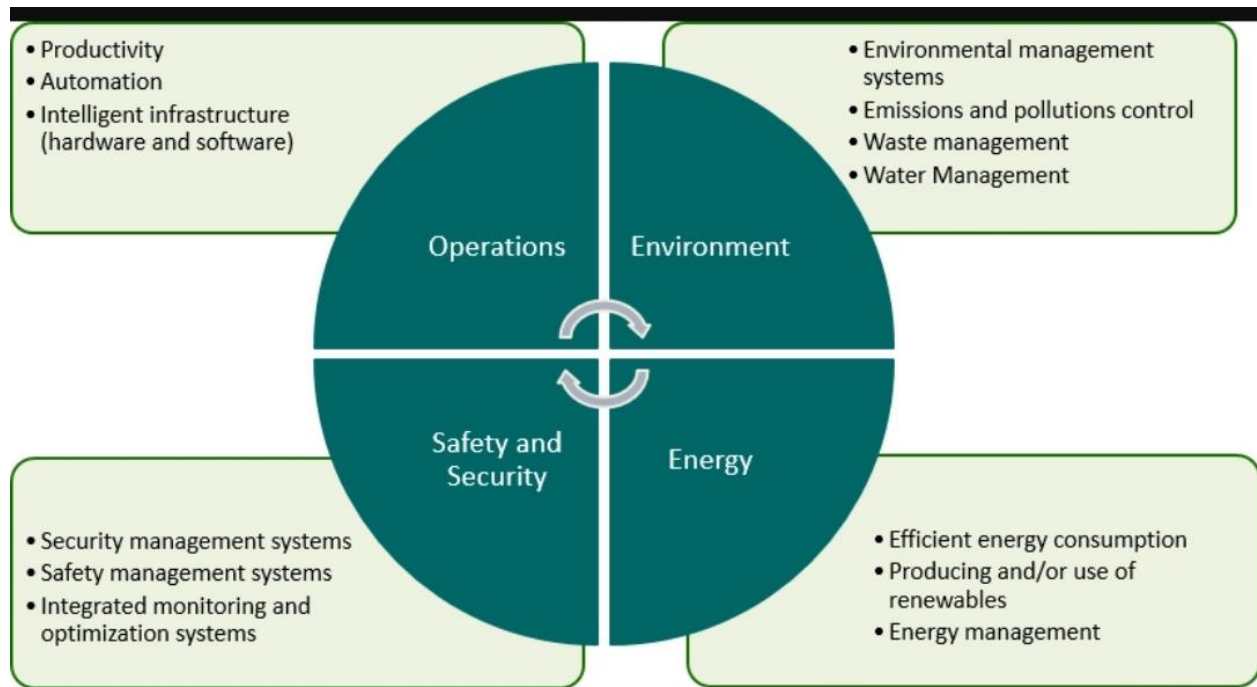


Fig 3.2 Smart Port Domain Activity- Bruce Race, Gino J. Lim, Anahita Molavi “A Framework for Building a Smart Port and Smart Port Index”

Integrated Monitoring and Optimization Systems

Establishing the integrated monitoring and optimization system based on the most updated software and hardware which enhances the security and safety in the port. This includes inter-connecting the hardware such as cameras, Wireless Technology, Sensors, RFID tags and software for Gathering, Visualization, analysis and optimizing the acquired data. Storing the data and analyzing it for the future use brings a several benefits like real-time information sharing among different port sectors , identification of Preventive actions , increased readiness, effective decision making in the face of unpredicted events , hence the resiliency of the port operations⁵.

3.2 Challenges for modernization of Indian Port

Few of the challenges faced in the successful implementation of Digitalization ports

1. Inefficiency Due to Poor Hinterland Connectivity Through Rail

A Special Purpose Vehicle (SPV) – A Special Purpose Vehicle (SPV) – A Special Purpose Vehicle (SPV) – A Special Purpose Vehicle (SPV) – A Special Purpose Vehicle (SPV) – A Special Purpose Vehicle (The Indian Port Rail Corporation (IPRC) was established under the Companies Act of 2013, and is administered by the Indian Ministry of Shipping. The 11 Major Ports have contributed 90% of the company's paid-up equity, while Rail Vikas Nigam Limited has contributed 10%. (RVNL). The firm has a paid-up capital of Rs. 100 crore (US\$ 15 million) and an authorized capital of Rs. 500 crores (US\$ 77 million). It is also recommended to seek money from multilateral, bi-lateral, and other financial institutions.

