PORT CLUSTER CONSTITUENTS' FUNCTIONING AND ITS RELATIONSHIP WITH PORT PERFORMANCE: A CASE STUDY APPROACH

A thesis submitted to the
University of Petroleum and Energy Studies

For the award of

Doctor of Philosophy
in
Management

BY

Baiju. R

April 2021

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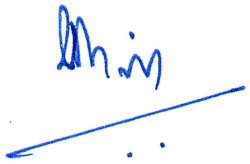
DECLARATION

I declare that the thesis entitled "Port Cluster Constituents' Functioning And Its Relationship With Port Performance: A Case Study Approach" has been prepared by me under the guidance of Dr. T Bangar Raju, (Professor of Port & Shipping, Dept. of Transportation, School of Business, University of Petroleum and Energy Studies), Dr. Tarun Dhingra, (Professor of Strategic Management, School of Business, University of Petroleum and Energy Studies) and Dr. C Unnikrishnan Nair (Former Chief Traffic Operations Manager, JN Port, Nhava Sheva).

No part of this thesis has formed the basis for the award of any degree or fellowship previously.



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ABSTRACT

For nations with maritime connectivity, shipping creates huge opportunities and takes a prominent role in economic development. Though India has vast potential for marine connectivity, the maritime sector in the country is stressed heavily when the utilisation is compared with international standards. The country, considering its geographic advantages, could emerge as a major hub if the sector was supported with sufficient policy initiatives. Currently, there are initiatives to establish a new state of the art infrastructure facilities in the sector for varied activities to elevate the Indian ports as attractive destinations for the industry.

As per the estimates of the Ministry of Shipping (MoS), thirty-eight per cent of the export cargo from the country are transhipped before reaching the final destination. In the case of import of containerised cargo, only fifteen per cent of the total volume is shipped to Indian ports through direct shipments (CRIER, Working Paper No 76) and the rest is arriving after one or more transshipments. Movement of cargo, in containers to an intermediary location to connect to the final destination, is referred to transhipment. Currently, the country's trade turns to other neighbouring countries with adequate facilities for transhipment of cargo. The major share of transshipments occurs at ports of Colombo, Port Klang and Singapore in the east and ports at Dubai and Salalah in the west. The Sri Lankan port of Colombo handles around forty-three per cent of the total volume of transhipment from and to India followed by twelve per cent by Port Klang. Ports in India which are at locations close to the international navigation routes can seize a massive opportunity by providing transhipment facilities.

The Cochin (Kochi) Port, is the only international transhipment port in India. The international container transhipment terminal (ICTT) at the Cochin port has modern infrastructure facilities and technology management systems, and have

an approach to an extensive hinterland. However, the extent of dissonance within the various actors of the port operations is causing major hindrances for achieving the designed level of performance, and hence the competitiveness of the port is substantially low. In similar transhipment ports in the region, the existence of port clusters (whereby due resonance had been created among various actors of the port operations), is one of the major reasons for having substantially higher performance. The formation of a port cluster in Cochin port may improve its performance and its market competitiveness. Hence, establishing such a port cluster and ensuring effective firm-level collaboration and cluster-wide governance have a rational and positive consequence.

Based on the above background, the business problem has been developed as under:

The performances of Colombo Port (Sri Lanka) and Port Klang (Malaysia), are complemented by the presence of port clusters, however, at Cochin Port, the performance is relatively low in-spite of having many commonalities, but without recognising, developing and promoting cluster constituents.

This business problem motivates the researcher to perform this study. With this background, this research has undertaken the study of the functioning of firms in port clusters, interlinkages of the functionalities of clusters in a seaport cluster's perspectives and the influence of various governmental and non-governmental institutions and agencies on cluster development.

Research in the area of geographical agglomeration, and in the domain of maritime business evidenced that port clusters enhance competitive advantages for the port firms and strengthens the development of the region. Therefore, the clusters are viewed as an important policy tool while considering various options for the development of the port region, from the network perspective. This research focused on studying the functioning of the constituent firms in clusters, its functionalities and its interrelationship with the determinants of port performance, which are identified as the gaps in the existing literature on port clusters which is a dynamic concept.

Based on the innovative conceptual development of the evolution and development of seaport clusters from the perspective of the dynamic functionalities at the port, this study took more measures to analyse the influence of constituents of the clusters on the determinants of performance at the port and the policy implications on the development of port clusters.

A detailed literature survey was carried out on the themes of industrial clusters, cluster theory, port cluster, cluster functionalities, cluster governance, cluster development policy, cluster performance and port performance. The exhaustive literature review revealed that there are gaps in the literature on the areas of cluster constituents' functioning and its relationship with the determinants of port performance and the manner in which the government policy influences port cluster development.

The following research problem statement had been developed on the basis of these gaps identified in the literature review.

Although the existing literature talks about the port cluster and about the port performance, the constituent firms' functioning within the cluster, which result in the port performance is not known. Also, the influences of the Government policies on the development of port clusters is not known.

Further, the research questions & research objectives were formulated for this research study to analyse how to port cluster constituents function and influence the determinants of port performance, and how government policy influences the port cluster development. These questions are exploratory, and it seeks to explore and find out the cluster dynamics existing at the selected ports. Further, it seeks to understand the influence of policy initiatives with regard to the cluster evolution and development in the seaport sector, in each of the ports of study.

The purpose of the research was to critically analyse the functioning of seaport cluster constituents, its influence on the performance of the port and to understand the influence of the Government policy on the cluster development, in the transhipment ports of Colombo and Klang and to identify those constituents which are relevant for the port of Cochin, and to attempt to create a framework for the establishment of a port cluster at Cochin port. Accordingly,

the research objectives; (i) to analyse how the port cluster constituents function (ii) to analyse how the port cluster constituents' functioning influence the determinants of port performance, and (iii) to explore how the Government policies influence the port cluster development, had been finalised.

At the organisational level, the tacit knowledge, as well as the explicit knowledge in the field of cluster constituent functionalities, are available with the personnel associated with the port authority and the professionals in the firms associated with port activities. It was required to gather an in-depth understanding of this knowledge in analysing the cluster constituent functioning. Therefore, qualitative research method was adopted to capture and reuse the tacit and explicit knowledge in the field of clusters at the seaports reviewed. The requisites of the research study and the researcher's ability, best matches with the case study method. Hence the case-study method was chosen for this research. This method of investigation and analysis is chosen when inquiries are in the nature of "how"s or "why"s, and also when the investigator has partial or no influence on the occurrence of incidents, and as the current events are emphasised over archaic events within few real-life situations (Yin, 2003). Also, the case study research method permits the researcher to analysing both the events of interest and various situations, establishing a substantial number of prospectively significant factors (Yin, 2003).

The case study approach has been found to be suitable for this research study, also since the method has established that the predominant disposition amongst various categories of case studies, is to highlight one decision or a sequence of decisions, namely, the reasons for drawing these decisions, the method of execution of these decisions, and the outcome of the implementation of these decisions (Yin, 2003).

For this research, to study of the constituent firms' functioning within the cluster which result in the port performance; two major transhipment ports in South Asia, the Colombo Port, Sri Lanka and Port Klang, Malaysia which is located in the East-West maritime route were selected.

Data collection was done through semi-structured interviews from professionals, practitioners and managers of various businesses associated with

port operations, through a structured Case Study Protocol (CSP), participant observation, collection of documentary evidences, and informal discussions at Colombo Port and Port Klang. The semi-structured interviews were duly recorded, and the recordings were transcribed. The interviewees' feedback on the transcripts were collected. Qualitative Analysis software, Atlas.ti, was used to perform the coding of the interview scripts. Atlas.ti aided the procedures and phases of data analysis in creating codes, linking the codes and quotations, assisted in editing and categorising, and in data visualisation as qualitative associative networks (QAN). Modified grounded theory approach (Eisenhardt, 1989; Charmaz, 2006) has been used for data analysis.

Individual cases were analysed, keeping research questions in mind. Further, Cross case analysis was carried out to correlate and discuss the similarities, differences and, harmonising evidences in the study of cluster constituent functioning, cluster functionalities, the influence of cluster constituent functioning on the port performance and the policy influences on port cluster development. Based on case comparison, the relative findings and contextual factors across the cases are brought out.

The detailed data analysis, as above, resulted in various categories which described the functionalities of the clusters, the influence of cluster constituents on the port performance and the influence of govt policies on the development of clustering activities at the port. This study was based on four major themes, i.e., cluster constituent functionalities, inter-linkages of firms within the cluster, the influence of cluster functionalities on port performance and Governments policy supports in port cluster development. Every port (and terminal) has a unique geographic, economic, regulatory and operational characteristics. The Efficiency of services, Logistical integration, Infrastructure and growth management and Terminal-city integration are the common challenges in all clusters. The study discusses the interlinkages of firms within the cluster, and it is observed that the strength of it increases with process complexity. "*Learning Intensity*", "*collaborative procurement*" and "*compositional effect*" are the new sub-constructs emerged from the study. This study identified the factors; trust, commitment, mutuality, dependency, relationship investment, shared values,

communications, flexibility and response, and co-operation as the major the dimensions for the interfirm relationship in a cluster. The study provides detailed discussions on the measures in Government policies developing clusters in the seaport. This research endows with vivid description to the cluster theory and cluster functionalities at a port level in an intensive industry like maritime industry. Twenty-two Propositions have been developed based on the cross-case analysis in the study.

The research study could provide guidelines for the cluster organisations, especially in the port and shipping industry, to optimise the cluster activities. This study would assist the practitioners in setting benchmarks for the cluster engagement and in utilising the cluster mechanism to optimise benefits for the firm. The study could also provide guidelines for formalising a port cluster and sub-clusters in Cochin port to optimise the cluster activities by helping the managers to set benchmarks for the cluster engagement and to utilise the cluster mechanism to optimise benefits for the firm. They can also develop effective and efficient collaborative and integration strategies with other players in the cluster.

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1st July 2021 Baiju R

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CFS	Container Freight Station
CHA	Customs House Agent
CICT	Colombo International Container Terminal
CSP	Case Study Protocol
EIS	European Innovation Scoreboard
FGD	Focus Group Discussion
GMpH	Gross Moves per Hour
GDP	Gross Domestic Product
ICC	Initial Conceptual Construct
ICT	Information and Communication Technology
ICTT	International Container Transhipment Terminal
IGTPL	India Gateway Terminals Private Limited
JCT	Jaya Container Terminal
MoS	Ministry of Shipping
PKA	Port Klang Authority
PKFZ	Port Klang Free Zone
PPP	Public Private Partnership
QAN	Qualitative Associative Network
SAGT	South Asia Gateway Terminal
SCPF	Structure-Conduct-Performance Framework
SEZ	Special Economic Zone
SLPA	Sri Lanka Port Authority
TEU	Twenty Equivalent Unit
UCT	Unity Container Terminal

CHAPTER 1.

INTRODUCTION

The cluster theory has been considered and adopted as an effective policy tool in implementing regional industrial development. The quintessence of an agglomeration is that the value of the aggregate economic contribution in a region shall surpass the sum of the individual contributions of its constituent firms, in cases where clusters are present. Further, the clustering creates a concentration of distinctive capabilities and competitive advantage in a particular domain. Clusters enhance the geographical advantage in terms of competitiveness. Clusters augment productivity, which in turn contributes to increased efficiency in the business processes. Clusters by way of creating networks and knowledge sharing thus created enhances the innovation capabilities. This strengthens the collaborative environment, which leads to increased productivity and efficiency. The evolution and development of seaport clusters have been considered as a highly relevant policy tool from the point of view of networking.

This research intends to study the inter-relatedness of functionalities of seaport cluster, the functioning of the constituent firms in a port cluster, its influence on the determinants of port performance and the influence of policy measures on the evolution and development of a seaport cluster. This chapter introduces the research background, business problem, the theoretical underpinning of the cluster concept, significance of research and thesis disposition.

1.1 BACKGROUND

For nations having maritime connectivity, the domain of shipping creates huge opportunities and takes a prominent role in economic development. Efficient ports add value the process of supply chain and thus contribute substantially to the economic growth of the region.

Though India has vast potential for marine connectivity, the maritime sector in the country is stressed heavily when the utilisation is compared with international standards. The country, considering its geographic advantages, could emerge as a major hub if the sector was supported with sufficient policy initiatives. However, currently, there are initiatives to establish new state of the art infrastructure facilities in the sector for varied activities to elevate the Indian ports as attractive destinations for the industry.

The economic development of a geographical territory has a direct relationship with the availability of infrastructure in the region. Establishing an effective system to provide adequate infrastructure support is the key element of progress in any nation. In a globalised era where the movement of resources are liberalised, the logistic connectivity across the borders is critical for the business and trade. A seaport is fundamentally an economic infrastructure which facilitates overseas traffic of goods. In the case of India, ninety per cent of the global trade is connected through the maritime sector. This makes the relevance of establishing the effectiveness of seaports.

1.1.1. Transhipment Of Goods From/To India.

As per the estimates of the Ministry of Shipping, thirty-eight per cent of the export cargo from the country are transhipped before reaching the final destination. In the case of import of containerised cargo, only fifteen per cent of the total volume is shipped to Indian ports through direct shipments (CRIER, Working Paper No 76) and the rest is arriving after one or more transshipments. Movement of cargo, in containers to an intermediary location to connect to the final destination, is referred to transhipment. There are two categories of activities involved in transhipment in the maritime sector, namely, hub and spoke transhipment and relay transhipment. In the case of former, the cargo is transshipped from smaller ships, which are called feeder vessels into larger ships which are called mainline vessels; and in the case of the former, the cargo is exchanged between two mainline vessels. In both cases, the process of transhipment causes a delay in transit and entails additional expenses.

Currently, the country's trade turns to other neighbouring countries with adequate facilities for transhipment of cargo. The major share of transshipments occurs at ports of Colombo, Port Klang and Singapore in the east and ports at Dubai and Salalah in the west. The Sri Lankan port of Colombo handles around forty-three per cent of the total volume of transhipment from and to India followed by twelve per cent by Port Klang. Ports in India which are at locations close to the international navigation routes can seize a massive opportunity by providing transhipment facilities. However, establishing port infrastructural facilities and ensuring operational efficiency is critical in realising that opportunity, by competing with Colombo and Port Klang to attract the domain's operators within and outside the country. This will be possible if the industry recognises the port as competitive and attractive in the by enhancing productivity and by adopting efficient processes.

1.1.2. Asian Container Transhipment ports in the East-West Maritime Route.

Major container transhipment ports in the Asian region are Colombo, Port Klang, Singapore, Port of Tanjung Pelepas, apart from the port of Cochin. India's trade through sea amounts to 90 % by volume & 70 % by value of the country's total international trade. India owns 53% of container throughput in the South Asian region with 13 major ports and 187 minor ports. Though many shipments are direct, 68% cargo is transhipped to various destination ports. Transhipment traffic is the cargo that is transported between one port and an international "hub" port when direct mainline connections are not available.

Colombo Port and Port Klang are nearest transhipment ports to India in South and Far East Asia. Even with better proximity to the busiest East-West route, Cochin Port is losing Indian transhipment business to Colombo port and Port Klang, which attracts 43% & 12% respectively, of Indian transshipment business. The features of the Colombo Port and Port Klang are illustrated in Table 1.1

Table 1.1 Features of Colombo Port and Port Klang

Features	Port of Colombo	Port Klang
Category	Transhipment Port	Transhipment port
Container throughput (Million TEU/annum) 2018/2019	7.01 / 7.20	12.32 / 13.58
Container handling Capacity (Million TEU/annum)	7.50	19.60
Capacity Utilisation (%) 2018/2019	94.00 / 96.00	62.85 / 69.29
Quay Length (km.s)	8.47	11.40
Access channel (mts) maximum Draft	18.00	18.00
JOC World Port Ranking 2019	25th Position	12th Position
Location	In Indian Ocean, on the East West maritime route (Suez route/ Gulf Route)	In Malacca strait, on East West maritime route (Suez route/ Gulf Route)
Clusters & Sub clusters	Yes	Yes
Special Economic Zone	Yes	Yes

(Source: World Port Source, http://www.worldportsource.com; Annual reports of Port Klang Authority, and Sri Lanka Ports Authority)

Fig.1. 1. Suez & Gulf Maritime routes (Source: IGTPL)

1.1.3. Cochin (Kochi) Port.

The Cochin (Kochi) Port, the only international transhipment port in India, 76 Nautical miles away from the mainline of the East-West trade route through Suez, as well as 11 Nautical miles to the Gulf route, enthralling an 8hr transit and deviation time from the route to the port, have access to resources and enjoy the strategic location, and huge potential for channelising a broad market base. The International Container Transhipment Terminal (ICTT), at the Cochin port has modern infrastructure facilities and technology management systems, and have an approach to an extensive hinterland. However, the extent of dissonance within the various actors of the port operations is causing major hindrances for achieving the designed level of performance, and hence the competitiveness of the port is substantially low.

In similar transhipment ports in the region, the existence of port clusters (whereby due resonance had been created among various actors of the port operations), is one of the major reasons for having substantially higher performance. The formation of a port cluster in Cochin port may improve its performance and its market competitiveness. Hence, establishing such a port cluster and ensuring effective firm-level collaboration and cluster-wide governance have a rational and positive consequence.

The International Container transhipment terminal (ICTT) which is known as the Vallarpadam terminal is located in Cochin, Kerala. The construction of this terminal was awarded in 2005, under a PPP concession mode and its first phase got commissioned in 2011 (IGTPL, 2018). The port is built under PPP structure on a Build Operate Transfer (BOT) mode for 30 years between the Cochin port trust and Dubai Ports World (DP-World). So as per the agreement DP World, through an SPV (special purpose vehicle) created by it in the style of India Gateway Terminals Private Limited (IGTPL), will operate the terminal for 30 years and thereafter transfer its control to Cochin port trust. ICTT is the only terminal in India built with the idea of a dedicated container transhipment business. The reason behind India government developing this terminal was to bring back the business from Colombo which is handling around 1.2 Million

TEUs of Indian export container business at various ports outside the country. Transhipment also creates dependence on the International hubs for the nation's foreign trade. The Cochin port is only 76 Nautical miles away from the mainline of the East- West (Suez) trade route and only 11 Nautical miles to the Gulf- Far East route. While Colombo has been the major competitive ports to India in terms of the container trade especially transhipment business as the proximity of the port to the mainline trade route is just 19 Nautical miles, i.e. an hour journey deviation to the port. Talking about the Infrastructure provision of the port, it is considered one of the most modern terminals in India and gives highest productivity. The current configuration of the terminal is having a capacity of handling 1 Million TEUs. The port has the unique status of "the only transhipment hub in India". The port has developed an 8.5 Km rail link to the national rail grid to support the transportation of the container from its hinterland and a six-lane road of 17 Km length linking to national highways, for container transportation. The container throughput of the terminal is functioning 50 % less than its capacity because of a lot of reasons like the introduction of the cabotage law, the dispute between the customs and the SEZ making the business at the terminal idle and shipping lines not wanting to visit the port.

Looking at the present figures, the operations of the port is not up to the mark and not utilizing capacity. The main reason is frequent dredging at the berth which delays the vessel berthing and the adequate draft not achieved to berth the mainline vessels. If focusing about only transhipment, the port handles an average of 10-15% of transhipment yearly of the total throughput which reflects a negative impact of the terminal as it was purely set up for transhipment business.

The Cochin International Container Transhipment Terminal (ICTT) is one of its kind and is the first one to operate in the Special Economic Zone (SEZ). The advantage of a port functioning in SEZ is that the traders would be offered duty-free debates, tax exemptions and easy customs clearance on the goods imported and exported. The SEZ would provide a hassle-free evacuation of cargo and allows the traders to set up industries near to the port under the specified zone.

The special economic zone is considered as a territory outside India even still operating under India. The union government has clarified that the special economic zone procedures will be only applied for the sea-sea transhipment container cargo at the ICTT. The cargo procedures for foreign-foreign, foreign-India and India-foreign custom procedures will be taken by the SEZ, while the cargo to be cleared and moved out of the port through rail and road will be inspected by customs of the department of revenue. The problem occurring between SEZ and revenue department is that the revenue department wants to check the transhipment cargo too which becomes a lengthy procedure which has declined the transhipment business comparing other International transhipment terminals, there is no such long time taking procedures. Due to this jurisdiction dispute between the customs (Revenue Department) and the Special economic zone caused delay over the clearance of the transhipment containers costing precious time for the terminal during its initial days. During this period, Colombo consolidated its position while Cochin was struggling for approvals and procedures. It was found from the pilot study that 100% of container cargo is transhipped from the East coast ports and 70 % from the south-east ports. The problem where ICTT lacks behind is the transferring of the duty-free debates offered to the traders which, when compared to Colombo, has a very transparent procedure. For example, if a container from Tuticorin port is to be transhipped through Colombo hub, then direct feeder service would be sent, and the duty-free rebates would be received the next day itself whereas, if the same container is to be transhipped from ICTT Cochin, then the traders have to wait for a week to retain the rebates because of which traders directly transhipto Colombo because of hassle-free service. Port of Colombo is the biggest contender of the Cochin port in the container traffic market, especially in the transhipment segment in the Indian sub-continent. Colombo is way ahead of Cochin in terms of capacity, pricing and productivity. ICTT does not have flexibility in rates, unlike Colombo. The ICTT Cochin demands way high charges than what is offered by Colombo. Here the vessel-related charges are managed by the Cochin port trust while the operational charges are managed by the DP world. Usually, the charges are decided by the terminal operators, but a meeting is organised by the TAMP authority where the operator, government

and the shipping lines decide the tariff of the operations. The terminal handling charges are higher at ICTT when compared to the other major ports of India. To give competitive rates in vessel-related charges to attract big container ships, the Cochin Port Trust and the government took their own time by when Colombo further established its credentials as a trans-shipment hub.

1.1.4. Colombo port: The transhipment Competitor – a profile.

The Colombo port is a major transhipment port in the Indian ocean, strategically located close to the major maritime network. Colombo port consists of Colombo International Container Terminal (CICT), Jaya Container Terminal (JCT), Unity Container Terminal (UCT), and South Asia Gateway Terminal (SAGT). JCT and UCIT are fully owned and operated by the Sri Lanka Ports Authority (SLPA). The CICT, SLPA and SAGT accounted for 38.0 per cent, 32.7 per cent and 29.3 per cent, respectively, of total container handling within the Colombo port during 2018 (Sri Lanka Port Authority, 2018). The existing capacity of the Colombo port is to handle approximately 7.50 Million twenty equivalent units (TEU) annually. The port handled 7.01 million TEUs in 2018, which is 12.88 per cent growth from the previous year (Sri Lanka Port Authority, 2019). Forty three per cent of cargo originating from India are transhipped at the Colombo port. Colombo has a structured port cluster with multiple sub-clusters in various forms, including trade associations. With a work force of approximately 13,500 personnel including professionals and skilled labour, Colombo hasn't had a work stoppage in more than two decades. Colombo Port is ranked at 24th position among container seaports in the world (World Shipping Council, 2018). In the ranking by the JOC port productivity research, Colombo port had been ranked consistently in the first place among the south and south-east Asian ports since 2014, with an average rate of 86 gross moves per berth during a vessel is at berth in the port. That compares with Asia's top port overall rating, which is at Tianjin port, China, with 127 moves per berth (Szakonyi, 2016). The container moves which include onload, offload and repositioning of a container, during the vessel is at berth, is described as the gross moves per berth for an individual ship.

1.1.5. Port Klang, Malaysia.

Port Klang, the maritime gateway to Malaysia is the major transhipment port in the East Asian region. Prominently located on the busiest East- West maritime route, Port Klang act as the transhipment hub for South Asian and ASEAN major ports. Being a geographical area surrounded by sea and the excellent navigability of the Straits of Malacca strengthened the visibility of Malaysia in the maritime sector. Malaysia also has a substantial maritime industry consisting of many major ports, state of the art terminal facilities, ship services, numerous shipyards and an overabundance of other businesses and institutions concerned with activities related to the maritime sector. All these entities become cardinal and critical constituents of the port clusters in Malaysia.

Port Klang Authority (PKA) consists of two separate port operators, the West Port and the North Port, with container throughput contributions of 77 per cent and 23 per cent respectively in this major seaport in the East-West international maritime route (Port Klang Authority, 2018). Port Klang, with handling approximately 12.32 million twenty equivalent units (TEUs), is ranked at 12th position among container seaports in the world (World Shipping Council, 2018). In 2018, West port terminal alone has handled 9.50 Million TEUs (West port Holdings Bhd., 2018). To accelerate port's operations from the hinterland, dry ports at Padang Besar Cargo Terminal (PBCT) and Ipoh Cargo Terminal (ICT) in the northern region of peninsular Malaysia, Nilai Inland Port (NIP) in the central region and Segamat Inland Port (SIP) in the southern region of peninsular Malaysia (Jeevan et al., 2015) are well connected to the Port Klang terminals. Port Klang has a Free Commercial Zone (FCZ) and two Distribution Parks. The FCZ facilitates support activities transhipment operations at the port. The Distribution parks, termed as Distriparks, offers facilities for storage, consolidation of cargo and regional distribution to support the port terminals. These distriparks also extends the services of Port Klang's Global Procurement Office and the Asian Parts Centre to the trade.

1.1.6. Performance of Transhipment Ports: Presence of Clusters

The port productivity and efficiency depend upon efficient operational ecosystem at the port, the quality, consistency and reliability of seaside and hinterland services, connectivity to the port and adequate warehousing, handling and transport facilities at the port. From among many factors which decide the efficient performance of the ports, the operational systems holds a prominent position. Such a system should have operating efficiency at par with the leaders among the global transhipment ports. On examining the different elements contributing to the operational efficiency and thus, the port performance, it was noticed that the operational efficiency of successful transhipment ports, is hugely impacted by the presence of port clusters. In the current context, among the transhipment ports, the trade from India is dependent on, the ports of Colombo and Port Klang benefit immensely from the existence of port clusters.

1.2 BUSINESS PROBLEM

Based on the above background, the business problem has been developed.

The performances of Colombo Port (Sri Lanka) and Port Klang (Malaysia), are complemented by the presence of port clusters, however, at Cochin Port, the performance is relatively low in-spite of having many commonalities but without recognising, developing and promoting cluster constituents.

All the above three ports, Colombo Port, Port Klang and Cochin Port are international trans-shipment ports and are strategically located in similar geographies, along the major international East-West shipping lanes (Suez route and Gulf route), connecting Europe, Africa & Middle East ports and the Far East and the Australasian ports. This business problem motivates the researcher to perform this study. With this background, this research has undertaken the study of the functioning of firms in port clusters, interlinkages of the functionalities of clusters in a seaport cluster's perspectives and the influence of various governmental and non-governmental institutions and agencies on cluster development.

This business problem lead to further exploration of literature.

1.3 CLUSTERS: AN INTRODUCTION

Clusters are populations consisting of associated business in an industry where public or private organisations individually or collectively have already established or potential to establish economic linkages with each other. The term cluster articulates the subsistence of an agglomeration of similar economic activities in a geographical territory, in terms of inputs, technology or products and markets. Their Interconnectedness is driven by inter-firm networking, collaboration and labour mobility. Firms in a specific geography, engaged directly or indirectly in the business processes of an industry can have linkages with all or some of these other businesses in that industry cluster. The cluster provides opportunities for businesses to establish links whenever there are possibilities for developing a relationship with each other. The basic functionalities of a cluster and the benefits for a firm in the cluster are illustrated in fig. 1.2.

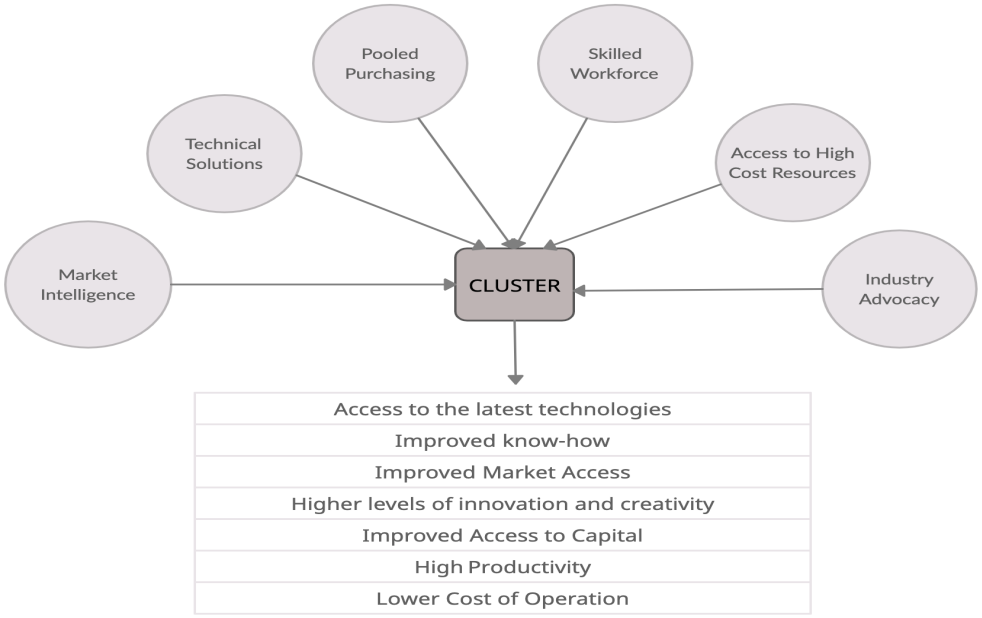

Fig.1.2. Basic functionalities of a cluster (Source: Alan M Field, 2013)

Being part of the cluster, the chances of establishing such relationships are high. These complementary relationships are often established among competing organisations, which are constituents in the cluster. While the cluster firms often work in such a manner that they complement each other, they also conduct their businesses individually, which is not in isolation. Each of the constituent firms

can be part of any other value chain outside the cluster as well. This connection which crosses the boundaries of the cluster arrangement can bring in the growth of the business, which in turn shall be beneficial for the competing or complementing firms in the cluster. This widens the domain of the cluster, arbitrarily. However, as to analyse a cluster, we have to establish a boundary in-order to analyse the cluster for its economic processes, to develop economic policies and to establish proper coordination.

Clusters are of various types, categorised depending on the core industry, geographical region and economic activity. The categorisation of the clusters made thus, shall be somewhat primary in-order to incorporate all constituents in the specific economic specialisation. This also allows the firms part of one cluster to be part of another cluster in distinct industry. In order to identify the categorisation of the cluster, it is appropriate to consider an economic specialisation that is relatively important in the specific region. Thus, a cluster can be called a port cluster when all the constituents of the cluster are associated with the economic specialisation of the region, that is the port industry.

Few basic analysis will help to establish the conceptual boundaries of clusters. Analysing (a) the economic specialisation of the region, (b) the economic activities and its interdependencies and linkages and (c) the nature and significance of the constituent firms in the core economic activity, will set an appropriate conceptual boundary of the cluster. A good overview of existing approaches, including the most commonly used methods are suggested by Bergman and Feser, (1999) to analyse the economic activities in a cluster. For certain situations, defining the economic activities considered in the cluste r will result in a shift in the economic specialisation. Further, the study of the particular geographical area will, in many situations, lead to the identification of certain economic specialisation and a clustered economic activity in that region.

The inter-relationship among the constituents of an agglomeration is quintessential for the efficiency and effectiveness of a cluster. Clusters enable the member firms to enhance the sophistication of company operations and strategy. Porter (2000) pointed out that the clusters facilitate the firms to move

along the trend of global business shifting the focus from internal vertical integration to relying on third parties which are the outside suppliers, partners, and institutions. He has further observed that the clusters impart efficiency improvements in the operations of the member firms due to quick diffusion of industry's best practices and opportunities for practising better business models and approaches.

The competition in the global, as well as local domains, are becoming more skill-intensive. The clusters create a quality business environment by facilitating formal as well as informal collaborations in the vertical and horizontal domains in the same geographic space. On analysing the influence of the clustering activity on the performance and the functioning of the constituent businesses, it is imperative to examine the effects of horizontal collaborations and vertical collaborations the cluster dynamics create. It is sensible to analyse the interrelationship of the cluster constituents on a supplier-customer framework, especially in a geographic cluster.

1.3.1. Defining Clusters

A cluster is defined as a geographic agglomeration, a consortium of enterprises engaged in activities within and supporting a particular business sector. This consortium enables the firms which are constituents of this cluster to operate at a bigger scale of operation and larger business domain.

1.3.2. Cluster Theory

Clusters were a topic of discussion among intellectuals since the later part of the 19th century. It was viewed as an agglomeration of business entities with a mutual interest to produce benefits out of businesses (Neale, 2017). Progression of the cluster concept is from externalities and agglomeration, agglomeration to an innovative environment, and lately to industrial districts (Iammarino & McCann, 2014). Fundamentally, the cluster concept is a theory of strategic management that emphasis on the features of clusters as an agglomeration of industries with specialised attributes in specific geographic territory identified as industrial districts (Sforzi, 2015). Even then, the research on the cluster concept is constructive since clusters are dynamic entities.

Horizontal integration strategy is about establishing interrelationship among competitors evolving from opportunities for sharing activities and know-how, in the core business process. And the vertical integration comprehends the collaboration between the suppliers and customers (internal or external) in the value chain of the business process. The members of the cluster are firms complementing the processes of other businesses in the industry. Firms in the industry establish competitor - collaborator relationships (horizontal) and complimentor- collaborator relationships (vertical), within a cluster.

1.3.3. Clusters and Competitiveness

A firm gains competitive advantage among other players in the domain it operates, by three basic ways, by having a focused customer base, with a proper differentiation in its product features and business models and by having effective cost advantage in its operations (Porter, 1990). Nelson (1992) noted that there are three levels of competitiveness. These are categorised as micro, meso and macro levels of competitiveness. He has linked these three levels to three domains of functioning, namely, the organisation, the industry and the nation respectively. Accordingly, the organisational competitiveness is reviewed as micro-level competitiveness and the industry level it is characterised as meso level. Competitive advantage is gained by acquiring distinctive competencies. Competency can be achieved by a firm by focusing on its innovation capability and productivity.

When suppliers are located in the same geography/ location, which is close to the consumers of products or service, the agglomeration effect is generated and the benefits of it, in terms of skills, labour pool, technical know-how and innovative practices are enjoyed by all stakeholders present in the cluster (Delgado, M, 2016). The relevant definition for suppliers in this context is providers of intermediary products of services (Delgado& Mills, 2016). The productive efficiency of any business is enhanced by establishing interdependence of all constituent firms in the value-chain, and their activities. Competitiveness of an industry is the ability of the firm or industry to address the challenges thrown up by the same industry operating in a different (geographic) domain (Ketels, 2006). Further, the competitiveness of the firm is

the degree to which the organisation can produce its products and services to compete with similar products and services in the international markets without compromising the interests of its stakeholders (Najib et al., 2011)

The firm's scale of operation and the extent to which the firm's competitiveness can be enhanced, are influenced by the volume of business it can access (Taybout, 2000). This means that the performance capability of the firms, especially firms in industries where the business models are diverse and scattered, is enhanced by achieving a higher volume. Such economies of scale available for the cluster members are a result of the division of labour within this consortium (Sonobe and Otsuka, 2006)

The spatial concentration of firms enhances the competitiveness of business enterprises in a bigger domain by imparting collective efficiency by innovation and process optimisation. Amin and Thrift (1994) noted that the clusters encourage the division of labour between the member firms and thus, help to enhance the innovation possibilities. As the firms within a cluster have access to more resources by virtue of being a part of the agglomeration, and hence benefit from these resources to gain competitive advantage (Hsu et al., 2013).

As noted by Porter (1990), the competitiveness of a nation in the international markets, for any specific industry depends on the geographic proximity it has with the supporting and ancillary businesses. It means, if there is a network of ancillary and support businesses exist, the chances of the nation becoming competitive in the market for that industry is more. One of the parameters in his diamond theory, thus, emphasises the importance of a cluster of allied businesses in geographic proximity in the industry becoming competitive. In the perspective of the network theory, healthy interactions among stakeholders hold significant importance in maintaining a competitive advantage for the business (Bell et al., 2009).

The cluster creates constructive measures for the overall development of the member companies. Cluster models will exhibit horizontal and vertical integration of business processes. Pomponi et al. (2015) noted that horizontal collaborations enable the firms to sustain their market power. The vertical

collaboration leads to a healthy contractual relationship. Maskell (2001) observed that if the firms in the value chain components are clustered, it can bring in savings in transaction costs and long-standing contractual relationship. Vanovermeire et al., (2003) observed that in addition to the cost-saving and optimisation in transportation activity, the horizontal collaboration leads to many other benefits for the participating firms in a cluster. This includes savings in handling cost, service improvements, brand promotion and business model innovation. Studies (Awad, M.I et al., 2017) have shown that there is a unidirectional link between the performance improvements and competitiveness of firms in the cluster.

Leading firms of the key (anchor) industry and the related and supporting businesses, work in unison in clusters enabling the processes in the value chains to ensure more value-added and competitive deliveries in the markets. This enhances the efficiency and competitiveness of the firm in a cluster scenario. As a network-based collaborative system in industry generates benefits to the associated firms, the region and the nation, the authorities are focusing on the formation of clusters. UNIDO (2013), observed that the industry agglomeration is an import element enabling the economic development, many governments and policymakers consider clusters as a measure for the development of enterprises which act as a catalyst for innovation in the industry.

It is important to consider the contributions an industry agglomeration make towards the regional development. Vlasceanu (2014) noted that the geographic concentration of innovation activities in a cluster leads to more employment opportunities and thus, living standard of the population. Haviernikova (2013) observed that in various definitions of clusters, the common feature is the geographic concentration and the ability to network within the industry as well as related businesses. Thus, clusters are defined as a collection of firms, economic entities, and institutions which are carrying out their businesses in geographic proximity and thereby acquire skills, resources and capabilities for enhanced competitiveness (Clipa et al., 2012).

The productivity of firms is equally important, besides competitiveness. The pattern of competition impacts productivity than the characteristics of the

market. The industry clusters have influences on shaping the pattern of competition, as the characteristics of the business environment in a region and industry are shaped by the influence of the business aptitude of the active participants. This aptitude in a clustered environment is shaped by a collective effort and will be often standardised and could be benchmarked for the industry. Thus, the defining factors of competition in the constituents of a business model are associated with the industry cluster. Such determining factors constitute many of the essential features of microeconomic competition (Hsu MS et al., 2013). Malmberg and Maskell (2002) identified three benefits for the firms in a cluster, availability of collective resources and facilities thereof, availability of specialised inputs due to development of intermediary businesses and access to the pool of skilled human resources from the locality. Further, the research of Knox et al. (2003), endorsed that these benefits are available to the enterprises within a cluster and leads to cost advantages.

1.3.4. Port Clusters

The development of clusters in a specific industry in a particular location demands the appropriate triggers and conditions (Isaksen, 2016). The development and impacts of the agglomeration of firms had been reviewed in the literature using various distinct approaches. The port (maritime) sector is one such industry where the geographical agglomeration of related firms has considerable potential to contribute to the economic performance of the region. Concept of clustering in the maritime sector had been developed over the years, and the components and functions of the clusters in the sector had been optimised during this evolution. The port cluster comprises of establishments and firms (Fig. 3) contribute to the competitiveness and innovative capabilities in the maritime industry.

Research shows that such clusters enhance competencies of the port, the clusters and its constituent firms in the maritime industry which in-turn contribute to the development of the region. This encourages the policymakers to consider clustering in the maritime industry as a policy tool to promote regional development. And this corroborates the relevance of an effective cluster policy for the ports (maritime) sector.