2. Inadequate Navigational Aids

For safe and pleasurable travel, AVIATION traffic necessitates a dependable and continuous guidance service. Traditional technologies have given way to the most up-to-date equipment in the industry, which has undergone a gradual evolution in navigational facilities. The inadequacy of navigational aids such as smoke, light, and magnetic compass in adverse weather led to the introduction of radio navigational aids, which are now crucial in the aviation industry. Radio navigational aids have the advantage of not being impacted by weather and being able to direct aero planes over long distances and at very high altitudes. Guidance precision is of the highest degree.

3. Insufficient Dredging Capacity

During the five-year period (FY2013 to FY2017), only 440 million cubic meters was dredged at major ports. Another 103 million cum only was dredged at non-major ports (FY2014 to FY2016) besides ports, dredging is also undertaken at inland waterways (in rivers, canals, lakes, etc.). From 2011-12 to 2015-16, around 50 million cum of dredging was undertaken at National Waterways (NWs)-1, 2 and 3.

4. Coastal Shipping and Inland Waterways

Since 1947, India has achieved significant growth in the shipping industry, eventually becoming Asia's second largest and the world's sixth largest. Indian ships travel the majority of the world's shipping routes. Inland waterways of India total 14500 km. Only 5685 kilometers are passable by automated vessels.

5. Issue of Port Tariffs

The issue of port tariffs has previously been a source of concern. To address this problem, the government plans to create a single regulator, the Major Ports Regulatory Authority, which will be in charge of developing rules, concepts, approaches, and methodologies for determining rates for facilities and services offered at port terminals. Once the Ports Regulatory Authority Bill, 2011 is passed, this single regulator will be established. The bill also aims to provide a consistent platform for government-owned major ports and state-controlled ports around the country by allowing them to set their own tariffs.

6. Financial viability of port projects

The financial viability of port projects is a major deterrent for private developers as well as financiers. Greenfield port developments are typically located in distant areas, necessitating significant government investment to build basic infrastructure for site access. The developers of port projects often need to address the supply of manpower and their housing and infrastructure for habitation.

7. Trend for Brick & Motor Logistics

In India, most ports are owned and controlled by the government. These ports were built many years ago and will have to be modernised at a significant cost. There have been concerns that present port designs are unable to satisfy contemporary requirements for quick turnaround and handling of increased quantities, causing delays in cargo feeding and evacuation and, as a result, reducing vessel efficiency and productivity. Large or ultra-large vessels must be moored at a distance and cargo supplied or emptied via smaller vessels in some ports, which are not intended to handle them.

8. Lack of education – Majority of population in the country is still not qualified enough to use digital devices and technology. Most of people are not capable of using a simple mobile phone.

9. Lack of infrastructure and required technology – The Digital campaign needs high quality infrastructure to be implemented efficiently in the ports. India still lacks the basic infrastructure required to move digital ports. The technological infrastructure and technology required for the campaign is still not available that easily in the country. The conditions are even more inadequate in the rural areas. Further, the servers are overloaded due to pressure of work.

10. Financial and technical issues – India is still a developing country. For a plan like this, huge financial resources are required and the country somehow lacks in that area. It requires financial assistance from other sources. Technical issues like appropriate band width, firewalls, filters, anti-virus software's, protection from hackers, buffering are some of the technical issues the country has to face.

11. Attitude of citizens as well as government personnel –For successful implementation of the program, a wholesome effort is required of both the citizens and the government personnel. But the devil may care attitude is the hindrance in the path. Moreover, the older generation is set in their ways and find the traditional methods of doing things easy and convenient. Indian political power structure and lack of inter-departmental coordination add to the problem.

12. Cyber-crimes and Lack of confidence – Cyber safety is still not given as much importance as it should be given. People find it risky to make transactions online due to safety issues. Cyber laws are not paid that much heed too. Also, most of people still have lack of confidence on machines and prefer hand done things. Inept cyber services are also one of the reasons for this.

13. Tide Level

Unexpected changes in tide levels can maroon ships and boats for days, as well as cause costly mishaps. To begin with, port authorities should invest in technologies that allow them to predict and correctly assess water levels, current speed and direction, air

temperature, and water salinity in order to avoid delays and accidents caused by these flaws.

14. Trucker shortage

This is another issue that has plagued the transportation business for many years. In most ports, there aren't enough trucks to handle the cargo, which has led to the congestion you're seeing. To address this issue, legislators should develop policies and regulations that stimulate the development of more trucking companies. Trucking companies may find it easier to find, hire, and retain drivers if taxes are reduced. To address this issue, governments should invest more on roads.

15. Lack of Chassis

There was a time when most ports required carriers to furnish chassis for container shipments. The quantity of chassis, on the other hand, has reduced, and most carriers have sold off their chassis. As a result, there was a chassis problem that was difficult to resolve. The chassis crisis hampered container transit from one country to another and caused traffic congestion. If carriers are encouraged to supply chassis for their cargo, this situation can be remedied. In addition, relevant port authorities should devise innovative processes to facilitate the provision of chassis services.

3.3 Effects of Challenges

1. Ease in purchase and inventory control – The procurement of raw materials will become an easy and effective process by automation. One can procure the desired quantity and quality of materials at competitive prices. Systems like JIT (Just In Time) inventory system, ABC, EOQ (Economic Order Quantity) system, as well as automation of ordering, billing and payment systems, leads to better inventory control, thereby reducing inventory management costs. The supply chain management will function smoothly.

2. Wider customer base and market reach – Customer base for goods is increasing due to availability of products through various online sources like online shopping portals, i.e., myntra, jabong, snap deal, or company's web pages, i.e., reliance trends, woodland, pantaloons, Adidas etc. Due to the omnipresent nature of internet, the producers can reach their customers in every nook and corner of the world within seconds, thereby expanding the markets to no bounds.

3. New product mix and product innovation – The product mix of the industrial sector is undergoing changes as more preference is being given to the FMCG and technological products. New kind of products will also be introduced having both physical and digital characteristics. This will lead to a new era of product development.

4. Trade relations and competition – Supplier-producer, producer-customer, labour-management, intermediary relations as well as all other trade relations become cohesive due to increased transparency in trade. The competitive structure will change due to increased foreign competition after liberalization, increased efficiency due to privatization and opening of new markets due to globalization. A healthy competition will result in better quality products at reasonable prices, benefitting the consumers.

5. Employment variations – The employment scenario will be dual impacted. On one hand, digitalization will lead to unemployment because of machines replacing man power. And on the other hand, new jobs will be created as the sector will move towards growth and expansion. The job requirements and specifications will change with the changing scenario.

3.4 Economic restructuring of the ports-logistics sector in India

In India, a total of 213 ports handle 95 percent of the country's trade (13 major and 200 non-majors). India's domestic shipping industry, on the other hand, is not a major international player. With a combined fleet ownership of 22,665, India now ranks 52.9 on the UNCTAD liner connectivity index. This is significantly less than industry giants China (165,430) and Germany (165,430). (112,028). Essar, Mercator, Great Eastern, and the Shipping Corporation of India, a public sector initiative, are among the country's major shipping corporations. However, the transportation of wet and dry bulk, rather than container freight, accounts for the majority of the companies' revenue.

The logistics industry in India generates between 13 and 14 percent of the country's GDP and is a 160 billion dollar industry that employs around 22 million people. 29 Allowing up to 100% Foreign Direct Investment (FDI) under the automatic route for constructing and managing ports and harbors under the Build Operate and Transfer (BOT) model was one of the first attempts to make the sector more competitive.

3.5 SAGARMALA-A paradigm for port-led growth: The Sagarmala project is a large-scale initiative by the Indian government that promotes the concept of "port-led growth." The initiative, which was approved by the union cabinet in 2015 and implemented through a National Perspective Plan in 2016, aims to achieve the following goals.

- Optimizing multi-modal transportation to reduce the cost of moving domestic cargo.
- Improving export competitiveness by building port-proximate discrete manufacturing clusters
- Lowering the logistical cost of bulk commodities by putting new industrial capacity near the coast.
- Improving the efficiency and cost of export-import (EXIM) container transit.

The Sagarmala project is divided into four parts:

1. Port modernization and new port development
2. Port connectivity to the hinterland
3. Port linked industrialization through the development of port-proximate industrial clusters and Coastal Economic Zones (CEZs)
4. Coastal community development through skill development and livelihood generation activities.

In its **Dun & Bradstreet** 2018 research on Port Logistics: Factors and Challenges in India, the government think tank NITI Aayog identified five significant issues affecting port performance. 38 Port congestion, customs clearance, shipping line troubles and charges, documentation and paperwork, and regulatory clearance are among them. Only four ports—Mundra Port, Jawaharlal Nehru Port Trust (JNPT), Ennore Port, and Visakhapatnam Port Trust—received a “Good” ranking in the NITI Aayog assessment of 14 ports. The “Average” score was given to Cochin, Kandla, Paradip, Chennai, Mormugao, New Mangalore, and the V.O. Chidambaranar Port Trust. Haldia, Kolkata, and the Mumbai Port Trust (MbPT) were all given a “Poor” rating.

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Chapter IV

A Case study of Digitalization- Cochin Port

4.1 Introduction about Cochin port

4.1.1 Cochin Port

Cochin Port, also known as Kochi Port, is a major port in the city of Kochi, located on the Arabian Water – Laccadive Sea – Indian Ocean sea route. It is one of India's largest ports. It is also India's first transshipment port. Willington Island and Vallarpadam, two islands in the Lake of Kochi, face the Fort Kochi river mouth, which opens onto the Laccadive Sea.