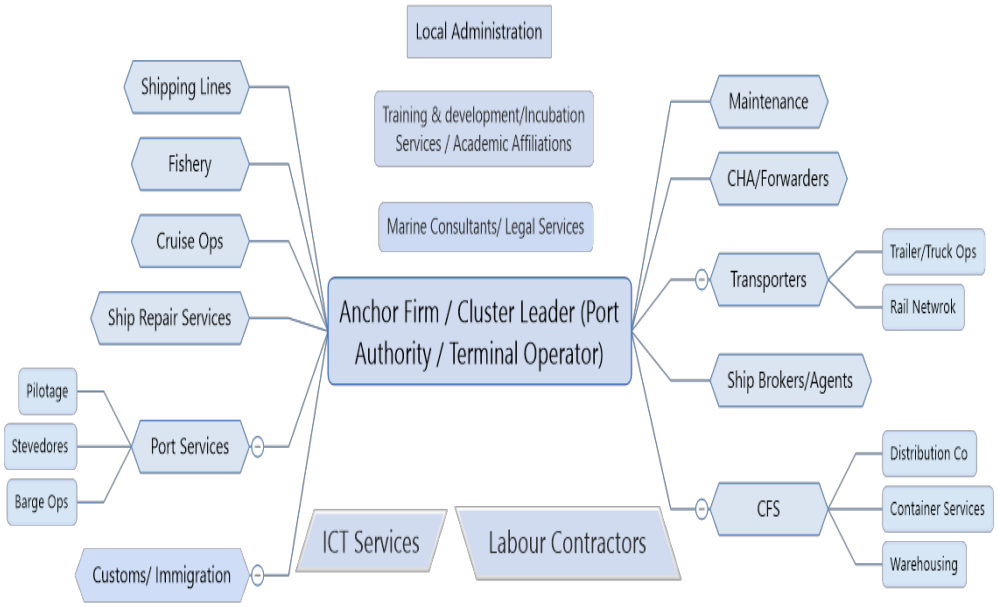

Fig.1. 3. Port Cluster Constituents (source: Author)

The competitive strength of a seaport lies in its expertise in establishing and maintaining its competitive advantage. Ports focus on creating combinations of unique resources through internal and external strategic collaborations in order to gain a competitive advantage (Haezendonck & Langenus, 2018). Zainal et al. (2019) observed that the competitiveness of Malaysian seaports is limited to ten factors among many more for major world seaports (Fig. 3) They further argue that competitiveness can be further enhanced by strengthening the cluster competitiveness of the ports. Research of Noralam et al. (2019) established that the seaport competitiveness depends on port effectiveness, reliability and governance. Existence of clusters in seaports enhances these factors.

A port cluster is looked at as a combination of horizontal as well as vertical collaborations of businesses engaged in port logistics in the specified geographic space, that is, the seaport. Each of the constituents of the cluster interacts in the horizontal plane, with its peer firms who are competitors and with its customers and suppliers. Customers and suppliers could be internal customers and suppliers.

The inter-relationship with the competitors or the co-operation with the competitors provides learning opportunities for the firm apart from the benefits of collective bargaining with its customers and suppliers.

Most-applied dimensions identified for the interfirm relationship are trust, commitment, inter-dependence, networking, common ethics and beliefs, interactions, the longevity of relationship, adaptability and environment for collaborations.

The collective representation of the business by the competing firms and thereby gaining opportunities to engage in more business leads to improve the performance of the firms. Further, the firm gains learning opportunities from its competitors and opportunities, to engage in collective innovation in the industry's business process. Thus, the cluster environment helps the clustered firms in a similar business to enhance its competitiveness through collaboration with each other within the cluster.

In the context of port operations, clusters refer to a group of interrelated business firms that have geographic proximity. These business entities strive for the improvement of their economic activities (Morosini, 2004). These agglomerated business firms will have access to strategic assets, improved and updated know-how, information, and infrastructure facilities (Hoffmann et al., 2011; Niu et al., 2012).

To a greater extent the competitiveness of ports, including transhipment ports, depends on the business generated from the hinterland. The hinterland networks, hence influence the competitiveness of the ports (Robinson, 2002; Notteboom et al., 2005). Clusters enable the hinterland network, which includes transporters, railway, container freight stations, and agents to be more efficient and effective. There are two distinct dimensions to a cluster, a functional dimension and a geographic proximity dimension, as shown in fig. 1.4

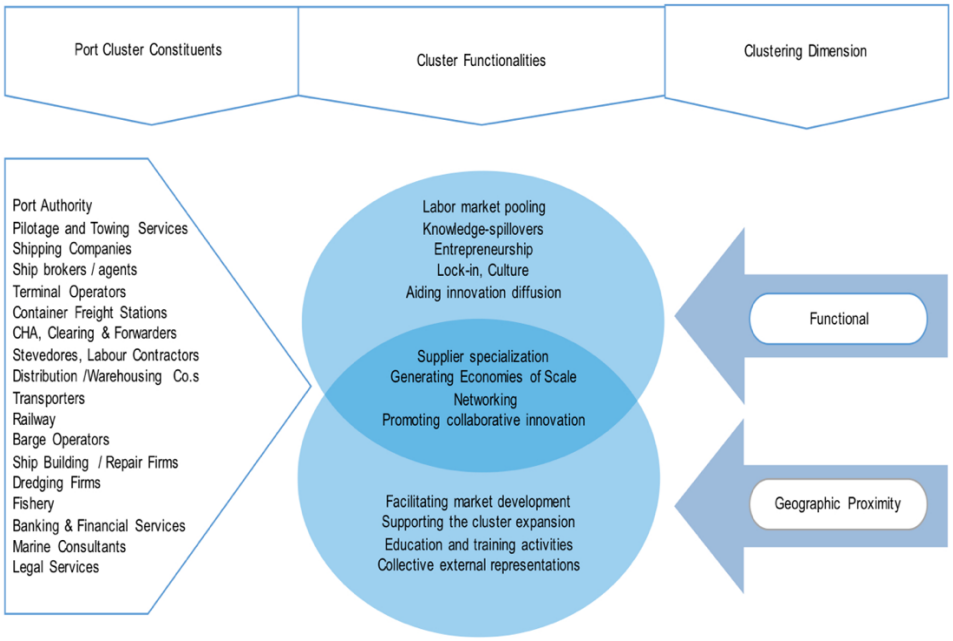

Fig. 1.4. Cluster functionalities (source: Author)

1.4. IMPLICATIONS OF CLUSTER THEORY AND RESEARCH

Ports play a major role in regional and national development and hold a definitive function in the structure of trade and manufacturing. Thus, the performance of ports impacts the nation's productivity and competitiveness. This is all the more critical in the perspective of globalisation. Globalisation is reviewed in the context of the huge economic and technological changes happening at the institutional level as well as the national level, which compels the trade to demand new and improved facilities and infrastructure. This, in turn, demands new models of development in the activities at the port. Further, the ports accordingly need to explore the features and elements of the requirements of modern ports, in view of new concepts.

Most of the transactions in international trade are dependent on the activities at the port. This dependency is not only on elements related to the infrastructure of the port but on the activities, and those comprehend the modern concepts of development of the port. Since clusters involve many dominant derivatives around businesses in a geographic territory and related public utilities, there is a compelling justification for its alignment with public policies.

Clusters bestow a theoretical structure by which a provincial economy can be reviewed and comprehended. An agglomeration structure hence warrants that the architects of policy and practitioners of development schemes have to target not exclusively the specific export sectors, but on the broader business domain, participants and organisations those constitute a cluster and enable clusters to enhance its effectiveness. This facilitates a clearer awareness about the process of regional economic endeavours which strengthen the regional development activities than having an emphasis exclusively on trade and industry sectors. Cortright (2006) observed that the cluster theory recommends that practitioners of provincial economic development need to associate with a congregation of organisations instead of with single organisations. Further, he has noted that employing cluster structure might change focus from institutional level rent-seeking, wherein policy support, incentives, tax holidays etc. are availed, to a wider perspective wherein collaborative problem-solving approach is adopted on competitive issues. Hence it is highly beneficial for practitioners of regional economic development schemes and projects to consider processes of development of economies by means of a cluster framework.

1.5. SIGNIFICANCE OF RESEARCH

This research presents a practical reference for port cluster constituent functioning, its influence on port performance and on the influence of policies on port cluster development.

On recognising the functionalities of the port cluster, the decision-makers on policies for the strategic development of seaports and the port's functional managers will be able to understand and establish the extent to which the evolution, development and management of clusters should take place. Intrinsically, inefficiencies can be avoided understanding the functionalities and its impact on performance. The research also contributes to cluster organisations to optimise the cluster activities for better efficiencies and in the economic development of the region. The economic development of the region and the development of global trade is hugely dependent on maritime services.

This study benefits the managers of firms associated with the port by providing

insights to set benchmarks for the extent of engagement in clusters and to make use of the cluster organisation to maximise advantages for their businesses. These managers can develop strategies for purposeful association with other constituents in the cluster. Also, this study facilitates in understanding the features of the government's involvement and policy measure for cluster development and can be used to establish necessary policy measures in new clusters in other seaports. Such insights strengthen the effective utilisation of seaport clusters and accelerate regional economic development.

This research facilitates evolving clusters, which are targeting to become centres of global maritime business in their respective regions, by familiarising with the ways and means of establishing relationships in maritime business, engaging stakeholders at the port and beyond.

On discussing these new approaches, the study adds to the literature on cluster functionalities by demonstrating a dynamic perception of the development and progression of a seaport cluster. Conceptually, the research reviews port clusters in connection with the inter-relationship with various firms at ports.

In practice, the research offers a constructive reference for decision-makers in policy matters by evaluating the models on establishing and developing seaport clusters and collaboration among the constituents of seaport clusters and its development leading to establishing the status of an efficient international maritime centre.

1.6. THESIS DISPOSITION

This study is discerned in the parts of introduction, literature review and research design and methodology. Analysis of individual cases of both port clusters, cross-case analysis and findings and conclusions follow.

This chapter outlines the background of the research, business problem, scope and significance of the study.

Chapter 2 discusses an extensive literature review conducted and conceptual underpinning employed in this research. This chapter reviews related literature on the concept of development and functioning of seaport clusters and various methods, functionalities and models of clusters. The literature on the impact of

clusters on port performance is explored and discussed in the chapter. Also, the literature concerning the policy aspects and its influence on cluster development is discussed in this chapter. The identified literature had been classified on key themes based on different aspects of port cluster evolution, development and sustenance. Then the initial conceptual constructs (ICC) were derived from literature. The major literature gaps are summarised at the end of the chapter.

Chapter 3 presents the research design and research methodology of this study. It includes the sections on research objectives, research questions, rationale and approach of the research study, discussions on case study research, design and methods of data collection, strategy for analysis of evidence and quality of the empirical research. The development of an appropriate case study protocol (CSP) is discussed, and protocol, developed thus, is presented in this chapter.

Chapter 4 reviews the data collected as per the case study protocol and discusses the inferences of analysis of the data for the case studies on clusters at Colombo Port and Port Klang.

Chapter 5 discusses the cross-case analysis and findings. The similarities and dissimilarities between the two cases with respect to the cluster functionalities, determinants of the port performance and the influence of policies on cluster development. Subsequently, the cross-case comparison is reviewed in detail. The findings of the cross-case analysis are presented. Cross case findings in-terms of research questions is reviewed in this chapter. These propositions are discussed in detail in this chapter.. Finally, the implications for the Cochin port had based on the outcome of the focus group discussion are discussed.

Chapter 6 presents the conclusions. The findings of this research study had been reviewed with reference to the conceptual framework. Further, based on the findings of the cross-case analysis, propositions have been developed. Also, the limitations of the study and scope for further research had been discussed.

1.7. CONCLUDING REMARKS

The context and background of the study had been discussed in this chapter. Significance of this research and thesis disposition are discussed in this chapter. The chapter presented the business problem considering the background

discussed. On the basis of the business problem identified thus, further review on literature had been conducted, and theoretical underpinning had been discussed along with establishing the conceptual lens and discussed in the next chapter.

CHAPTER 2.

LITERATURE REVIEW

A detailed literature review had been carried out to understand the cluster dynamics in the maritime industry. Based on literature review, the definitions and theoretical foundations of geographic clusters, port clusters, cluster functionalities, governance of clusters, determinants of port performance and features of cluster policy had been identified and are discussed in detail. The research gaps recognised from the literature review strengthened formulation of the research objectives. The outcome of this extensive literature review is the development of initial conceptual constructs (ICC) and sub constructs. The constructs conceptualised from the literature review are various port cluster constituents, cluster functionalities and the determinants of port performance.

2.1 INTRODUCTION.

There has been a growing interest recently, in the study of local industrial agglomeration and specialisation, not only by economic geographers but also by economists, industry and policymakers. The literature review was carried out from sources such as research articles, books, documents and reports in order to find out the multidimensional research carried out in this area to understand and analyse the various aspects of agglomeration and cluster theory, especially the port clusters, and the academic and industry research in the area of cluster's influences on port competitiveness and performance. Table 2.1 illustrates the details of the literature review conducted with the following thematic categories:

Table 2.1 Literature Review: Keywords & Sources

Key Words Used	Journals Explored	Databases
Cluster Theory, Port Cluster, Cluster Development, Cluster Functionalities, Port Performance, Cluster Performance, Cluster Policy, Governance (210 papers reviewed)	Journal of Economic Geography Journal of Research in Marketing and Entrepreneurship Asian Journal of Shipping and Logistics Competitiveness Review Economic Development Quarterly European Planning Studies International Journal of E-Navigation and Maritime Economy International Journal of Engineering Business Management International Journal of Production Economics Journal of Transport Geography Journal of Marine Policy Journal of Maritime Policy & Management Maritime Economics & Logistics Journal of Ocean and Coastal Management Research in Transportation Business and Management Research in Transportation Economics Asian Journal of Shipping and Logistics International Journal of Innovation Science Maritime Policy & Management UNCTAD Reports Ministry of Shipping – Reports (Website) Indian Port Association – Reports (website)	Emerald, EBSCO, Pro-Quest, Taylor & Francis, Elsevier, Google Scholar

The cluster has a positive, synergistic impact by bringing business to the maritime industry and enhancing the economics for the stakeholders in the cluster. Brazil, China, Denmark, France, Germany, Italy, Japan, Malaysia, Netherlands, Norway, Russia, Singapore, South Korea and Sri Lanka are some of the major maritime clusters.

2.2. THEORETICAL FOUNDATIONS OF CLUSTER.

Cluster concept and its application as well as cluster-based economic growth plan, have largely remained in the leading edge of regional economic growth concept and technique during the recent years. A cluster is specified as a populace regionally focused and interconnected businesses as well as companies focused on the distinct commercial and operational field of expertise (Langen, 2002). A cluster is a populace, not an individual unit. Cluster usually are geographically concentrated. This dimension establishes the extent and depth of clusters in addition to networks. The cluster constituents consist of service firms, businesses, industry associations and institutions. Additionally, the clusters are evolved around a central business activity which is considered the fundamental hub of the cluster, which usually referred to as core business in a cluster. Clusters consist of the sections of the companies as well as organisations that are a component of, or reasonably highly pertaining to, the core of the cluster. Cluster concept indicates that the companies that become a member in a geographical agglomeration take advantage of being associated in the cluster, which in turn contribute to the economic development of the area. These benefits accumulated because of the locational advantage of the geographical closeness that, in turn, creates a reduced cost of operations of the businesses creates cluster economic climates and helps with expertise overflows that create advancement and boosted productivity. As a result, cluster firms that produce and avail these advantages certainly have a more competitive advantage, and territories having clusters will undergo greater development.

The Cluster concept had been analysed and defined by various researchers as under:

Wolman & Hincapie (2010): There is an extensive selection of ideation of clusters, many of which are concentrated completely on relationships within the firms and across the firms and in few cases more comprehensive inter-connectedness.

Krugman (1991): The concept of new commercial location which defines the collections as co-location choices of firms as a result of enhancing scales of operations, controlled and reduced expenses of logistics.

Rosenfeld (2005): Contemplated that clusters are a geographical agglomeration of related firms as well as organisations of sufficient scale to create externalities.

Cortright (2006): Taken into consideration a market cluster as a group of companies and related economic stars as well as organisations, that lie near each other as well as that draw efficient benefit from their common proximity and links.

Glaeser and Gottlieb (2009):, suggested that according to the firms join in clusters, the outcome of the cluster's economic situations are just decreased in transportation expenses.

Marshall (1890): Defined clusters as exterior economic climates established by merging of the pool of labours and by the advantages in exchanging labour throughout companies, specialisation in resource mobilisation and exchange of skill and process knowledge.

Porter (1998): Classified geographical focus of interconnected business and the organisation in any specific domain, connected by similarity in the business process as well as harmonisation in internal and external processes as clusters. Clusters are constituted by the interconnected businesses and other stakeholders, circulation networks as well as clients and academic institutions.

Saxenian (1994): Recognised clusters as a community as well as organisational incidents: industrial transformations, companies, an association of communities, as well as various associations which are indirectly taking part and cause an impact in the firms' businesses and influence connectedness amongst business organisations.

Hill and Brennan (2000): Specified an effective commercial cluster as a regional agglomeration of competing businesses or facilities in the very same domain where exists a supplier-customer connection with other businesses in the area, or exchange skilled labour which gives companies with an economic

benefit as compared with any other player in the same industry in any other location.

Nevertheless, there is a common foundation for the cluster theory. The advancement of the concept on the value of geographical agglomeration of companies leads to businesses benefiting from knowledge spill-over (Asheim,1996; Lundvall,1992) and to the industrial and commercial advancement of regions (Krugman, 1995; Scott, 1995). This has likewise been instrumental in promoting and encouraging participation in clusters.

The deliberation on the subject of clusters by Porter (Porter, 1990, 1998, 2000) have influenced the policymakers and think tanks in industry and politics (European Commission, 2002). Clusters evolve as economic agglomerations as explained by Marshall (1890) and later used by Richardson (1978) to regional economies as well as by Krugman (1991) to the concept of neo-economic geography. Many cluster economic climates are widely acknowledged, three of which are important (Krugman, P., 1991). Companies agglomerate mainly due to the existence of a huge pool of skilled labour in the clustered environment.

In addition, these collective labour force at specified locations, encourage and facilitate cost-effective training and development activities. This will eventually enhance the skill sets of the workforce. Companies associated with each other, also due to the fact that the presence of distributors and consumers in a cluster is beneficial for them. Because of reduced transportation expenses, due to the location of suppliers as well as consumers (within the clustered geography) contribute to price advantages. Proximity likewise makes it possible for closer tracking and frequent face-to-face interactions and negotiations.

Companies participate in clusters expecting to benefit from knowledge exchange possibilities. Clusters augment knowledge spill-over within the member firms. Due to regular communication and since growths are very easily observed in the same location, exchange of knowledge is faster and effective (Baptista, R., 2000). These agglomeration economic climates discuss why the firms situated in clusters. Of the numerous concepts and principles been evolved from this recent thought process, Michael Porter's contributions

in the domain of clusters have got accepted as one of the most significant and persuasive. Porter's concept of industrial clustering has been adopted as a conceptual foundation for policymakers all over the world to develop policies for regional development and growth. The concept of concentration of industries based on its specialisation is not new. Alfred Marshall, in his "Principles of Economics" (1890), discussed the agglomeration of specialised manufacturing in any specific region or location. After a century, Michael Porter's neo-Marshallian cluster principle has transformed the theory of agglomeration.

The process of the development of clusters as well as the extreme inter and intra-relationships by various types of businesses in the cluster are more effective when the firms included are regionally located (Porter, 1990). Porter's cluster concept is not a recent standalone re-invention of Marshallian agglomeration concept. Much more thought leaders in the area of economic geography have worked on and contributed largely to industrial development, regional growth, evolution of economic zones as well as learning hubs (Markusen, 1998; Asheim, 2008). Some researchers in the domain began to adopt the terminology of the cluster instead of applying the terms they have been otherwise using in the literature (Pinch and Henry, 1999; May et al., 2001; Scott, 2001; Keeble and Wilkinson, 2000; Nachm and Keeble, 2002). This influence could be due to the fact that the concept developed by Porter was more inclined towards the business strategy and competitiveness of firms. Additionally, Porter had used the concept of a competitive method as well as tactical positioning in the suggestion of clusters (Martin & Sunley, 2003). Porter (1998), indicated that the clusters could have an effect on competitors in multiple directions. At first, it can raise throughput and process effectiveness. It can instigate and accelerate technological changes. Subsequently, the clusters encourage innovation and facilitate entrepreneurship. In cluster research studies, the significance of collective action for the efficiency of the agglomerated businesses is generally acknowledged (Nadvi, 1999; Giuliani, 2005).

Affiliations with strategic importance (exhibited by regular knowledge sharing and collaborations) are a lot more pertinent than the independent transactions of firms. Business information offers a criterion, which is regularly enhanced by process evaluation, centred on an assessment of communications, associations, stakeholder frameworks and expertise (Porter, 1998). Existence of a business congregation provides information on the characteristics of links.

A local confederation which unites companies in various domains, (when it comes to a seaport, associations of the various businesses in the port), reveals these kinds of affiliations. Consequently, a review of the social framework of a specified geographical location is the initial functional phase of any cluster evaluation. When considering clusters containing the similar constituents (sectors, R&D capabilities, academic institutions, etc.), a local agglomeration can be much differently efficient compared to a cluster in another geographic location, whose characteristics and performance are different. According to Glasmeir (as pointed out in Martin et al., 2003, p. 22), main advantages recognised from geographical clustering seem certain to particular sectors in identical phases of evolution in specific areas and are just understood by a review of certain preconditions. Several of the challenges could result from inherent distinctions in the operational features and efficiencies of various geographic regions. Some might be because of agglomerations which are in distinct phases of the life cycle of the process, identified as the outcome that goes to the predominant sector of the association. However few cases would exhibit reasoning of high standards of the entity (association), the communication of its participants, the means by which they are associated in the establishment and specific culture of the area.

A cluster is considered to have the following attributes (Spencer, et al., 2007):

- Specialisation of employment in a sector that is not geographically omnipresent in all regions and thus, establish a competitive advantage over other regions.
- Adjoining locations with less or no specialisations, specific market and various other relevant markets where interconnected businesses exist

are specified only by the partnership of the seller and purchaser or similarities and resemblances in the process technologies.

- Extent of specialised skill sets of the workers engaged in the cluster.
- Skill of occupation in the cluster, gauged in comparison to the extended geographic territory.
- Prominence or extent throughout the array of businesses constituting the cluster which usually is viewed as a regional concentration of expertise in an individual constituent member of the cluster.

Cortright (2006) details the kinds of practices or methods which strengthen the basic functionalities, which are the operational variables of the cluster dynamics, as under:

- Amalgamation of the workforce: details about the labour market, skill up-gradation opportunities by the way for training and development.
- Expertise of service providers and uniqueness of resources: agenting, selection, enterprise creation and development, terms of business.
- Knowledge spill-overs: associations, industry-relevant r & d assistance from the government.
- Entrepreneurship: support for innovation and new venture creation, spin-offs.
- Lock-in: Combining and retaining skill sets and unique field of expertise.
- Culture: acknowledge as well as support cluster organisation.

Mills et al. (2008) endow with the following extra certain checklist of functionalities or operational variables of clusters:

- Accelerating market expansion with collective market studies, promotion as well as advertising.
- Augment intra-cluster networks, intra-region collaborations, as well as inter-cluster collaborations in multiple regions and domains.
- Encouraging collaborative product development, process and study advancement, and market development.

- Evolving mechanisms for dispersion of development activities, the fostering of cutting-edge output, methods, as well as processes.
- Strengthening the cluster by bringing together companies in the region and attracting from among outside the region and enabling the growth of new businesses.
- Supporting training and development activities.
- Representing the association or cluster in forums, external companies, professional organisations, and regional, state, and national governments.

Clusters characterise following advantages according to Sheffi, Y (2010):

- Trust: Clusters are in general, an association of firms with identical background and operate in a specified geographical area. They have many similarities in social norms, work culture, language etc. This makes it much effortless to create trust amongst individuals and organisations, making inter-firm operations and transactions. Trust this makes the clustering in a specific region easier with collaborations amongst companies irrespective of the status as business associates or competitors. It is observed that in the majority of instances, the trust amongst the cluster firms is based upon relationships created external to the job setting.
- Tacit expertise exchange: As systems and services of firms end up being a lot more complicated, much of the understanding connected with their growth as well as operations are required. These implied transfer of information sustains over conversations. This may be product or service details and specifications with a resource provider; communicating standards with a rival; or extending service to a client. All these become less complicated, much expeditious, more economical and efficient among the cluster constituents as a result of tacit knowledge transfers. This holds both for straight as well as vertical business associations. A relevant experience in this regard is knowledge spill-over. Rodrıguez et al., (2008) explain this as the procedure of expertise build-up which triggers knowledge and

information overflows that can profit an entire set of prospective (designated or unintentional) recipients. Much of this information exchange occurs casually, between all internal stakeholders, as well as investors, depending upon the kind of association, these firms are associated with.

- Collaborations: The focus of companies in a similar domain, with their similar demands and issues, offers all opportunities for collaborative tasks. They are lobbying for infrastructure facilities and policies, rewards, as well as various other incentives, promotions and involvement in industry associations, such as the chamber of commerce. Also, there are possibilities of building cluster oriented purchase policies which will be bringing about reduced costs for all the participating firms.
- Education, Research, Training and Development: Various studies by researchers in the field of the cluster had earlier recognised that the clustered firms could gain access to advanced research study as well as have a constant supply of informed workers. Numerous associations sustain professional training and learning to augment the availability of workers as well as to upgrade skills and capabilities. This provides a platform for the executives of member firms, where they can connect with executives from among numerous firms.
- Supply base: As stated by Marshall(1890), agglomerations bring in vendors that see benefits in situating alongside the consumers. From the clients' perspective, an active supplier base with numerous vendors promises economic and competitive rates as well as distributor technology which are critical for competitiveness.

There are various interpretations of clusters in the literature. However, no consonance has been reached to date on an ideal and a commonly approved definition, approaches for evaluation as well as the contrast of local agglomerations termed as clusters. According to Gault (2002), the

agglomerations, called clusters are associations of exclusive businesses which are connected with each other for a supplementary function.

The explanation by Cooke and Huggins (2002), is an instance of a wider interpretation of agglomerated businesses, since the definition projects the clusters as support platforms, as these consists of building a framework which enhances the capabilities of associated firms for conducting business in the specified environment. This meaning consists of aspects similar to Porter's explanation of clusters. Geographically near companies in upright and straight partnerships engaged in a regional venture facilitating the facilities with common growth perspectives for organisation's development upheld by all stakeholders in the business environment (Cooke and Huggins, 2002). The inquiry is what establishes a cluster. Is a cluster figured out by the dimension of the agglomeration, or by the linkages in between firms in the cluster, or by the distance as well as resemblance in the innovations utilised for the organisation process? Or is all of it important for the effective functioning of the cluster?

Though the clusters should contain many organisations and multiple industries as per many definitions, there is no indication of how large the community should be to form a typical cluster. The size of a cluster is an independent variable. The localised perspective of the agglomeration is highlighted in all deliberations on clusters, but these descriptions do not specify any geographic limits with regards to the coverage required for the cluster. The idea of interconnectedness in both upright links (with various supply chain agents) and horizontal links (with the competitors amongst a group of participants), is an essential component of all interpretations.

On a policy perspective, the idea of "shared vision" discussed by Cooke's is similar to the "collective objective" by Gault (2002). The concept of evolution and development of clusters has been focused by multi-disciplinary scholars, business leaders and policymakers.

It is essential to review the term cluster by various schools of thought, as it is to be used extensively in this research.

In the perspective of business and strategy, the definition of cluster put forward by Michael Porter is a classic one and is cited extensively in management and economics literature. Related businesses in a specific geographical area associate together to form a cluster bond by their complementarities and commonness. Though the characteristics of clusters differ depending on their intricacies and style, many depend on the similarity of factors like the products and services, type and nature of inputs, the technology used in the business process, as well as companies in associated sectors. Clusters likewise frequently include companies connected without inbound logistics in the value chain, producers of matching and accessory items, suppliers and fabricators of customised facilities, government as well as various other organisations offering specialised training, education and learning, information, research study, as well as technological support, such as universities and skill up-gradation and training service providers.

Authorities established by Governments which substantially influence the activities of the clustered industry can be considered as a constituent in a cluster. Clusters usually consist of industry associations as well as other agencies and forums which supports the business of the member firms. (Porter, 1998). The OECD (1999) interpreted clusters with a focus on knowledge spill-over and resultant learning. Accordingly, the clusters are platforms where related businesses share information and link various stakeholders and thereby add value to the member firms. The principle of this agglomeration is extended beyond establishing networks.

The area of economic geography emphasises elements of geographical focus, spatial closeness and benefits stemmed on account of scale (Belussi 2004, Gordon and McCann 2000).

The foundation of the theory of economic geography is the concept of an industrial district developed by Marshall. Belussi (2004) made the distinction of a cluster and an industrial district contemplating the cluster as an indeterminate spatial arrangement and the other as a system which includes economic and social considerations. It is also pertinent here to note that scholars like Asheim and Isaksen (2002), and Cooke and Huggins (2003),

considered cluster as virtually identical with the industrial district. Though the expression cluster, is referred to in the literature interchangeably, the one based on location (geographical cluster) or with the type business (industrial cluster), the term industrial district is typically applied in cases where firms in any specific industry are located in a geographical territory (Maskell 2001). As per the observations of Malmberg (2001), Porter's contribution to the theory of clusters in the evaluation of fundamental problems in locational clusters as it addresses the economic climate systematically (i.e. the way the numerous kinds of commercial tasks are interconnected). Cooke and Huggins (2003) merged the notions of cluster characteristics, processes of evolution of clusters and factors of governance in clusters, with Porter's explanation on clusters, which they observed, was challenging the dynamism of cluster environment.

Clusters are an agglomeration of businesses located in specified geography with relationships extending in horizontal and vertical domains and with localised infrastructural assistance framework for these firms, with a mutual aspiration for growth, centered on competition and co-operation in the related domain (Cooke and Huggins 2003).

The Cluster Policies White-book (Andersson et al., 2004), discusses the attributes of the geographic agglomeration, more lucidly. According to the white-book, clusters are qualified by the following seven aspects:

1. Physical concentration in a specific geography.

2. Focus on a specific industry.

3. Multiplicity of constituents.

4. Competitors as well as co-operators.

5. Decisive multitudes of actors.

6. The cluster lifecycle.

7. Innovativeness.

Enrico and Grandi (2005) proposed including 'social homogeneousness and historic conventions' in the above list of clustering aspects. Though the aspects

of culture are acknowledged as an important catalyst for the growth of a vibrant agglomeration, it is not usually considered while developing policies on clusters.

Corroborated upon the numerous common explanations of cluster mentioned above, a cluster is perceived with the following fundamental attributes, namely, (i) Geographic distance or co-location of companies and relevant organisations, (ii)Mutual dependence or links of tasks of companies in a value-chain with various inter-related and ancillary businesses as well as firms, (iii) Specialisation based upon sharing of knowledge and skill, and (iv) Shared philosophy, norms as well as vision.

Each cluster is distinct considering the environment, domain of the firms business, purposes as well as its elements and dynamics (Sölvell et al., 2003). Clusters establish gradually. Agglomerations are not an effect that happens inexplicably at geographical regions which extend facilities and factors that are theoretically conducive for clustering, but it is developed over time (Ketels, 2003). Clusters are started in areas which have previous experiences of co-operation, wherein many firms associated with a common cause and have established financial linkages for collective actions. Also, it is pertinent to note that a "clusterpreneur" (Sölvell et al., 2003) whose presence in the cluster impact significantly on the evolution of the clusters bring in more firms into it.

In many of the situations, the clusterpreneur is the local or national governments which after recognising the process of natural agglomeration, start independent or participatory projects like innovation parks or processing zones to formalise the cluster organisation. In other situations, efforts are initiated by the external organisations to establish economic zones and parks, on observing opportunities and gains due to localisation of supporting and ancillary business in their favour (Leleur, 2009). It had been observed that the like -businesses are concentrated in a geographical area for the common benefits. Clusters can be discovered in lots of economic climates globally, each of which is pursuing distinct track and background. The evolution of clusters in any specific area can be analysed in different ways. One of it could be the in terms of the offered variable benefits, like specific natural and physical environmental

resources, logistic establishments like ports etc. which are to the benefit of the firms and to the geographical area. Another type could be described by the reasons such as the area where several successful entrepreneurs establish businesses in any specific domain and hence a huge availability of skilled labour and common research and development facilities exist. For the clusters to expand and develop, several components are required in the environment which include specialisation requirements, technological improvements and skill set up-gradation, the potential for co-operation among competitors, innovation climate and the possibility of intervention in policy matters (Porter 1990).

Operational agglomerations which are successfully organised ensures delivery of value to its stakeholders and exceeds the conventional practices of serving the customers by industry. These clusters were found emerging at geographies where the end-users are located or where the input resources are available. Specific parameters of these clusters, including the geographical coverage could vary, and could be centered around the aspects of technological, customer base and other influencing factors which determines the extent of inter-firm relatedness and co-location of core activities. Clusters are dynamic, and the capabilities change over time. Based on the changes in market conditions including nature of the product and services and channels of delivery, and based on the changes in the characteristics of the actors involved there will be changes in the core activities of the cluster. With the dynamic capabilities gained by the cluster over time, they respond positively to the environment thus changed. Successful clusters thus get upgraded and reinvent themselves. Two crucial catalysts for this up-gradation of clusters to wider domains are territorial enlargement of business activities and development of expanded networks.

The constant progress of clusters is influenced by its capacity to transform and to become accustomed to the changing environment. The degree of specialisation of businesses in the cluster determines the degree of its adaptation capabilities, in line with the changes in market conditions. More specialisation makes it challenging for clusters to upgrade itself with the changes in the environment. These type risks are usually mitigated by candidness and

receptiveness towards external collaborations. Usually, the cluster policies are not effective, and thus, the clusters are not stable due to these challenges. Many deep diving and reviews had been done to evaluate the factors behind the success of clustering. For instance, a research study of Brenner et al. (2007) evaluated one hundred fifty nine regional agglomerations with regard to 35 distinct processes and models that result in the evolution of industrial clusters. The research differentiates three categories of success variables for the evolution of clusters, namely the pre-requirements for the establishing clusters, the "initiating incidents" and actions that introduce the process of utilising the cluster advancement possibility and "strengthening processes". According to Wolfe and Gertler (2004), the idea of agglomeration has been used in two attributes in the cluster literature, political as well as analytical. As a functionally specified team of companies and sustaining establishments that produce as well as market items and solutions from a collection of inter-related firms whose business processes are locally concentrated. This approach exhibits the deviation in the explanation of clustering that is very similar to Porter's definition that was discussed in the beginning (Porter, 1998). The major reason for engaging this technique is to discuss analytically the dynamism of development of clusters. These recognised methods could provide directions to regional and national policymakers developing support measures (Wolfe and Gertler, 2004).

The concept of clusters is used as a policy tool in the political perspective. Wolfe and Gertler (2004) expressed their views on the use of agglomeration concept by the political experts as a tool for policymaking as an overarching structure to enhance the development of clusters.

2.2.1. Clusters and Economic Development

The notion of clusters is a contemporary interpretation of the interminably noticed trend of geographical concentration of trade and industrial activities, which are extensively considered as an important aspect for economic growth. Marshall (1890) explained in the 19th century itself, the benefits of concentration of economic activities in with regard to the availability of skilled labour and their expertise. The conception of clusters is very wide and

extensive and encompasses many proportions and approaches dealt by various other concepts that existed for a long time. Cluster theory was developed around the agglomeration theory and assimilated other theories, for instance, the idea of “industrial districts”, growth poles (“poles de croissance”), new trade zones, production systems, innovation parks and special economic zones, to name a few.

In the paper titled “From industrial sectors to industrial districts”, Becattini (1979), an Italian presented the pivotal model of "industrial districts" for consideration in regional development policies. Footing his views on the concepts of Alfred Marshall, Becattini highlighted the significance of locational economic growth with the conceptions of independent domains that altered the move towards the industrial policy. The author emphasised the significance of societal bonding, geography, sociology, politics and history in the outlining of innovation policies. Off-late, the theory of clusters had been made popular and instigated by Porter (1990), developed on his so-called "diamond model" of competitive advantage. The intensity of agglomeration of economic activities in groups is viewed as the result of "competitive advantages" of businesses in establishing novel and beneficial approaches to participate in a domain of its business and to bring innovation quickly to the industry. Though many views on clusters emphasise district parameters that establish the development and functioning of agglomerations, the theory of clusters usually consists of three major aspects: First being that the clusters are seen as localised agglomerations of distinctively specialised organisations, upgraded skilfulness and expertise in the worker communities, and supplementary firms those enhance skill exchanges as caused by their locational closeness. This assemblage of various capabilities of skills and benefits thereon is usually described as a potential tactic to stay internationally competitive.

Because of the proximity, the organisations can take advantage of over-all agglomeration phenomena in on account of economies of scale and scope which enhance their competitiveness (Audretsch & Feldman, 1996). Worldwide, the geographies strive to excel over others in extending the better systems and environments so as to provide economic development and to mobilise capital

and skilled labour. Secondly, these economic concentrations extend an operational objective to facilitate a range of exclusive and unique services to a categorised set of businesses, like the facility of modern and selective infrastructure, customised business facilitation services or skill up-gradation and training of employees. Cluster establishments assist in channelising, facilitating and extending the physical approach to services and installations, including unique research and testing facilities, mentoring, guidance, coaching etc. A Cluster is, thus, a type of consortium that extends competitive advantages. These concentrations of firms in the form of clusters provide both extreme competition and intimate support, often termed as co-opetiton. Locational closeness is supposed to accelerate the exchange of tacit knowledge and the casual communications that are important and crucial components of the process of innovation. Such knowledge spill-overs depend upon the readiness of organisations to communicate with others about their know-how, which banks on the trust corroborated amongst the firms. These knowledge exchanges can be extended by establishing regular face-to-face interactions, for which successful cluster establishments play a significant part by promoting opportunities for interaction and collaboration.

Finally, the clusters are, illustrated by a particular societal and firm-specific aspect, the usually referred institutional coherence or societal congruity which ties up the various interconnected innovation agents, like academic institutions, industries, trade and governmental establishments, collectively and provides opportunities for extensive communication and collaborations between them. Clusters have the potential to develop many distinctive rules and customs, organisations, teams, and trust. Vigorous and successful collaboration and partnership in the knowledge triangle of learning, exploration and innovation are critical for establishing competitive advantages in the times of mounting sophistication of new technologies, products and services and need for up-gradation of skills and expertise.

Technological spill-overs usually take place within the clusters due to inadvertent contacts and formal or informal discussion on operational data and technical capability (Jaffe & Henderson, 1993). Spill-overs can be attributed to

the evolution of innovative and unanticipated initiatives and improved patterns of business, products, services and business models that enhance the innovation capabilities of businesses (Florida, 2002). Though these aspects of locational closeness facilitate trust and coherence among the participants of innovation within clusters, the transference of new skills and co-operation from other clusters also has to be secured by way of networks and collaborations (Bathelt & Maskell, 2002).

Cluster policy in many economies had emerged from the deliberate focus on enhancing regional economic growth and strengthening of activities to improve productivity which is noticed by a concentrated effort to embrace developments in technology to enhance overall productivity at the national level (Nagel, 2002). Industrial development policy, as an inevitable component of national economic policy, is a predominantly important aspect in the schedule of priorities in many countries.

Policymakers in the past concentrated on creating the resource side of the economy that was described as supportive policies targeted to encourage the private enterprises to enhance their economic performance and align with government's direction in regional growth (Hall and Soskice, 2004). However, the direction of development policy has progressively moved in the direction of policies involving more harmonisation within the region to influence the various capabilities of various constituents in an economy.

Synchronising the activities of participants in the economic system in order to create regional development and thus to ensure better co-operation between private and public businesses and other entities is the primary responsibility of the governments (Hall and Soskice, 2004). However, governments in many countries face challenges in establishing coordination of non-market forces. The economic forces often do not follow governmental directions as to what to do and what not to do neither can the governments entirely dictate the way the business activities shall be conducted. This is not exclusively due to the intricacy and unpredictable nature of the output in a business model. This uncertainty can be on account of the insufficient communications among the actors for articulating efficient strategies for economic development. In this

aspect, the establishment of clusters play a role as a substitute model for economic advancement. It strengthens the possibility of creating an avenue for inter-segment discussions and co-operation and recommends substitute proposals for the government for formulation of collective and discreet policy measures for the development of industries.

For instance, Porter (2003) when explored clusters in the US, revealed that the regions in the US which possessed huge fractions of the total national labour force-placed inefficient clusters deliver an enhanced extent of economic development in average remunerations and growth of employment. This is in excess of the benefits of higher patenting.

Although the great extent of innovation can be attributed to clustering activities, a study by Brenner & Gildner (2006) reveals that the explicit connection

between the regional clusters and economic accomplishments may diminish with the factor of time. It had been substantiated that the cluster-based economies perform more effectively and create better results.

2.2.2. Clusters and Innovation

From the fundamentals of the cluster model, it is obvious that the framework ensures an intensely supportive environment for constituent firms to strengthen their capability for innovation. Clusters are well balanced with the contemporary method of "open innovation". This approach explains that the innovation is not shaped by standalone firms, but usually inactive environs in which the proficient firms and skilled workforce cooperate in a mutually beneficial and harmonised pattern to integrate prevailing skill and knowledge and thus ideate and create better products (Chesbrough, 2003). Though the idea of industrial clustering is congruous to the idea of "open innovation", similarities prevail with the concept of "triple helix" of which the highlight is that the innovation revolves around the connectedness between active academic research (in institutions), active entrepreneurship and the existence of working assets (usually prominent in the private sector) and on an empathetic policy framework (public authorities) (Etzkowitz & Leydesdorfff, 2000).