The Cochin port was established naturally in 1341 AD when the Periyar River was flooded, and it has since grown into a significant commerce hub. The port drew European merchants in its early years, primarily Dutch and Portuguese, and was later enlarged by the British with the building of Willington Island. Near Mattancherry was the traditional harbor. The idea of establishing a modern port was put forward by lord Willington. He knew that opening of Suez canal will bring up a great opportunities in west coast countries like India So Lord Willington appoint Robert Bristow as a engineer to built the cochin port.

4.1.2 PAST PRESENT & FUTURE

There was rock prescience under the sea which prevent large ship to come near to the port however after some studies conducted by Robert Bristow. Bristow planned out a detailed proposal of reclaiming part of the backwaters at a cost of ₹25 million. The construction of Willington dredger was completed in 1926. The Willington Island was artificially created with the mud sledged out for the harbor construction. During World War II the port was taken over the Royal Navy to accommodate war ship and cruisers .The Maritime Board of British India declared the Port of Cochin a significant port in 1932, and it was accessible to all vessels with a draught of less than 30 feet. On May 19, 1945, it was returned to civil authorities. The port was taken over by the Indian government after independence, and the port's administration was

vested in a Board of Trustees under the Major Port Trusts Act in 1964. The port is one of 12 major ports.

Kochi Marina, an offshore crude carrier mooring facility, and the Kochi Refineries facility of SPM. The Cochin Port Trust (CoPT), a government of India entity, manages the port. It was founded in 1928 and has served the community for more than 90 years. The Kochi Port is part of a network of maritime-related infrastructure in Kochi's port city. The Cochin Shipyard, India's largest shipbuilding and repair facility, is one of the others.

The CPT was the first Indian port to launch E-Thuramukham, a full enterprise resource planning implementation program. Tata Consultancy Services will customize the project, which is based on the SAP platform.

The Cochin Port Trust has established a Maritime Heritage Museum on Willington Island, which has a large collection of unique and rare navigational equipment and photographs.

4.1.3 Organizational Structure in Cochin Port

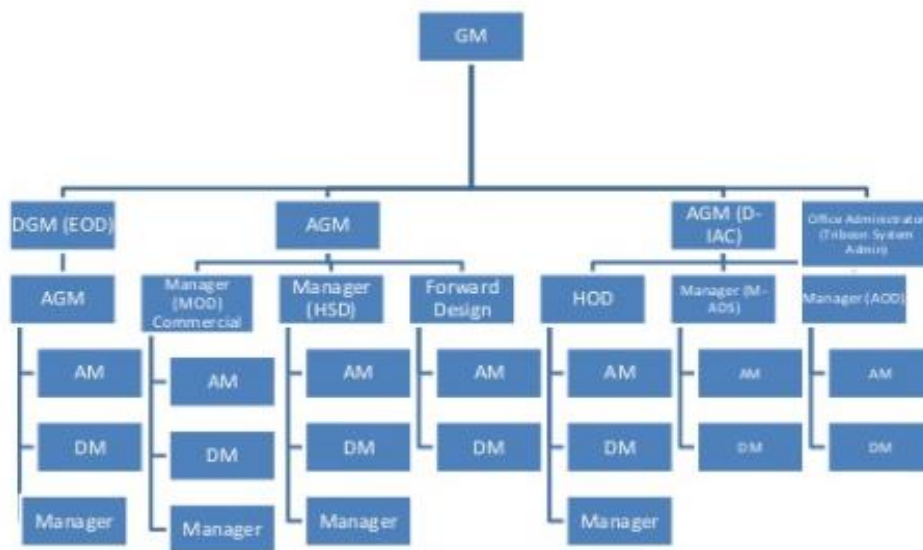


Fig 4.1 Source: Cochin Port Trust Website

4.1.4 SERVICES IN COCHIN PORT

❖ MARINE SERVICES

When approaching Cochin, all ships should call Cochin Port Control on VHF Channel 15 / 16 and report their E.T.A. to get instructions on pilot boarding / anchoring. Cochin Port Control has a V.T.M.S. based on Radar / A.I.S. that monitors the approach of vessels to the fairway buoy. South of the Channel, there is an open anchorage with a clay and sand bottom that provides adequate holding ground.

A 16500m long and 260 m wide 15.95 m deep outer approach channel marks the entrance to the port, with eight sets of buoys numbered 1 to 16. The Ernakulum Channel is 2800 meters long and 300 to 500 meters broad, with depths ranging from 9.75 to 13.5 meters, and the Mattancheri Channel is 2200 meters long and 180 to 250 meters broad, with a depth of 9.75 meters.

❖ Cargo Services

1. Import/Export procedure of Cargo
2. Personal Baggage Clearance
3. Container Freight Station (CFS) Facilities and Operation
4. IMO Class -I cargo
5. LO-LO/RO-RO Terminal
6. Bunkering
7. Pipe Line Network
8. Wharf Information Centre

4.1.5 Cruise Terminal

Cochin Port sees cruise ships as an important source of revenue. We are dedicated to making Cochin Port a premier cruise destination on the Indian coast, with world-class services. Every year, major cruise lines such as Cunard Lines, Royal Caribbean Lines, Aida Cruises, Costa Cruises, and others dock in Cochin Port. BTP, Cochin Port's specialized cruise terminal, is a contemporary world-class facility. CRUISE PASSENGER FACILITATION CENTRE –

“SAMUDRIKA”, where all statutory clearances like Customs and Immigration for cruise passengers are given under single roof.

4.1.6 Estate

Cochin Port Trust has about 881.43 ha (2177.14 acre) of land at various locations in Ernakulam District, which include Willington Island (879.80 acre), Vallarpadam and Bolgatty (502.27 acre), Puthuvypeen (762.43 acre), Ernakulam (18.1 acre), Fort Kochi (4.76 acre) and Palluruthy (9.79 acre).

4.1.8 General Utility Services

- ❖ Ferry Services
- ❖ Fire Fighting Services
- ❖ Port Health Organization

4.1.9 Cargo and Container handling equipments

- ❖ One 40 T Mobile Harbor Crane ItalGru make at E/Wharf.
- ❖ Two Heavy Duty Reach stacker of TIL-HYSTER make of 45 T capacities each.
- ❖ Five 3 T Fork Lift Trucks of Komatsu and Voltas Kion makes for stuffing and de stuffing operations.
- ❖ One 5 T Fork Lift of Voltas Kion make for handling heavy cargo.

4.1.10 Cargo Storage

Storage Facility		
COVERED AREA (Transit Sheds and Overflow sheds)		
Location	Total Sheds	Area (Sq.m)
Mattanchery Wharf	6	19170
Ernakulam Wharf	2	5411
Container Freight Station	1	10000
Grand Total	9	34581

Fig 4.2 Source: Cochin Port Trust

A study of Cochin Port- Digital changes

4.2 Cochin Port- Digital changes

4.2.1 Digital Changes in last 10 years:

4.2.1.1 E-Thuramukham

The Cochin Port Trust (CPT) has begun a large-scale Enterprise Resource Planning (ERP) Project dubbed 'E-Thuramukham. Cochin will become the first major port in India to have a fully integrated computerized system if E-Thuramukham is implemented. Tata Consultancy Services (TCS) has modified the SAP platform for the Cochin Port Trust, and the project be in ten months. This project will build a fully integrated port information system (iPINS) based on SAP, which will aid the Port in improving its business processes and work practices, as well as its operations, management, and service. The port has decided to go with a whole and integrated IT solution due to economic imperatives and international trade compulsions.

Through this initiative, the port is integrating its operational, financial, estate, and human resource systems, which will have real-time interfaces with customs, port users, banks, and the Indian Ports Association's port community system. The system will give the trade a single point of contact for filing applications, receiving service invoices, making payments, and fielding inquiries. E-Thuramukham will match the demands of worldwide standards of service to the shipping and export and import communities by using a satellite imaging system to monitor the port's geographical elements.

It is well-known as an all-weather natural port and is strategically placed among the busiest international marine routes from the Gulf to Singapore and Europe to the Far East. During the 2006-07 fiscal year, Cochin Port handled an all-time record of 15.31 million MTs of cargo, an increase of 10.28% over the previous year (throughput during 2005-06 was - 13.88 million MTs). Container traffic increased by 11.82 percent to 2,26,808 TEUs over the period, compared to 2,03,112 TEUs handled in 2005-06. In total, 38 cruise ships docked at the Port this year, transporting approximately 16,000 passengers. Cochin has the distinction of having the most cruise ships of any port in India.

1. Commencement of first phase of International Container Transshipment Terminal

The Vallarpadam Terminal, also known as the Kochi International Container Transshipment Port (ICTT), was India's first transshipment terminal and the first container terminal to operate under a Special Economic Zone. It is located in Kochi, Kerala, and is a part of the Cochin Port. The first phase of the terminal, which was built in three stages, was completed on February 11, 2011. This facility can handle one million TEUs (twenty-foot equivalent units) of freight per year. The port will be able to accommodate 5.5 million Twenty-foot equivalent units (TEUs) of cargo per year after the third phase is completed. The terminal is managed by Dubai Ports World (DPW), which will run it for the next 30 years before handing over Cochin Port Trust authority.