Cluster organisations take advantage of the from the locational closeness of other factors of innovation which ensure the exchange of informal knowledge, the availability of a trained workforce and the casual connections and communications which are crucial aspects of the process of innovation. Firms in the clusters communicate more with research facilities like universities and incubation centres those located in the neighbourhood than other firms and thus gain easier access to global communities and resources. Also, within clusters which are hugely dynamic in nature, the levels of communication between the personnel and between organisations are evidently more than among the firms in a non-clustered environment (OECD, 2007). The cross-pollination of themes and collective innovativeness has been acknowledged as one of the major factors of the success achieved by many cluster models. (Saxenian, 1994) Another case of collective benefits is the Stockholm ICT cluster which evidenced substantial amounts of inter-firm workforce movements than the rest of the worker pools and increased intra-firm mobility in comparison to other enterprises outside the cluster (Power & Lundmark, 2004).

There are many instances in various clusters around the world which substantiate the fact that the clusters extend competitive advantages for the constituent firms. The participation of businesses in clusters is driven by the necessity to work together and pool resources in order to the wider complexities of the innovation process.

2.2.3. Cluster Characteristics

The development of clusters and the type of its governance is significantly influenced by the nature of the core business around which the cluster is formed. In order to analyse the nature of the cluster, the characteristics of the core business and industry and the structure of the agglomeration are to be considered. The features of the industry, of the core business, influence the specific framework that determines the constitution of the cluster and the gravity of inter-relationship between the firms constituting the cluster. According to the idea of the Structure-Conduct-Performance (S-C-P) framework, the structure of the market has an impact on the way in which the firms behave and on the performance of the industry.

Enterprises in progressive industries where the technology is changing rapidly are challenged with the requirement of high investments in technology, R&D facilities and skill upgradation. Relatively small firms in these domains are faced with huge difficulty in establishing and expanding along with the bigger players in the industry unless they are part of the clusters, from which the technical support and access to various modem channels to reach to the market. Noticeably, many technology-driven clusters sectors in developing regions are connected with large businesses having global presence.

As seen in many countries, lead firms tend to dominate the development direction of clusters since they have negotiating power and high influence over the decision-making of government, the behaviours of small firms and the governance of clusters, especially at the growing stage of development (Rabellotti & Schmitz, 1997). However, some exceptional cases might emerge. For example, in Italy, some clusters are mostly SME-based and SME-driven. The nature of the industry and the magnitude of size and influence of the leader firms influence the way the cluster structure is shaped, and governance practised (Bianchi et al., 1997).

2.2.4. Cluster Organisations

The cluster organisations are attempts to strengthen the effectiveness of an agglomeration within a geographic territory, collectively by firms in public and private sectors, governmental agencies and centres of learning, contained in a geographical territory and specific category of industry (Sölvell et al., 2003). These are fundamentally developed and governed by a cluster policy and they in many cases ensue a bottom-up method and are controlled by designated establishments, like cluster organisations.

The financial support from public agencies reduces over time in case of cluster programs also as in the case of many other long term policy initiatives. There is certainly an increased need for concentrated support from public authorities and designated agencies for the cluster at the evolution stage in order to attract more firms into the clustering activities. However, on a later stage, the cluster organisations become capable to stand alone and be self-sufficient, by substituting the public funds with its own corpus generated through various

internal contributions and sponsorships. The leader firm or the cluster leader could be any entity associated with the core business, like public authorities, not -for profit organisations, trade and business associations or academic institutions. Though they usually evolve from within the core business actors based on the government's policies and schemes, it is often a distinct individual within the industry would be assuming the lead role of the "clusterpreneur", in order to promote the establishment, and that is subsequently assigned to a formal cluster manager (Andersson, 2004).

These new establishments provide effective assistance for innovative initiatives by channelising firm-specific, speciality platforms and connections, most often to small and medium enterprises. A cluster organisation can be described as a formal arrangement which design, drive and control the cluster's collaborative activities.

2.2.5. Business Clusters and Challenges.

Governance of clusters, innovative practices, orientation towards innovation within the firms' collaborative skill upgradations on the foundation of innovative entrepreneurship had become areas of relevance in cluster studies recently (Beerepoot, 2004; Boschma & Ter Wal, 2005; Camagni & Capello, 2000; Guerrieri & Pietrobelli, 2000; Keeble & Wilkinson, 2000; and Lawson, 2000). The policies in economic and technological domains, the business strategies and schemes of innovation in national level will be impacted by the changes in the technology employed in the business process and being utilised by the core business in the region (Hodgson, 1999; Sam, 2000; Tamasy & Sternberg, 2000). Thus the analysis of technological changes enables policy researchers to conduct successful reviews. Furthermore, this understanding is regularly employed in micro-level reviews, wherein the evaluations at the functional or business level, in order to highlight the learning abilities of businesses and theories of firms based on resources and competencies (Hodgson, 1999; Lorenzen & Foss, 2003). These concepts provide explanations on the status, relevance, organisation and limitations of business entities with respect to the subsistence of firm-level or collaborative capabilities, like

information's and skillsets, which usually are generated and retained within firms.

The major idea of progressive economic concepts emphasising the review at the macro level is the way in which the economic components and constituents handles changes within an organisation and its systems and not on the changes of systems (Lambooy & Boschma, 1998). In this regard, it is pertinent to review the methods by which the cluster organisations address the challenges posed by various environmental aspects in the governance structure they function. The capability and competitiveness of clusters to address the challenges of international competition had been the topic of many studies (Pietrobelli & Rabellotti, 2006; Schmitz & Nadvi, 1999). On a macro perspective, these studies focus on the methods adopted by the clusters to prevail over the challenges negatively impacting their competencies.

Essentially the cluster organisations adopt specific methodologies to create distinct solutions to respond to particular issues. These customised methods can be of several styles. Helmsing (2001) reviewed and explained six forms, as under, that clusters may choose in order to provide specialised services.

- Public provision, in which generic facilities, like marketing services, technological skill up-gradation services etc., extended by public agencies to cluster environment.
- The 'public-private partnerships', in which the public agencies establish the facilities and the private agencies implement them.
- Quasi-governmental agencies aimed at providing customised services for the development of enterprises.
- Trade and business associations are delivering sector-specific services for member firms in the clusters.
- Unions formed collectively by relatively small and medium enterprises with proper understanding among them to combine resource capabilities to gain collective objectives.
- Group formations to address short term tactical goals.

It is usual that the clusters encounter various types of competitive challenges, like, unavailability of skilled workforce, absence of crucial business information, restrictions and controls by authorities, barriers in the market place, insufficient infrastructure, substandard research facilities, lack of awareness and capabilities to cope with global process standards, inadequate industry networking and so on. Clusters generally opt for an institutional process which usually aids them to establish positive entailments, also appropriate to the prevailing governance conditions. They might start new schemes, standards and operating procedures to provide the establishment of platforms for co-opetition among member firms. These agglomerations might establish a new organisation to address these specific demands, like a skill up-gradation centre. Other option is to restructure the prevailing establishment to provide them with enhanced roles for development clusters, is a possibility.

The governance in clusters and management processes of organisation may be perceived as a similar activity. However, the methodologies of the two concepts are different with regard to the interferences each of it make to the processes which they are referring. In the case of cluster governance, it involves organisational structures and interrelationships between the cluster constituents which occur during generalised situations. On the other hand, the modality of organisation functioning refers to inter-relationship and cooperation between the stakeholders of the cluster focused on a particular problem they face or a specific competitive issue.

Organisational processes are impacted by multiple factors, including governance in the cluster. Differences in process capabilities of firms, which decides strength or weakness of firms participating in a cluster and its dependency on the ways and means of business are other potential causes for changing patterns of responses of cluster constituents. Cluster actors employ the ways and means which they are acquainted with, in order to handle the challenges they face in clustering. Cluster organisations choose the process methodology they are comfortable with and which adequately takes care of the challenges in the environment. However, an organisational process model

executed by one cluster may not be successful when implemented by a different cluster or in an alternative environment.

2.2.6. Cluster Performance

The nett performance of an agglomeration is not the sum of the nett of the results of all the participating firms in the cluster. The performance of clusters is not the sum of the performance of the individual business units in the cluster but is a factor that relies on multiple parameters like the cluster's economic and organisational features, co-ordinates of the nation such as per capita wage, prevailing regulatory systems, control of authorities, schemes and facilities ensured by the various government policies and specific industry features and market situations.

Value added from the business process, is considered to be a good indicator of the cluster performance. A cluster is said to be delivering good performance if an increase in the value-added is collectively created in the cluster. Incumbent development and growth in participation are the two growth processes for the value-added in a cluster. A strong cluster economy will lead to an improved, performance of the cluster. And further, an environment of competition enhances the performance of the cluster, as internal competition encourages specialisation and, therefore, form a cluster perspective, competition within the cluster enhances the service to the market divisions (Porter, 1990; Baptista, 2000)

Furthermore, a communitarian competition, which more of cooperation among competitors, exist among the constituent members of the cluster. The easiness of a new business's entry to the clustered environment and the difficulty in exiting from the business from within a clustered environment are factors which directly impact the cluster performance. In general, the barriers existing in a cluster with regard to the entry of a new firm creates a negative effect while the barriers for exit from a cluster which in effect create an economic lock-in contribute to the performance. Also, the diversity of the nature of business and business models, though around the core business, of the cluster participants enhances the cluster performance (Metcalfe, 1998).

The performance parameters of clusters are comprising of two categories, namely, governance parameters and structural parameters (de Langen, 2003). Governance parameters include all factors of consideration connected directly to the pattern in which the firms function within the cluster, and the structural parameters relate to all other factors. European research studies on clusters observed that a practising cluster manager and a facilitating organisation to manage the clusters are crucial for cluster performance. Cluster institutions possess multiple capabilities and tasks (Cluster Initiative Greenbook, 2003). The major task for the cluster organisations is to collate and distribute information among members, encourage business collaboration, encourage innovation process, strengthen business processes, develop and upgrade workforce and expand the cluster's domain

2.3. CLUSTER DEVELOPMENT AND POLICY

The policies for cluster development and governance are rationalised by various considerations. Instances of effective and efficient clusters like the Silicon Valley have upheld the political enthusiasm in the concept of clusters and instilled their pursuit to recreate the model in various other locations. For policymakers, the concept of clustering addresses the requirement to follow a contemporary, multifactional and collaborative approach ("triple helix") which promotes innovation in addition to assisting firms to deal with the challenges of global competition (Etzkowitz & Leydesdorff 2000).

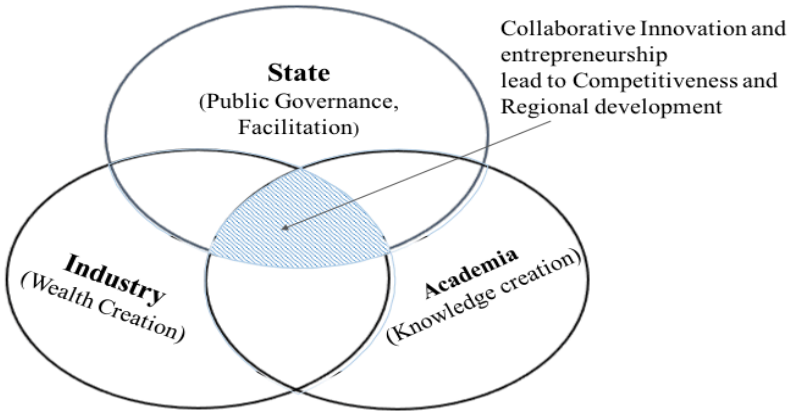

Fig. 2.1 Triple Helix clustering model of Etzkowitz & Leydesdorff (2000)

Cluster policies target to encourage development and innovativeness by addressing the failures experienced in the market like the coordination mistakes which blocks the flow of information, which might be the result of independent firms in the cluster neglecting the need and benefit of knowledge spill-over, communication imbalances and path dependency - which are related to tangible spill-overs (Oxera, 2006).

The cluster model provides planning authorities the possibility to a better streamlining of different plans in the direction of stimulating development and innovation, by utilising harmonies in between the constituent firms as well as involving in discussion with various external agencies to explore methods to eliminate challenges, constraints and hindrances for effective development of the regional economy. This way, the policies for cluster development and governance are important catalysts of establishing support systems that augment growth and employment in the region. The possible cluster policy instruments (Wijnolst et al., 2003 & Isaksen, A,. 2001) are presented in Table 2.2.

Table 2.2 Possible cluster policy instruments (source: Wijnolst, 2003 & Isaksen, 2001)

Options to Stimulate Cluster Development	Specific Policy Measures
Firm oriented Support	• Financial Support of Firms Projects • Advice and consulting for individual firms • Stimulation of leader firm development
Attraction	• Cluster
Support Infrastructure	• Physical infrastructure • Specific service or technology centres • Other cluster organisation
Provide Information	• On technology • On general business fields • On market/export fields
Support training, research, recruiting	• Education and Training programmes • Research programs • Mobility schemes
Support collaboration	• Networking and collaboration programmes • Foster social interaction

As established by the European Innovation Scoreboard (EIS), there is a strong connection between the development system and output of innovation agents. Innovation is progressed only when the environment and facilities

support the process. This horizontal view is reflected in most of the cluster policies which targets to align various distinct policies together and establishing harmony among them.

Though there are instances of promising provisions in many cluster policies across economies, there cannot be a standardised pattern for the provisions of the policy for the efficient functioning of the clusters or a standard model of the provisions as there are many factors which are specific to the region and industry in question, which needs to be considered. These agglomeration policies contemplate as to where a region propose to project itself in a global scenario on a short term perception, banking on the prevailing capabilities and ensuring the required engagement of all parties concerned in the process of innovation. A major challenge associated with this method is that these tactics may ignore the comparative advantage of the geographical territory with respect to the status of the market environment in other regions. In short, the risk of inwardly focused strategies are existing in many policies connected with cluster development and functioning.

Based on the regional objectives and requirements, three different categories, are identified in the cluster policies. First being, the policy or the part of the policy that commits facilitation of cluster development, which is based on those factors that ensure the creation of a supportive macro-economic environment for development and sustainability of trade and business activities, which in turn encourage the evolution of clusters. Another type of the policy is the one consists of policies with traditional structures, such as many economic policies, policies supporting innovation practices, and policies for regional development which usually include aspects related to clustering in order to enhance the effectiveness of a particular provision (OECD 2007). The third classification comprises of development policies, targeting to evolve, develop and sustain a specific type of clusters which are focused on any initiative of clustering in a particular sector. Many clusters evolved independently without any backing and patronage of policy measures. However, the encouragement and assistance of the governmental agencies, beyond any policy provisions, in the evolution of

clusters is deemed as important by the constituents of multiple clusters as evidenced by the reports of the Innobarometer (2006).

Though the concept of assessment of clustering policies is relevant for those who are involved in the development of policies to evaluate the performance and recognise progresses, no structured framework for this activity could be identified. Generally, the parameters for accessing the impact of a policy on clustering include the evaluation of the processes information of firms in clusters, improvements in the performance of constituent firms as well the core business in totality, changes in profitability of businesses, the quantum of collaborative innovation achieved, etc. On the other hand, it is extremely laborious and often challenging to obtain verifiable and accurate information on these aspects concerning the regional and external domains.

Most of the effects of the clustering policies are incidental and contingent and constantly influenced by many external factors and casual outcomes; it is hard to ascertain the direct influence of these policies and schemes. Hence it is difficult to actuate accurate connection between policies and schemes and their conceivable influences on clusters. Further, as the effects on the performance of the firms in the clustered environment take time to transpire and are visible only after being in existence for a considerable length of time.

The cluster specialists listed four criteria impacting the output of the cluster: the involvement of leading services, the involvement of intermediaries, the degree of self-confidence as well as approaches to collective action issues (P. De Langen, 2004). Following the policy proposition, some clusters are created. Cluster plans are made with the sentence that the cluster would certainly bring economic development (Aziz & Norhashim, 2008). Reinforcing the directional relationship inside the cluster pyramid might be regarded for speeding up the growth of the existing clusters (Aziz & Norhashim, 2008). The cluster approach is a combination of methods that assist participants to prepare as well as carry out the joint activity with campaigns that explicitly promote these joint measures (Ketels, 2009). The government ought to urge the growth of networks that focus on overcoming the issues of cooperation within a cluster. Policy advancement, such as promoting advancement as well as attracting foreign

direct investment uses stability and affordable financial investments in the industry for private ventures (Ketels, 2009). Cluster policies' vital feature is to use, well-established agglomerations as a shared discussion forum, to boost cluster characteristics (Ketels, 2009). The most crucial element for the development of any kind of port cluster is the development of an efficient administration framework (Bai & Lam, 2015)

The concept of geographical agglomerations or clusters is attracting more and more interest and deliberation from national and regional authorities, trade and business community, utility and service providers and many professionals (Cortright 2006, Sölvell et al., 2003). The cluster policy in many economies are part of the industrial policy and are often intertwined. The cluster policy can be understood as a new emulation of industrial policy.

The entire domain of business, categorised in general by-products and service sectors, has turned out to be co-dependent and interconnected in the perspective of industrial policies. As a result, new process synchronisation issues, especially relating to mutual dependences, relationship with external businesses, collaborative processes and communication develops. Evolution and development of clusters extend one answer to these recent market demands and pre-requisites of economic development.

Cluster policy is complex and exhibits many levels and types. Porter (1990) and Ketels (2003) view clusters in a broad sense as a new model of economic development, not just a narrow revision of traditional sectoral policies or merely an additional economic policy instrument. Clusters provide a more effective way to conduct microeconomic policy in regions and nations. Cluster policy assists the constituent firms to recognise issues impacting on an economy and provides strong and effective opportunities for dialogue and cooperation between the authorities and trade (den Hertog et al., 1999). Impact of provisions in the policies on clustering is significant in the development of the regions, as it reacts to the change with regard to regionalisation of policy and a focus on the development of aboriginal capabilities of the regions (Martin & Sunley, 2002). Though Nauwelaers (2001) considers the agglomeration policy as a novel mix of historical practices taking into account of the policy influences on

various cluster functionalities, her opinions coincide with Porter's concept that both view cluster policy as an effective measure for the economic development of the region. Clusters establish a new pattern of public involvement which make possible a collaborative mode for implementation of economic and industrial policy. The fact that all clusters are not producing improved financial results nor otherwise functioning efficiently give rise to lack of credence regarding the interventions in cluster policy. A great amount of scepticism exists as to the effectiveness of such interventions and contribution thereof, for a firm to gain by virtue of its association with the cluster than being not participating in the cluster. These policies are aimed for initiating exhaustive modes to prevail over the failures in the industry, public establishment and systems (Andersson et al., 2004).

The interference and involvement of various policies of governments, which are not directly related to clusters, need to be identified and dealt with appropriately. For instance, a scheme to elevate general infrastructure facilities in a region need not be regarded as a cluster oriented scheme; however, it can be looked at as a support scheme for clusters, if the sole objective of the scheme is to provide any facility exclusively for the benefit of the clusters. The policy should extend some support to the cluster development to be recognised as a cluster policy (England's Regional Development Agencies, 2004).

Cluster policies incorporate a set of schemes and provisions to be undertaken by the governmental agencies, to provide socio-economic advantages for the geographic territory. Such policies can initiate to establish collaboration among the public, and private entities provide opportunities for learning and skill upgradations and establish standards for carrying out innovation (Andersson et al., 2004). Generally, the cluster policies augment evolution, development and sustenance of clusters.

The features of the prominent industries in a region influence the focus of its cluster policy. Also, the same consideration prevails in interlinkage of various policies concerning the region with the cluster policy. For instance, the schemes targeting evolution and development of clusters in sectors having direct linkages to technology and related areas are likely to be closely tied up with the

other policies in science and technology domain. Also, the policies aimed at encouraging emerging technology agglomerations are inclined to be top-down policies. On the other hand, the policies to encourage clusters development in traditional sectors might have a bottom-up orientation. However, for all intents and purposes, in reality, there is no definitive segregation between cluster policies in its different forms.

Economic policies, especially those concerning industrial policy and its schemes should include participatory processes for communication and collaboration establishing involvement of both public and private entities aimed at drawing out the requirements of trade and businesses to formulate adequate policy measures and schemes (Rodrik, 2007). Economies across the world, have provided necessary provisions of clustering in their industrial policies, with stress on the schemes of implementation. In the case of cluster policies, it can be observed that the collaboration and competition are promoted at the same time and this a feature which makes the conventional industrial policy different. Porter (1998) observed that the way the nation (or specific geography) competes in the domain of business is more important than the sector in which it competes. This suggests that all categories of businesses, trade and industries in a geographical region can take advantage of a policy focused on clustering. This outlook conflicts with traditional policies for industrial development, which have an objective to prevent competition, in-order to ensure preferentiality to a specific geographical area. On the other hand, the cluster policy focuses on eliminating limitations to performance improvements of the constituent firms in a cluster.

2.3.1 Governance of Clusters.

The core understanding of the cluster concept is that the clusters evolve when a where a collection of actors, set up systems for coordination of business process with an objective to control and reduce the costs of business processes in design and execution and to speed up exploration of innovative processes among the constituent forms in the cluster (Lorenzen & Foss, 2003). An agglomeration involves innumerable constituents involving business entities, public agencies, trade forums and universities and research institutions. Each of these entities

plays distinct and relevant roles. The accomplishments of debacles of the cluster organisations depend heavily on the interrelationship, communication and mutual recognition. Interactions and power relations between these key actors are crucial to the success or failure of cluster development.

Governance in clusters is explained as the combination of and relationships among various governance approaches, which is, the systems to establish and maintain relationships in an agglomeration, which means that the governance is associated with the way in which the firms participating in the cluster activity, behaves within the clustered population. The extent of the impact on transaction costs and the dimensions of collaboration in a clustered environment are the two factors that decide the merit of the clustering activity (de Langen, 2004). The effectiveness of businesses in the cluster is enhanced by reducing the process cost. The extent of reduction of the process cost is impacted by the existence of the trust and of mediators. If the potential for synchronisation is high, it ensures improvements in the competitiveness of member firms in the cluster.

Constituent firms in a cluster usually are closely associated and synergised, since each of the firms is constrained with insubstantial competence to accommodate the ever demanding and intricate threats in the global business scenario, independently. Firms in clusters by virtue of their participation in collaborative activities, become more capable of negotiating business with other actors, internally and externally and become more competent to upgrade acumen to obtain knowledge to enhance their understanding and skill for innovative practices (Ketels, 2003; Porter, 1998). A core idea in the agglomeration theory is collaboration and synergism. Issues concerning collaboration and cooperation can come up in any business activity, and the failure in tackling these issues can derail the anticipated economic and commercial results. This strengthens the criticality of having an adequate focus on governance aspects (Helmsing, 2001; Schmitz, 1999). Porter (1998) and Lorenzen & Foss (2003) observed that an adequately organised and governed cluster addresses the challenges of appropriate coordination of activities among the constituent firms. Further, Lorenzen and Foss (2003) observed that the implementation of the collaborative action plans involving multiple

stakeholders in the geographical agglomeration is influenced by the structure of the industry.

The literature on "industrial districts" extensively deliberates on the importance of collaborations between stakeholders, in establishing distinctive processes to the benefit of the firms in clusters. It is pertinent to note that Humphrey and Schmitz (2004), had observed that the recent literature by professionals in cluster started to focus their studies also to global trade and related issues in the governance of clusters through international value chains.

The concept of organisations is highly relevant when we consider cluster governance. These two are formed by the way the stakeholders in an agglomeration engage among themselves in a collaborative manner. According to Williamson (2001), organisations function in two layers. At the macro level, it concentrates on the organisational environment emphasising the formal and casual norms of political, economic, social and technological synergies. Other layer, which is the micro level, concentrates on the organisation's governance and different contracting styles it follows. Combining Williamson's theory on organisations, Nauwelaers (2001) defined organisations as a set of norms and regulations in business and culture those the stakeholders employ in order to modify the unfavourable state of affairs existing in a territory of business where schemes, plans and practices are extensively comprehended. This approach is concordant with the viewpoint of Den Hertog et al. (1999), who defined organisations from a wider perspective-taking into consideration the way the stakeholders respond to the norms, regulations and culture. Fagg Foster (as quoted in Bush and Tool, 2003) explained the concept of 'institution' giving due consideration to the societal point of view and stressed more on the macro-level of organisations.

The functional structure of the "organisation" was analysed at a macro level to investigate deep into the concept of cluster governance by Brown (2000) and Enright (2000). They observed that a framework of governance in clusters relates to the inter-relationship of cluster's constituent firms with respect to the style in which they handle business processes, the general structure of the industry and the extent of decentralisation of authority within the cluster are

established. The style of governance and its structure can be established in many forms. It is not imperatively consorted with cluster-based schemes or management of clustered institutions.

Business processes in the agglomerated territory can be controlled by any form of affiliations in associations amongst the member firms (Enright, 2000). Furthermore, the cluster governance emphasis the industry structure and the way the businesses with the industry behaves with each other. Governance also comprises a system of cooperation on the basis which the relationship amongst the constituent firms are taking place and the way the government deals with the cluster environment (Brown, 2000).

The conception of governance of clusters is usually made with macro-level of review. That is justified as the agglomerations involve different players and stakeholders which function in complex socio-economic, institutional settings. Organisations at the macro-level control the governance of interrelationship of various actors in the cluster and at the micro level the way the cluster players act depends on the distinct styles in which the transactions and activities take place in a cluster. A clear awareness of cluster governance can be obtained by understanding the organisational structure and studying the impact on the way the stakeholders behave in the clustered environment. In this review, governance of clusters is considered as a system for control of activities encompassed in the particular cluster's evolution, growth and sustenance.

Governance of the geographical or industrial agglomerations deals with the intricacies of rules, procedures, norms and practices those having an impact on the usual methods of doing business and patterns and nature of inter-firm transactions in a cluster. Accordingly, governance is an integral aspect of the situations and conditions through which the cluster functions. Governance has linkages to the authority, structural relationships and inter-play amongst active stakeholders in clusters.

2.4. PORT CLUSTERS

A seaport comprises of an enormous number of distinct and at the same time synergistic firms. An agglomerated environment where a strong information exchange which drives in innovation and effectiveness exist in ports which are operating competitively is identified as a port cluster (Krocis, 2011). The concept of a seaport cluster which is also referred to as a port cluster is about combining the industrial agglomeration model to a business development approach for the ventures at ports. The term "port cluster" was first introduced by Haezendonck (2001). According to author's explanation, a seaport cluster is the collection of inter-related businesses engaged activities related to the port industry, geographically contained within the same territory of the port and potentially having comparable business plans enhancing to competitive advantage and identified by a collaborative strength in comparison with the businesses outside the agglomeration.

A core premise in the evaluation of clusters introduction has been the vital and central duty of organisations in driving the development of collective groups of companies (Porter, 1998). Different scholars have given interpretations for clusters; a commonly accepted explanation is "a spatially concentrated group of companies functioning in the exact same or related domain of business that has linkages with vertical and horizontal partnerships (Porter, 1998).

Though various scholars have provided cluster definitions; an often cited one is "a spatially concentrated group of firms competing in the same or related industries that are linked through vertical (buyer/supplier) and/or horizontal relationships (alliances, collaborations, resource sharing, etc.)" (Porter, 1998). The definition of port clusters proposed by Haezendonck (2001) is that the port clusters are an agglomeration of firms between entities functioning in varied sectors and located at the critical boundary of the land and the water segments of trade and business activities. These include shipping companies, pilotage and towing services, terminal operators, warehousing firms, value-added logistics companies, manufacturers, forwarders, shipping agents, distribution companies, hauliers, railway companies, barge masters, maritime service companies.

Subsequent to Haezendonck (2001), many researchers studied the clusters in specific focus to seaports to analyse its characteristics. De Langen (2002) studied the Netherlands port clusters and its functions and performance. He observed features like the existence of agglomeration economies and anchor firms which impact the performance of these clusters. Rodrigue (2003) studied the New York and New Jersey port cluster and emphasised the responsibilities of authorities to expedite regional growth. De Langen and Visser (2005) suggested establishing for collaborative action schemes reviewing the cluster Lower Mississippi port. They have proposed five components to focus, covering, innovation, access to the hinterland, marketing, global expansion and skill upgradation. They further recognised the public agencies as catalysts in attracting capital and in resolving issues of complementariness. Lee and Rodrigue (2006) reviewed the business creation and diversion of Korean port clusters and the ways in which it impacts on the port operations in the region along the Yellow Sea Rim. They observed activities leading to the evolution and growth of a supply chain system across the borders of Korea and China, which in turn strengthening the shipping traffic at the Korean Yellow Seaports. Baccelli et al. (2008) termed port authorities, cluster managers reviewing the Ligurian ports cluster. An elementary type of port cluster was suggested to explain the issues of insignificant reserves in consideration of implicit consequences in an agglomeration. Sheffi (2012) studied the evolution and development of clusters in the domain of logistics and suggested that the logistics clusters could entrench massive value and growth.

The port is an ecosystem whose performance is a variable of coordination between the firms associated with the port operations. These firms collectively contribute to the performance of the port and often form an agglomeration with a proper structure and functionalities. Collaborative actions of different entities in these clusters could be troublesome, on account of trust and competition. However, collaboration can strengthen capabilities and improve the performance of the port. Jans and Haezendonck (2010) observed that the cluster institution, as an entity, impacts positively on the pre-emptive business strategies of constituent members in the cluster. A cluster is a collection of

specific businesses located in the same geographical territory(Langen, 2004). This harmonised group of businesses exists around a specialised economic activity, a core segment or distinct processes (Nijdam & Langen, 2003). The seaport cluster is a critical path to ensure effective utilisation of determinate resources. Port cluster is a distinctive agglomeration which evolves on the foundation of the concept of industrial clusters. The competitiveness and capability of the port can be enhanced by the existence of port clusters.

The concept of agglomeration, with necessary up-gradation in the process and with necessary policy support had since been practised in many modern-day ports. Many European and Asian ports developed logistics clusters recently, and there is an emphasis by international port and shipping industry in promoting the development of port and logistics clusters.

The anchor firm in a port cluster usually is the port authority, and this gives a uniqueness to the port clusters in comparison with other industry clusters. In many other clusters, a core actor, a stakeholder with regulatory authorities and also with comparable resources and more importantly, with a congruent establishment status, is non-existent. Hence, the organisation, structure and management are more progressive in seaports compared to clusters in other industries. The important features of competitiveness in a seaport cluster, are the territorial factors, geographical characteristics, magnitude, resources, the framework of business and infrastructure of ports. Conducive environment, in terms of easiness of doing business, support policies and schemes, national and regional regulatory and legal framework of the specific country are also relevant when considering the competitiveness of the cluster (Krocis, 2011).

The recognition of seaport as transport nodes in logistics studies is well documented (Button, 1993; Charlier & Ridolfi, 1994; Cooper, 1994; Goss, 1990; Pallis and de Langen, 2010; Robinson, 2002). The perspective of the port cluster harmonises the perspective of transport nodes. The main point of view of the cluster perspective is the establishment of the proposition that co-dependant business entities agglomerate in the geographical territories of the port, with different types of collaboration and sharing of resources as a

sequential development. In the perception as a transport node, the effectiveness of the seaport is deliberated by the quantum of throughput.

The notion of cluster extends parameters like "value-added" as additional measures of the port's effectiveness (Haezendonck, 2001; Haezendonck and Verbeke, 2000; Robinson, 2002) and the measure of investment intensity (Mathys, 2009). In general, the concept of clusters presents a theoretical structure which can be effectively applied to ports scenario. This structure supports the general framework by which a seaport is reviewed as a part of a value chain, and which is particularly helpful in establishing the influencing factors of effectiveness and governance in seaports. The core business activity in a cluster establishes itself as the centre of the cluster and thus at the seaport cluster, the centre of the cluster is the port logistics which involves all the core activities related to cargo and ships.

Evidences from ports across the globe, confirms that various entities at ports such as port authorities, providers of various services, supporting and ancillary businesses, local administration authorities, public agencies at the regional level, financial institutions, academia, and research establishments are constituents in port clusters and that many of these companies which are solely related to port activities are permanent actors (de Langen, 2004).

Cost-effective transportation is the primary interest of the end-users of a logistics facility. The interest of the trade (exporters and importers) usually are distinct from those of service providers in the logistics industry, as the former are responsive to consistency, flexibility, speed of delivery and security which are factors affecting cost indirectly (Murphy et al., 1992). Many global firms operating at multi locations internationally are constituents of the port cluster. These global players in the domains of terminal operation, shipping, multi-modal agencies etc., are not usually attached on any one port, but conduct business in multiple ports in various countries. This enables them to get exposed and acquire updated technology, updated operational processes and systems, modern port equipment and contemporary management capabilities.This suggests that the governance framework in clusters has a potential role as a catalyst of competitive advantage (Wolfe & Gertler, 2004).

Port authorities regularly employ strategic management tools in order to stay competitive, as in any other anchor firm, who participate in the business activities beyond the regulatory role. The port authorities have broadened their activities transcending the local territory, tactically establishing a network with various stakeholders and associates (Verhoeven, 2010). The port authorities have initiated interactions with hinterland entities started contributing in the hinterland development by way of investments and assuming facilitating responsibility through the establishment of purposive alliances with dry ports (Cuypers, 2011; Van Den Berg & De Langen, 2011). They initiated mutual alliances amongst other seaports irrespective of the proximity and similarity in operations. Thus it is observed that the port authorities around the globe are redefining role and purpose, thereby assuming an imperative position in the management of logistic systems (Carbone & De Martino, 2003).

Traditionally the ports were considered as an interface between land and waters and were managed by public agencies. Though the ineffectiveness of the system was known, the ports were exclusively owned and regulated by public agencies due to the ever-increasing and assured demand for services at ports. Such monopolistic environment ensured safeguarding the port authorities from any external competition, and this complacence gave rise to establishing more barriers to the trade instead of becoming agents for development (Haralambides, 2012). On the other hand, the trade comprising of importers and exporters, shipping lines and logistics agents and service providers have multiple options in goods movements. This is more important in the context of the industry's pressure to establish improved levels of efficiency in order to be competitive. As a result, port authorities are required to take an extreme position with an entrepreneurial attitude with an emphasis on innovativeness, effectiveness and customer focus. Also, the port authorities globally are redefining their role and structure, assuming more aggression and commitment in the management of the logistics process and often switching to execution and enterprising character. The port authority has been recently encouraging the shift in the methodology of organisational functioning and in the business process of the

ancillary and supporting agencies in the logistics chain (Cepolina & Ghiara, 2013).

Literature have discussed the responsibility of governmental agencies at the national and regional level, in providing support for evolution and development of clusters. The relevance of an anchor firm to lead the process and the need for engaging the ancillary and supporting businesses has been recognised in cluster literature. The perspective on clusters is equally important for reviewing the adequacy of the geographical scope of the port authorities. The relevant territorial approach could be having one port authority against each port cluster. The constituents of the port cluster should have adequate encouragements to enhance the performance of the port authority.

2.4.1. Operational Advantages of Port Clusters

Many characteristics and benefits are similar in port clusters and industrial clusters. However, the seaport clusters have many distinctive features which strengthen the evolution of the cluster and its benefits which can be categorised into two, namely, operational improvements related to the movement of goods and benefits with regard to the exchange of capabilities among the clustered firms (Sheiff, Y 2010). Both these advantages contribute considerably to the collaborative response system, which helps the cluster look more attractive while it develops, causing further development. The improvements in transportation-related to the movement of goods at the seaport clusters include economics of range, volume and incidence of services for the movement of goods to and from a seaport cluster. In addition to these benefits, these agglomerations offer its members more benefits based on their capability to exchange resources and better customer service.

2.4.2. Development of Port Cluster

Clusters contain more than just this territorial aspect, and some authors claim that regions that run large clusters benefit from increased start-up rates. There are three types of cluster policies: promoting policies that establish a favourable microeconomic business environment for innovation and growth (indirect stimulation of cluster formation and dynamics); conventional system policies,

i.e. policies for business and SMEs, initiatives for research and innovation, and regional policies; development measures aimed at developing, mobilising or streamlining.

The real essence of any port cluster is the strong association that makes the cluster highly competitive and sustainable between a distinctive range of sectors. Leading port clusters are expected to be one-stop service centres, clusters with existing ports are supposed to note the tremendous potential and profit from the provision of increased value-added services including marine insurance and shipbroking services.

In continuation to the works of de Langen, (2003), categorising the two performance parameters in clusters, Edgars, et al., (2011) identified four distinct parameters with regard to the structure as detailed below:

- Clustering and dissolution dynamics: Linages in the agglomerated community by way of connection among various players in the cluster. Interactions and associations can be transaction-based, knowledge spill-over and inter-firm information flow on specific projects. The common constituents of the clusters at seaport are management of freight, cargo movements, logistics, production, service industry, related academia and market.
- Competition from internal and external businesses: inherent competition from amongst businesses those are co-located in the region and part of the cluster, and extraneous competition from businesses from outside the region and located in various other seaports.
- Barriers in clustering: There are barriers to the cluster because of closed consortium and lock-in because of collaborations and specialisations. There are barriers that restrict businesses from joining the cluster, and exit barriers are lock-in features which confine stakeholders of the cluster from parting the cluster, mainly due to the specialisation and the skilled labour resisting themselves from working outside seaport activities.
- Cluster diversity: Multiple business activities are present in port clusters. The cluster encompasses firms operating in diverse domains

and varied sizes of the organisations and its scope in terms of presence in various international and domestic markets.

Also, Four general attributes of governance in a port cluster were identified by Edgars et al. (2011):

- Management of functionalities and harmonisation among member firms in the port cluster
- Facilitating the anchor firm which has a bigger capability to organise the interfirm collaborations
- Acting as Conciliators of knowledge who assist to develop, collect and dispense knowledge among member firms.
- Addressing the collective action problems and facilitating infrastructure.

In the studies on port clusters, Haezendonck (2001) reviewed the functioning of a seaport cluster based on the diamond framework of Michael Porter, and has recognised fourteen factors which impact the effectiveness of seaports, which include competition among the participating firms, cooperation among constituent firms, the existence of ancillary businesses, and the character of regional and national administration.

2.4.3. Constituents of Port Cluster and its Operating Definitions

Port clusters consist of an array of constituents, which are influenced by or can impact upon the accomplishment of the objectives of the cluster (Freeman, 1984). The major constituents of the port cluster are:

- Port Authority, is a public entity established by statutory bodies for a specific objective of developing, maintaining and operating the ports.
- Pilotage and Towing Services, facilitates berthing and un- berthing, navigating to and from the designated territory and other services to the ships calling at the respective seaport.
- Maritime suppliers, are firms are engaged in the supply of Maritime goods to the shipping industry.
- Inland waterway firms are transportations firms operating in a system of navigable inland bodies of water, in the form of rivers, canals, backwaters and creeks

- Shipping companies are the businesses is in transporting cargo by ships.
- Shipbrokers and agents, who are the agencies appointed the shipping companies assigning authority for managing shipments.
- Terminal Operators are those extending facilities of wharfage, dock, warehouse, or other facilities to logistics services moving consignments in the ships.
- Warehousing companies are container freight station (CFS) extending facilities for shipments to get amalgamated and placed between logistics chains.
- Customs house agents (CHA) or Customs Brokers (CB) is an entity authorised to represent the customers for carrying out of any activity at a customs location.
- Stevedores are firms or individuals engaged in the loading or unloading of a vessel at port.
- Labour Contractors are intermediaries who supply labour in a system whereby workers are hired by to the employer for a fee.
- Distribution Companies are entities involved in the process of reaching a product or service to the consumers or businesses which utilises it.
- Transporters are firms engaged in transporting goods, containers and other materials in the port and to/from the port hinterland.
- Railway Companies are those establishments which are engaged in transporting by rail facilities, goods, containers and other materials to/from the port hinterland.
- Barge Masters are the persons or firms in charge of the transportation on a barge or barges, in a port.
- Ship Building / Repair Firms/ Spare Part Suppliers are those firms which are engaged in shipbuilding, maintenance and repairs of ships.
- Dredging firms are those businesses who are engaged in dredging operations at the port in order to keep the waterways navigable.
- Fishery Firms are those engaged in businesses related to Fisheries, using the port infrastructure.
- Marine Consultants (Naval Architects- Surveyors) are entities extending

the consulting services and Surveying services in connection with the port activities.

- Legal Services firms are those who are extending the legal services to the other constituents in a port.
- Banking & Financial Services are the firms extending financial services (including banking services), to the other constituents in a port.