Fig 4.3 Existing and Planned Facilities

Source: Vallarpadam Terminal

2. Kochi LNG

Kochi LNG is a liquefied natural gas (LNG) re-gasification plant in Puthuvype, Kochi, India, operated by Petro net LNG. At a cost of Rs.4,200 crore, the LNG terminal was built and commissioned in August 2013. Petro net LNG developed the terminal, which has a 5-million-tonne-per-year storage and distribution capacity. The terminal is currently running at a capacity of 8%. Fertilizers and Chemicals Travancore (FACT), BPCL (Bharat Petroleum Corporation Limited), and Nitta Gelatin India Ltd are the current customers. So far, two LNG-carrying ships have berthed and unloaded at the terminal. According to a deal inked in August 2009, Petronet LNG will receive 14.4 lakh tons of LNG per year for the Kochi port from the Gorgon project in Australia over a 20-year period.



Fig 4.4 Kochi LNG Terminal
Source: Google Earth

3. Samudrika – cruise passenger facilitation centre

The Cochin Port Trust's Samudrika Convention Centre (Cruise Passenger Facilitation Centre) is available for rent for wedding receptions, exhibitions, conferences, important business meetings, and banquets. The Convention Centre, which has both air-conditioned and non-conditioned halls, is located near the backwaters on Willingdon Island's north end. M.G. Road (6 km), Kundanoor Junction (10 km), and Thoppumpady Junction are all easily accessible from this area in Cochin (4 km).

4. Development of an International Ship Repair Facility

Cochin Shipyard Limited (CSL), with a projected investment of Rs. 970 crores, has been awarded development of an international ship repair facility by the Port. The facility is being built on 41 acres of land near the Mattancherry canal on the western side of Willingdon Island. A dry dock (66m x 12.5m x 4m), a slipway, and a Shiplift with transfer system for six boats will be available at the facility. The Shiplift system would be 120 metres long with a 30 metre wide lifting platform, capable of lifting light ships weighing up to 6,000 tonnes, with a LOA of 130 metres and a beam of 25 metres. Ships visiting Cochin Port will be able to get floating and docking repairs at the facility.

5. Cryogenic Warehousing

Cryogenic warehousing proposed is basically for perishable products like vegetables, meat, fish as also for pharma products. The business of an LNG terminal consists of importing, storing and regasification of LNG. The process involves handling of LNG at -160° C. As a synergy many LNG terminals world over are establishing cryogenic warehouses for multiple products – perishable and other valuable products adjacent to LNG Terminals. In the process it recovers “waste cold” from LNG Terminals. The facilities will be in line with the requirements for cold storage by significantly raising the temperature from -160° C to -70° to $+10^{\circ}$ thus meeting the cooling demand of a refrigerated food warehouse and recovering the waste heat. An area of 10 acres in Puthuvypeen next to the LNG terminal has been earmarked for setting up cryogenic warehousing using the cold energy available from the regasification process that can be used for creation of a zero CO₂ emission cold-chain hub.

6. Tea Park

Willingdon Island in Cochin Port handles around 15 million Kg of tea every year. However, the majority of present tea processing processes are done in a traditional way, with plenty of room for improvement.

On a PPP (DBFOT) basis, the Cochin Port Trust would seek to create a Tea Park with world-class facilities, similar to the Dubai Tea Trading Centre, in order to boost the quantity of tea

transacted to 25 million Kg per year. On Willingdon Island, 10 acres have been set aside for the purpose. The activities of the Tea Park would be as follows:

1. The auction house
2. Tea warehousing and the supplies needed for tea packaging.
3. Temperature-controlled storage facilities.
4. Tea firms that use Cochin Port have offices there.
5. Tea companies can use the factory to produce value-added products.
6. Tea blending and bulk packing facilities are widely available.
7. Shipping company offices to integrate manufacturing and export together in one location.

Even for projects constructed in the PPP model, there is opportunity for funding such a development through ASIDE, which is run by the Department of Commerce, Government of India.

7. Ro-Ro Facility

Kerala is a fantastic market for automobiles. Because of the traffic congestion on the roads, there is now a possibility to operate coastal Ro-Ro services for car transportation.

It takes 5 days to travel from Mundra to Cochin, and 7 days to travel from Cochin to Ennore. On the Mundra to Cochin to Ennore run, OEMs such as Maruti, GM, Ford, Tata, and Honda might be prospective clients, while on the Ennore to Cochin to Mundra run, Hyundai, Nissan, Toyota, Ford, and Renault could be potential clients.

For committed, regular Ro-Ro runs, Cochin Port offers good storage yards and reduced Port rates.

4.3 Implementing POS at CPT

Navayuga contracted to implement Integrated Port Operating System (POS) for Cochin Port Trust dated March 5 2019. Which is expected to complete first phase by 2022. Which can be delayed due to corona virus.