Dynamics of the port cluster constituent firms within the cluster is unknown. The dynamics refer to the functioning of the constituent firms within and among the firms with regard to the cluster principles, and with reference to the factors of cluster performance.

2.4.4 Impact of Clusters on Port Performance.

Seaports are regarded as intersections in a logistics chain, as well as a geographical agglomeration of economic activities. Many functions in logistics and especially transportation are converged in the seaport, which includes cargo generating firms. The growth of the entire cluster reflects in the growth of individual constituent member of the cluster, and this phenomena of facilitating growth is reciprocal. Handling of cargo within the geographical territory of the port is the core function in a seaport. However, hinterland transportation, logistics, industry and trade are the other components of a seaport cluster (Langen & Chouly, 2004). As the firms engaged in warehousing the cargo, manufacturing of goods and movement of cargo are contained within the seaport cluster, the aggregate value-added of the cluster is more than the sum of the value-added of individual constituents.

The most significant elements of the effective functioning of the port are the efficiency of the port and the terminal (Tongzon, 1995; Tongzon & Heng, 2005). Terminal effectiveness can be explained as the quantum of cargo handled, which include loading and unloading, per berth hour. This represents the extent of productivity of labour and capital in the port (Tongzon, 1995). When the level of effectiveness is enhanced, the productivity improves, and more quantity of cargo could be handled, and the throughput of the port builds up (Tongzon & Heng, 2005). The study by Tongzon (1995) evidenced that the efficiency of the port-terminal impact significantly and positively on port

performance, however, the port effectiveness is impacted by multiple factors such as the nature of cargo, capacity of the ship and the efficiency of handling equipment.

Work habits and systems with regard to the time consumed in port operations influences the effectiveness of the port. The time lag from the berthing time and total work time projects the delays in initiation. Similarly, the time lag between the gross operating time and net engagement time is the stevedoring delays, because of scheduled stoppage of work, bad weather, power failure, breakdown of equipment etc. The port performance is usually ascertained by the efficiency of activities at the port and especially at the terminal (Loo & Hook, 2002). Hence it is important to review clusters as one of the main factors influence the efficiency of activities at the port .

The performance features of the seaport and the business ecosystem have an impact on bringing in the trade and hence an influence on the quantity of cargo handled at the port. There are seven significant factors of port performance which are identified as the determinants of the effectiveness of a seaport, namely, the geographical identity of the port, access to the port hinterland, accessibility of port from the seaside which is determined by the draft, the presence of various business entities at the port, the efficiency of terminals and the port, the charges for operations at the terminals and port and the commercial activities leading to the development and growth.

The geographical position of the port acts an important element of consideration on selecting the port of choice by the trading entities. The distance of the port from the place of manufacturing or cargo processing is the greatest influencer in deciding the port of choice (Malchow & Kanafani, 2004).

Further, the maritime distance between the ports of origin and destination influences the decision on the selection of port for shipment. The research of Caldeirinha, Felício and Coelho (2009) established that a port's commercial performance is impacted positively by the closeness of the urban hubs to the location of the port. In a study, Caldeirinha et al. (2009) observed that the geographical position is a major element of influence on port performance. The cluster concept is useful as it acknowledges the complementarity of businesses

in core and assisting operations, the complementary inputs and the capacity of companies to achieve shared benefits through multiple actors. Port clusters add a great deal of value to the economy's GDP, generating employment and demand. Maritime cluster main sectors are the shipping firms, ports, and marine businesses. The greatest economic contribution comes not from maritime operations at sea, but from the shore derivatives also.

2.4.5. Determinants of Port Performance

As discussed in the previous sections, various researchers have studied multiple factors impacting port performance. The major determinants which have a direct influence on the performance of seaports are discussed hereunder:

- Geographical identity of the port *(Geographical Location and hinterland)*: Port's effectiveness and competitivity are enhanced by having a good location. Location of port takes account of the geographical features like the accessibility to the hinterland and easiness for the ships for entry and operations at the port, and chances of further development and growth. Hinterland is neighbourhood area of the coast, from which the cargo is delivered to a seaport for transporting to other destinations. Port activities have very strong connections with its hinterland.
- Access to port's hinterland: Hinterland access is a major matter of concern for any seaport. Seaports and the transport network in its neighbourhood be able to enhance the volume of cargo, only if transport systems in the hinterland is adequately established and the connectivity to the port is managed efficiently. In order to effectively utilise the transport network, synchronisation among a substantial group of firms in the hinterland chain is essential (De Langen, 2004). The way in which operators of the terminals, clearing and forwarders who handles the cargo, shipping companies, and the port authority, behave have an effect on the quality of access to a port's hinterland. Access to the hinterland is imperative for the seaports to be attractive (Kreukels and Wever, 1998). The extent of the commitment of firms in the port cluster influences the quality of the hinterland. Though an independent firm will not be able to completely avail the advantages of a well-networked hinterland, a group of businesses in a port cluster can take

advantage. Such entities in the cluster and the port authority can take advantage of the joint action.

- Draft and accessibility: (*accessibility of port from the seaside which is determined by the draft).* Draft is the vertical distance from the water surface to the keel of the vessel and the permissible draft is dependent on the depth of the waterbody. This is considered as a measure of the extent of accessibility of vessels in a port. Geurs and Van Wee (2004) explains that ease of access as the degree to which the land use and logistics channels strengthen firms to engage in endeavours and reaching targeted destinations using multiple transportation modes. In the scenario of the global port sector the for the international container port sector, the inherent meaning of the above concept shall be assumed for a firm at port wherein many clients and resources are reachable when the capability for providing adequate access in independent ports are more. Accessibility can be assessed mainly on three aspects, viz., Infrastructure Based, Activity-Based and Utility-Based.

- The presence of various business entities at the port: This refers to the existence of firms to provide all related maritime services and activities in a port.

- The efficiency of terminals and the port: Tonnage of cargo being handled in a specific period or the number of shipping containers loaded and unloaded at the port during a specific period is the prominent measures discussed in most of the studies on the performance of ports (Song & Yeo, 2004; Tovar & Trujillo, 2007; Garcia-Alonso & Martin-Bofarull, 2007). The quantum of the cargo handled at the port, in terms of the number of units of twenty-foot containers had been taken in to account to study the element for evaluating the port performance by Cheon et al. (2010). And the effectiveness of the terminals is reviewed in terms of the freight charges offered by the shipping operators, the time taken by the vessels at the port for operations, and goods dwelling periods. The major indicators of the efficiency of a terminal are classified into two groups by Tongeon and Ganesalingam (2009), namely, the measures for effectiveness with regard to the physical operations at the terminals and those which are oriented around customer activities. The

former discusses the workforce productiveness and rate of usage of resources and the later discusses the cost of availing services, holding time of ships, management of delays in hinterland movements and dependability (Tongzon and Ganesalingam, 2009).

- Charges for operations at the terminals and port: The facility charges and cost of operation impact the competitiveness of the seaport. The trade and other users and beneficiaries of the facility have a preference for the port, offering the optimum price for a comparable quality.
- Commercial activities leading to the development and growth: Activities at port and allocation of resource and its utilisation are strongly connected to macroeconomics. Hence any alterations in the movement or activities at port or modifications in the port establishment influence the growth and development of the hinterland. Seaports are centres of focus where many complementing and competing for business entities operates towards a common objective of performance delivery at the port. These businesses characterise a multifaceted assortment of interconnectedness, which provides for the cluster of institutions of both regulatory and operational in nature.

2.4.6 Port Cluster Functionalities

Various functionalities of the port cluster had been identified in literature. These functionalities and their major features are listed hereunder (Courtright, 2006; Mills et al., 2008) :

- Workforce collective and mobility: (*pooling of labour market*): concerning the information exchange, skill upgradation, recruitment and training of the workforce and the labour dispute resolution mechanism.
- Domain expertise: *(supplier specialisation*): concerns with the skill development specific to the domain of operation.
- Information exchange: *(knowledge-spill overs):* concerns the collaboration among the firms resulting exchange of technology, information and process improvements, networking, support for innovation.
- Enterprise development and start-ups: (*development of entrepreneurship*):

concerning the support and facilitation of incubation services for new businesses.

- Lock-in: Concerns with the strengthening of specialisations, complementarities and developing distinctive capabilities.
- Culture: concerns the work culture which encourages acknowledging and supporting cluster dynamics.
- Facilitating business development: concerns activities, collaborative in nature which encourage tasks of market research, business promotion and establishing brand image
- Facilitating network development: *(promoting relationship-building):* concerns with establishing cooperative and collaborative activities within the cluster and external to the cluster for the benefit of the industry.
- Encouraging collective innovation: *(facilitating collaborative innovation):* Concerns activities to encourage collaborative innovations aiming at better delivery of products and services and improvements in process design.
- Promoting diffusion of innovative concepts: *(innovation diffusion):* concerns encouraging the process of adoption of innovative systems and practice
- Encouraging expansion of cluster organisation: concerns with the activities in promoting the cluster concept and drawing more firms to participate in clustering.
- Training and development activities: concerns with the skill up-gradation of the workforce to be in line with the global standards in processes operations
- Assuming representative role before external establishments: concerns with representing the cluster in establishing and maintaining the relationship with various governmental and non-governmental bodies for the interest of the cluster.
- Creation and Sharing of common infrastructure facilities.

2.4.7. Port Cluster Formation & Development

An anchor firm acts as an agent for evolution and development of a port cluster. The governmental agencies or authorities established by the governments act as anchor firms in most of the cases where port clusters are developed. Also, in some cases, it had been observed that the public-private partnerships (PPP)

which are in the form of a semi-governmental agency, like the port authority acts as the anchor firm. There could be many privately owned and maintained logistics and service parks within a port cluster.

The distinctiveness of the port cluster is that the port authorities manage the dynamics within the clusters, contrasting the modalities and practices prevailing in the other clusters. Moreover, the policy and regulatory measures of the regional and national governments influence the activities of the cluster, irrespective of the extent of direct participation in the cluster evolution, development and activities at the port.

The geographical environment is considered to be an important factor in the growth and success of a port cluster. Several business firms with the similar interest or industrial activity, a comparably more number of players of a specific industry in the region and a high extent of exports are pointers towards the potential of agglomeration (Porter, 1990).

Researchers in economics and related areas observed that in many cases other than in the port industry, the government has only insignificant roles in the formation of clusters. This is particularly noticeable in reviewing and comparing with the clusters in technologically oriented industries (Wadhwa, 2010). Evolution and development of clusters are possible as a result of the following logics:

- Manufacturing processes which involve production process with features having a competitive advantage due to the geographic location will form clusters (localised economic regions) and facilitate firms to gain economies of scale which in turn will ensure cost savings for associated firms.
- Exchange of workforce by which the businesses gain advantages from a labour pool having necessary and diverse capabilities. Also, the workers gain from a large number of potential establishments to engage them. Clusters will evolve where the workforce in the region possess specialised skills. This leads to the regions getting dense with firms requiring workers with the specific specialised skillset. Locations where the processing of products in need of specialised skills will attract workers possessing those

specific skillsets. Also, the locations where the specifically skilled workers are will appeal to firms that are in need of workers with those specific skills.

- Demand exists for products where consumers require some additional features force innovation and the member firms take advantage of the extended market for their products and services.

Societal features, organisational and cultural characteristics which speed up the cluster evolution.

2.4.8. Clusters and Port Competitiveness

The capability of a business firm to deliver a distinctive value proposition is being recognised in the literature as competitiveness (Prahalad & Hamel, 1990; Woodall, 2003). The seaport industry comprising of active business systems and connections (van der Lugt et al., 2007), contemplates competitiveness of the seaport as a function of the industry's capability (Garcia de la Guia, 2010) in developing functional strength, skills and expertise in a collaborative approach (Nalebuff & Brandenbunger, 1996). Two major areas had been categorised in the studies on competitiveness by the academia namely, the recognition of the causes and agents of competitiveness of seaports (Pearson, 1980; Tongzon & Heng, 2005; Yeo et al., 2008) and the recognition along with the measurement of the extent of the cause and involvement of the agents in the competitiveness of seaports (Tongzon 2001; Teng et al., 2004).

The clusters enhance the performance of firms, augment the innovation process in the firms as well as the environment, and promote the expansion of businesses and encourage entrepreneurship (Porter, 2008). A major presumption in studies relating to clusters is that the locational closeness provides opportunities for skill up-gradation, transfer of information and innovativeness within the agglomeration, by way of regular collaborative activities (Asheim and Gertler, 2005; Maskell, 2001; Payne, 2008). Moreover, innovation is inspired by the demands of customers, and by the movement of a skilled labour pool among the firms. Hostility and competition among firms have been identified as an essential requirement for innovation.

The performance and the capability to generate economic development and growth, of a cluster wherein the same or similar constituent firms are forming the agglomeration can be different in different regions. The advantages enjoyed from locational agglomeration are found to be distinctive to some businesses at particular phases of growth in specified geographies and are available only in certain situations (Glasmeir, 2000, as cited in Martin and Sunley, 2003). These differences may be because of inbuilt distinctiveness in the economies of those geographical regions. Further, in some other cases, the difference may be because of different phases agglomeration's life cycle (Wolman & Hincapie, 2010).

2. 5. THEME BASED LITERATURE CLASSIFICATION AND IDENTIFICATION OF INITIAL CONCEPTUAL CONSTRUCTS & SUB-CONSTRUCTS

The literature have been categorised into different key themes with respect to clusters in the maritime industry. Total of 206 research papers had been reviewed. The details are presented in table 2.2. Sub-constructs with regard to the major constructs developed have also been derived from the reviewed literature.

Table 2.3 Theme based Literature Review

Theme I	**Industrial clusters; Cluster Theory, Port Cluster (69)**
Authors	Delgado, M., Porter, M. E., & Stern, S. (2016), Sheffi, Yossi (2010), Rivera, Liliana; Sheffi, Yossi; Knoppen (2016), Kramer, Mark R (n.d), Kasalis, Ivars (2011), Porter, Michael E (1998) (2007) (2008), Zhang, Wei; Lam, Jasmine Siu Lee (2013), Hamdouch, Abdullah (2007), Association of Danish SO (2010), Rakesh, AK (n.d), Doyle, Eleanor; O'Connor, Sean (2016), Lindberg, Malin; Sahill, Line (2013), Martin, R; Florida, R; Pogue, Melissa; Mellander, Charlotta (2015), Ysand et.al, (2012), Langen, PW de (2002), Belussi, F. & Gottardi, G. (2000),

Authors	Wolman, Hal & Hincapie, Diana, (2010), Krugman, P. (1991, 1995), Rosenfeld (2005), Cortright (2006), Glaeser & Gottlieb (2009), Marshall (1890), Saxenian (1994), Hill and Brennan (2000), Asheim (1996), Lundvall (1992), Scott (1995), (Porter, 1990, 1998, 2000), European Commission (2002), Department of Trade and Industry (2001, 2003), Marshall, A (1890), Richardson, H. W. (1978), Baptista, R. (2000), Scott (1988, 1998), Amin & Thrift (1992), Harrison (1992), Harrison et al., (1996), Markusen, (1998), Asheim, (2000), Pinch & Henry (1999), May et al. (2001), Scott, (2001), Keeble & Wilkinson (2000), Keeble & Nachm (2002), Martin and Sunley, (2003), Nadvi (1999), Giuliani (2005), Glasmeir, (2000), Mills et al. (2008), Sheffi, Y (2010), Rodrı́guez-Posea and Crescenzi (2008) , Langen & Chouly, (2004), Langen, (2004), Nijdam & Langen, (2003), Tongzon, (1995), Tongzon & Heng (2005). Loo & Hook (2002), Malchow & Kanafani (2004), Caldeirinha, Felício & Coelho (2009), Caldeirinha et al. (2009), Notteboom & Rodrigue (2005), Garcia-Alonso & Sanchez-Soriano (2009), Langen, Nijdam, & Horst (2007), Talley (2006). Belussi, F. & Gottardi, G. (2000), Wolman, Hal & Hincapie, Diana, (2010), Krugman, P. (1991, 1995), Rosenfeld (2005), Cortright (2006), Glaeser & Gottlieb (2009), Marshall (1890), Saxenian (1994), Hill and Brennan (2000), Asheim (1996), Lundvall (1992), Scott (1995), (Porter, 1990, 1998, 2000), European Commission (2002), Department of Trade and Industry (2001, 2003), Marshall, A (1890), Richardson, H. W. (1978), Baptista, R. (2000), Scott (1988, 1998), Amin & Thrift (1992), Harrison (1992), Harrison et al., (1996), Markusen, (1998), Asheim, (2000), Pinch & Henry

	(1999), May et al. (2001), Scott, (2001), Keeble & Wilkinson (2000), Keeble & Nachm (2002), Martin and Sunley, (2003), Nadvi (1999), Giuliani (2005), Glasmeir, (2000), Mills et al. (2008), Sheffi, Y (2010), Rodrı´guez-Posea & Crescenzi (2008) , Langen & Chouly, (2004), Langen, (2004), Nijdam & Langen, (2003), Tongzon, (1995), Tongzon & Heng (2005). Loo & Hook (2002), Malchow & Kanafani (2004), Caldeirinha, Felício & Coelho (2009), Caldeirinha et al. (2009), Notteboom & Rodrigue (2005), Garcia-Alonso & Sanchez-Soriano (2009), Langen, Nijdam, & Horst (2007), Talley (2006).
Inferences	An agglomeration of inter-related businesses, trade and industry associations and institutions concentrated at a geographical location is termed as a cluster. This similar and harmonised congregation of entities is usually concentrated around an economic speciality, a similar service, product or business process. Clusters are accumulations of three types of firms: (i) firms in the logistics industry which extends services, (ii) establishments servicing the firms in logistics industry and (iii) businesses that significantly dependent on services of logistic companies. Port cluster is the group of inter-related organisations involved in activities related to port operations and located within the geographic territory of the port region. The constituent firms in a port cluster Port clusters consist of shipping companies, pilotage and towing services, terminal operators, warehousing firms, value-added logistics companies, manufacturers, forwarders, shipping agents, distribution companies, hauliers, railway companies, barge masters, maritime service companies.

Initial Conceptual Constructs / Sub Constructs	Port Cluster Constituents
Gap	Cluster constituents' functioning (cluster functionalities) and its relationship with the determinants of port performance is unknown.

Theme II	**Cluster Functionalities (22)**
Authors	Lämmer-Gamp, T., & Meier, G. (2016), Gereffi, G., & Lee, J. (2016), Langen, PW de (2002), Belussi, F. & Gottardi, G. (2000), Wolman, Hal & Hincapie, Diana, (2010), Rosenfeld (2005), Cortright (2006), Glaeser & Gottlieb (2009), European Commission (2002), Department of Trade and Industry (2001, 2003), Asheim, (2000), Pinch & Henry (1999), May et al. (2001), Keeble & Wilkinson (2000), Keeble & Nachm (2002), Martin and Sunley, (2003), Nadvi (1999), Giuliani (2005), Glasmeir, (2000), Mills et al. (2008), Rodrı́guez-Pose and Crescenzi (2008)
Inferences	Agglomeration of firms wherein inter-related activities are clustered, enhances the competitiveness and effectiveness of cluster constituents by improving their production efficiency, reducing the cost of operations, bringing innovation in process and technology and encouraging the establishment of new business entities. The literature identifies the major constituent firms of a port cluster and categorised into three categories, The shipping Services, Primary Service Providers and the port authorities and terminal operators.

Initial Conceptual Constructs & (Sub Constructs)	Labour Market Pooling, (Occupational Agglomeration, Labour compositional effect); Knowledge spill-over (Intellectual spill-over, Technology spill-over); Entrepreneurship, (Innovation diffusion); Supplier Specialisation, (Value chain partnership); Lock-in, (Inter-firm relationship, Path dependence); Innovation, (Business process innovation, Technological innovation); Business development, (Trade Promotion, Value chain management); Training & Education, (Competency building)
Gap	Contributions of cluster functionalities in port performance are not known.
Theme III	**Cluster Governance (30)**
Authors	Konstantynova, A. (2016), Webers, Harry (2008), Maskell, Peter; Lorenzen, Mark (2004), de Langen, Peter W (2006) (2007), Hamdouch, A (2007), Policy Research Corporation (2008), Solvel, Orjan (2008), Muro, Mark; Katz, Bruce (2011), Nyoman Pujawan and Mansur Maturidi Arief, Benny Tjahjono, Duangpun Kritchanchai (2016), Korcis, Alexandra (2011), Cepolina, Sara; Ghiara, Hilda (2013), Kuah, Adrian T H (2002), Viederyte, Rasa (2013), United Nations conference (2013), Laaksonen, Eini; MÃ¤kinen, Hanna (2013), de Langen (2004), Rosenfeld (2010), Freeman (1984), Murphy, Daley, & Dalenberg (1992), Wolfe & Gertler (2004), Verhoeven (2010), Cuypers (2011), Van Den Berg & De Langen (2011), Carbone & De Martino (2003), Haralambides (2012), Cepolina, Sara & Ghiara, Hilda (2013), Bird & Hayuth (1988), Brooks & Pallis (2008), Rinkinen, S. (2016).
Inferences	The literature suggests that Cluster governance is a mechanism to coordinate interaction in a cluster. The

	quality of cluster governance depends on the degree of transaction costs among the clustered firms and the scope of collaboration and synchronisation of activities within a cluster.
Initial Conceptual Constructs & (Sub Constructs)	Cluster Leader, Terminal Operators, Anchor Firms
Gap	The extent to which the governance of the port cluster influences its constituent's performance is not known.

Theme IV	**Cluster Performance (31)**
Authors	Homosombat, W., et.al. 2016), Dooms, M., & Parola, F. (2016),Chung, T. W. (2016), Das, K. (2016), De Langen, Peter W.; Visser, Evert Jan (2005), Langen, PW de (2002) (2005), Baccelli, O; Percoco, M; Tedeschi, A (2008), Chung, Tae Won (2009), Monteiro, et al. (2013), Othman, Mohamad Rosni; Jeevan, Jagan; Rizal, Shamsul (2016), Kim, Tae Seung (2015), Chang, Yen Chiang (2011), Wijnolst, Niko; Jenssen, Jan Inge; Sa¸dal, Sigbja (2003), Doloreux, David; Shearmur, Richard (2009), Engelke, Thomas; Schleswig-holstein, Hanse-office Land (2009), Othman, Mohamad Rosni; Jeevan, Jagan; Rizal, Shamsul (2016), Langen, Peter Wubbe De (2004), Rosni, Mohamad; James, George; Abdul, Saharuddin (2011), Marina, Beacon Point; Chapman, Blakeslee Arpaia (2000), Porter, M.E (1990), Baptista, R. (2000), Metcalfe, S. (1998), Krocis, Alexandra (2011), de Langen, W. (2003, 2004), Edgars, Kasalis; Ivars, Kassalis & Janis, Kasalis (2011), Van Klink

	(1995), Haezendonck (2001), Spencer, M Gregory et al, (2010), Morrissey, K., & Cummins, V. (2016)
Inferences	The effectiveness of a cluster is evaluated in terms of the value-added. A remarkable performance is evidenced by an increase in the value-added the cluster generates. In the available literature, the presence of related and supporting industries has been identified as the major factor of influence on the efficiency of the port and the terminal, which in turn impacts on the competitiveness of seaports.
Initial Conceptual Constructs & (Sub Constructs)	Hinterland Access, (Transportation & warehousing); Cost Effectiveness, (Scale parameters)
Gap	Individual contributions of factors (of cluster performance), in port performance, is not known.
Theme V	**Port Performance. (26)**
Authors	Chen, S. L., Jeevan, J., & Cahoon, S. (2016), Woodall (2003), Porter, M.E (1980), Grant, (1991), Barney (1991), Van der Lugt et al. (2007), Garcia de la Guia, (2010), Nalebuff & Brandenbunger (1996), Pearson (1980), Tongzon & Heng (2005), Yeo et al. (2008), Tongzon (2001), Teng et al. (2004), Asheim & Gertler (2005), Maskell (2001), Payne (2008), Martin & Sunley (2003), Wolman, Hal & Hincapie , Diana (2010), Notteboom & Rodrigue (2005), Moglia & Sanguineri (2003), Notteboom

	& Winkelmans (2002), Van de Voorde and Winkelmans, (2002), Brooks & Cullinane, (2007), Musso & Ferrari (2011), Musso & Ghiara (2008), Brooks et al. (2011).
Inferences	Effectiveness of the port and the terminal is a prominent measure of port performance. The major operational features of a port and the economic environment can influence shippers decisions in port selection and thus impact the cargo throughput in a port. The firms at the port which forms the cluster have the potential to influence the port performance.
Initial Conceptual Constructs & (Sub Constructs)	Efficiency of Terminal Services (Service Improvement); Efficiency of processes (Service capability).
Gap	The ways in which the clusters at port impacts the performance of the port is not known.
Theme VI	**Cluster Development / Policy (28)**
Authors	Isaksen, A. (2016), Galvao, C. B., et.al. (2016), Viederyte, Rasa (2013), Colgan, Charles S.; Baker, Colin (2003), Lindqvist; Ketels, Christian; Lindqist, Garan; Salvell, Arjan (2003), Ketels, Christian H M (2011), Mokhele, Tsietsi (2015) (2015), OECD (2010), Zagkas, Vassilios K; Lyridis, Dimitrios V (n.d), Karlsson, Charlie (2008), FlÃ¸ysand, Arnt; Jakobsen, Stig Erik; Bjarnar, Ove (2012), Coimbra, Joalo(2012), Toh, Keith K T; Welsh, Karyn; Hassall, Kim (2010), Trippl, Michaela; Grillitsch, Markus; Isaksen, Arne; Sinozic, Tanja (2015), Pedro, Valadas: Monteiro, Teresa de; Noronha, Paulo Neto (n.d), K.T., Keith; Welsh, Karyn; Hassall, Kim (2010), Trippl, Michaela; Grillitsch, Markus; Isaksen, Arne; Sinozic, Tanja (2014), Shakya (2009),

	Xiao, Zhanxin; Zhou, Liuyu; Liang, Jin; Hongzhong, Li; Hong, Zihan (2014), Porter, M.E (1990), Wadhwa (2010), Graham (2006), Cortright (2006), Markusen et al, (1991), Krugman (1991), Salvador, R., Simões, A., & Guedes Soares, C. (2016).,Yang, Y. C., & Chen, S. L. (2016).
Inferences	Regulations and policies of governments influence the operation and success of a seaport cluster. Clusters evolve through, processes of production and operations, labour market, the market for goods and social/institutional/cultural reasons. Few of the studies and deliberations on establishment of clusters are explorations of reasons for agglomeration of specific types evolving and developing in a particular geographical territory or region, by processes of path dependence and lock-in.
Initial Conceptual Constructs/ Sub Constructs	Support Measures, (Infrastructure development, Incentive schemes); Government's Direct Role, (Regulatory framework); Transparency, (Planning stability); Constituent Management, (Facilitation measures); Engagement Process, (Factors of production)
Gap	How government policy influences a seaport cluster development is not known.

2.6. GAPS IN LITERATURE

Based on the above literature review, the major gaps in literature, linked with the business problem can be summarised as given below:-

1. Cluster constituents' functioning and its relationship with the determinants of port performance is unknown.
2. How government policy influences port cluster development is not known.

Based on the gap in the literature, the research problem is developed. The Research problem, research design and research methodology are discussed in the next chapter.

2.7. REVIEW OF FURTHER LITERATURE

Literature published subsequent to the identification of the major gaps in literature as above, linked with the theoretical underpinning and research methodology were reviewed. However, no relevant contribution in literature, further to the ones identified prior to identification of gaps and the formulation of the research questions, which would address any aspects of the research questions of this study, could be found on reviewing 45 peer-reviewed papers published in the domain of port clusters during the period June 2017 to September 2020.

2.8. CONCLUDING REMARKS

As initial phase in the literature review, an extensive literature survey was carried out related to cluster theory, geographic clusters, port clusters, cluster functionalities, governance of clusters, determinants of port performance and features of cluster policy. Then, the literature was analysed and categorised based on key themes. As identified from the literature, initial constructs have been conceptualised.

A detailed review of various theoretical frameworks and models identified from literature is also presented in this chapter. Finally, literature gaps were arrived from this detailed literature review and presented.

Next chapter discusses the research design & research methodology adopted for this research study.

CHAPTER - 3

RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

This chapter discusses the research design and methodology for carrying out the research study. Research design explains the relationship among the experimental evidences to the research investigation's primary research questions and the findings of the study (Yin, 2009). Discussions on multiple research concepts, standards, methodologies and strategy, the method for data collection and strategy for analysis of evidences are carried out in this chapter. The focus of research, research questions and research objectives are discussed. The broad approach and reasoning for choosing the case study methodology for the research and strategies adopted are discussed in Section 3.4. This section describes the various methods engaged by the researcher to carry out study and the relevance of these approaches to the research. Section 3.6 and 3.7 describes the strategy of the research by the case study method, its design considerations including the number of cases, criterion for selection of cases and configuration of case study design in terms of the unit of measurements and levels of measurements. The methods adopted for the research to collect evidences are discussed in Section 3.8. Section 3.9 and 3.10 discusses the strategy for data analysis which includes scrutiny and review of evidences with grounded theory (Charmaz, 2006), with-in case review (Tsang, 1997), and cross-case explorations (Miles and Huberman, 1994). The discussions in section 3.11 explain the empirical study's quality with regard to the analysis which is significant in the case of research using qualitative research methodology, namely, construct validity, internal validity, external validity, and reliability (Yin, 2009). The use of Case Study Protocol (CSP) for data collection is

explained in Section 3.12, and the protocol document developed and made use in this research study, also is presented. Finally, Section 3.13 describes the method and format of the focus group discussion.

3.2. RESEARCH FOCUS

The economists, the industry, and the policymakers around the world have, over the last few decades, shown concern and attentiveness towards the concept of regional agglomerations bases on specialisations of economic activity. To find out various research carried out in this area to understand and analyse the various aspects of agglomeration and cluster theory, especially the port clusters, and the academic and industry research in the area of clusters influences on port competitiveness and performance, a detailed literature review was carried out from sources such as research articles, books, documents and reports. The focus of research is on cluster dynamics, its constituent members, cluster functionalities, its influence on the firm and port performance in the maritime industry context.

It is observed from the literature review that the cluster dynamics and related frameworks established the existence of cluster functionalities and practices in the maritime industry, but they failed to explain how are the cluster constituents behave with reference to the functionalities and how the cluster functionalities influence the port performance. As explanation is essential for building theory and for establishing the importance of the existence of cluster on the port performance, there is a need for process study of cluster dynamics at the level of the firms engaged in the clustering.

Further, extensive literature search for cluster constituent's functioning using qualitative research approach in an industry level concentrating more towards the operations intensive industries like the maritime industry in South Asian context found no reference in the existing academic literature. Literature in databases such as EBSCO, Pro-Quest, Emerald, Elsevier's Business Management & Accounting Collection (Science Direct) among many others, with the keywords, cluster theory, port cluster, cluster-firm engagement, port performance, port structure, port cluster constituents, port competitiveness, port

governance, cluster governance, cluster competitiveness, cluster policy, and cluster development were searched.

At an industry level and the firm level in port operations function, the tacit and explicit knowledge on the functionalities, contributions and management of an industry agglomeration are available with the various professionals working in the maritime industry. It was required to gather a detailed understanding of this knowledge in establishing the relationship structure and functioning of cluster constituents and the ways in which these functionalities influence the port performance.

Therefore, the focus of the research study is to understand & describe the functionalities of port clusters, inter-relationship of its functionalities and the influence of the cluster functionalities on the port performance. Since the nature of enquiry is of exploratory study (Maxwell, 1996; Yin, 2009), the method selected for this research is qualitative research. Qualitative research enables the scholar to conduct a detailed evaluation of the questions with regard to the awareness of the scenario, cultural and societal where the problem exists (Myers, 1997). In this method, the research problems are reviewed by analysing the configurations and relationships from interviews and secondary sources of data like records and documents and process diagrams. Qualitative research method follows the inductive approach, and this is the strength of the method. Qualitative research method concentrates on distinctive contexts or populations and gives prominence for words rather than numbers (Maxwell, 1996).

The method of case study research had been chosen for this study since the form of research questions are 'how' and 'why' and the 'process'. The case study method has the feature that "the principal approach amid most of the case-study research method, is that the method attempts to highlight a group of decisions: as to why these solutions were considered, how these solutions were executed and the features of the outcome it generated" (Yin, 2093). For this research, case-study with holistic research design involving multi-cases (Type 3; Yin 2009) had been used. Also, the case design approach was of Multiple-case design, since the evidence from more number of cases is more convincing, and therefore the study largely, is considered as being more realistic.

3.3. RESEARCH PROBLEM

The research problem had been formulated as under:

Although the existing literature talks about the port cluster and about the port performance, the constituent firms' functioning within the cluster, which result in the port performance is not known. Also, the influences of the Government policies on the development of port clusters is not known.

3.3.1. Research Questions

Based on the above, the research questions had been formulated as under:

RQ1. How port cluster constituents function and influence the determinants of port performance?

RQ2. How Government policy influences the port cluster development?

These questions are exploratory, and it seeks to explore and find out the cluster dynamics existing at the selected ports. Further, it seeks to understand the influence of policy initiatives with regard to the cluster evolution and development in the seaport sector, in each of the ports of study. The research questions are of exploratory nature since the method attempts to analysing a design of interconnectedness and its effects (Yin, 2009).

3.3.2. Objectives of the Study

The purpose of the research is to critically analyse the functioning of seaport cluster constituents, its influence on the performance of the port and to understand the influence of the Government policy on the cluster development, in the transhipment ports of Colombo and Klang and to identify those constituents which are relevant for the port of Cochin, and to attempt to create a framework for the establishment of a port cluster at Cochin port.

Accordingly, the research objectives had been finalised as under:

RO 1.a: To analyse how the port cluster constituents function.

RO 1.b: To analyse how the port cluster constituents' functioning influence the determinants of port performance.

RO 2: To explore how the Government policies influence the port cluster development.

3.4. OVERALL APPROACH AND RATIONALE

In the process of the research, the problem in the system is defined by the researcher. Then, the researcher investigates and analyses the features and characteristics of the problem entirely through an organised and methodical analysis (Maxwell, 1996).

Subsequently, the questions and the design of the research are formed in order to systematically analyse the research problems. Then the prevailing concept associated with the research problem is investigated and unified by the help of a method to develop and establish a theory. Centered on the theories in practice, a detailed conceptual lens is developed for an in-depth investigation into the research problem.

On the basis of the research questions and the conceptual lens created, the methodology for research design involving the collection of empirical evidences and analysis of collected evidences are developed. Then, the researcher initiates collection of data based on the outlined research design and study methods in the study. The collected evidences are reviewed on the basis of the structure of the conceptual lens, and the results of a review of evidences are considered as the final outcome and conclusions of the study. Such conclusions may direct the researcher to the development of an extension to the existing theories and enable to establish recommendations to the solution to the initial research problem. The research design, thus established, is illustrated in Figure 3.1.

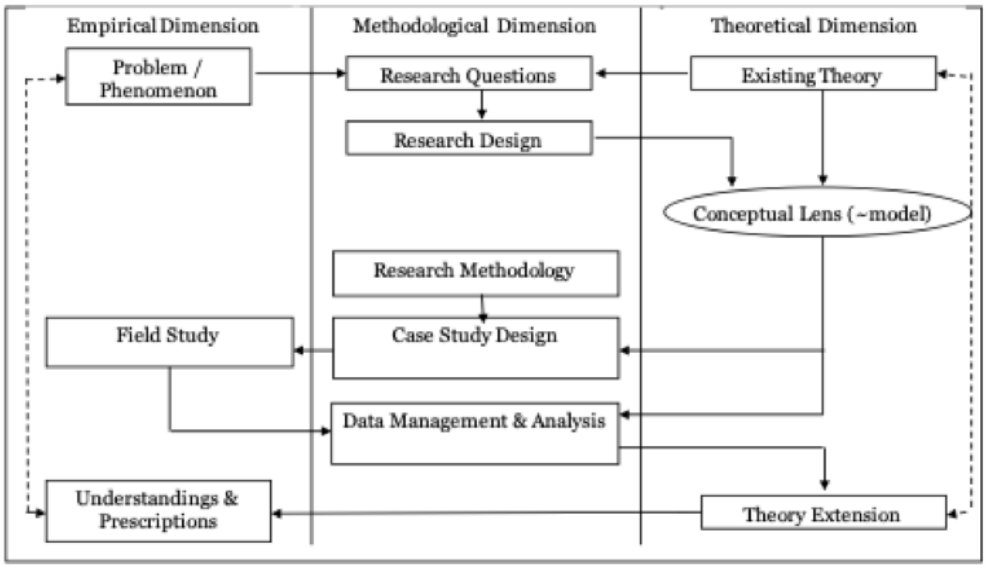

Figure 3.1 – Research Design (source: Maxwell, 1996)

The focus of this study is on the functioning of seaport cluster constituents, its influence on the performance of the port and to understand the influence of the Government policy on the cluster development. This research approach is targeted to impart adequate information and description of the cluster dynamics and policy implications in cluster development in the operational and tactical level.

Considering the background of the research and the research questions evolved, the study on port clusters at a geographic level in transhipment ports in the East-West maritime route (Colombo Port and Port Klang) was found appropriate. This study uses the case study research method under qualitative research methodology.

3.4.1. Philosophical Assumptions

As suggested by Myers (2013), the key factors which influence the quality of a research study are a selection of suitable research method and design, measurement of a theoretical element, beliefs about the characteristics of reality, analysis of evidences and interpretation of the findings.

As explained by Creswell (2007), five philosophical assumptions lead to a researcher's choice of qualitative research method, namely the nature of the reality and the way it needs to be constructed (ontological assumptions), the

way the investigator understand the reality and what matters as the required understanding (epistemological assumptions), the knowledge gains established out of the investigation and the value propositions in the investigation (axiological assumptions), the way the investigator describes the study (rhetorical assumptions) and the process adopted for the research (methodological assumptions). Such assumptions suggest a specific paradigm that investigators establish in choosing qualitative research methods. A point of view of some phenomenon is called a paradigm (Taylor et al., 2007). A selection of paradigms can influence the research study, and it can be identified as belief patterns and the limiting factors in a domain which regulates the research in a discipline using lenses, frameworks and manners by which the data collection and review are achieved (Weaver et al., 2006). Positivist, interpretive, or critical are the three categorisations of approaches in qualitative research. Interpretive researchers attempt to comprehend the occurrences of events through the meanings that respondents assign to them (Boland, 1991; Orlikowski & Baroudi, 1991).

The researcher's mode of study, selection of methodology, and the paradigm assumed for the study have to be discussed preceding to any elaboration on any particular methodologies employed in the research. This research used the interpretive paradigm.

3.4.2. Scientific Approach

Researchers use three distinctive approaches to establish a relationship with the current concepts to empirical evidences. These approaches are termed as deductive, inductive, and abductive. The approach which uses the existing concepts in the domain of the research is termed as a deductive approach, and the inductive research approach is based on empirical evidences establishing propositions to evolve theoretical framework and create new knowledge.

When the researcher employs iterative processes among the theoretical framework and empirical evidences to apply or test a hypothesis, it is termed as an abductive approach. These are presented in figure 3.4

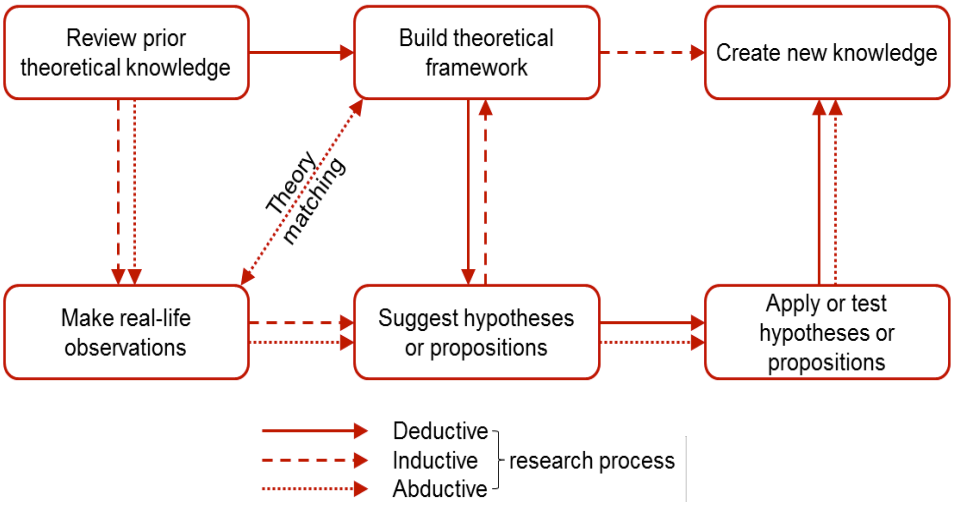

Fig . 3.2. Research approaches (source: Wieland, Andreas, 2016)

In the inductive approach, empirical evidences are gathered initially. Further, the evidences are reviewed by analysing the focused codes. These focused codes are emerged from the empirical evidences in individual case studies processing the transcripts of the semi-structured interviews and archival data. Based on the conceptual constructs and focused codes from empirical data, the investigator establishes a concept. In this research study, the inductive approach has been used.