Cochin Port Trust will benefit from the Integrated Port Operating System, which will assist them increase the efficiency of their whole port operations. The implementation will be carried out in two stages. Provisioning of essential modules such as Marine, Cargo, CFS, and Billing operations with PCR, EDI, and SAP connectors will be part of Phase 1 activities. Online berthing, mobile applications, customer portals, RFID integration, and dashboard implementation will all be part of Phase 2.

To meet CPT's requirement for an Integrated Port Operating System, Navayuga will furnish and customise PortKonnnect, its flagship solution for the maritime area (POS). PortKonnnect, an end-to-end port management system, is already in use at major ports around the world, such as Durban, Cape Town, and Krishnapatnam, and is currently being implemented for Dubai ports under Dubai Customs' administration. Expected Modules to be availed after Navayuga Contract:

1. Equipment Management System

- Equipment Categorization
- Equipment Indent/ Approval
- Transfer/ Receipt/ Release
- Equipment Log Entries
- Service Management

2. Material Management System

- Vendor Management
- Procurement Process
- Quotation System
- Purchasing & Invoicing
- Inventory & Stores
- Goods Indent/ Receipt/ Issue/ Transfer

3. Costing Reports

- Collection of terminal operating costs
- Usage of EBIDTA to ascertain the cost of services rendered

4. Invoicing

- Alerts and reports on total pending invoices and invoice amounts
- Configurable port tariffs with effective dates onto the application
- Generation of pro forma invoices for marine and cargo operations as per tariff configurations
- Generation of pro forma invoices from service requests as per tariff configurations
- Revise option for pro forma invoice on receiving new service request
- Ability to revise invoices
- Ability to generate invoices in multiple currencies
- Integration with foreign exchange sites for currency conversions
- Seamless Integration with external finance applications such as SAP/IFS

5. Dashboards

- Terminal performance reports
- Dwell time reports
- Berth utilization reports
- Resource performance reports
- Load/discharge rates report
- Annual comparison report

6. Finance Management System

- Terminal performance reports
- Dwell time reports
- Berth utilization reports
- Resource performance reports
- Load/discharge rates report
- Annual comparison report

7. Human Resource Management System

- Recruitment Management
- Employee Information
- Leave Management
- Attendance
- Payroll Management
- Appraisals
- Personnel Calendar
- Personnel Requisition/ Allocation

8. System Administration

- User and User Group Setup and Administration
- Privileges Setup and Management
- System Configuration and Customization

Expected Features availed post contract:

1. Online Access for External Stakeholders

Vessel Agents, Terminal Operators and other external stake holders can easily access the application from any computer using a web browser without any software installation

2. Application Security

Application functions based on access privileges wherein each user is able to access the features he has access to. The login credentials are stored in an encrypted form to provide an additional layer of security

3. Alerts and Notifications (SMS/ Email)

Modern notification system capable of sending out SMS and Email notifications to the stakeholders for any events of their interest.

4. Dashboard with drilldown features

The unique dashboard designed gives an immediate snapshot of the port operations. This facilitates the senior management to analyze, monitor the performance thus enabling quick and critical decision making.

5. Automated Visual Berth Planning

The system enables Berth Planner to efficiently plan the berths using multiple berth views. System allocate berth automatically based on the configured business rules but allows the planner to override if required.

6. Auto Resource Planning

Based on the services sought and available resources, the system allows for autonomous resource planning (Pilots, Tugs, Gangs etc). It is also possible to overrule an existing plan.

7. Mobile Application

Instead of inputting data at the end of the day, the mobile solution provides pilots and field workers access to real-time updates and entry of operational information during operations. This allows for more effective planning and decision-making.

8. Tablet (Smart Phones) based solution

Tablet based solution enables the senior management to get the real time information regardless of their geographical location.

9. Integration with External Systems

Port Konnect architecture allows seamless integration with external systems like Lloyds Register, AIS, EDI, and SAP etc. as per the needs of the Port operations.

10. Reporting

Port Konnect provides comprehensive reporting which give a clear picture of the current scenario of the port which aids tracking, monitoring and analysis for better decision making. Facility to export the report to PDF, Word or Excel formats is also provided.

11. Easy System Administration

Comprehensive administrative features helps the administrator configure business critical berthing and port parameters as per the changing needs and policies. This also includes threshold values for all alarms.

12. 24x7 Support

24x7 supports through phone and email ensures that customer is never out of service. Online service desk allows registration of issues by the customer for immediate escalation and rectification.

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CHAPTER V

FINDINGS AND CONCLUSION

5.1 Findings

- India has 12 major ports run by the central government and over 200 recognized non-major ports run by state governments. In 2014-15, 69 Non-Major Ports were reported to have handled cargo traffic, out of a total of 200. With the expansion in international and domestic trade volumes, the infrastructure industry, particularly the maritime sector, is likely to grow dramatically. Because the maritime route accounts for about 95 percent of India's commerce volume (source: NTDP), there is a constant need to expand India's ports and trade-related infrastructure in order to boost industrial growth and support the 'Make in India' drive.