3.5. RESEARCH METHOD

Research methods are practices and procedures adopted for the collection of evidence for the analysis of information in order to establish new or better insight into an area of knowledge. Research methods are categorised in many ways in social science research based on the various tools used for the collection of information. The major categorisations are Quantitative, Qualitative and Mixed Research Methods. The quantitative method collects numerical data and reviews it with the statistical tools, usually starting with a test of theory the established concept then the researcher ascertains the correlation among variables and proposes this in the form of hypotheses. In qualitative research, the researcher establishes methods to collect data, which could be sound, words, illustrations, visuals or numbers and these are arranged into patterns to construct information. In order to explore, how and why events have occurred, its interpretations and explanations for actions, complex concepts behind these

events and social and cultural experiences, the qualitative method of research is useful. Case study method of research, action research and ethnographical study are few prominent methodologies used by qualitative researchers (Ritchie & Lewis, 2003).

Qualitative researchers need to understand the perspective of the research problem and are required to build a framework for the participants to engage in the process which enables the researcher to gather evidence directly. This will help them to make interpretations based on their findings. Further, the experience and background of the researchers empower them to consolidate the findings and conclusions (Denzin & Lincoln, 2005). Rossman & Rallis (1998) highlighted the characteristic of qualitative research as naturalistic, as it occurs in the natural world. This profoundly interpretive type of research is emergent in nature and uses multiple modes which are collaborative and humanistic. Even though theoretical parameters and leading questions are formulated prior to the research by the qualitative researchers, they tend to get around forming formal propositions preceding the study.

As compared to the quantitative methods, which make efforts to organise, regulate and forecast, qualitative methods attempt to describe, analyse and interpret evidences with the objective of yielding appropriate perception of the domain. Features of both the qualitative and quantitative methodologies are evaluated and presented below in Table 3.1 with reference to different parameters for adequate comprehension of the qualitative method.

Table 3.1 Factors in designs of qualitative and quantitative methodologies (Source: Maxwell & Loomis, 2003)

	Quantitative Methodology	**Qualitative Methodology**
Objective	Accurate magnitude of variables	Meaning, Context and Process
	Inter-connectedness of variables	Discovering unanticipated events, influences, and conditions
	Inference from Data	Comprehending evidences and cases

		Inductive derivation of theories
Conceptual context	Theories of Variance	Theories explaining processes
Research questions	Questions concerning variance	Questions concerning Processes How and why queries
	Correlation	Inference
	Hypothesis testing	Context (holistic)
	Causality (factual)	Cause- effect Relationship
Research Methods		
Relationship	Objectivity / independence (minor influence of the researcher's perception)	Subjectivity(researcher is included in the process)
Sampling Technique	Probability sampling	Judgemental sampling / Purposive Sampling
	Corroborating inter-relationships by similarities and divergences	
Collection of Evidences	Establishment of instruments in the beginning.	Inductive elaboration of evidence collection methods
	Standard methodology	Adapting to event
	Quantitative measurements	Textual or visual evidences
Data analysis	Numerical descriptive analysis	Textual analysis (memos, coding, connecting)
	Established statistical methods for analysis and correlation	Conversion of textual data into appropriate categories
	Measurements of samples and variables	Descriptive approaches

	Hypothesis testing using statistical tools	Establishing Grounded theory
Validity		
Internal Validity	Validity supported by statistical tools.	Validity of Interpretive in nature and Descriptive in nature
	Validity of the construct	Validity of the construct
	Validity by control of extraneous variables: Causal	Validity by identification and assessment of alternative explanations: Causal
Generalizability	Externally Comparable	Externally transferable
		Generalisation to develop theories

Review of the above table posed as a guideline for the selection of the research method for this study. Accordingly, Qualitative Research methodology was selected for reasons explained hereafter. Also, the characteristics of research questions propose a qualitative methodology. The questions comprise mainly "how"s and "what"s instead of "how-many"s or "how-much"s or the "why" sorts. For developing an exhaustive awareness of the dynamics of clusters and to describe it, one has to deep dive into the activities of the clustering process. This necessitated, undertaking semi-structured discussions and interviews and use of secondary data for major data collection. Collection of data through participant observation has been used as a supplementary procedure in this study. This further helped the investigator to better recognise silent and inherent aspects of the cluster dynamics prevailing in the maritime sector. Studies were to be conducted in absolute natural situations rather-than in a regulated and contained experimental setting, in order to explore the development, progression, operational and functional attributes of the clusters.

3.6. RESEARCH STRATEGY– CASE STUDY

Any specific type of methodology within the various methods available under the qualitative research mode can be chosen by the researcher. Few of the various options within qualitative mode are action research, case-study method, and ethnographical study (Ritchie & Lewis, 2003). On the basis of the characteristics of research questions, the researcher exercises dominance on real-time behavioural occurrences and concentrate on current events in preference to any archaic events. Each of these methods is distinct and have its own advantages and disadvantages (Yin, 2009).

Current events contained in its tangible perspective where distinctions of the peripheries are not well distinguished between events and situations is the principal emphasis of case-study as a research methodology. This method utilises more than one data sources for triangulation of data (Yin, 2009). In the current research, the prevailing dynamics of a seaport cluster needs to be analysed. In a seaport, the implicit and specific knowledge, of the professionals engaged in the port-related businesses ought to be acquired and encapsulated for adequate comprehension of existing practices in the functioning of clusters. Hence, there is a need to bring together a detailed cognisance of this knowledge in the articulation of the cluster constituent's functioning and the features of functionalities and its influence on the sport performance. The qualitative research methodology is an appropriate method in acquiring and re-utilising such implicit and specific knowledge of many best practices in the field.

The requisites of the research study and the researcher's ability, best matches with the case study method. Hence the case-study method was chosen for this research. This method of investigation and analysis is chosen when inquiries are in the nature of “how”s or “why”s, and when the investigator has partial or no influence on the occurrence of incidents, and as the current events are emphasised over archaic events within few real-life situations (Yin, 2009). The case study research method permits the researcher to analysing both the events of interest and various situations, establishing a substantial number of prospectively significant factors (Yin, 2009). The case study approach has been found to be suitable for this research study, since the method has established

that the predominant disposition amongst various categories of case studies, is to highlight one decision or a sequence of decisions, namely, the reasons for drawing these decisions, the method of execution of these decisions, and the outcome of the implementation of these decisions (Yin, 2009). The selected research design and methodology, which include the methods and practices applied in designing the current research is recapitulated in Figure 3.3. The design of the case-study and strategies for data collection are explained in detail in the subsequent sections.

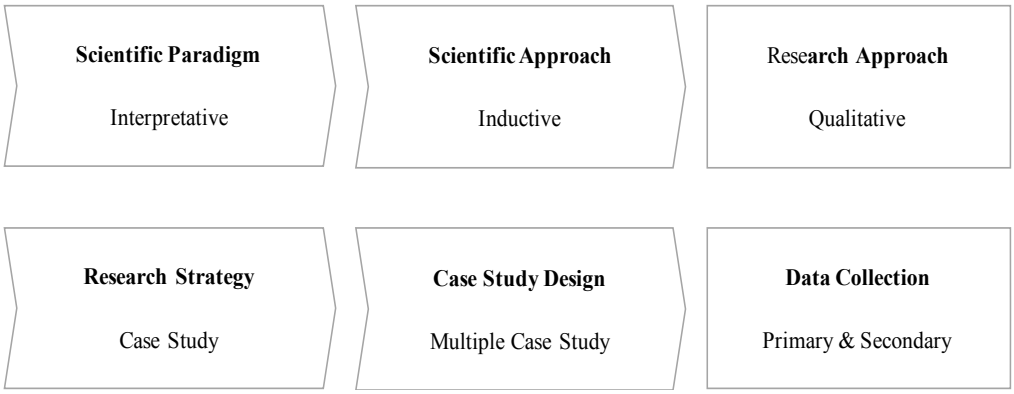

Figure 3.3 Summary of Research Design & Methodology

The case study method has many advantages, namely, (i) it facilitates organised and logical collection of evidences, comprehensive methods of data analysis whereby the in-depth knowledge of processes in each case under study is ensured, (ii) it permits the respondents to express their views and understandings in expressions familiar to them instead of the investigators' language, (iii) it encompasses the collection of evidence from many secondary sources including public records, archaic documents, interview data, scrutiny of real events, and review of physical articles (Eisenhardt, 1989, Yin, 2009), and (iv) in this research methodology, by way of triangulation of data collected from multiple sources, the validity of the research findings are ensured.

3.7. CASE STUDY DESIGN

In the designing of research using case study method, the researcher incorporates the process of conducting the case study, deciding on the number of cases, finalising the units of analysis and establishing the case selection criteria. The design of the case study employed in this study is shown in Fig.3.4

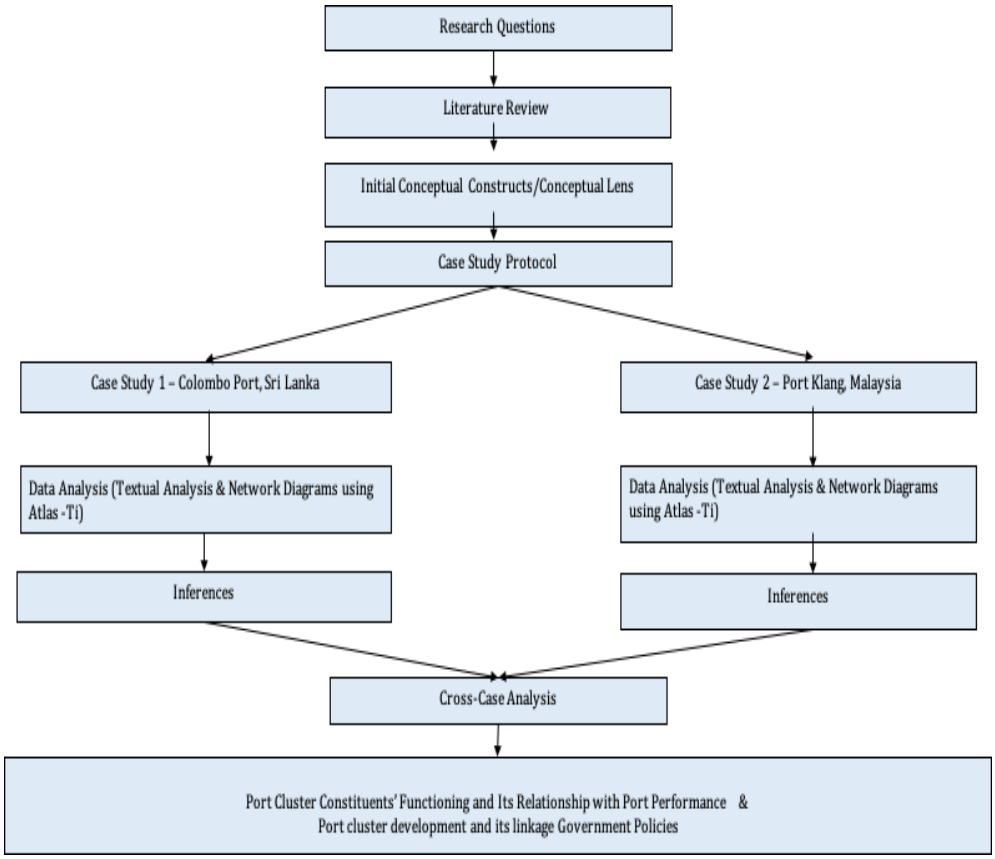

Fig. 3.4 Case study Design

Case Study method as a research strategy could be considered as a composite method comprehending all the stages, namely, collection of evidences, review of evidences, and presentation of data (Yin, 2009). Hence, this type of investigation begins from the review of prevailing literature, collection of data and a prudent review and processing of the data through a revelatory point of view (Yin, 2009). A similar approach has been engaged in current research.

3.7.1. Number and Type of Cases

Choosing between the two options of single or multiple cases for the study by case study research is an important activity. According to Yin (2009), a single case study is adopted when the researcher's objective is to test a well-constructed theory. Also, in case the case under consideration is a revelatory case, or if it is unique in features and characteristics, then a single case study is adopted. In this research, the characteristics and features of the study fall in

neither of these categories. Therefore, a multiple case study design was chosen for the current research. Once the decision to choose a multiple case study method, the number of cases that was sufficient to address the research questions has to be finalized. In the case of multiple case studies, each of the cases contributes to a perspicuous objective within the total scope of the investigation (Yin, 2009). The replication logic is required for the analysis in multiple case studies method. The replication logic enhances the external validity of the study (Eisenhardt, 1989; Yin, 2009). Hence, two case studies are selected with the purpose of comparison of findings from the multiple sources and cases, which appropriately follow the rationality of replication. Replication logic put forward the concept of considering a series of cases as a series of investigations. Each case facilitates in confirming or refuting the initial conceptual lens established during the research. Replication logic intends to exhibit or envisage analogous outcomes and explain conflicting results by giving probable causes (Yin, 2009). Hence, multi-case Type 3-holistic design (Yin, 2009) has been chosen for this study. Fig. 3.5 explains the fundamental categories of case-study designs proposed by Yin (2009).

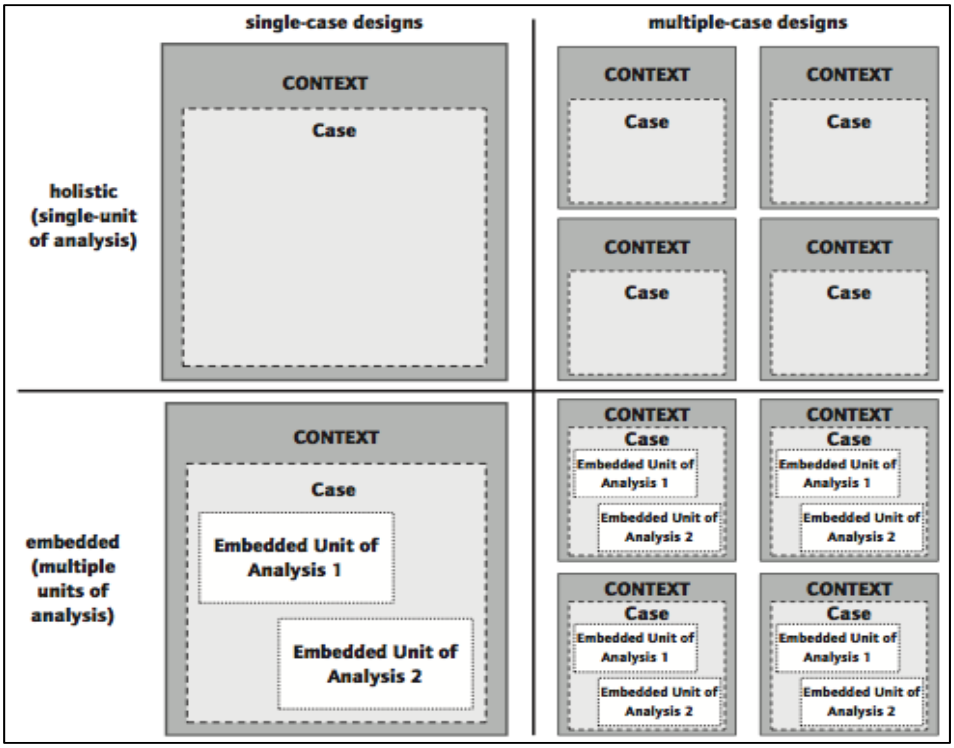

Figure 3.5 Categories of case study designs. Source: Yin (2009)

3.7.2. Structure of Case Study Design

Since the evidences from several numbers of cases are usually more convincing, the multiple-case design has been adopted. Overall investigation in the research is hence considered as being more robust (Yin, 2009). An initial conceptual lens based on the initial conceptual construct from the literature review had been developed. The initial conceptual lens, thus developed, is shown in Fig. 3

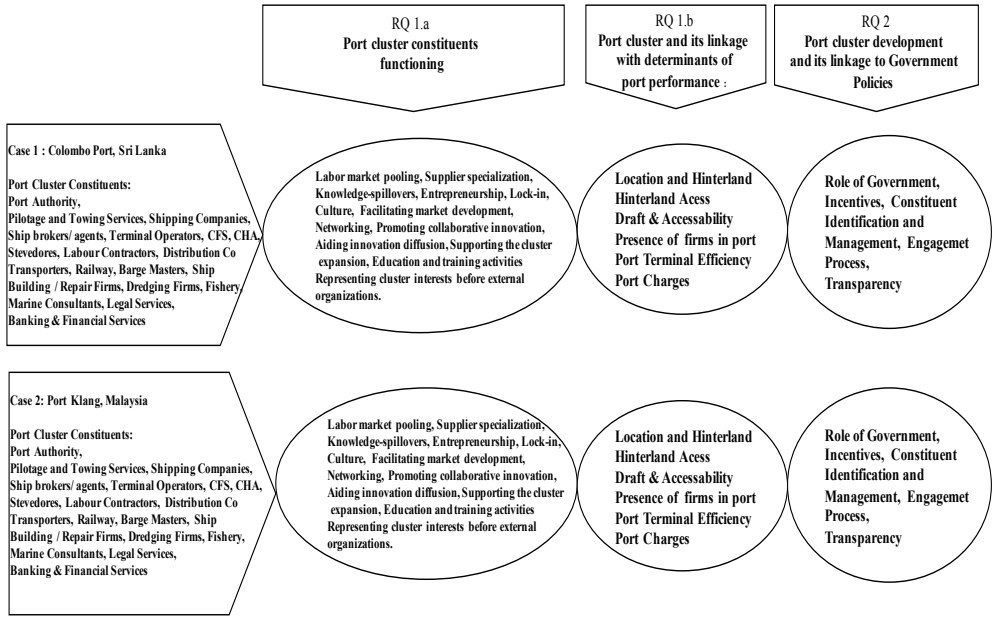

Fig. 3.6 Conceptual Construct Lens drawn from literature review (Source: Author)

3.7.3. Selection of Cases

For this research, to study of the constituent firms' functioning within the cluster which result in the port performance; two major transhipment ports in South Asia, the Colombo Port, Sri Lanka and Port Klang, Malaysia which is located in the East-West maritime route were selected.

The structure of case design is as given under:

Potential Cases

- Colombo Port, Sri Lanka
- Port Klang, Malaysia

Case 1 a.: Port cluster constituents functioning and its linkage with determinants of port performance: Colombo Port, Sri Lanka

Case 1 b.: Port cluster development and its linkage Government Policies: Colombo Port, Sri Lanka

Case 2 a.: Port cluster constituents functioning and its linkage with determinants of port performance: Port Klang, Malaysia

Case 2 b.: Port cluster development and its linkage Government Policies: Port Klang, Malaysia

Units of Measurement: (i) Cluster Constituents, and (ii) Port Authority.

Levels of Measurements:

Unit 1: Corporate & Business Heads of constituent firms
Unit 2: Top-level and Middle-Level Executives of the Port Authorities.

Above two case studies had been conducted independently, and then the cross-case analysis of findings is done. Relevant conjoint and distinct cluster dynamics are recognized from among the above two case studies.

3.8. DATA COLLECTION METHOD

An in-depth investigation into the specifics and specifications of the evidences to explore prominent types, elements, aspects and inter-connectedness, exploration of authentically open queries instead of evaluating hypotheses which are developed on the strength of theories and concepts (Patton, 1990). Also, evidences collected by qualitative methods are elaborate, detailed explanations, in-depth reviews, direct quotes expressions of respondent's personal views and knowledge (Patton, 1990). Hence, the evidences congregated in this study has been studied and elucidated inductively.

3.8.1. Data Collection

Data collection process essentially comprises of visiting the study site for collecting evidences through observation, interviews and discussions for the case studies, collating and organizing data prior to and subsequent to the visits based on the situational requirement. Data at the port clusters were collected from multiple sources which include investigators' observation, interviews,

formal and informal discussions and archaic records. The studies are concentrated on the method in the respective framework, components, constituents and activities (Pettigrew, 1997). The investigator recorded elaborate notes on observations regarding the activities, systems and process dynamics occurring among the cluster constituents, whenever possible.

- Semi-Structured interviews using Case Study Protocol
- Documents referred by Interview participants.
- Field Observations
- Field Notes
- Informal Discussions

Sampling: Theoretical Sampling will be employed (Yin, 2009). An interpretive view (Qualitative Research), sampling is different from a quantitative perspective, so the study samples are "representative which facilitate information flow from different perspectives." (Ritchie & Lewis, 2003)

***Sources of data*:** Evidences from primary and secondary sources are collected in the research.

Primary data

A case study protocol was used to collect the primary evidences from the port industry personnel. The case study protocol is a document for data collection, that includes the guiding questions supported by necessary explanations which are based on the conceptual constructs drawn from the review of the literature. This document also describes the procedures and guidelines to be followed in administering the selected primary data collection methods. In the course of collecting data, the validity of each construct was examined using different data sources employing the analysis of documents, and the protocol employed for the case study is used to confirm the reliability (Yin, 2009). Initially, a case study protocol was established, and interviews were conducted with the respondents treating the protocol as a guiding document. Other complementary methods of data collection, namely, site visit and field observations, also had been used.

Secondary data

Data were gathered from published documents, journal publications and other publications comprising of the of following:-

- Annual Reports & Monthly Reports by Port organizations
- Annual Reports & Monthly Reports at the unit level
- Ministry Reports
- Government Policy documents
- International journals
- Business related books & international journals
- Operating Manual of Port Businesses

Additional Data collection were carried out as required midcourse or during the analysis stage, from appropriate sources. The data were collected from the professionals and practitioners in the port industry through semi-structured interviews make use of the protocol, which was developed for the case study as part of the data collection strategy.

A case study protocol is a document which includes the interview brief and questions for the collection of evidences as well as the methods and general guidelines to be pursued in the process. All through the stages of collecting evidences, the validity of the constructs was examined through different sources of data, which is termed as document analysis, and the case study protocol was used for ensuring reliability (Yin, 2009).

Before the beginning of the interview, the respondents were explained that the materials used and derived from the case study interview, and discussions would be made use of in two ways, namely, (i) to understand and document the port cluster dynamics in-order to develop models and carrying out of this study and (ii) to utilize the evidences to develop and publish the case in any appropriate form. The respondents were briefed prior to the discussions, on the research using the case study method based on the structure discussed earlier in this section. The discussions and interviews were recorded and subsequently transcribed. The transcripts of the interview were also shown to the respective respondents and invited feedback. Also, the investigator presented follow-up

questions, and the responses were collected and incorporated in the data analysis.

3.9. DATA ANALYSIS STRATEGY

Qualitative research aims at conducting investigations systematically and analyzing the same so that the observations, the evidences and the data can be interpreted in-order to present the findings. According to Patton (1990), the data analysis poses the challenges of justifying the process of accessing of a massive amount of data, minimizing the volume of facts and evidences, identifying relevant and important configurations, designs and relationships and constructing a structure and system to present the quintessence of material what the evidences uncover. The foundation for a review and assessment of the evidences in the study was formed by the manner in which the researcher interpret and explain the features and characteristics of processes and events. These expositions are subjectively rooted in stakeholders' contextual understandings. This method is categorized in a modified form of grounded theory (Locke, 2001; Charmaz, 2006).

Analysis of collected evidences is intended towards recognizing (i) how port cluster constituents function, (ii) how the port cluster constituents' functioning influence the determinants of port performance and (iii) how the Government policies influence the port cluster development. The major phases implemented in analyzing for this study are analysis within the cases and analysis across the cases. Selecting the methodology of analyzing the cases from within was with an objective to review and analyze the cases independently and discretely. This in-turn facilitated the researcher to document the cases systematically. The similarities and differences across cases were dealt with in cross-case analysis. Analysis within each case facilitates to arrange each single case data for detailed review and to manage the phenomenal amount of data (Eisenhardt, Kathlene., 1989). Fig. 3.6 explains the various phases associated with the process and the related steps. After completion of data collection and analysis for each of the single cases, exploration for cross-case patterns like the classifications, codes, elements and its extents, and various categorizations of schemes, are conducted from the qualitative data. The rationale for recognizing the within-case matches

and cross-case conflicts are the conceptual constructs initially identified from the review of literature for developing the conceptual lens.

Table. 3.2 Phases of case study research strategy. (Source: Eisenhardt, 1989).

Step	Activity
Getting Started	• Definition of research question • Possibly a priori construct
Selecting Cases	• Neither theory, nor hypotheses • Specified Population • Theoretical, not random, samples
Crafting Instruments and protocols	• Multiple data collection methods • Qualitative and quantitative data combined • Multiple investigators
Entering the field	• Overlap data collection and analysis, including field notes • Flexible and opportunistic data collection methods
Analysing data	• Within-case analysis • Cross-case pattern search using divergent techniques
Shaping Hypotheses	• Iterative tabulation of evidence for each construct • Replication, not sampling logic across cases • Search evidence for "why" behind relationship
Enfolding literature	• Comparison with conflicting literature • Comparison with similar literature
Reaching closure	• Theoretical saturation when possible

3.9.1. Textual Analysis

Textual Analysis and cross-case synthesis were employed for analysis of the data. Textual analysis is an extended terminology used in several research studies in processing, explaining and comprehending to describe texts or group of texts derived from transcripts of discussions, interviews and surveys. Textual data is used to draw empirical inferences by social sciences researchers. Many types of evidences can be gathered from texts. It extends a platform for detailed and ingenious evaluation of texts which draw out significant connotations for a specific situation, process and environment. The procedures used to carry out the textual analysis be determined by the domain and the objectives of the study. Selection of the category of texts to be analyzed, selection of appropriate subtext

and selection of the approaches and instruments to carry out the assessment of the texts are the major considerations while choosing this method. Atlas.ti software was used for textual analysis in this study. Analyzing the frequency of codes using Atlas.ti., network diagrams have been prepared.

3.9.2. Data Analysis using Grounded Theory

The steps used iteratively for conducting data analysis include open coding, focused coding and recognizing and establishing interconnectedness between conceptual categories.

Multiple iterations between data derived from discussions and interviews, evidences gathered from observations and prevailing theory were used in the iterative process of data analysis using grounded theory. (Charmaz, 2006).

The phases wherein open coding and focused coding are conducted assist in exploring and understanding the cluster functioning and the linkage between the firms by developing codes, categories and concepts of cluster functionalities in action at seaports. The final phase in the process facilitates the identification of the factors contributing to the functioning of the cluster firms and its impact on the determinants of port performance. These activities are elaborated in the following section.

Step I: Initial Open Coding

Open coding method is used to review the main concepts, by selecting the input data, categorizing it and combining it. It is also used to recognize the most relevant constructs. The process of open coding involves the researcher recognizing conceivable premises by selecting real instances from the transcript (Ryan & Bernard, 2000). The codes ascertained from the empirical data is classified as open codes. Each additional code is conceived as a new issue or theme that emerges from the evidence. Open coding is used to analyze a new phenomenon or theme, thus emerge. The emphasis of review in this method is on the generation of conceptual classifications from observed substantiations (Strauss & Corbin, 1990; Charmaz, 2006).

Atlas-ti software which is predominantly used for textual analysis in qualitative research was used for coding of the interview transcripts. This software enabled

the data analysis process by facilitating coding, establishing connections between codes and sections of texts, constructing memos, searching, reworking, rearranging and creating illustrations for display, of evidences, observations and conclusions.

Step II: Focused Coding

In focused coding, the codes with mutually exclusive characteristics and qualities are consolidated to establish conceptual categorizations and abstractions from the empirical evidences. Such kind of merging enabled in reducing the number of codes to work with, without losing the essence of multiple codes. It facilitates creating the main arguments which evolve from the observed evidences (Strauss & Corbin, 1990). The identified codes are congregated into groups in a bottom-up manner, as in Figure 3.7.

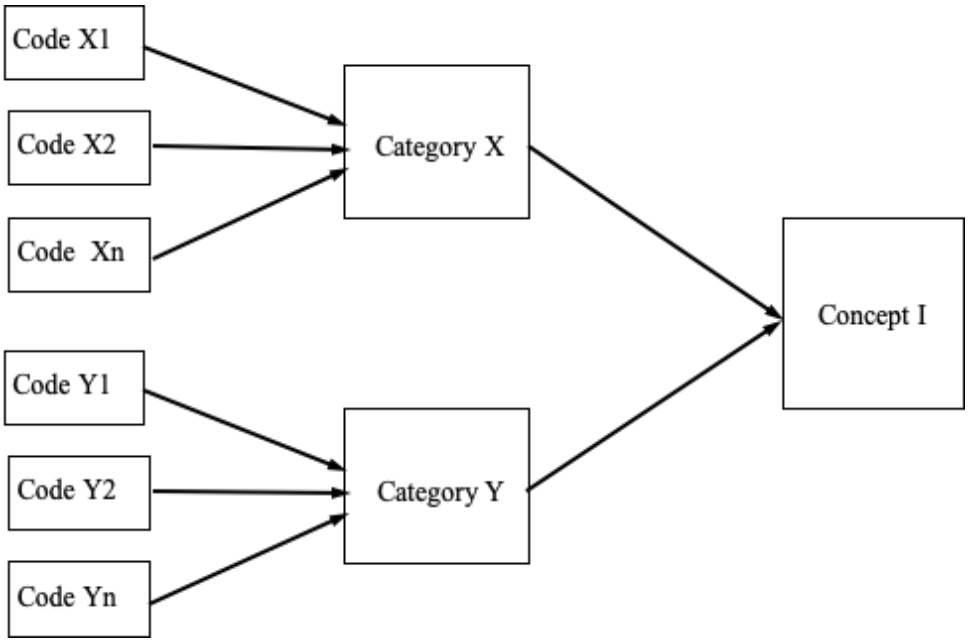

Fig. 3.7. Deriving concepts and categories from Codes.

The codes illustrating the functionalities of the clusters and the determinants of the port performance are ascertained from the empirical evidences in the course of the open coding. These codes are then unified into wider and comprehensive categorizations. These categories of codes are organized into perceptions, arguments and themes. As these are derived from the abstractions and perceptions on the evidences, these are considered as the fundamental units of

analysis in grounded theory. The initial conceptual constructs established from the literature review on the port cluster constituents, the cluster functionalities and the determinants of the port performance, acted as the fundamentals of recognizing concepts. Assertions expounding these constructs were initially coded. Then these codes were merged into categories, each of which corresponds to the aspects directly related to the above features of the port cluster. Each of the categories is connected to the factors in the initial conceptual constructs. Any new concept emerged, which could not be linked with any of the factors in the initial conceptual construct was recognized as a new category of code.

Categorizing of all evidences from the interviews into codes, classifications, groups and concepts were carried out by way of the processes of first level open coding and focused coding as described in the previous discussion. The association amongst codes and its groups and categories are of compositional characteristics. The correlations are generally of 'is part of', 'is a', 'is associated with', 'is cause of' and 'is effect of'. The interconnectedness between codes, categories and concepts are identified using these causative correlations. Accordingly, the relationship is established as the composition of a specific presumption or theory.

Step III: Recognizing the interconnectedness among conceptual categorizations.

This step enabled the identification of the causal interconnectedness among the codes, groups, classifications and theories. In the analysis of evidences, the recognized correlations were causal, like 'is part of' or 'is associated with'. These casual correlations can be correlated. Therefore, these codes were networked by these relationships using Atlas.ti software.

Consolidation of the codes into specific groups and such categorization into concepts establishes a legacy of connections between codes which had already been recognized from within the data.

3.10. CROSS CASE ANALYSIS

Replication logic is the rationale used for cross-case analysis. This method of analysis compares and rationalize the connections, differences and mutually inclusive observations of the study on the functioning of constituent firms in the cluster. Case evaluation had been done by documenting and highlighting similarities and variations between the observations and evidences in the cases. Also, the comparative findings and circumstantial elements across cases are highlighted in such case comparisons (Eisenhardt, 1989).

The outcome of the cross-case analysis was tabulated as an extraction tabulation of analysis of contents. Such an analytic table primary emphases on the content. Such cross-case analysis tabulation does not indicate from which case the observation is drawn (Miles & Huberman, 1994). In this research study, the abstracts of the content analysis are organized as a qualitative associative network (QAN). The findings from the cross-case analysis are incorporated in these QAN diagrams.

3.11. QUALITY OF EMPIRICAL RESEARCH

Through this research study uphold the contention that the developing theory is one of many potential elucidations of certainty authentically crafted with the investigators as functional mediums, does not claim independence, consistent with the view of socially constituted reality. The observation, as well as the observed, is emulated in theory. Hence, all the expositions and rationalizations are not ordained to be considered as equivalently significant, reliable, and adequately standardized. As a researcher, it is required to portray the contention of the case for conceptual rationalization and confirmation as per the requirement of the study. Construct Validity, Reliability and Internal, as well as External Validity, are used for evaluating the quality of any study (Yin, 2009), in different phases as presented in table 3.3. Further, the details of these methods are discussed in the following sections.

Table 3.3 Quality evaluation methods

Tests	Case Study tactic	Phase of research which tactic occurs
Construct Validity	• Use Multiple Source of evidence • Establish Chain of evidence • Have key informants review draft	Data Collection Data Collection Composition
Internal Validity	• Do pattern-Matching • Do Explanation Building • Address rival explanations	Data analysis Data analysis Data analysis
External Validity	• Use replication logic in multiples case studies	Research design
Reliability	• Use study protocol	Data Collection

3.11.1. Construct validity

Construct validity is referred to as the method of ascertaining the proper processes for the models and perceptions under review and analysis (Yin, 2009). This enables the researcher to ensure that the chosen models are evaluated accurately and appropriately. Data triangulation deals with the conceivable issues of construct validity when the data are collated from different sources. According to Yin (2009), the data triangulation is focusing the corroboration the identical event or incident happening in reality when the multiple sources that address varied aspects of the same phenomena. Collecting data from various sources in effect enable the researcher for more amounts of information on the identical event or incidents (Yin, 2009) and enable the researcher to strongly substantiate and establish the constructs and hypotheses (Eisenhardt, K., 1989). According to Rossman and Wilson, (1985), the triangulation procedure which assembles various data sources in any specific study is used to address construct validity. Fundamentally the process of data triangulation is strong, as it uses the prevailing data for scrutiny and evaluation. Instead of depending on findings from isolated, individual studies, data triangulation make use of varied sources of evidence in order to evaluate a scenario. Huge extent of pertinent information pragmatically ensures that those scenarios of concurrences and conflicts are discovered which might not have been

recognized in the data considered from an isolated, individual study. An added advantage of using this method of validation to make the analysis more precise is that the evidences are drawn from distinct sources, and this multiplicity of sources enables the researcher to have wider scrutiny of the scenario.

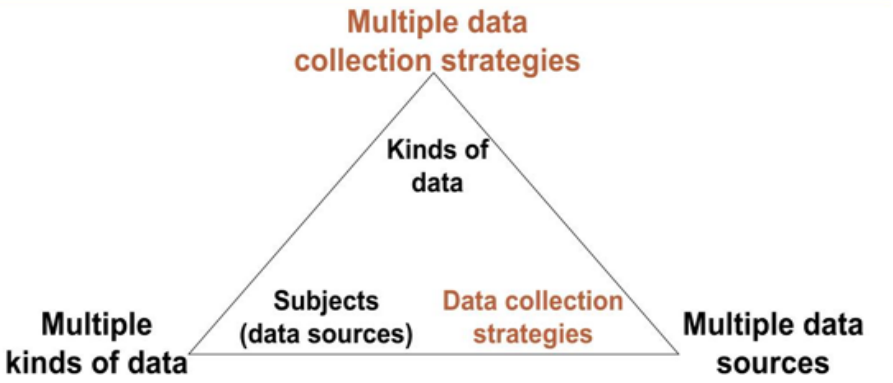

Fig. 3.8 Concept of data triangulation. (Source: Rossman & Wilson, 1985)

Method of triangulation is making of various sources and methodologies to study the situation or phenomenon. For data triangulation, the researcher benefit from the multiplicity of data sources gathered from diverse methods along with parameters of time, space and individuals. Results can thus be substantiated. Further, the limitations or preconceptions due to any predisposition of any nature in the different methods or sources of evidence, considered could be balanced by the strengths of other methods or sources, which increases the validity and reliability of the result. Interviews, Focus Group Discussions (FGD) and secondary data, including case studies, had been used in the methods' triangulation to address the construct validity in the current study. The intention is to curtail the limitations and preconceptions that emanate from any single source of evidence or method of study. Also, triangulation of evidences and approaches can support and strengthen the validity and reliability of an observation, which helps the investigator to explain and justify. It can also facilitate a more precise and inclusive assessment of a given scenario and create new perceptions of situations.

The case-study approach is strengthened by the approach of combining different sources of evidences (Yin, 2009). This case study was designed to make use of

various sources for collecting relevant data like interviews, records, documents in the public domain, accessible sections of port intranet, field study and objects. The transcribed content of the discussions and interviews were used in the assessment of evidences. This methodology augments the validity of construct by endowing varied assessments of the observable facts and events. The sequence of evidence technique allowed the investigator in comprehending sources of evidences from preliminary research questions to the conclusion of the case study.

Yin (2009), suggests that the key informants should review the case study findings. Accordingly, the feedback of the respondents is also incorporated while the final reporting of the findings of case-study. Continuous conceptual analysis and detailed review are the two levels of analysis carried out during data analysis. This process of review, called the theoretical triangulation, assist the researcher in improving the construct validity of the study by triangulation of the theoretical point of view on the identical data set (Patton, 1990).

3.11.2. Internal Validity

Internal validity is the extent of conformity of factual dependence on the cause-effect connectedness among the conditions under investigation. This also confirms that the evidences are not subjective to other aspects or elements. Two types of challenges are concomitant with establishing internal validity. The challenges posed are making conclusions exclusively from the case study and that the chances of spurious effects in which meaningful parameters in addition to those observed in the study.

In this study, two methods are used to attend to the problems mentioned above to confirm internal validity. Evaluations by the theory triangulation method and the reviews based on participant review on the observations made. Observations and evidences had been studied with different viewpoints during within-case analysis, and the key respondents were called upon to analyze and suggest on case reports. The researcher engaged these methods to concentrate on observations and explanation of the practices that can be illustrated as underlying relationships between cause and effect.

3.11.3 External Validity

Findings and conclusions from research can be made comprehensive by corroborating the area of the research, and this is termed as External Validity (Yin, 2009). Multiple case-study approach aids to reinforce the generality of the data iterations and conclusions of the research.

Designing multiple case studies and review and analysis of each case followed by cross-case analysis are major phases of case study methodology as per the replication logic. This is synonymous to the use of carrying out tests in research where the investigator generalize the concept using one method and process to more instances (Yin, 2009).

External validity can be dealt with replication logic in case-study methodology. The case-study method is dependent on rational generality (Eisenhardt, 1989). It is not statistical generalization as in the case of hypothesis testing method in research. Findings of the study can be admitted even after initial usage of the logic of replication. Repeated replications are not necessarily to be carried out (Yin, 2009).

3.11.4. Reliability

The basic purpose of the reliability test is to identify and limit the inaccuracies, oversights and predispositions. Phases of the research like the steps to collect data can be recurrent to establish similar outcomes by usage of the reliability test (Yin, 2009). Accordingly, if an additional investigator follows the identical approach for data collection, as undertaken by the former investigator in the case study method, the first researcher will get to the same results and conclusions.

A number of methods had been used in this study to confirm consistency in the approach for collecting evidences. A case study protocol had been developed initially and had been utilized as a guideline for the process of research. The case study protocol enhances the reliability of this method of research. The consistency in the domains and topics covered within the individual cases and across the many cases had been ensured by keeping the case study protocol as

the guideline which includes a questionnaire, rules and procedures, in the entire process of interviews for data collection.

Subsequently, the transcriptions of the interviews and discussions in-order to encapsulate the entire data for independent review and evaluation by other investigators as well. And by using the features of Atlas.ti software the investigator systematically and consistently evaluate the evidences, which is qualitative in nature (Weitzman, 2000). This procedure enhances the reliability of the study because the steps employed in the study can be repeated (Yin, 2009).

The entire steps of validation, as described in the previous sections, were followed in the current study. The transcripts of the discussions and semi-structured interviews were shared with the respondents and feedback taken and incorporated in the final data, which was subjected to textual analysis.

3.12. CASE STUDY PROTOCOL DEVELOPMENT

The process of developing the case study protocol for this study is discussed in this section. The adequately defined case study protocol strengthens the reliability of the study and performs as a guideline for the investigator to conduct the collection of evidences in each of the individual case study (Yin, 2009).

3.12.1 Process of Developing Case Study Protocol (CSP)

Two distinct methods by which data are collected from individual respondents in a case are survey questionnaire and case-study protocol, though the latter differs from the questionnaire method in major ways. The significant difference is that a case-study protocol contains the methods and norms to be practised in conducting the study. A protocol is oriented more towards the attitudes and approaches of the investigator than the substances of the research. Multiple case study research necessitates having a well-designed case study protocol before stating the investigative study (Yin, 2009).

A case study protocol consists of three major main segments (Yin, 2009), (i) introduction to case study and rationale of the protocol which describes the research, (ii) processes identified for data collection which describes the norms

to be followed in carrying out the research, (iii) a framework for the final report, which describes the format for the case study report and (iv) most importantly the section on the case study questions which lists the objectives of the case study and questions the investigator must focus on collecting and arranging evidences and potential sources of material and information to address each of the research questions.

Referring to the structure suggested by Yin (2009), a detailed protocol for the case study was developed for the research, and discussed in detail in the following section.

3.12.2. Case Study Protocol

The case study protocol had been formulated with the purpose to investigate on the research problem, i.e., (i) how to port cluster constituents function and influence the determinants of port performance and (ii) how government policy influences the port cluster development. Accordingly, two case studies are considered in this case study protocol.

The case study protocol had been used for reference with the guiding questions for the interviews the case study on the port clusters to address the research questions. These questions were formulated on the basis of the initial conceptual constructs, which are also used for the purpose of validation in the course of the discussions and interviews.

There were five sections of guiding questions in the protocol. The initial four sections, A.1 through A.4, of the interview, contained questions addressing the first research question of this case study which deals with the cluster constituent functioning and its influence on the sport performance.

The guiding questions which was a significant component of the protocol is presented below:

A.1. How are functional constituents of the port cluster understood in case of (Port Klang / Colombo Port)?

- *How is the governance in the port cluster established in (Port Klang / Colombo Port)? Please highlight its formulation and responsibilities.*

- *Do all entities in a port cluster equally influence the commercial activities of clusters? Do these clusters identify any core segment impacting their commercial performance? If yes, please highlight.*
- *Do some entities in (Port Klang / Colombo Port) show characteristics of strengthening cluster infrastructure collectively? Can these entities be identified as a segment in a port cluster environment? If yes, please highlight.*

A.2. How functionalities of port cluster constituents are understood in case of (Port Klang / Colombo Port)?

- *Dose formulation of the port cluster affect the functionalities of cluster constituents? Can you highlight a few examples/ instances from (Port Klang / Colombo Port)?*
- *Does formulating port cluster help in creating additional functionalities by clustering entities (constituents)? Can these be classified into knowledge and innovation, capacity enhancement and business development in the context of (Port Klang / Colombo Port)?*
- *Does clustering of entities increase "knowledge and innovation" gradient in (Port Klang / Colombo Port) clusters? Can you highlight a few examples?*
- *Does clustering of entities help in "development of business" in (Port Klang / Colombo Port) clusters? Can you highlight a few examples?*
- *Does clustering of entities "enhances capacity" of overall clusters of (Port Klang / Colombo Port)? Can you highlight a few examples?*
- *Apart from mentioned functionalities of knowledge and innovation, capacity enhancement and business development, is there any other class of functions created because of the existence of clusters?*

A.3. How do Constituents in a port cluster understand the performance of a transhipment port in a port cluster?

- *How are performance characteristics of a transhipment terminal established? Can you please Highlight a few examples?*

- *Do you find the performance of a transhipment terminal is related to its geographical location (Proximity with trade lanes) and connectivity with hinterland? How does it affect the performance of a port in general and transhipment terminal specifically?*
- *What kinds of firms are present in (Port Klang / Colombo Port)? Does the presence of these firms in a port impact the overall performance of port? Can you throw some lights on how their presence influences the performance of transhipment terminals of (Port Klang / Colombo Port)?*
- *Do port charges influence the performance of the port? Can you please Highlight the relationship in the context of (Port Klang / Colombo Port)?*
- *Can you identify any specific attribute of port performance?*

A.4. How do cluster constituents and their functionalities are associated with port performance?

- *How does the clustering of activities impact the port performance of (Port Klang / Colombo Port)?*
- *How does the cluster governance impact port performance of (Port Klang / Colombo Port)?*
- *Can you please describe the significance of clustering activities for knowledge and innovation, capacity enhancement and business development in port clusters of (Port Klang / Colombo Port)?*
- *Can you please describe the significance of governance for knowledge and innovation, capacity enhancement and business development in port clusters of (Port Klang / Colombo Port)?*
- *Can you please describe the significance of supporting activities for knowledge and innovation, capacity enhancement and business development in port clusters of (Port Klang / Colombo Port)?*
- *How does infrastructural support in port cluster impact port performance of (Port Klang / Colombo Port)?*
- *Can you describe the significance of infrastructural support for knowledge and innovation, capacity enhancement and business development in port clusters of (Port Klang / Colombo Port)?*

- *Does port performance is influenced by knowledge and innovation as a result of clustering? If yes, can you please describe how the performance of port is associated with knowledge and innovation?*
- *Does port performance is influenced by capacity enhancement created by clustering? If yes, please describe how the performance of port is associated with capacity enhancement by clustering?*
- *Does port performance is influenced by business development created by clustering? If yes, please describe how the performance of port associated with business development environment under a port cluster.*

The last segment of the interview, section B.1, deals with the second research question of this case study which focuses on the influence of government policies on the evolution and development of port clusters.

B.1 How are the cluster Policies linked to the development and performance of the clusters?

- *Do the Port Authority's policies/objectives influence the functioning of the cluster? If yes, can you please highlight a few examples?*
- *What factors are influencing the formulation of cluster strategies? How do you deal with the preparation of strategic initiatives for clusters for diverse business verticals?*
- *What are the different management methods adopted for planning the cluster strategies for various business activities in the port?*
- *How did the strategic initiatives for clusters have any effect on the resource planning and budgeting in your port?*
- *What are the motivations & challenges in the cluster policies, systems and regulations?*
- *How does the execution of cluster strategies evaluated and controlled in the port?*
- *Do you foresee enablement of constituents playing an important role for the functioning of the cluster? If yes, how do you achieve this? Can you provide some examples?*

- *According to you, does IT been leveraged in the formulation and implementation of clusters? If yes, can you highlight some examples?*
- *Does the cluster constituents influence the long term planning of port development? If yes, Can you highlight some examples?*
- *Does the cluster constituents influence the short term planning of port development/ plans/ operations? If yes, Can you highlight some examples?*
- *What are the approaches by authorities to influence the cluster operations in the port?*
- *What selection criteria are the authorities employing in the selection of Cluster constituents?*
- *How is the compliance of ports operational strategies by the cluster constituents ensured?*
- *What kind of incentives are provided by the Government to each cluster constituents or for the cluster collectively to improve/augment the performance of the constituents?*
- *What kind of incentives are provided by the port authorities (as leader) to each cluster constituents or for the cluster collectively to improve/augment the performance of the constituents?*
- *Can you please elaborate on the prominent challenges in cluster policy?*
- *Can you please indicate the main challenges in cluster management?*

3.13. PERIOD OF DATA COLLECTION

Collection of data from the various stakeholders of the port operations in Port Klang, Malaysia and Colombo Port, Sri Lanka, were undertaken during the period August 2017- December 2019, through multiple semi-structured interviews with professionals, practitioners and experts from the maritime industry and related domains using the case study protocol, collection of secondary data from various related sources and independent field-study and field observations. Since data saturation was observed on interim analysis of data collected after 11^{th} to 12^{th} interviews at each of the locations, as the responses from participants showed repetition in the information and themes

provided, based on the methodological rationale, it was decided that further interviews are not necessary to finalize the data-set.

3.14. FOCUS GROUP DISCUSSION

Focus group discussion generates evidences which are observational and qualitative in nature and can be evaluated by the method of grounded theory analysis (Leech, N. L., & Onwuegbuzie, A. J., 2008). The major objective for choosing the focus group discussion as the review methodology is the necessity to initiate discussions and deliberations on a research topic.

Focus group discussion (FGD) embroils a central point, in a formal group conversation on a predetermined topic, with a pre ascertained set of individuals, taking part in a collaborative discussion. Focus group discussion as a data collection methodology in research has progressed over a long span of time leading to the evolution of several applications of the technique. Each of these multiple applications has distinctions in the purpose, procedure, and outcome. The approach for research adapted by academics using focus group methodology is targeted at generating data, and its detailed evaluation.

As described by Hennink and Bailey (2011), the focus group discussion method is an avenue for collaborative communication among few pre-recruited stakeholders, guided by a moderator and concentrating on a certain explicit and a limited number of issues with an objective to get a wide range of viewpoints and perspectives based on participant's experience in the domain. This method is different from other methods of qualitative research mainly in its constitution, and in the collective style of data gathering.

The focus group research majorly aims to recognise a range of views on the area of study and to create a deep insight on the topics from the perception of the participants. Each of the participants tends to emphasis their perceptions and concerns on the topic in a relaxed environment, where they can share their views with a group of people from the same background (Madriz, 2003). This method can quickly generate a comprehensive range of information. The most distinctive feature of this method is the collective participation of respondents

by which more comprehensive and unique data are generated, otherwise not accessible in individual interviews.

The group environment in a focus group discussion accentuates a wide range of perspectives and the interactive forum stimulates reasoning, and specific instances, wherein multiple relevant aspects and traces of the issues are uncovered. This method of data collection generates combined narratives on the topic of study, which transcend the individual perspectives in establishing a collective perspective on the topic, leading to generating data of different kinds and intensity than those obtained through individual interviews.

The method is used to identify the diversity of experiences and perceptions and not to seek a consensus on the issues discussed. The academic approach to using focus group discussions focuses on generating scientific data follows a research process to ensure rigor and validity, and contributes to scientific knowledge.

The objective of focus group research, as described by Krueger & Casey (2009), is to understand rather than infer the features, to determine the variety of viewpoints than arriving at generalised conclusions, and to comprehend the way the participants in the groups recognise a situation.

Focus group discussions are exceptionally appropriate for the following research applications:

- To investigate areas in which information is limited or ambiguous.
- To explicate specific manner and circumstances in which various activities occur.
- To assess and understand the reasons for the success or failure of a scheme, event, or engagement.
- To establish the problems, subject-specific lexicons, or contents to include in a survey or experiment.
- To gather diverse experiences and views of experts and stakeholders on the topic of the study.
- To familiarise the contextual, cultural, and societal norms concerning the area of research.

The objectives of the study are significant as it constructs the task for the focus group and all the decisions that the researcher makes on the sequential activities in the research project.

The strength of the method is the group assemblage through which the data are collected. A focus group discussion for a time span of an hour leads to gaining a large volume of information with distinctive perspectives than the same time spent in an in-depth interview. However, the group environment has a more valuable contribution than simply generating a large volume of data; it is the discussions among the participants that lead to the transcendental categories of data. The collaborative space empowers the participants to bring up multiple perspectives and discuss matters and contentions with minor involvement of the moderator, thereby identifying new issues or perspectives on the research topic that may be unanticipated by the researcher. Additionally, the discussion components allow participants to elaborate on the aspects presented by other participants, raise contrasting ideas, and deliberate on contentions and corollaries. Interactions within the team of participants also induce the quality of the generated data, as it may lead to contemplation, reasoning, or rationalization of opinions expressed in the discussion, offering a coherent and theoretically comprehensible understanding of the topic. In addition, the group environment acts to temper extreme views within the group and is, therefore, a highly effective method to access community norms, views, and behavior. This social moderation of information results from the group nature of data collection and is therefore not evident in individual interviews.

A focus group discussion is designed by an explicit research question, conceptual framework, research background, and both the specificities and distinctiveness of the participants. The general conceptual framework for a focus group process is shown in Figure 3.9

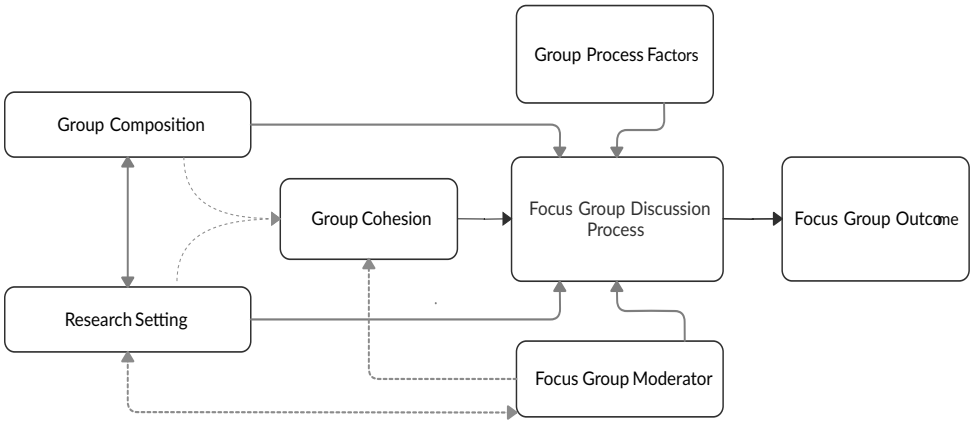

Fig. 3.9 Focus Group Discussion Framework. Source: Fern, Edward F., (2001)

The following steps are involved in a focus group discussion.

- Setting the research objective
- Participant Selection
- Developing a discussion guide
- Conducting group discussion
- Data transcription and textual analysis
- Reporting the Findings and conclusions

Decisions concerning the selection of the focus group method are dependent on the research objective. The objective of the study is significant as it influences various other options amongst the factors affecting the process and outcomes of the method.

Participant recruitment is carefully planned and may involve segmenting the study population into different groups to avoid the creation of a hierarchy in group discussion, which may influence participant's contributions.

Group composition implies the distinctiveness of the focus group participants. It can have a critical impact on the group dynamics in the discussions and thus calls for judicious contemplation. A good group constitution can facilitate a coherent, acquiescent environment that engages participants in productive discussions. The major attributes of the composition of the group in order to develop an engaging environment are the homogeneousness of the participants and their level of acquaintanceship. In general, six to eight participants take part

in a focus group discussion. The participant strength of the group has to be moderate enough so that everyone gets an adequate opportunity to express their views and has to be large enough to gain multiplicity of perceptions (Krueger & Casey, 2000). The size of the group is also contingent on the objective of the research, the theme of discussion, and the categories of participants. Group cohesion is very critical in this method. Group cohesion is influenced by the composition of the team, the features of the discussion setting, and the characteristics of the moderator. The constitution of the group is a within-group design aspect and it implies the combination of participants. The homogeneity and heterogeneity of the participants in terms of the distinctiveness of their characteristics with regard to a socio-cultural value orientation, ethnographic elements, and features of personality, affect the cohesiveness within the group.

Qualitative research uses purposive approaches for participant recruitment. Respondents in qualitative research are chosen on purpose, as they have explicit characteristics or precise experience that can address the research issues.

In a focus group discussion, the moderators use a judiciously designed discussion guide to steer the discussion on the specified area of interest. The vital role of the moderator is to encourage a constructive group discussion that creates meaningful data to address the research objectives. A discussion guide is a list of topics and a set of guiding questions to be used by a moderator in order to lead the discussion. Thus it essentially becomes a checklist to make sure that all desired areas are discussed.

A focus group discussion typically begins with an introduction by the moderator, which may be included in the discussion guide as a written narrative or a series of bullet points. A brief summary of the study is generally provided, as is an indication about how the information will be used. Ethical issues are reviewed during the introduction. Although permissions may have been sought before participants joined the group, a moderator often reviews permission to record the discussion and ensuring participants of confidentiality of the discussion.

The discussions are recorded and later transcribed accurately, which forms the scientific data that is analyzed. The nature of information generated in a focus

group discussion is called output. Analysis of the evidences generated in such a discussion is a formal process, adhering to a scientific protocol to appropriately code, categorize, and interpret the information, and may use a textual data analysis program. Focus group discussions produce textual data that can be analyzed using a range of analytic approaches. The method of analysis selected depends on the purpose of the study.

The format of a single focus group is the collaborative review of a subject or an issue by a set of participants and a researcher as one congregation in one location. And the investigator has to integrate the outcome into comprehensive information for distribution, once all the evidences are analysed. Accordingly, the findings on the cluster dynamics of Colombo Port and Port Klang analysed by a focus group discussion participating the stakeholders of Cochin port and thereby made an attempt to create a framework for the establishment of a port cluster at the Cochin port.

3.15. CONCLUDING REMARKS

This chapter discussed the objectives of research and research questions conceived on the basis of the problem statement for the research study. The research methodology and rationale in general for this study is explained logically. The methodological underpinning for this research study is paradigms of interpretative and inductive approaches of qualitative research and case-study research strategy with multiple case design. Also, this chapter presented a detailed discussion of data collection methods, which included interviews based on the case study protocol, field observation and review of documentary evidences. Subsequent to data collection, the interview data were transcribed and analysed using the Atlas-ti software. The data analysis strategies involving analysis of single, individual cases and of cross-case are discussed in this chapter.

The chapter also discussed the methods engaged to confirm the quality of research explaining the features of appropriate tests, namely, (i) construct validity, (ii) internal validity, (iii) external validity and (iv) reliability. The case study protocol had been discussed in the last section of the chapter.

The findings on the cluster dynamics of Colombo Port and Port Klang reviewed in the focus group discussion of the stakeholders of Cochin port and thereby attempted to establish a framework for the development of a port cluster at the Cochin port.

Next chapter discusses the analysis of two case studies conducted at Colombo Port (Sri Lanka) and Port Klang (Malaysia) for this research study.

CHAPTER 4.

PORT CLUSTER: CASE STUDIES

4.1 INTRODUCTION

This chapter discusses in detail the case studies conducted at Colombo Port and Port Klang. Details regarding the collection of data pertaining to case study-1 (Colombo Port) and case study -2 (Port Klang) are presented in this section. Detailed analysis and findings derived from the evidences thus collected are discussed in the subsequent sections on the constituent functioning, the cluster functionalities, the influence of the cluster functionalities on the determinants of the port performance and the influence of Government policies on the port cluster development. Detailed discussions on findings from the cases also are presented in this chapter.

4.2. DATA COLLECTION

The case study protocol developed as per the research design for the study was used to conduct many semi-structured interviews with the key personnel of different constituents in the clusters, who are the decision-makers and major influencers in the operations at the Colombo Port and Port Klang. Evidences were collected from multiple sources, namely: (i) Observation of functioning of member firms of the cluster; (ii) Interviews; (iii) Port authority website and Company websites and cluster related documents; and (iv) informal discussions with managers of the member firms, operations officers and managers at the port and maritime professionals. The data collection was carried out at terminals, and outside locations of both the port territory, and this phase consisted of the initial twelve months.

The details of personnel at different levels from within the industry, who had been interviewed are annexed. All recorded interviews were subsequently transcribed. The transcriptions were provided to the interviewers for their feedback and up-dations. Also, the draft reports of the case studies were discussed with critical respondents in-order to incorporate their suggestions and feedback.

Based on the data evolved out of the interviews and discussions, within case data analysis was carried out with reference to the research questions, (i) how to port cluster constituents function and influence the determinants of port performance and, (ii) how government policy influences the port cluster development. This lead to the recognising of multiple factors which establish the ground for cluster dynamics. The forthcoming section discusses the data analysis and findings of the two case studies at Colombo Port and Port Klang, respectively.

The first research question (RQ1) had been divided into two separate investigations and analysis, viz; Port cluster constituents functioning with respect to Cluster Functionalities and Influence of Cluster Functionalities on port performance determinants. And the second research question (RQ2) had been analysed independently.

4.3. CASE STUDY -1: COLOMBO PORT

Colombo port is a major transshipment port in the Indian ocean, strategically located close to the major maritime network. Current handling capacity at the port is around 7.4 Million TEU, which, with the development of the South Harbour, shall be increased to 12.2 million TEU per annum. Around forty-three per cent of the total container volumes at the port of Colombo consist of transshipment traffic from India. Colombo has a structured port cluster. Colombo hasn't had a work stoppage in more than two decades. Colombo had been ranked consistently at top positions in JOC port productivity research for South and Southeast Asia during the decade. The port recorded an average of eighty-six gross moves per crane, per hour during the period a vessel is at berth at the port. That compares with Asia's top port

overall, Tianjin, China, with one hundred and twenty-seven moves per hour (Szakonyi, 2016). The total movement of containers including, on-load, off-load and repositioning during the number of hours the vessel is at berth in a port is termed as gross moves per hour.

4.3.1 Port cluster constituents functioning with respect to Cluster Functionalities.

Data collected from Colombo Port was reviewed as per the strategy for data analysis discussed in detail in the previous chapter on research methodology. A detailed analysis based on the initial conceptual constructs (ICC) and sub-constructs recognised & derived from the literature review such as Labour market pooling, Knowledge spill-over, Entrepreneurship, Supplier specialisation, Lock-in, Innovation, Business Development and Training & Education is presented in Table 4.1.

The interview data evidences that the sub-constructs such as Labour compositional effect, Occupational agglomeration, Technical Spillover, Intellectual spill-over, Innovation Diffusion, Value chain partnership, Interfirm relationship, Path dependence, Technological Innovation, Business innovation, Trade promotion, Value chain management, and Competency building.

Table. 4.1 Constituent functioning / cluster functionalities at Colombo Port : Sub constructs and Empirical findings.

Initial Conceptual Construct	Sub Constructs	Categories from empirical data	Focused code from empirical data	Observations
Labour Market Pooling	Labour Compositional Effect	Labour Market Pooling	Labour Engagement	Port worker's use of specialised equipment and keeping updated with the new trends in port operations helped Colombo Port to cope up with world operational standards, often demanded by the shipping community. The extended labour reserve, usually tied up with contractors and assigned to specific tasks get trained in the cluster for flexible worker-firm matches. This enhanced labour inter-changeability. The worker mobility thus created in Colombo Port reduced the incidence of downtime and ensured a faster vessel turn-around.
	Occupational Agglomeration	Labour Market Pooling	Labour Mobility	Clusters enabled an increase in mobility of workers within the jobs and across jobs at Colombo port. The cluster identifies the training needs of employees in the constituent firms, also with the assessment of process requirements and practices

				demanded by international standards. Labour mobility has impacted on the performance of terminal services and hinterland access.
Knowledge Spillover	Technological Spill-over	Learning Intensity	Skill Upgradation	Skill enhancements of stakeholders said to have a crucial impact on efficiency in the operational processes at the Colombo Port terminals. Clusters have facilitated the transmission of new knowledge through interactive learning associated with inter-organisational linkages. This promoted improvement in the performance of the organisation and augmented innovation capabilities. This has also aided the easy acceptance of new technologies.
	Intellectual Spillover	Learning Intensity	Tacit Knowledge	Firms in Colombo Port on the cluster platform, interact closely, and this proximity leads to the exchange of information which helps to reduce transaction costs and facilitate knowledge development which in turn help firms to improve performance. The cluster facilitates opportunities for interpersonal contacts through which the tacit knowledge can easily flow.

Entrepreneurship	Innovation Diffusion	Relational capital	Innovation Diffusion	The cluster and the sub clusters in Colombo port provide direct and indirect support for successful new business development as well as small firm growth by encouraging an entrepreneurial culture, access to existing clients and businesses, channeling public and private capital and access to exploitable knowledge within the industry.
Supplier Specialisation	Value Chain Partnership	Collaborative Procurement	Institutional Linkage	Those member firms at Colombo port cluster which are linked through any core activity in the industry, operating in tandem, are enabled to utilise resources and facilities those would not have been accessible to them in case they were functioning independently. This leads to productivity advantage, and cost benefits as the firms can access institutions, inputs and services more flexibly and at low cost and risk.
Lock-in	Inter-Firm Relationship	Neighborhood Effects	Complementary Firms	The constituent firms in the cluster usually collaborate on the principal activity in the domain, employing their core competencies to complement each other.

	Path Dependence	Neighborhood Effects	Strategic Coherence	The interrelatedness of operations and business processes produce enhanced returns and incite increasing economic performance. Firms are co-dependent due to the orientation of the activities at the port. Inter-relationship strength increases with the complexity of the process.
Innovation	Technological Innovation	Collaborative Innovation	Technological Innovation	Inter firm innovation activities are significantly influenced by the proximity of related industries. Colombo port has witnessed few major indigenous collaborative innovations in equipment upgradations, in its terminals, in automation and autonomous transport, meeting industry demands of international standards.
	Business Process Innovation	Collaborative Innovation	Business Process Innovation	Port operations being primarily contained within the geographically bounded territory, the intellectual networks evolved due to involvement in collaborative processes are found to be more candid and well defined. Therefore these networks can be meticulously targeted. This lead to active innovation drives in the business processes, especially in the port information systems.

				Tacit knowledge sharing plays an important role in innovative activities that build competitive advantages to the participating firms since the information required to augment the dissemination of innovation is effected through informal connections, and experience and expectation sharing. The process is augmented by direct user-to-user influence.
Business Development	Trade Promotion	Co-operative Strategies	Trade Promotion	Collective actions among the firms strengthen the market position and create more trade opportunities, thereby enhancing the competitiveness of the individual firms in the port. Instead of practicing many independent competitive strategies as single firms, multiple related businesses (e.g. the three terminal operators at Colombo Port) take up co-operative strategies as appropriate choice to establish competitive positions in their domain. Thus strategies for collaborative actions in the cluster offer opportunities which are beneficial for constituent firms to strengthen their positions in the industry. The cluster lead by the

				SLPA participate in industry trade fares, shared marketing channels, obtain collective market intelligence and generate leads for the member firms for participation in global business opportunities.
	Value Chain Management	Co-operative Strategies	Value Chain Management	Shipping lines and shipping agents have associations facilitating alliances and joint operations, thereby optimising the cost of operations. Firms in the Colombo port cluster use collaborative strategies as a tool to make better customer service and control total costs. Cluster creates opportunities for establishing relationships among value chain partners, in the upstream and downstream processes. It also helps to realise the optimal resource allocation, and thereby strengthen the collaborative functioning.

Training & Education	Competency Building	Skill Upgradation	Competency Building	There are many universities and training institutes in and around Colombo, some of which are patronised by the Port Authority which continuously impart customised training for the employees of port cluster member firms. This helped to build trust and confidence in the port community. The clustered firms started actively participating in programs. This also brought platforms and channels for information flow and thus helped the firms to perform better. The port established Mahapola Ports & Maritime Academy for training & education for the benefit of port cluster constituents.

Further, a qualitative associative network (QAN) has been developed using atlas.ti, to understand the Port Cluster constituent functioning with respect to the cluster functionalities at the Colombo Port, and is presented in Figure 4.

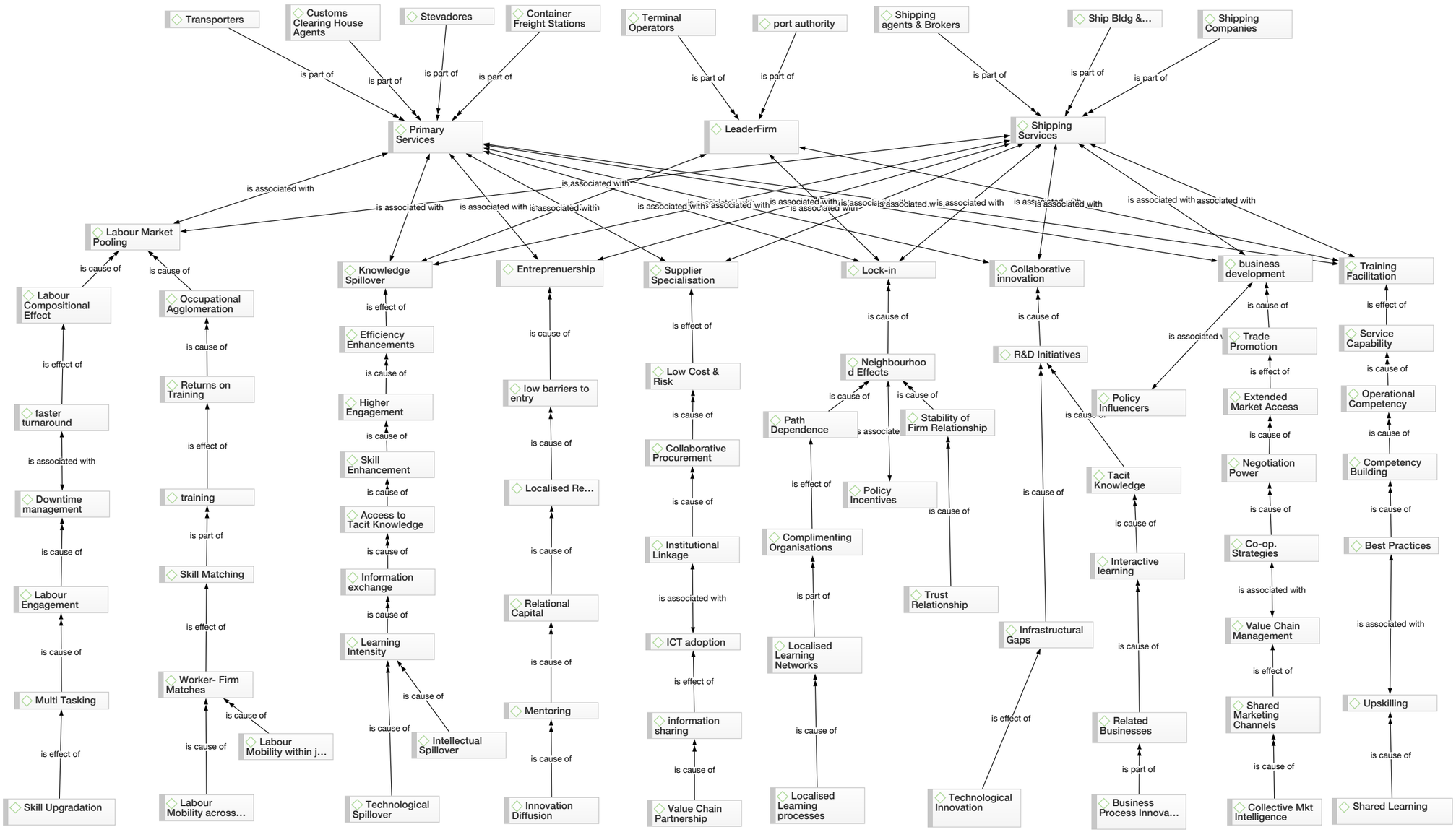

Fig. 4.1. QAN – Port Cluster constituent functioning w.r.t cluster functionalities: Colombo Port.

Table. 4. 2 Port cluster constituents functioning w.r.t Cluster Functionalities: Colombo Port

Port Cluster Constituents		Port Authority	Terminal operators	Transporters	CHA / Forwarders	Stevadores	Container Freight	Shipping Co.s	Shipping Agents /	Ship Bldg. & Repairs
Cluster Constituent Functioning (Functionalities)										
Labour Market pooling	Labour Engagement	x	✓	✓	x	✓	✓	x	x	✓
	Labour Mobility	x	✓	✓	x	✓	✓	✓	✓	✓
Knowledge Spillover	Skill Upgradation	✓	✓	x	✓	✓	✓	✓	✓	✓
	Tacit Knowledge	x	✓	✓	✓	✓	✓	✓	✓	✓
Entrepreneurship	Innovation Diffusion	x	x	✓	✓	✓	✓	x	✓	✓
Supplier Specialisation	Collaborative Procurement	✓	✓	✓	✓	✓	✓	✓	✓	✓
Lock-in	Complimentary Firms	x	x	✓	✓	✓	✓	✓	✓	✓
	Strategic Coherence	✓	✓	✓	✓	✓	✓	✓	✓	✓
Innovation	Technological Innovation	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Business process Innovation	✓	✓	✓	✓	✓	✓	✓	✓	✓
Business Development	Trade Promotion	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Value Chain Management	x	✓	✓	✓	✓	✓	✓	✓	✓
Training & Education	Competency Building	✓	✓	✓	✓	✓	✓	✓	✓	✓

4.3.2 Influence of Cluster Functionalities on port performance determinants

Data collected from Colombo Port with respect to the influence of cluster functionalities on port performance determinants was reviewed as per the strategy for data analysis discussed in detail in the previous chapter on research methodology.

A detailed analysis based on the initial conceptual constructs (ICC) and sub-constructs recognised & derived from the literature review such as efficiency of terminal services, cost effectiveness, process efficiency and hinterland access is presented in Table 4.3.

The data collected during the interview also evidences the occurrence of the sub-constructs such as service improvement, scale parameters, service capability and transportation & warehousing.

Table 4.3. Influence of Cluster Functionalities on port performance determinants at Colombo Port: Sub constructs and Empirical findings.

Initial Conceptual Construct	Sub Constructs	Categories from empirical data	Focused code from empirical data	Observations
Efficiency of Terminal Services	Service Improvement	Efficiency of Terminal Services	Speed of Services	The cluster by means of its various functionalities adds to the service improvement at the port. This efficiency enhancement of the terminal services builds customer confidence and positively impact on the port performance.
Cost-Effectiveness	Scale Parameters	Cost-Effectiveness	Collaborative Procurement	Cluster and sub-clusters facilitate alliances and joint operations, thereby optimise the cost of operations. Firms in the Colombo port cluster use collaborative strategies as a tool to optimise the cost of operations and to impart process improvements. Cluster set up platforms for linkages among the inbound and outbound streams of the value chain in businesses, and ensures opportunities for optimal utilisation of port resources, achieve economies of scale and thus become cost-efficient.

Efficiency of Processes	Service Capability	Best Practices	Process Improvement	Colombo port cluster claims to its credit its responsiveness in faster development of customised service capabilities by following the best practices. Colombo Port Cluster is networked through an extended port information system, "portcom". This contributes to the process efficiency.
Hinterland Access	Transportation & Warehousing	Hinterland Access	Connectivity	The cluster driven intermodal system is the prominent interface between the port terminals and hinterland in Colombo Port. The hinterland connectivity is augmented by the cluster by way of optimising the service, firm collaboration and adopting a multi-layer approach of synchronising the mobility factors of logistics, infrastructure and transport. Evidently, this smoothens the multimodal hinterland connectivity and boost the port performance.

Subsequently, a qualitative associative network (QAN) has been developed using Atlas.ti, to understand Influence of Cluster Functionalities on port performance determinants at the Colombo Port, and is presented in Figure 4.2

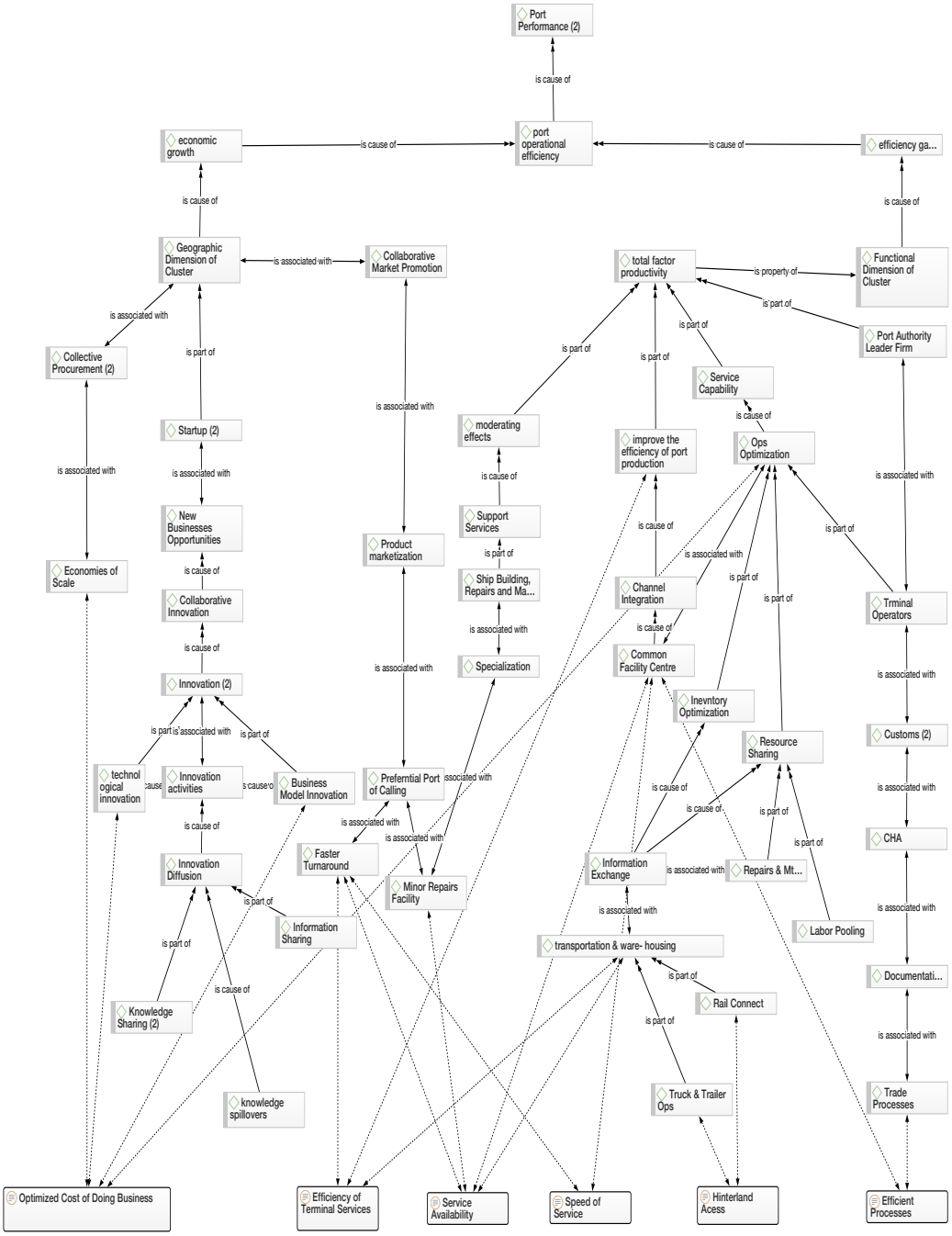

Fig. 4.2 QAN: Influence of Cluster Functionalities on port performance determinants

Table 4.4. Cluster Functionalities w.r.t. port performance determinants: Colombo Port.

Port performance Determinant		Efficiency of terminal Services	Cost Effectiveness	Efficiency of Processes	Hinterland Access
Cluster Constituent Functioning (Functionalities)					
Labour Market pooling	Labour Engagement	✓	X	✓	X
	Labour Mobility	✓	X	✓	X
Knowledge Spillover	Skill Upgradation	✓	✓	✓	X
	Tacit Knowledge	✓	✓	✓	✓
Entrepreneurship	Innovation Diffusion	✓	X	✓	✓
Supplier Specialisation	Collaborative Procurement	✓	✓	✓	X
Lock-in	Complimentary Firms	✓	✓	✓	✓
	Stretegic Coherence	✓	✓	✓	✓
Innovation	Technological Innovation	✓	✓	✓	✓
	Business process Innovation	✓	✓	✓	✓
Business Development	Trade Promotion	✓	✓	X	✓
	Value Chain Management	✓	✓	✓	✓
Training & Education	Competency Building	✓	✓	✓	✓

4.3.3 Influence of Government policies on the port cluster development.

Data collected from Colombo port with respect to the influence of government policies on the port cluster development was reviewed as per the strategy for data analysis discussed in detail in the previous chapter on research methodology.

A detailed analysis based on the initial conceptual constructs (ICC) and sub-constructs recognised & derived from the literature review such as support measures, governments' role, transparency, constituent management and engagement process is presented in Table 4.5. The data collected during the interview also evidences the occurrence of the sub-constructs such as incentive schemes, infrastructure development, regulatory framework, planning stability, facilitation measures and factors of production.

Table 4.5. Influence of Government policies on the port cluster development at Colombo Port: Sub constructs and Empirical findings.