Challenges Faced in Digitalization of Indian Ports

- Lack of Proper Infrastructure Only certain ports are well structured and organised ports in India rest of the ports were facing poor infrastructure in India. Poor handling equipment in several port which results in poor operation efficiency. Since Most of the Indian ports were available from the olden days hence dredging is also the negative impact for attracting the more number of new and large vessels. Since there is no proper integrated structure in its ports structure, it's very much difficult to apply the technological innovation in the ports. There is no proper space for installing the smart grid and even after installing maintenance will be the other challenges. Some of the challenges described below were made by Interview with the senior executives at Adani Ports.
- Lack of PPP in Ports Public private partnership is going to be the key factor for developing the technological innovation in the ports. But Indian ports doesn't believe too much on private partnership, port will laid down too much tariff for handling the technological innovations. This will slow down the improvement in the port with respect to that of the technology. So in 2018 Ministry of shipping laid down the new regulation in which Private sector participation has been amalgamated in the development of port.
- Lack of Real Time data: In order to form the integrated system in the port, Real time data sharing about the process inside the ports stakeholders in various departments are much

more important to build up the technological innovations in the port. With the help of real time information more number of processes gets automated and digitalised in the port.

- Poor Hinterland Connectivity Even now many ports in India were not properly connected with the transport connection for local movement of goods. Hinterland connectivity of road, rail to the port is also poor. Smoothness of connectivity is also much important as far as the generating number of cargoes inside the port. Several old ports were in the heart of the city and hence the hinterland connectivity will plays an major role in port development
- Lack of Technical Expertise Another big challenges in Indian port is like, professional inside the port were having more knowledge about the business in port industry. Since the ports were from olden days, there has been a greater number of aged professional with the lack of technical expertise in the field of innovation and technology. They focus only on the operation and management. Port should include a greater number of technology experts in Business development department of port industry.
- Innovation: India needs to enrol themselves in certain initiatives by the world port industry to share and acquire more knowledge about the technological innovation in the industry. Initiatives like Chainport, Caresmatic, and Sea Traffic Management (STM). Thus looking into the Indian smart ports underdeveloped situation these are all some basic challenges in bringing up the port industry. Hence these need to be focussed in the upcoming years and make the ports smarter by creating a creating the government initiatives.
- The low capacity equipment employed at numerous berths is limiting productivity. These are primarily ancient and were created to meet certain productivity goals at the time of acquisition. The majority of the outdated equipment is woefully inadequate to fulfil today's productivity demands. Furthermore, due to a lack of regular maintenance, numerous of these pieces of equipment are severely degraded. Several ports, notably Kandla, Haldia, and Tuticorin, have highlighted a critical need for higher capacity equipment to replace existing obsolete ones. A total of twenty new mobile harbour cranes have been suggested for use in major ports.

- The draughts at major ports have typically been low in proportion to the required draught to keep up with changes in ship size and design. The average draught is between 12 and 14 meters, with some areas reaching 18 to 19 metres. To handle new generation container boats with capacity of more than 15,000 TEUs and super tankers, most ports have extended their draughts up to 23 meters globally. Indian ports will increase their draughts to take super max vessels in order to keep up with the growing expansion in freight and container traffic.
- Existing ports are unable to handle the increasing traffic predicted to arrive on Indian coastlines (both coastal and EXIM) over the next ten years due to their current infrastructure. Building new terminals and berths at existing ports has the potential to boost capacity. One such example is Kandla's coastal berth for handling food grains and fertilizers.
- Potential Projects
 1. Improvement of gate processing (at Chennai, JNPT)
 2. Improvement of rake turnaround time (in KDS)
 3. Multiple advanced technology based solutions like RFID and OCR based gate processing, etc. have been recommended across the ports. Of these, implementation of several of initiatives is underway.
 4. Increasing the draft at Ennore and Paradip from 16 to 18 m
 5. Edible oil terminal in Kochi
 6. Urban multipurpose cargo terminal
 7. Nhava creek coastal cargo terminal
 8. Ro Ro berths for handling automobile exports at Kandla.

5.2 Conclusion

By 2025, ports are predicted to be able to handle 2500 MTPA of cargo, compared to India's current capacity of 1500 MTPA. The upgrading of current ports might add 100 MTPA of new capacity. Recognizing this, Indian ports have already started a huge Port Mechanization and Modernization program to improve efficiency and keep up with international standards. Various financial opportunities exist to support this initiative, including PPP-based mechanization projects.

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