Initial Conceptual Construct	Sub Constructs	Categories from empirical data	Focused code from empirical data	Observations
Support Measures	Incentive Schemes	Support Measures	Incentive Schemes	Sri Lanka's various national policies, including industrial policy, national maritime & logistics policy, innovation policy, provides many incentive schemes (tariff and non-tariff incentives) for the industry cluster. These encourage cluster development.
	Infrastructure Development	Support Measures	Infrastructure Development	The policies ensure the promotion of operational commitments to standard levels of service. The various policy provides for setting up infrastructural facilities for the cluster and sub-clusters in the Colombo Port in order to facilitate cluster development.
Govt.'s Direct Role	Regulatory Framework	Govt.' s Direct Role	Regulatory Framework	The National Govt. through the following measures have promoted the development of Port Clusters: Linkages and alignments with support institutions, stimulation of

				Entrepreneurial activities, Establishment of Cluster skill centres, support for innovation with funding and incubator facilities etc.
Transparency	Planning Stability	Transparency	Planning Stability	The transparency in the policy measures governing the Colombo Port Cluster encourages the firms to participate in cluster activities and thus impact positively on the cluster development. Transparency and Single window mechanism, integrating thirty-two different agencies under different ministries supporting the cluster development.
Constituent Management	Facilitation Measures	Constituent Management	Governance	The governance provisions in the policies related to clusters of the Colombo Port are designed to improve on competition and co-operation within the cluster and to stimulate entrepreneurship and innovation. These provisions attract more firms to the cluster and hence positively impact the cluster development.

Engagement Process	Factors of Production	Rules of Engagement	Constituent Engagement	Policies relating to the engagement processes in the clusters at ports in Sri Lanka are concerning the connection among, the organisations and institutions those encourage coordination and extending help in pursuing projects that support the development and growth of clusters.

A qualitative associative network (QAN) has been developed using Atlas.ti, to understand Port cluster development and its linkage Government Policies at the Colombo Port, and is presented in Figure 4.3

Further, the various constructs under the categories and sub categories from the study had been reviewed with reference to various documents published by respective organizatios associated to the Colombo Port. The observations are presented in Table 4.6

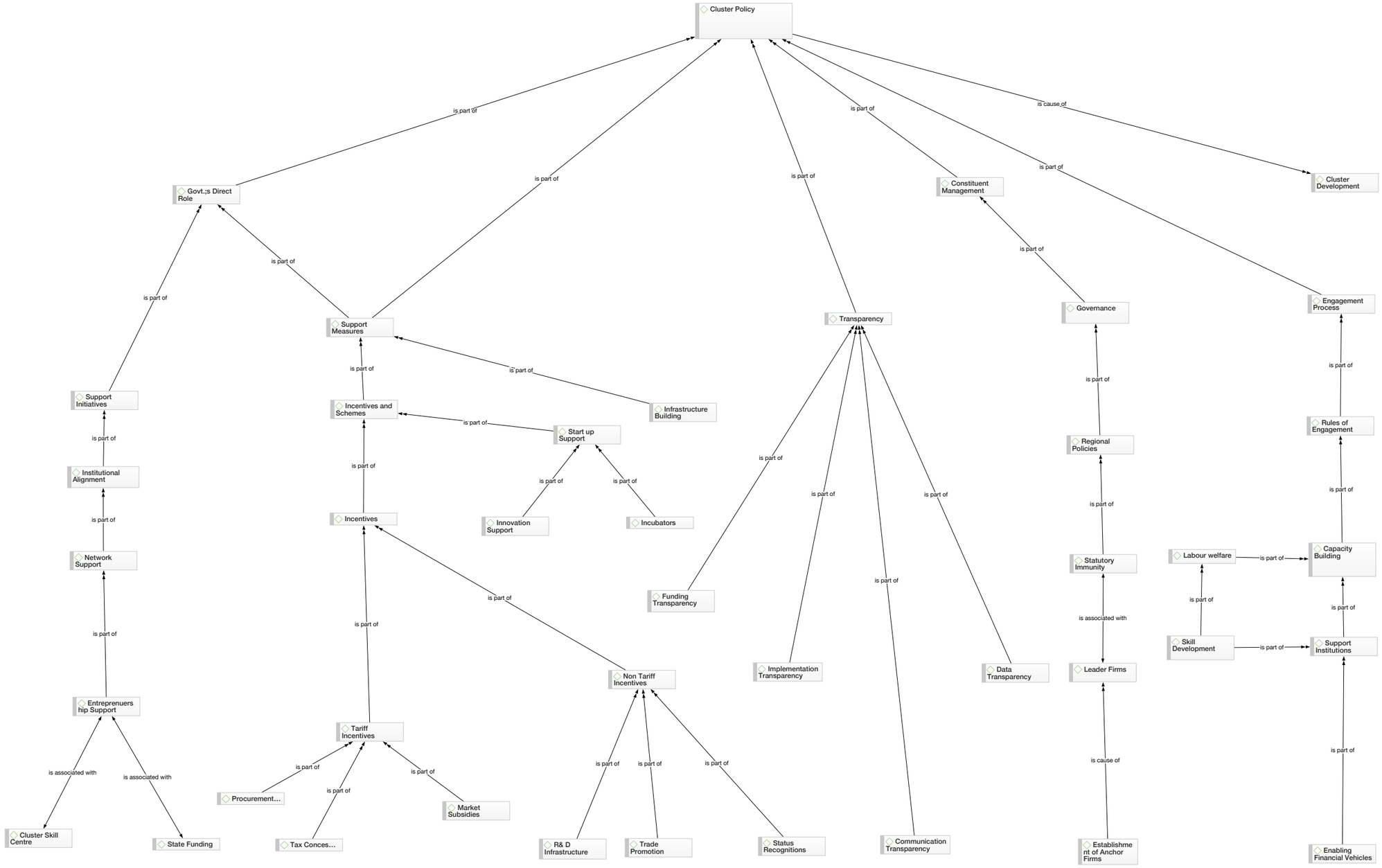

Fig. 4.3 QAN Network: Port cluster development and its linkage Government Policies : Colombo Port

Table. 4.6. Review of the categories and sub categories from the study w.r.t. the theoretical framework and observations drawn from secondary sources (Colombo Port).

R O	Initial conceptual construct identified in LR	Sub-constructs identified in LR	Categories emerged out from this study	Sub-categories emerged out from this study	Observations drawn from secondary source.	Document reference.
Constituent Functioning w.r.t. Cluster functionalities	Labour Market Pooling	Labour Engagement	Labour Market Pooling	*Labour Compositional Effect*	*Common labour pool at CICT leads to effective labour utilisation*	*Colombo Port Development plan, ADB, 03/2019 vol.2. Pg 290*
		Occupational Agglomeration		Labour Mobility		
	Knowledge Spillover	Technological Spillover	Learning Intensity	Skill Upgradation	*Multiple programs for skill upgradation through the network, for Colombo Port. Knowledge and experience gained through local &overseas training programs.*	*Performance Report (2019), Ministry of Ports and Shipping, Sri Lanka., Pg. 124-127*
		Intellectual Spillover				
	Business Development	Trade Promotion	Co-operative Strategies	Trade Promotion	*"Total cargo handled" had been increased from 77.61 Million MT in 2015 to 106.93 Million MT in 2019*	*Annual Report (2019) of Ministry of Finance, Govt. of Sri Lanka, Pg 361*
		Value Chain Management		Value Chain Management		
	Training & Education	Competency Building	Skill Upgradation	Competency Building	*Mahapola Port & Maritime Academy (of SLPA) conducted training and workshops for 401273 hrs during 2018*	*Annual Report (2018), Sri Lanka Ports Authority, Pg 56.*

Influence of Cluster Functionalities on port performance determinants	The efficiency of Terminal Services	Service Improvement	The efficiency of Terminal Services	Speed of Services	*Total Container traffic had been increased from 5.19 Million TEU in 2015 to 7.23 Million TEU in 2019*	*Annual Report (2019) of Ministry of Finance, Govt. of Sri Lanka, Pg 361*
	Cost-Effectiveness	Scale Parameters	Cost-Effectiveness	Collaborative Procurement	*Operational expenses had been reduced by 7%, even when there is an increase of 38.73% in volume handled during 2015-19*	*Annual Report (2019) of Ministry of Finance, Govt. of Sri Lanka, Pg 162.*
	Efficiency of Processes	Service Capability	Best Practices	Process Improvement	*Volume of transshipment had been increased from 3.97 Mil. TEU in 2015 to 5.96 Mil. TEU in 2019*	
Influence of Govt, Policy on Port Cluster Development.	Support Measures	Infra-structure Development	Support Measures	Infrastructure Development	*Productivity enhancement through collective infrastructure development yielded gains.*	*Annual Report (2018), Sri Lanka Port Authority, Pg. 11*
	Transparency	Planning Stability	Transparency	Planning Stability	*Strategic Enterprise Management Agency (SEMA), under the MoP&A guide the collective planning activities of clustered port enterprises.*	*Annual Report (2018), Sri Lanka Port Authority, Pg. 81*

4.3.4 Findings in response to research questions: Case study-1 (Colombo Port)

The constructs and sub-constructs drawn during the literature review had been corroborated in the analysis of empirical data collected from professionals and practitioners in the maritime industry.

The findings of the case study with reference to the research questions are summarised and discussed below:

Findings with reference to RQ 1.a (How does the port cluster constituents function?)

- Labour compositional effect facilitated flexible worker-firm matches and labour interchangeability, resulting in better downtime management and faster vessel turn around.
- Occupational agglomeration leads to labour mobility within the job and across the jobs in the cluster, achieved by required training to cop-up with international standards.
- Clusters facilitated the transmission of new knowledge through inter-organisational linkages leading to innovation and performance improvement.
- The proximity of firms in the cluster led to gaining tacit knowledge, which helped them to reduce transaction costs.
- Innovation diffusion, mostly due to relational capital lead to entrepreneurial activities in the port.
- Firms in the cluster are saving cost and reducing risk in its value chain activities by engaging in collaborative procurement.
- Constituent firms create complementary businesses, as a result of the neighbourhood effects in the cluster.
- Firms at the port are co-dependent due to the orientation of activities at the port.

- Proximity and close interaction opportunities created by the cluster have the most significant effect on technological and business process innovation.
- Various co-operative strategies adopted by the cluster and sub-clusters at the port created more business, value – add and better value chain management.
- The competency building at the cluster level and firm-level had been achieved by training and education patronised by the cluster. The port established Mahapola Ports & Maritime Academy for training & Education in Colombo for the benefit of port cluster constituents.

Findings related to RQ 1.b (How does Cluster Functionalities Influence the determinants of port performance?):

- Faster turn around and speed of services achieved by clustering result in efficiency of terminal services.
- Port's operational efficiency is enhanced by the cluster through collective coordination of value chain activities, labour and systems of the port.
- Speed of Service attracts more customers (hinterland & foreland) to ports.
- The scale of operation is enhanced in Colombo port by the cluster's use of collaborative strategies.
- Collaborative strategies help firms to improve customer service and cost-effectiveness.
- Colombo port cluster is networked through an extended information system, “portcom", which enhances the service capability.
- Colombo port cluster adopted a multi-layer approach of synchronising the mobility factors of logistics infrastructure and transport to capitalise on the hinterland business.

Findings related to RQ 2. (How does Government policies influence port cluster development?)

- Multiple Policies of the national Govt. guide port clusters in Colombo Port.
- These policies provide multiple tariffs and non-tariff incentives to support clusters and sub-clusters. Incentives and subsidies are a major attraction for firms to associate with clusters.
- Huge investments follow policy provisions to set up infrastructure facilities for the development of clusters and sub-clusters at Colombo Port.
- Sri Lankan Govt. through various policies, facilitate regulatory support by extending linkages and alignments with other institutions.
- Transparency and Single window mechanism, integrating 32different agencies under different ministries supporting the cluster development.
- Governance provisions attract more firms to the cluster and hence positively impact the cluster development.
- There are established rules of engagement in each policy which ensure inter-ministerial engagement for development of clusters.

4.4. CASE STUDY – 2 : PORT KLANG.

Port Klang is the major maritime gateway to Malaysia. Prominently located on the busiest Ease- West maritime route, Port Klang act as the transhipment hub for South Asian and ASEAN major ports. The Straits of Malacca is a prominent gateway for international trade to and from the Asian continent. It is identified as the second busiest waterway in globally. The Malaysian maritime sector got its prominence in the world trade due to the geographic advantage it enjoys because of the Straits of Malacca. Malaysia also is a nation surrounded by sea and has a vibrant maritime industry comprising of many shipyards, major and minor ports and world-class terminal facilities, established ship services facilities and an overabundance of enterprises and institutions engaged in activities in the maritime industry and construed as essential constituents of the nation's maritime clusters.

Port Klang Authority (PKA) consists of two sizable distinct operators, namely, the West Port and North Port, which contributes sixty-seven per cent and thirty-three per cent respectively of container throughput (Salisbury, 2014). Port Klang, with approximately 12.32 million twenty equivalent units (TEUs), is ranked at 12th position among container seaports in the world (World Shipping Council, 2018). Port Klang is well connected to its hinterland with adequate facilities at the dry ports across the country, of which the prominent ones being, the cargo terminals at Padang Besar (PBCT) and Ipoh (ICT) in the North, Nilai Inland Port (NIP) in the central and Segamat Inland Port (SIP) in the south (Jeevan et al., 2015).

4.4.1. Port cluster constituents functioning with respect to Cluster Functionalities

Data collected from Port Klang was reviewed as per the strategy for data analysis discussed in detail in the previous chapter on research methodology.

A detailed analysis based on the initial conceptual constructs (ICC) and sub-constructs recognised & derived from the literature review such as labour market pooling, knowledge spill-over, entrepreneurship, supplier specialisation, lock-in, innovation, business development and training & education is presented in Table 4.7.

The interview data also evidenced occurrences of the sub-constructs, namely, labour compositional effect, occupational agglomeration, technical spillover, intellectual spill-over, innovation diffusion, value chain partnership, interfirm relationship, path dependence, technological innovation, business innovation, trade promotion, value chain management, and competency building.

Table. 4.7. Constituent functioning / cluster functionalities at Port Klang : Sub constructs and Empirical findings.

Initial Conceptual Construct	Sub Constructs	Categories from empirical data	Focused code from empirical data	Observations
Labour Market Pooling	Labour Compositional Effect	Labour Market Pooling	Labour Engagement	At Port Klang, the labour supply and management companies hugely engage migrant workers. The cluster initiatives promote training these semi-skilled workers for worker-firm matching, for extended labour engagements by the constituent firms. This results in flexibility in the inter-firm engagement of labour at the port.
	Occupational Agglomeration	Labour Market Pooling	Labour Mobility	The mobility of semi-skilled workers is optimised by the cluster by imparting training. Depending on the projected demand for labour for various operations, which has a seasonality character, the cluster at port Klang facilitates the mobility of workers. Also, cluster initiated skill up-gradation opportunities enhance the workers' competency in operations matching with the demand of shipping industry. This has contributed positively to the performance improvements of the

				terminals at Port Klang, in addition to vertical mobility of competent employees.
Knowledge Spillover	Technological Spill-over	Learning Intensity	Skill Upgradation	At Port Klang, the clusters and subclusters have actively promoted up-gradation of processes by creating opportunities for interactive learning. This is helping in acquiring much new knowledge for the stakeholders. In turn, this promoted innovation and organisational performance improvement and supported the easy adoption of new technologies. Constituent firms are benefited immensely by the opportunity created by the cluster.
	Intellectual Spillover	Learning Intensity	Tacit Knowledge	Mutual trust between the firms in the industry is necessary to establish relationship and networking which promote the transfer of information, skill and knowledge from among them. More of tacit knowledge spill-over occurs when there are opportunities for intra and inter-firm job switching. The Port Klang cluster organise periodical and regular meetings of the firms in the cluster, cluster-specific training programs, courses and workshops, relevant on-site training, and participation in

				various industry events. This enables the stakeholders to keep current with the new information and trends in the industry and leads to innovation.
Entrepreneurship	Innovation Diffusion	Relational Capital	Innovation Diffusion	Port Klang Cluster and the subclusters encourage entrepreneurship activities. The cluster channelises direct and indirect support for successful action plans for business development as well as small firm growth by facilitating access to existing clients and businesses, channelling public and private capital and access to exploitable knowledge within the industry.
Supplier Specialisation	Value Chain Partnership	Collaborative Procurement	Institutional Linkage	Those member firms at Port Klang cluster, which are linked through any core activity in the industry, operating in tandem, are able to attract resources and services that would not have been available to them isolated. This gives immense productivity advantage, and cost benefits as the firms can access institutions, inputs and services more flexibly and at low cost and risk.

Lock-in	Inter-Firm Relationship	Neighborhood Effects	Complementary Firms	The member firms in the cluster cooperate around a core activity, using their key competencies to support each other.
	Path Dependence	Neighborhood Effects	Strategic Coherence	The inter-relatedness of operations and business processes generate increasing returns and stimulate rising performance. Firms are co-dependent due to the orientation of the activities at the port.
Innovation	Technological Innovation	Collaborative Innovation	Technological Innovation	Innovativeness is influenced by the proximity of related industries. The terminal operations and processes administrations at the Port Klang has witnessed in recent past, many effectively implemented innovations which are participatory and collaborative in nature.
	Business Process Innovation	Collaborative Innovation	Business Process Innovation	A major part of operations connected to the port business is contained within the geographical territory of the port. Hence the knowledge spill-over due to network effect due to the collaborative actions are more focused, and they can be collated with greater accuracy. This lead to active innovation drives in the business processes, especially in the port information systems. It is also observed that the tacit knowledge contributes in many ways in the

				process of innovation, to gain competitive advantages to the stakeholders, as it often acts as the catalyst to the diffusion of an innovation theme through experience/expectation sharing. The process is augmented by direct user-to-user influence.
Business Development	Trade Promotion	Co-operative Strategies	Trade Promotion	Thus a co-operative strategy in the cluster offers a mutually beneficial opportunity for constituent firms to reshape their positions in the industry. The cluster and sub-clusters lead by the Port Klang Authority (PKA) and Port Klang Free Zone (PKFZ) participate in industry trade fairs, common facility centres, shared marketing channels, obtain collective market intelligence and generate leads for the member firms for participation in global business opportunities.
	Value Chain Management	Co-operative Strategies	Value Chain Management	Member firms in Port Klang cluster use collaborative strategies as a mechanism to upgrade the customer service as well as optimise the costs of operations. Opportunities are created by the port cluster for promoting effective linkages between value chain partners, thereby enhancing the benefit of collaborative functioning.

				Various associations, acting as sub-clusters, engage in collective management of value chain activities.
Training & Education	Competency Building	Skill Upgradation	Competency Building	The Port Klang Authority promoted many skill up-gradation centres and training facilities which continuously impart customised training for the employees of the member firms. Cluster organisation has a significant role in increasing the knowledge up-gradation and information exchange by building appropriate linkages between institutions in academic, research and skill domains and the constituent firms to strengthen operational capability for the adoption of updated technology.

In addition, a qualitative associative network (QAN) has been developed using Atlas.ti, to understand the Port Cluster constituent functioning with respect to the cluster functionalities at Port Klang, and is presented in Figure 4.4

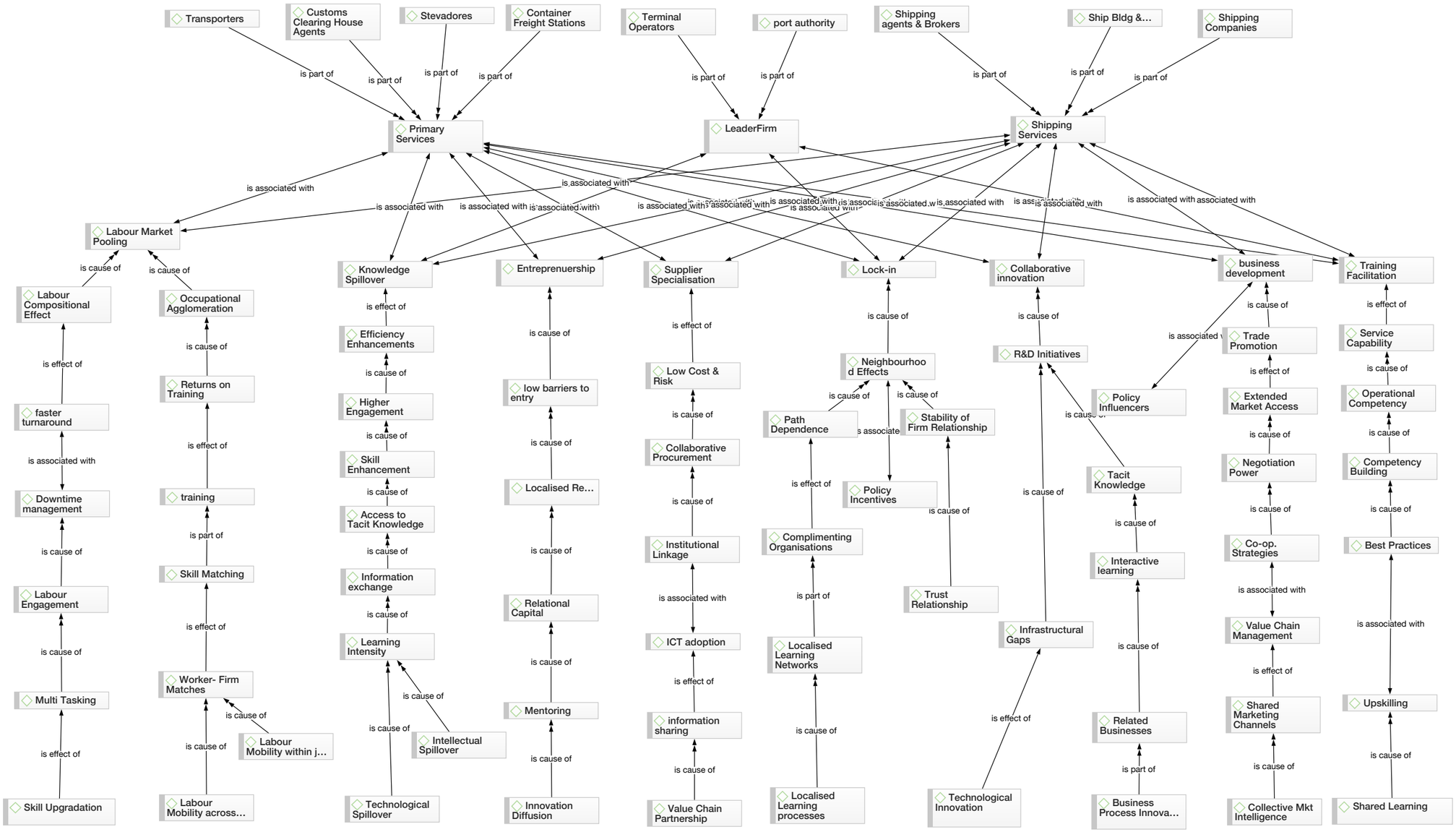

Fig. 4.4. QAN – Port Cluster constituent functioning w.r.t cluster functionalities: Port Klang

Table. 4.8 Port cluster constituents functioning w.r.t Cluster Functionalities: Port Klang

Port Cluster Constituents		Port Authority	Terminal operators	Transporters	CHA / Forwarders	Stevadores	Container Freight Stations	Shipping Co.s	Shipping Agents / Brokers	Ship Bldg. & Repairs
Cluster Constituent Functioning (Functionalities)										
Labour Market pooling	Labour Engagement	X	✓	✓	X	✓	✓	X	X	✓
	Labour Mobility	X	✓	✓	X	✓	✓	✓	✓	✓
Knowledge Spillover	Skill Upgradation	✓	✓	X	✓	✓	✓	✓	✓	✓
	Tacit Knowledge	X	✓	✓	✓	✓	✓	✓	✓	✓
Entrepreneurship	Innovation Diffusion	X	X	✓	✓	✓	✓	X	✓	✓
Supplier Specialisation	Collaborative Procurement	✓	✓	✓	✓	✓	✓	✓	✓	✓
Lock-in	Complimentary Firms	X	X	✓	✓	✓	✓	✓	✓	✓
	Strategic Coherence	✓	✓	✓	✓	✓	✓	✓	✓	✓
Innovation	Technological Innovation	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Business process Innovation	✓	✓	✓	✓	✓	✓	✓	✓	✓
Business Development	Trade Promotion	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Value Chain Management	X	✓	✓	✓	✓	✓	✓	✓	✓
Training & Education	Competency Building	✓	✓	✓	✓	✓	✓	✓	✓	✓

4.4.2 Influence of Cluster Functionalities on port performance determinants

Data collected from Port Klang with respect to the influence of cluster functionalities on port performance determinants was reviewed as per the strategy for data analysis discussed in detail in the previous chapter on research methodology.

A detailed analysis based on the initial conceptual constructs (ICC) and sub-constructs recognised and derived from the literature review, such as, efficiency of terminal services, cost effectiveness, process efficiency and hinterland access is presented below. The interview data also evidenced occurrences of the sub-constructs, such as service improvement, scale parameters, service capability and transportation & warehousing.

Table 4.9. Influence of Cluster Functionalities on port performance determinants at Port Klang: Sub constructs and Empirical findings.

Initial Conceptual Construct	Sub Constructs	Categories from empirical data	Focused code from empirical data	Observations
Efficiency of Terminal Services	Service Improvement	Efficiency of Terminal Services	Speed of Services	The cluster by means of its various functionalities adds to the service improvement at the port. This efficiency enhancement of the terminal services builds customer confidence and positively impact on the port performance.
Cost-Effectiveness	Scale Parameters	Cost-Effectiveness	Collaborative Procurement	Cluster and sub-clusters create avenues for alliances among the constituent firms leading to joint operations helping them to optimise the cost of operation. Constituent firms in these port clusters strategies to collaborate in order to achieve service deliveries at optimal costs. Firms use cluster platform to create linkages among value chain partners, to their benefit often with optimal utilisation of common resources. This collaborative procurement of resources helps the firms to achieve economies of scale and cost-effectiveness.

Efficiency of Processes	Service Capability	Best Practices	Process Improvement	Clusters encouraged the process-centric approach at ports. The processes in soft as well as hard domains of operation in a port environment are exposed to rapid changes. Collectively guided process improvements lead to the establishment of best practices. The port Klang clusters and sub-clusters are supported with a wide port information system, which contributes to the process efficiency.
Hinterland Access	Transportation & Warehousing	Hinterland Access	Connectivity	The multimodal approach, guided by the dynamics of the port cluster is the main interface between the seaport terminals and hinterland. The hinterland connectivity is augmented by the cluster by way of optimising the service, firm collaboration, and adopting a multilayer approach of synchronising the mobility factors of logistics, infrastructure and transport, which enhances hinterland connectivity, promote regional industry and improve the port performance.

Subsequently, a qualitative associative network (QAN) has been developed using Atlas.ti, to understand Influence of Cluster Functionalities on port performance determinants at Port Klang, and is presented in Figure 4.5

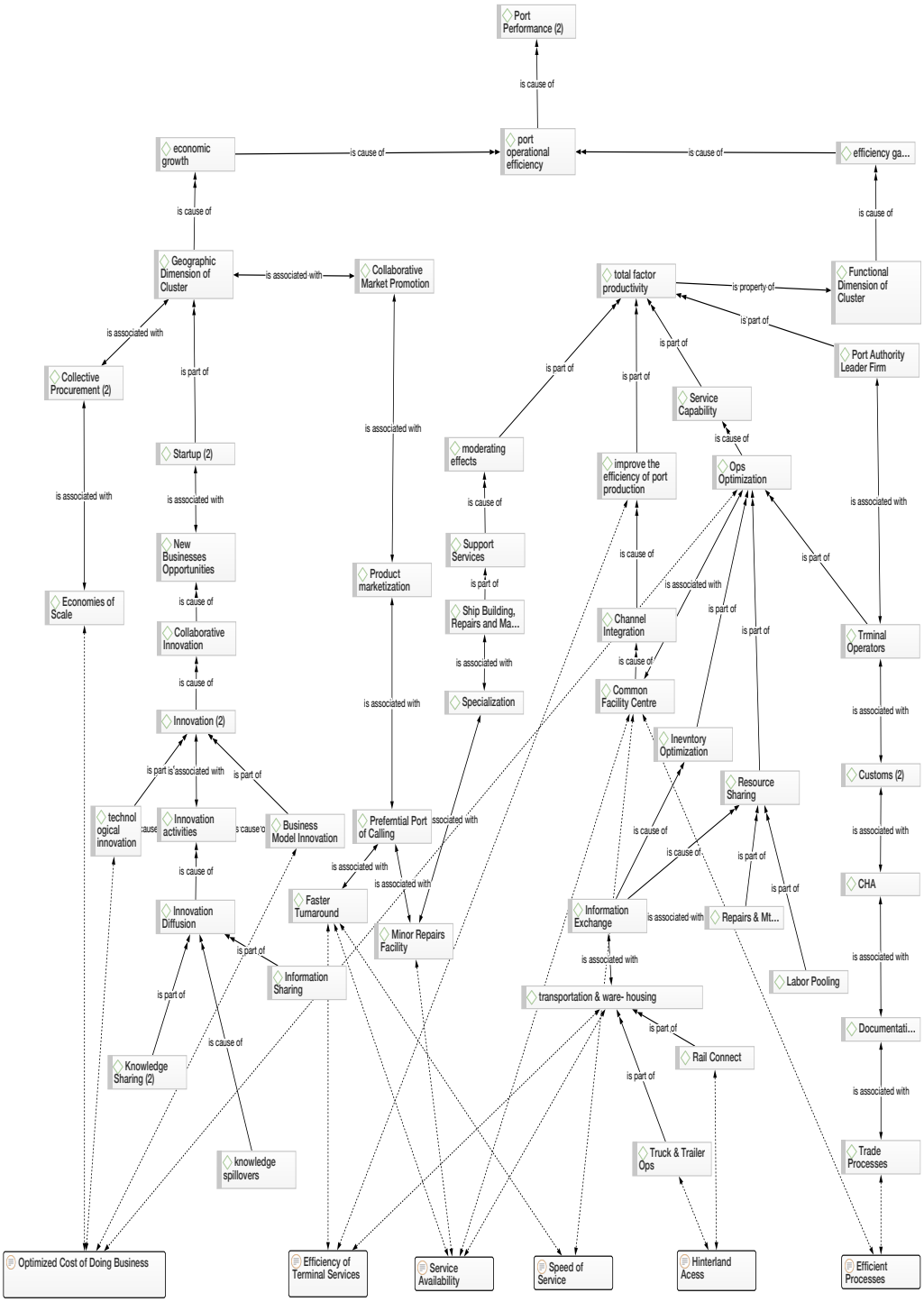

Fig. 4.5. QAN: Influence of Cluster Functionalities on port performance determinants: Port Klang

Table 4.10 Cluster Functionalities w.r.t port performance determinants: Port Klang

Port performance Determinant		Efficiency of terminal Services	Cost Effectiveness	Efficiency of Processes	Hinterland Access
Cluster Constituent Functioning (Functionalities)					
Labour Market pooling	Labour Engagement	✓	X	✓	X
	Labour Mobility	✓	X	✓	X
Knowledge Spillover	Skill Upgradation	✓	✓	✓	X
	Tacit Knowledge	✓	✓	✓	✓
Entrepreneurship	Innovation Diffusion	✓	X	✓	✓
Supplier Specialisation	Collaborative Procurement	✓	✓	✓	X
Lock-in	Complimentary Firms	✓	✓	✓	✓
	Stretegic Coherence	✓	✓	✓	✓
Innovation	Technological Innovation	✓	✓	✓	✓
	Business process Innovation	✓	✓	✓	✓
Business Development	Trade Promotion	✓	✓	X	✓
	Value Chain Management	✓	✓	✓	✓
Training & Education	Competency Building	✓	✓	✓	✓

4.4.3 Influence of Government policies on the port cluster development

Data collected from Port Klang with respect to the influence of government policies on the port cluster development was reviewed as per the strategy for data analysis discussed in detail in the previous chapter on research methodology.

A detailed analysis based on the initial conceptual constructs (ICC) and sub-constructs recognised & derived from the literature review such as support measures, governments' role, transparency, constituent management and engagement process is presented below.

The interview data also evidenced occurrences of the sub-constructs such as incentive schemes, infrastructure development, regulatory framework, planning stability, facilitation measures and factors of production.

Table 4.11. Influence of Government policies on the port cluster development at Port Klang: Sub constructs and Empirical findings.

Initial Conceptual Construct	Sub Constructs	Categories from empirical data	Focused code from empirical data	Observations
Support Measures	Incentive Schemes	Support Aspect	Incentive Schemes	The maritime policy and the complementing policies of the Malaysian Government provide for various direct and indirect incentives (concessional tax structure, tax holidays, infrastructure, training facilities) which encourages the development of port clusters.
	Infrastructure Development	Support Aspect	Infrastructure Development	Through PKA, SEZ and the local administration, the national policy, support infrastructural development for the Port Klang cluster. These measures speed up cluster development.
Govt.'s Role	Regulatory Framework	Govt.'s Direct Role	Regulatory Framework	The National Govt. through the following measures have promoted the development of Port Clusters: Linkages and alignments with institutions, stimulation of Entrepreneurial activities, Establishment of cluster skill centers, support for innovation with funding and incubator facilities etc.

Transparency	Planning Stability	Transparency	Planning Stability	The transparency in the policy measures governing the Port Klang cluster encourages the firms to participate in cluster activities and thus impact positively on the cluster development.
Constituent Management	Facilitation Measures	Constituent Management	Governance	The governance of the port cluster is vested with the PKA, in Port Klang. These are designed to improve on competition and co-operation within the cluster and to encourage entrepreneurship and innovation. These provisions attract more firms to the cluster and hence positively impact the cluster development.
Engagement Process	Factors of Production	Rules of Engagement	Constituent Engagement	The development and functioning of clusters at ports in Malaysia including Port Klang, are characterised by the engagement aspects of the policies which concerns the inter-relationship between, firms and regulatory institutions that nurture the harmonization and support activities that promote the evolution and expansion of clusters.

A qualitative associative network (QAN) has been developed using Atlas.ti, to understand Port cluster development and its linkage Government Policies at Port Klang, and is presented in Figure 4.6

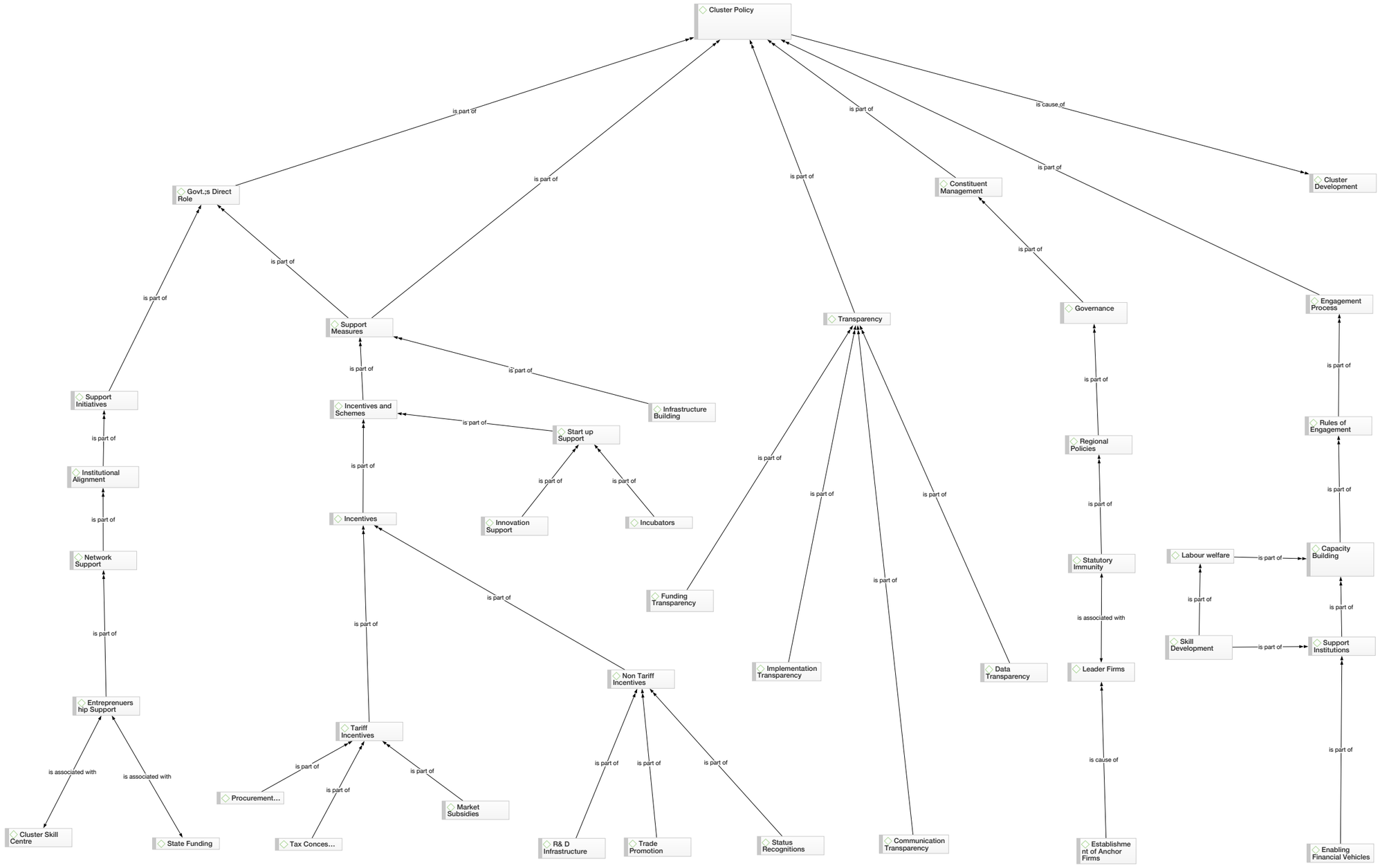

Fig. 4.6. QAN Network: Port cluster development and its linkage Government Policies: Port Klang

Further, the various constructs under the categories and sub categories from the study had been reviewed with reference to various documents published by respective organizatios associated to the Colombo Port. The observations are presented in Table 4.12

Table. 4.12. Review of the categories and sub categories from the study w.r.t. the theoretical framework and observations drawn from secondary sources (Port Klang)

R O	Initial conceptual construct identified in LR	Sub-constructs identified in LR	Categories emerged out from this study	Sub-categories emerged out from this study	Reference drawn from secondary document in	Document reference
Constituent Functioning w.r.t. Cluster functionalities	Labour Market Pooling	Labour Engagement	Labour Market Pooling	*Labour Compositional Effect*	*Employee cost per Million containers, throughput had been reduced by 3%*	*Annual report (2019), West-Port Holdings Bhd., Pg. 3.*
		Occupational Agglomeration		Labour Mobility		
	Knowledge Spillover	Technological Spillover	*Learning Intensity*	Skill Upgradation	*Association with Maritime Skill Institute to facilitate sectoral skill upgradation.*	*Annual Report (2017), Port Klang Authority, Pg.44*
		Intellectual Spillover		Tacit Knowledge		
	Innovation	Technological Innovation	Collaborative Innovation	Technological Innovation	*Innovative technologies enhanced efficiency of operations. Implemented EDI through cluster network.*	*Annual Report (2017), Port Klang Authority, Pg. 7, 36*
		Business Process Innovation		Business Process Innovation	*Adoption of new technology, enhanced process efficiency.*	*Annual Report (2017), Port Klang Authority, Pg. 25*

	Business Development	Value Chain Management	Co-operative Strategies	Value Chain Management	*PKFZ established CFC for value added cargo handling for cluster constituents, resulted in YoY 39.40 % increase in no of TEUs*	*Annual Report (2018), Port Klang Authority, Pg. 27*
	Training & Education	Competency Building	Skill Upgradation	Competency Building	*Conducted 355342 training hours, in 2019 for industry. Inhouse trained workforce added competency and continuous improvement in port performance*	*Annual report (2019), West Port Holdings Bhd.,(Port Klang), Pg.5*
Influence of Cluster Functionalities on port performance determinants	Cost-Effectiveness	Scale Parameters	Cost-Effectiveness	Collaborative Procurement	*Cost effectiveness and scale had been achieved by collaborative resource management.*	*Annual report (2017), West Port Holdings Bhd.,(Port Klang), Pg.84*

4.4.4 Findings in response to research questions: Case study-2 (Port Klang)

The constructs and sub-constructs drawn during the literature review had been corroborated in the analysis of empirical data. The findings of the case study with reference to the research questions are summarised and discussed below.

Findings with reference to RQ 1.a (How does the port cluster constituents function?): Port Klang (Case study-2)

- At port Klang, the cluster promotes training the semiskilled workers for extended labour engagements.

- Cluster initiated skill up-gradation enhance in the workers' competency matching with the demand of the international shipping industry.
- Clusters facilitated knowledge transfer between the cluster constituents leading to innovation and performance improvement.
- Port Klang cluster promotes tacit knowledge transfer enabling the stakeholders to activate collaborative process improvements.
- The cluster channelise direct and indirect support in establishing new businesses.
- The constituent firms gain productivity advantage and post benefit through institutional linkage and collaborative procurement.
- Cluster constituents cooperate in related businesses using their competencies to support each other.
- The cluster firms are co-dependent due to unidirectional orientation of activities at the port.
- Port Klang cluster systematically promote process innovation, especially in the port information systems.
- The cluster and sub-clusters engage in activities creating global business opportunities, accessing which otherwise will not be viable for individual firms.
- Cluster firms used collaborative strategies to improve linkages between upstream and downstream value chain partners cost-effectively.
- An important function of the cluster is to enhance skill by establishing networks for internal as well as external knowledge spill-over.

Findings related to RQ 1.b (How does Cluster Functionalities Influence the determinants of port performance?):

- Cluster through different internal linkages adds to the service improvement, dependability and reliability in operations which is reflected in the efficiency of terminal services.

- Various trade associations acting as sub-clusters achieved cost-effectiveness by practicing collective management of value chain activities, optimise labour and procurement.
- The scale of operation is enhanced in Port Klang by cluster's use of cooperative strategies.
- Port Klang cluster's information system enables the constituent firms to continuously improve their service quality and speed of delivery.
- Port Klang cluster and sub-clusters provide infrastructural support to equip the constituent firms regularly to update the process changes. PKA established two distribution parks for the benefit of the clusters at West port and North port terminals.
- Hinterland access is optimised by cluster aided infrastructure, labour pool utilisation, and establishing external alliances.

Findings related to RQ 2. (How does Government policies influence port cluster development?)

- The maritime policy and the complementing policies of the Malaysian Government provide for various direct and indirect incentives which encourages the development of port clusters.
- Port Klang Authority and Port Klang Free Zone are continuously developing infrastructure with the support from the national Government. This speed up the development of clusters and sub-clusters.
- National policies facilitate regulatory support by extending linkages and alignments with other institutions.
- Transparency in policy implementation attracts more firms to the clusters and sub-clusters.
- The policy support entrepreneurship and co-opetition within the cluster and hence positively impact the cluster development.

- The provisions in the maritime policy and free zone development policy encourage constituent engagements and speed up the cluster and sub-cluster development at Port Klang.

4.5. CONCLUDING REMARKS

This chapter discussed the observations, analysis and findings from the case studies on clusters at the ports of Colombo, Sri Lanka and Port Klang, Malaysia, in response to the research questions.

Categories of features and elements identified from the empirical data which are related to the functioning of the cluster constituents and the influence of the functionalities of clusters on the determinants of port performance have been discussed. Also, the factors identified which are related to the influence of the policies on cluster development have been presented and discussed in the chapter.

The findings of the case studies demonstrate that the respondents contemplated the categories such as labour compositional effect, occupational agglomeration, technical spillover, intellectual spillover, innovation diffusion, value chain partnership, inter-firm relationship, path dependence, technological innovation, business innovation, trade promotion, value chain management, and competency building while discussing port cluster constituents functioning with respect to cluster functionalities. Also, the factors namely, service improvement, scale parameters, service capability and transportation & warehousing in relation to the influence of cluster functionalities on port performance determinants. Factors such as incentive schemes, infrastructure development, regulatory framework, planning stability, facilitation measures and factors of production were highlighted by the interviewees with reference to the influence of government policies on the port cluster development.

This chapter presented and discussed case studies on port clusters at Colombo Port and Port Klang. Next chapter discusses the cross-case analysis and its findings of both these case studies.

CHAPTER 5.

CROSS CASE ANALYSIS & FINDINGS.

5.1 INTRODUCTION

This chapter discusses the cross case analysis of constituent functioning, the cluster functionalities, influence of the cluster functionalities on the determinants of the port performance and the influence of Government policies on the port cluster development across Colombo Port and Port Klang cases discussed in the previous chapter.

Propositions suggesting relationships between factors related to constituent functioning, the cluster functionalities, influence of the cluster functionalities on the determinants of the port performance and the influence of Government policies on the port cluster development are also developed. Cross Case Findings, with regard to the Research Questions also are discussed in this chapter.

5.2. SIMILARITIES AND DIFFERNCES AMONG CASES

In the cross case analysis of the case-studies, evidences had been reviewed through the whole of the cases (Colombo Port and Port Klang) to recognize the similarities and differences in various previously developed constructs in the cluster dynamics perceived in the research objectives. Replication logic is the rationale used for cross-case analysis. Similarities and differences amongst both the case studies as well as the critical inferences are discussed in the following sections. Further, the abstracts of the content analysis are organized as a qualitative associative network (QAN) using the Atlas.ti software. The findings from the cross-case analysis are incorporated in these QAN diagrams.

5.2.1. Port cluster constituents functioning w.r.t Cluster Functionalities (RO1.a)

Based on the earlier literature on functioning of the cluster constituents and functionalities of the cluster organisations at seaports, eight constructs such as Labour market pooling, Knowledge spill-over, Entrepreneurship, Supplier specialisation, Lock-in, Innovation, Business Development and Training & Education were recognised as presented in Section 2.5 of Chapter 2. This review has observed substantiations for entire eight conceptual constructs as categories of empirical evidence in both the cases of clusters at the Colombo Port and Port Klang. The details of similarities and differences in these evidences and the observations based on the cross case analysis are as presented in the Table 5.1.

Table 5.1 Port cluster constituents functioning w.r.t Cluster Functionalities: Cross case findings

Categories from empirical data (Case Study 1 & Case Study 2)	Focused code from empirical data (Case Study 1) Colombo	Observation on data analysis (Case study 1) Colombo Port	Focused code from empirical data (Case study 2) Port Klang	Observation on data analysis (Case study 2) Port Klang	Cross-Case Analysis Observations
Labour Market Pooling	Labour Engagement	Port worker's use of specialised equipment and keeping current with the new trends in port operations helped Colombo	Labour Engagement	At Port Klang, the labour supply and management companies hugely engage migrant workers. The cluster	In both Cases labour inter-changeability is facilitated by the cluster dynamics. The worker mobility thus created, enhanced

		Port to cope up with world operational standards, often demanded by the shipping community. The extended labour reserve, usually tied up with contractors and assigned to specific tasks get trained in the cluster for flexible worker-firm matches. This enhanced the labour inter-changeability.		initiatives pro-mote training these semi skilled workers for worker-firm matching, for extended labour engagements by the constituent firms. This results in flexibility in inter-firm engagement of labour at port.	the downtime management and ensured a faster vessel turn-around.

	Labour Mobility	Clusters enabled increase in mobility of workers within the jobs and across jobs at Colombo port. The Cluster identifies the training needs of employees in the constituent firms, also with assessment of process requirements and practices demanded by various international standards.	Labour Mobility	The mobility of semi-skilled workers are optimised by the cluster, by imparting training. Depending on the projected demand for labour for various operations, which has seasonality character, the cluster at port Klang facilitates mobility of workers. Also cluster initiated skill upgrad-ation opportunities enhance the workers' competency in operations matching with the demand of shipping industry.	The extent of mobility depends on the level of the task. In both the cases, it is being optimised by appropriate training activities in the cluster. This enhanced the operational competencies. Labour redeployment helped in increasing engagements, minimize worker's losses by being out of work, better wage levels Labour mobility has impacted on the performance of terminal services and hinterland access.

Learning Intensity	Skill Upgradation	Skill enhance-ments of stake holders, have a crucial impact on efficiency in the operational processes at the Colombo Port terminals. Clusters have facilitated transmission of new knowledge through interactive learning associated with inter organisational linkages. This promoted innovative-ness and performance improvement in organisations, and supported the easy acceptance of improved technologies.,	Skill Upgradation	At Port Klang, the clusters and sub clusters have actively promoted upgradation of processes by creating opportunities for interactive learning. This is helping acquiring new knowledge for the stake holders. In turn this promoted innovation and organizational performance improvement, and supported the acquisition of modified and upgraded technologies. The constituent firms are benefited immensely by	In both cases, it is observed that the proximity bet-ween firms in clusters influence the scheme of things for introducing and making advantage of new technologies. Changes occurring in the port sector is a series of technological shifts negotiated between many different actors. By the inter-national nature of the customers of the shipping industry, it is important for the stake holders to intensify the learning process to cope up with the demands of

				the opportunity created by the cluster.	the industry. Clusters facilitate know-ledge spillover. The skill upgradations which is the by-product of knowledge spill over, leads to entrepreneurial (internal and external) confi-dence and enhances the rate of adoption of innovative technologies.
	Tacit Knowledge	Firms in Colombo Port on the cluster platform, interact closely and due to this proximity lead to exchange of information helps to reduce transaction costs and facilitate knowledge	Tacit Knowledge	Mutual trust between the firms in the industry is necessary to establish relationship and networking which promote transfer of information, skill and knowledge from	In both cases, the closeness, familiarity and connectedness among people and firms, and high mobility of skilled and semi-skilled workers within the cluster are factors that allow imitation and acquirement

		development which in turn help firms to improve performance. The cluster facilitate opportunities for interpersonal contacts through which the tacit knowledge can easily flow.		among them. More of tacit knowledge spill over occurs when there are opportunities for intra and inter firm job switching. The Port Klang cluster organize periodical and regular meetings of the firms in the cluster, cluster specific training programs, courses and workshops, relevant on-site training, and participation in various industry events. This enable the stakeholders to keep current with the new information and	of tacit knowledge which is easily acquirable in other situations. Innovation activities turn out to be collaborative among cluster firms. Distinct inter connectedness between them promote the diffusion of tacit knowledge as a result of trust as well as shared perceptions. The information exchange between firms located in the vicinity certainly have superior opportunities and results in innovativeness in comparison to

				trends in the industry and leads to innovation.	collaborations among remote actors. Proximity raises the frequency of personal contacts, the social relations between actors and enhances the learning intensity.
Relational capital	Innovation Diffusion	The Cluster and the sub clusters in Colombo port provide direct and indirect support for successful new business development as well as small firm growth by encouraging an entrepreneurial culture, access to existing clients and businesses, channeling public and private capital	Innovation Diffusion	Port Klang Cluster and the sub clusters encourage entrepreneurship activities. Cluster channelise direct and indirect support for successful new business development as well as small firm growth by facilitating access to existing clients and businesses,	Both the cases, it is observed that the clusters encourage formation of new firms and expansion of existing firms. The entry barriers for entrepreneurial activities are low.

		and access to exploitable knowledge within the port industry .		channeling public and private capital and access to exploitable knowledge within the industry .	
Collaborative Procurement	Institutional Linkage	Those member firms at Colombo port cluster which are linked through any core activity in the industry, operating in tandem, are enabled to utilize resources and facilities those would not have been accessible to them in case they were functioning independently. This create productivity advantage and cost benefits as	Institutional Linkage	Those interrelated constituent firms of the Port Klang cluster, attached to any of the principal business activity operative synchronously, would have access to resources and facilities by virtue of being part of the cluster. Firms acquire productivity gain and cost advantages since they have access	Individual firms benefit from being part of the clusters. These firms by being a constituent of the cluster, could gain and enjoy a series of advantages which are not attainable by stand-alone firms. Clusters create opportunities to collaborate and achieve collective gains. In this manner, the cluster organization facilitate the

		the firms can access institutions, inputs and services more flexibly and at low cost and risk.		to resources at comparable easiness and at low cost.	member firms in accessing new ideas and extended opportunities.
Neighborhood Effects	Complementary Firms	The constituent firms in the cluster usually collaborate on the principal activity in the domain, employing their core competencies to complement each other.	Complementary Firms	The member firms in the cluster cooperate around a core activity, using their key competencies to support each other.	At the port, the activities are heavily complementary and revolve around specific technologies and processes. In both the cases,
	Strategic Coherence	The interrelatedness of operations and business processes produce enhanced returns and incite increasing economic	Strategic Coherence	The inter-relatedness of operations and business processes generate increasing returns and stimulate rising economic	Complimentary functions of firms at the port exhibit a strategic coherence due to the orientation of activities at port. Also the strength of interlinkages of firms within

		performance. Firms are co-dependent due to the orientation of the activities at port. Also the inter-relationship strength increases with complexity of the process.		performance. Firms are co-dependent due to the orientation of the activities at port. Also the inter-relationship strength increases with complexity of the process.	the cluster increases with process complexity.
Collaborative Innovation	Technological Innovation	Inter firm innovation activities are significantly influenced by the proximity of related industries. Colombo port has witnessed few major indigenous collaborative innovations in equipment upgradations, in its terminals, in automation and	Technological Innovation	Innovativeness is influenced by the proximity of related industries. The terminal operations and processes administrations at the Port Klang has witnessed in recent past, many effectively implemented innovations which are participatory and	In both cases, the amalgamation of features internal capabilities, knowledge sharing and potential benefits conceived by the cluster dynamics motivated innovation. As changes in technology is taking place rapidly, the quantum of potential

		autonomous transport, meeting industry demands of international standards.		collaborative in nature	innovations and consequential improvements in business processes have enlarged beyond an individual firm's capacity to choose.
	Business Process Innovation	Port operations being primarily contained within the geographically bounded territory, the intellectual networks evolved due to involvement in collaborative processes are found to be more candid and well defined. Therefore these networks can be meticulously targeted. This lead to active	Business Process Innovation	Major part of operations connected to the port business are contained within the geographical territory of the port. Hence the knowledge spill over due to network effect due to the collaborative actions are more focused and they can be collated with greater accuracy. This lead to active innovation drives in the	The extend of information and knowledge a firm possess is directly related and influence the chances for the firm to innovate. The strength of information a firm possess depends on the firm's sources of information. The larger the source, the better the firm's chances to combine relevant knowledge and hence the stronger the

		innovation drives in the business processes, especially in the port information systems. Tacit knowledge sharing plays an important role in innovative activities that build competitive advantages to the participating firms, since the information required to augment the dissemination of an innovation is effected through informal connections, and experience sharing.		business processes, especially in the port information systems. It is also observed that the tacit knowledge contribute in many ways in the process of innovation, to gain competitive advantages to the stake holders, as it often act as the catalyst to the diffusion of an innovation theme through experience / expectation sharing. The process is augmented by direct user- to-user influence.	ability to generate and establish better processes.

Co-operative Strategies	Trade Promotion.	Collective actions among the firms strengthen the market position and create more trade oppo-rtunities thereby enhancing competitiveness of the individual firms in the port. Instead of practicing many independent competitive strategies as single firms, multiple related businesses, take up co-operative strategies as appropriate choice to establish competitive positions in their domain. Thus strategies for collaborative	Trade Promotion	The collaborative strategy in the cluster offer a reciprocally advantageous scenario for constituent firms to restructure their positions in the domain. The cluster and sub clusters lead by the Port Klang Authority (PKA) and Port Klang Free Zone (PKFZ) participate in industry trade fares, common facility centres, shared marketing channels, obtain collective market intelligence and generate leads for the member	Collaboration and collective actions among the firms strengthen the distinctive competencies and market position of the firms in the port. Instead of depending on many strategies as a stand-alone firm, various related businesses (eg. the three terminal operators at Colombo port and the various firms at the PKFZ) take up collaborative strategies as a practical choice to establish stronger positions in the respective markets.

		actions in the cluster offer opportunities which are beneficial for constituent firms to strengthen their positions in the industry.		firms for participation in global business opportunities.	
	Value Chain Management	Shipping lines and shipping agents have associations facilitating alliances and joint operations thereby optimising the cost of operations. Firms in Colombo port cluster use the collaborative strategies as a tool to make better customer service and control total costs. Cluster	Value Chain Management	Member Firms in Port Klang cluster use the collaborative strategies as a mechanism to upgrade the customer service as well as optimize the costs of operations. Opportunities are created by the port cluster for promoting effective linkages between value chain partners, thereby	In both cases the clusters and sub clusters facilitate alliances and joint operations to effectively manage the business process and its value chain thereby optimising the cost of operations. Often the complementor firms in the cluster act as intermediaries in the value chain.

		creates opportunities for establishing relationships among value chain partners, in the upstream and downstream processes. It also helps to realise the optimal resource allocation, and thereby strengthen the collaborative functioning.		enhancing the benefit of collaborative functioning. Various associations, acting as sub clusters engage in collective management of value chain activities.	

Skill Upgradation	Competency Building	There are many universities and training institutes in and around Colombo, some of which are patronised by the Port Authority which continuously impart customised training for the employees of port cluster member firms. This helped to build trust and confidence in the port community. The clustered firms started actively participating in programs. This also brought platforms and channels for information flow	Competency Building	The Port Klang Authority and the cluster patronized and promoted many skill upgradation centres and training facilities (Universities, R& D centres, Training institutions etc.) which continuously impart customised training for the employees of the member firms. Cluster organization has a significant role in increasing the knowledge upgradation and information exchange by building appropriate linkages	In both the cases, there had been many educational activities in the form of workshops, seminars and short and long term training programs organised by the cluster for the cluster constituents to understand the customer needs at different levels and times, based on which innovative ideas were collected and process changes designed and implemented.

		and thus helped the firms to perform better. The port established Mahapola Ports & maritime Academy for training & Education for the benefit of port cluster constituents.		between institutions in academic, research and skill domains and the constituent firms to strengthen operational capability for the adoption of updated technology.	

5.2.2 Influence of Cluster Functionalities on port performance determinants (RO1.b)

On the basis of earlier literature on influence of cluster functionalities on port performance determinants, four constructs such as efficiency of terminal services, cost effectiveness, process efficiency and hinterland access were recognised as discussed in section 2.5 of chapter 2 . This review has observed substantiations for entire four conceptual constructs as categories of empirical evidence in both the cases of clusters at the Colombo Port and Port Klang. The details of similarities and differences in these evidences and the observations based on the cross case analysis are as presented in the Table 5.2.

Table 5.2 Influence of Cluster Functionalities on port performance determinants: Cross case Findings.

Categories from empirical data (Case study 1 & Case Study 2)	Focused code from empirical data (Case Study 1) Colombo Port	Observation on data analysis (Case study 1) Colombo Port	Focused code from empirical data (Case Study 2) Port Klang	Observation on data analysis (Case study 2) Port Klang	Cross-Case Analysis Observations
Efficiency of Terminal Service	Speed of Services	The cluster by means of its various functionalities adds to the service improvement at the port. This efficiency enhancement of the terminal services builds customer confidence and positively impact on the port performance	Speed of Services	Port Klang Cluster enables PKA to be quick on taking decisions regarding altering schedules, amending orders and changing process's design to meet customers' demand. The cluster by means of its various functionalities adds to the service improvement dependability	Efficient services influences extent of activities at port. Ontime and efficient services attract more business. The supply chain integration through clusters and the operational optimisation and its competitive-ness achieved thereof enhances the performance of the port, by ensuring reliability, quality, customisation and cost effectiveness.

				and reliability at the port PKA established two distribution parks for the benefit of the clusters at West port and North port terminals..	
Cost Effectiveness	Collaborative Procurement	Cluster and sub clusters facilitate alliances and joint operations to optimise the cost of operations. Firms use the collaborative strategies as a tool to optimize the cost of operations and to impart process improvements. Cluster set up platforms for linkages among the inbound and outbound	Collaborative Procurement	Cluster organisations create alliances among the constituent firms leading to joint operations to optimise the cost of operation. Constituent firms in these port clusters colla-borate in order to achieve service deliveries at	In both cases the clusters and sub clusters facilitate alliances and joint operations to effectively manage the business process and its value chain thereby optimising the cost of operations and thus delivering cost effective services.

		streams of the value chain in businesses, and ensures opportunities for optimal utilization of port resources, achieve economies of scale and thus become cost efficient.		optimal costs. Firms use cluster platform to create linkages among value chain partners, to optimise utilisa-tion of common resources. This collaborative procurement of resources help the firms to achieve economies of scale and cost effectiveness.	

Best Practices	Process Improvement	Colombo port cluster claims to its credit its responsiveness in faster development of customised service capabilities by following the best practices. Colombo Port Cluster is networked through an extended port information system. This contributes to the process efficiency.	Process Improvement	The service efficiency in the port is enhanced continuously by process improvements in line with the technological changes. Port Klang cluster facilitate the member firms to update the business and technological process changes by infrastructural support and opportunities for skill enhancement.	The cluster emphasizes optimal adaptation of ICT to enhance process integration and effectiveness of services, which also involve skill upgradation and training for managers to improve employee output and quality. Adoption of best practices establishes efficient processes which helps in competency building and leads to operational Efficiency
Hinterland Access	Connectivity	Cluster driven intermodal system is the prominent interface	Connectivity	Multimodal approach guided by the dynamics of port cluster is	In both cases the cluster measures improve the hinterland connectivity.

		between the port terminals and hinterland in Colombo Port. The hinterland connectivity is augmented by the cluster by way of optimising the service, firm collaboration, and adopting a multilayer approach of sychronising the mobility factors of logistics, infrastructure and transport. Evidently this smoothens the multimodal hinterland connectivity and boost the port performance.		the main interface between the seaport terminals and hinterland. Hinterland connectivity is augmented by the cluster by way of optimising the service, firm collaboration, and adopting a multilayer approach of sychronising the mobility factors of logistics, infrastructure and transport, which enhances hinterland connectivity, promote regional industry and improve the port performance.	Hinterland acc-essibility allows terminal reach beyond the seaport's geo-graphic borders, thereby extending the area of influence of the terminals to inland container depots. Port clusters collectively with the port authority invest in ICDs nearby industrial clusters to captivate the linkage. Proximity to powerful eco-nomic centers and hinterlands create traffic networks that supplements performance in port terminals.

5.2.3 Port cluster development and its linkage Government Policies (RO 3)

Based on the earlier literature on port cluster development and its linkage to government policies, five constructs such as support measures, governments' role, transparency, constituent management and engagement process were identified as discussed in section 2.5 of chapter 2 . This review has observed substantiations for entire five conceptual constructs as categories of empirical evidence in both the cases of clusters at the Colombo port and port Klang. The details of similarities and differences in these evidences and the observations based on the cross case analysis are as presented in the Table 5.3

Table 5.3 Port cluster development and its linkage Government Policies: Cross case findings

Categories from empirical data (Case study-1 & Case Study 2)	Focused code from empirical data (Case Study-1) Colombo Port	Observation on data analysis (Case Study-1) Colombo Port	Focused code from empirical data (Case Study-2) Port Klang	Observation on data analysis (Case Study-2) Port Klang	Cross-Case Analysis Observations
Support Measures	Incentive Schemes	Sri Lanka's various national policies, including industrial policy, national maritime and logistics policy, innovation policy, provides many incentive schemes (tariff	Incentive Schemes	The maritime policy and the complementing policies of the Malaysian Government provides for various direct and indirect incentives (concessional tax structure, tax	The cluster organisation is treated as an active entity of the market. The government's role is to eliminate barriers to the development of clusters and to encourage regulation induced

		and non-tariff incentives) for the industry cluster. These encourages cluster development		holidays, subsidised infra-structure, subsidised training facilities) which encourages development of port clusters.	co-location of firms by incentivising the engagement and thus impact positively on cluster development The policy provides for incentives that spearhead cluster development.
Support Measures	Infrastructure Development	The policies ensures promotion of operational commitments to standard levels of service. The various policy provides for setting up infrastructural facilities for cluster and sub clusters in the Colombo Port in order to facilitate cluster development.	Infrastructure Development	Through PKA, SEZ and the local administration, the national policy, support infrastructural development for the Port Klang cluster. These measures speed up the cluster development.	The policy supports Development of port and maritime related operational and technological infrastructure, which include key physical infra structure and service infrastructure creating sustainable advantages for the clusters and thus promote the development of the port cluster.

Govt.'s Role	Regulatory Framework	The National Govt. through the following measures have promoted the development of Port Clusters: Linkages and alignments with support institutions, stimulation of Entrepreneurial activities, Establishment of Cluster skill centers, support for innovation with funding and incubator facilities.	Regulatory Framework	The National Govt. through the following measures have promoted the development of Port Clusters: Linkages and alignments with support institutions, stimulation of Entrepreneurial activities, Establishment of Cluster skill centers, support for innovation with funding and incubator facilities.	In both cases the National Govt. through the following measures have promoted the development of Port Clusters: Linkages and alignments with support institutions, stimulation of Entrepreneurial activities, Establishment of Cluster skill centers, support for innovation with funding and incubator facilities .
Transparency	Planning Stability	Transparency in the policy measures governing the Colombo Port Cluster encourages the firms to participate in cluster activities and thus impact	Planning Stability	Transparency in the policy measures governing the Port Klang Cluster encourages the firms to participate in cluster activities and thus impact	Transparency in the policy measures positively impact the cluster development. The national policies governing the port clusters in both the ports, proclaims transparent

		positively on the cluster development.		positively on the cluster development.	processes in formation of clusters, data transparency, and transparency in the manner the cluster interact with the economic system of the region. This in turn augments the cluster development process.
Constituent Management	Governance	The governance provisions in the policies related to clusters of the Colombo Port are designed to improve on competition and co-operation within the cluster and to stimulate entrepreneurship and innovation. These provisions attract more firms to the cluster and	Governance	The governance of the port cluster is vested with the PKA in port Klang. These are designed to improve on competition and co-operation within the cluster and to encourage entrepreneurship and innovation. These provisions attract more firms to the cluster and	In both cases the provisions in the policies by the national governments entrust the governance to the respective port authorities, referred to as cluster manager or cluster leader. The Cluster leader initiates to build scale and extent of operations and thereby facilitate the cluster development.

		hence positively impact the cluster development.		hence positively impact the cluster development.	
Engagement Process	Constituent Engagement	Policies relating to the engagement processes in the clusters at ports in Sri Lanka are concerning the connection among, the organisations and institutions those encourage coordination and extending help in pursuing projects that support the development and growth of clusters.	Constituent Engagement	The development and functioning of clusters at ports in Malaysia including Port Klang, are charectirised by the engagement aspects of the policies which concerns the inter-relationship between, firms and regulatory institutions that nurture the harmonization and support activities that promote the evolution and expansion of clusters.	In both cases the policies concerning to the engagement processes in the clusters are concerning the connection between, member firms and those institutions which encourage coordination and aids to pursue plans that supports the development and expansion of clusters.

5.3. CROSS CASE FINDINGS INTERMS OF RESERACH QUESTIONS

The findings of the case study with reference to the research questions are summarised and discussed below:

Findings with reference to RQ 1.a How does the port cluster constituents function?

- In both Cases, labour inter-changeability is facilitated by the port cluster dynamics.
- In-job and across-job labour mobility had been possible because of port cluster.
- Labour mobility has impacted the hinterland access and efficiency of terminal services by downtime management and ensured a faster vessel turn-around.
- Learning intensity in cluster constituents had been tremendously enhanced due to knowledge dissemination in port clusters.
- Knowledge spill over also had triggered innovation and innovation diffusion in port clusters.
- Clusters facilitated in lowering barriers to entry which helped new business projects to emerge.
- Institutional linkage created in port clusters paved ways for collective procurement.
- Collective procurement in port clusters reduced risk and optimised costs.
- Inter-relatedness of business processes lead to neighbourhood effects and created lock-in.
- Co-operative strategies improved value chain management and enhanced trade.

- Port clusters in both the cases facilitated skill upgradation and this had been a major reason in creating competency in the terminal operations.

Findings related to RQ 1.b How does Cluster Functionalities Influence the determinants of port performance?

- In both cases, supply chain integration through value chain partnership (co-opetition) contributed to enhance terminal efficiency.
- Participation of firms in cluster and sub-clusters in port, improved firms' competencies and port's performance both locations.
- Clusters contributed to improve the speed of service and reliability at both Colombo Port and Port Klang.
- Cluster initiated collaborative procurements optimised cost of operation at both ports.
- Clusters and sub-clusters emphasised on ICT and skill upgradation, enabling both ports to achieve process efficiency in line with demands of global shipping industry.
- Cluster initiated networking contributed to the process improvements at both ports.
- Hinterland access is a critical factor influencing port's performance. In both cases cluster measures improved the hinterland access.

Findings related to RQ 2. How does Government policies influence port cluster development?

- Transparency in establishing and implementing policy measures enhanced cluster participation in both ports. In both clusters very similar cluster policy activities are carried out.
- In both cases the policies promoted entrepreneurship at port through port clusters.
- In both cases the policies supported development of operational and technological infrastructure creating sustainable advantage for the cluster.

- In both cases, policy promoted building up scale and extent of operation of port clusters.
- In Colombo port and Port Klang, the policies encouraged institutional interlinkages through clusters.
- In both cases, cluster policies are a combination of various national and regional development policies.
- In both cases, the policies entrusted the port authority for development and governance of the cluster.
- Policies encouraged cluster development by promoting institutional linkages within and outside the port geography.
- Government policies provide for tariff and non-tariff incentives which augmented the cluster development.
- In Port Klang, the port authority has autonomy in many operational affairs with regard to port cluster whereas in Colombo the cluster development and management is controlled by multiple policies of Government.

5.4. PROPOSITIONS.

On the strength of the above cross case findings, 22 propositions are made with regard to the following themes of the research:

- *Port Cluster Constituent's Functionalities & Inter firm linkages and its Influence on determinants of port performance.*
- *Role of Government & Policies on Port Cluster Development.*

RO 1*: Port Cluster Constituent's Functionalities & Inter firm linkages and its influence on determinants of port performance.*

Evidences were found for all the sub-categories in labour market pooling, learning intensity, relational capital, collaborative procurement, neighbourhood effects, collaborative innovation, co-operative strategies, and skill upgradation categories of empirical data from both the case studies. On the basis of the inferences of the

cross-case analysis, following propositions are made with regard to the cluster functioning aspects of the first research objective.

P 01: Member firms of the port clusters actively engage in collaborative actions to strengthen their position in the industry.

P 02: Cooperative strategies of cluster constituents helps improve their competitiveness by achieving cost effective service delivery.

P 03: Enormous amount of skill upgradation takes place in ports where the clusters are active.

P 04: Labour pooling through clustering improves the productivity of member firms and the port.

P 05: Labour mobility within job and across jobs reduces the labour shock on account of seasonality of business, as higher number of firms in a pooled labor market enhances the probability of getting continuous engagement for workers facilitated by the clusters.

P 06: Labour mobility through clustering impacts the hinterland access and efficiency of terminal services by downtime management and ensured a faster vessel turn-around .

P 07: Knowledge spill over in the clustered environment stimulates innovation.

P 08: Innovation diffusion and low barriers to entry augments the degree of entrepreneurship in clustered environments.

P 09: Collaborative procurement makes the clustered firms more efficient.

P 10: Complementor firms in the cluster act as intermediaries in the value chain.

P 11: The firms within the cluster acting as intermediaries offers benefits to firms since the costs of engaging an intermediary agency, internal to the cluster, are cheaper compared to the costs of engaging an outside agency..

P 12: As there is a contingent fashion influencing the relationship in the cluster, the managers are enabled to recognize their firms' position in the cluster, reaching the right customers and suppliers.

Evidences were found for all the sub-categories in efficient terminal services, cost effectiveness, best practices and hinterland access categories of empirical data from both the case studies. On the basis of the inferences of the cross-case analysis, following propositions are made with regard to the port performance aspects of the first research objective.

P 13: Port clusters contribute positively to the efficiency of terminal services.

P 14: Skill upgradation initiatives in clusters uplift the quality and speed of service at Port.

P 15: Speed of Service, efficient terminal operations and service availability, achieved by clustering attracts more customers.

P 16: Hinterland Connectivity is a prominent success factor in seaports performance and this could be strengthened by presence of cluster activities.

P 17: Clusters by improving the infrastructure, equipment and facilities reduce the border compliance time for both export and import.

RO 2: Role of Government & Policies on Port Cluster Development.

Evidences were found for all the sub-categories in support measures, government's direct role, transparency, constituent management, and engagement process categories of empirical data from both the case studies. On the basis of the inferences of the cross-case analysis, following propositions are made with regard to the second research objective.

P 18: The cluster evolves, develop and sustain within the framework of policy and linked regulatory environment, without which the fulfilling the potential of the agglomeration will be limited.

P 19: The key purpose in establishing cluster policies is to enhance the business environment, strengthen competencies and improve performance of firms in the targeted industry.

P 20: The cluster development policy consider functional dynamics and linkages within the cluster with regard to connections between cluster constituents, trust among firms, shared vision, complementing strategy, institutional structure, systems, and cooperation & competition among businesses.

P 21: Financial support and tax holidays promote participation, engagement, development, resource mobilisation and innovativeness within the port cluster.

P 22: The policies entrusted the port authority for development and governance of the cluster. Though the collaboration among related businesses might occur instinctively, provisions in the policy to support the establishment and development of clusters are role of governments.

5.5. FOCUS GROUP DISCUSSION FOR COCHIN PORT

Based on the evidences from the case study research at the Colombo Port and Port Klang, a focus group discussion was conducted at Kochi on the 25th July 2020 to develop an initial framework for cluster development at Cochin port. Discussion guidelines were prepared. Eight senior professionals from various port related industries were invited for a discussion. Also a briefing note had been generated and circulated among the selected participants prior to the discussion. The discussion had been recorded and transcribed. The transcribed data had been analysed using Atlas.ti, and the output generated. The process flow chart for the focus group discussion conducted at Cochin along with the outcome is illustrated in Fig. 5.1.

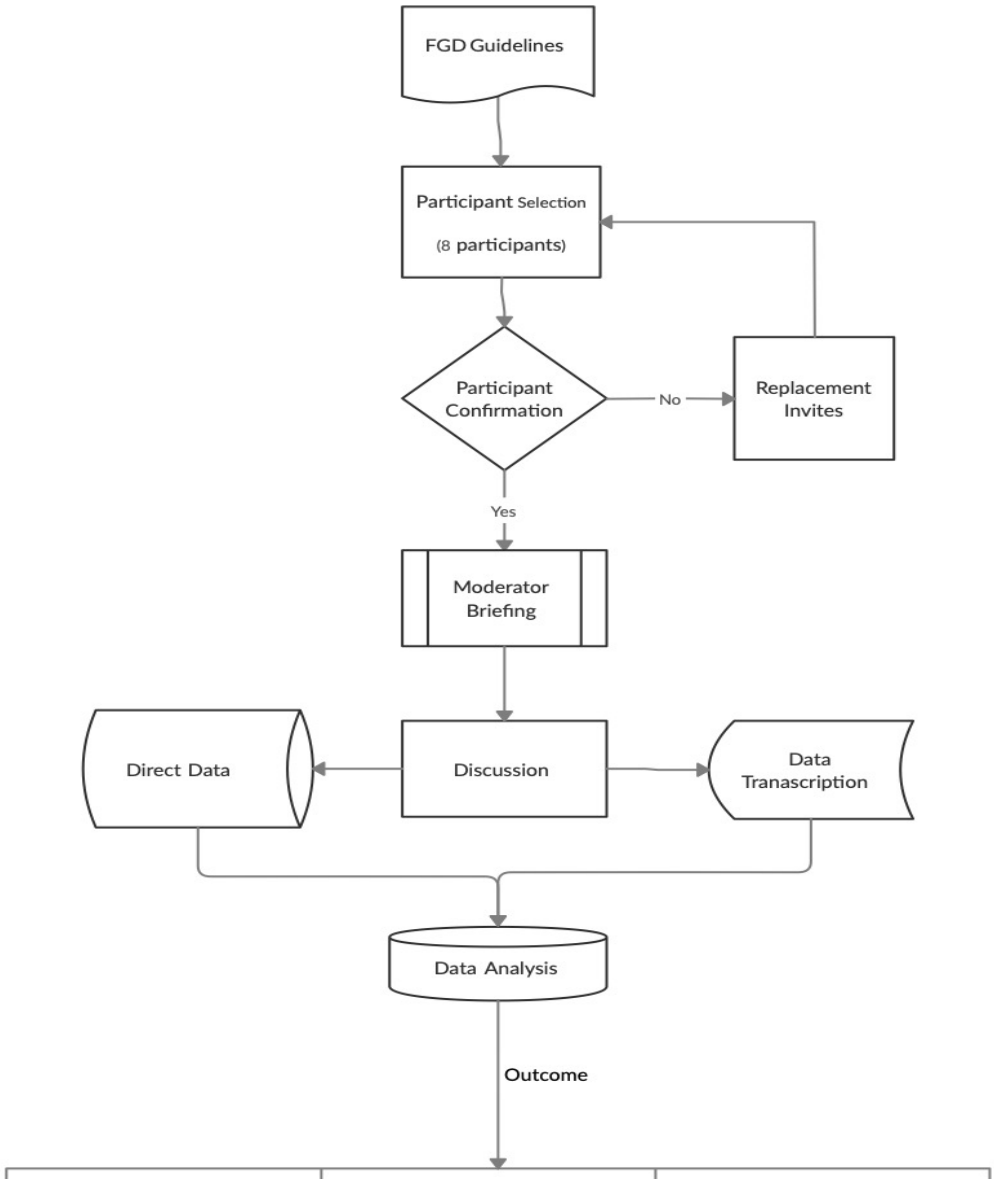

Fig. 5.1 Focus Group Discussion: Process flowchart and outcome.

The details of the participants of the focus group are presented in annexure A. The outcome of the focus group discussion at Cochin Port, is summarised below in Table 5.4

Table 5.4 Outcome of Focus Group Discussion on cluster development at Cochin Port

Theme	Focused Codes	Explanation
Existing Platforms	Labour Market	The labour market in port operations and allied operations are structured. However, further co-ordination is required for a cluster format.
	Repairs and Services	State of the art facilities for repairs and services are available in the region. Clustering will require further co-ordination
	Marketing	Collaborative and sector specific marketing activities by various trade association is already being carried out. Consolidated efforts in a cluster format is lacking.
Potential Platforms	Specialised Suppliers	Opportunities existing for collaborative procurement of resources in a clustered environment
	Training & Development	Establishing industry-academia collaborations will enhance the skill and competitiveness of stakeholders. Cluster organisation could be an appropriate vehicle for training & development.
	Communication	Stand-alone procedures and systems at various key establishments within the industry can be networked and consolidated so as to enhance productivity. A cluster organisation could set up a potential platform.

	Innovation & Incubation	With knowledge diffusion and common facility centers under cluster dynamics, innovation could be encouraged and would lead to enhanced competitiveness of the port. The cluster organisation can set stage for incubation and entrepreneurship.
Strategic Pathways	Collective Aspiration	Raising awareness and reinforcing cluster dynamics in all operations will enhance aspiration among the stakeholders
	Balance of Power	Establishing participatory systems for management of operations and governance of cluster programs.
	Virtual Cluster Organisation	Establishing virtual organisation for transparency and speed of engagement
	Integrated Cluster Policy	Developing policy framework to resolve inconsistency in provisions of different policies applicable to clusters.

5.6. CONCLUDING REMARKS

This chapter discussed the cross-case analysis of case studies on clusters at the Colombo Port and Port Klang. The similarities and differences among the two cases had been elaborated.

The comparison of the findings from the two cases were presented for the cluster constituent functioning, the cluster functionalities, the influence of the cluster functionalities on the determinants of the port performance and the influence of Government policies on the port cluster development. All the initial conceptual constructs related to these aspects from literature reviewed are present in the discussed case-studies on clusters at the Colombo Port and Port Klang.

Also the similarities in all the sub constructs identified in the review of literature was evidenced in both the case studies. Twenty two significant propositions were made from the inferences drawn from the cross case comparisons.

Also the details of the focus group discussion conducted with reference to development of cluster organisation at Cochin port had been discussed in the capter.

Next chapter discusses the findings and conclusions of this research study.

CHAPTER 6.

CONCLUSIONS

6.1. INTRODUCTION

The findings and conclusions of this research study are summarised in this chapter. The theoretical and practical contributions of this research are discussed in detail in this chapter. Also, the theoretical framework adopted for the study is reviewed, covering all initial conceptual constructs (Section 6.4). A focus group discussion based on the findings in order to adapt for the benefit of the Cochin port had been conducted and the implications thus identified are also discussed in this chapter, in detail. A discussion on the limitations of this study and the scope for future research concludes this chapter (Section 6.7).

6.2. SUMMARY OF MAIN FINDINGS

The three objectives of this research are discussed in Chapter 3. The major findings regarding the achievement of these objectives are summarised in this section.

1) To analyse how the port cluster constituents function.

This objective is addressed by reviewing the existing literature on port clusters and propositioning the elaboration for the port cluster concept. Considering the dynamic performance and composition of port clusters, it is interesting to carry out comparative studies on port cluster functioning. This was not found in the existing literature. This dynamic research topic enhances the understanding of port cluster characteristics and fits functioning at the different stages of development and the impact of the functionalities on the performance of the port. In particular, it addresses the functionalities of the cluster and interplay among the cluster

constituents from a new perspective which has not been addressed in the literature. The conceptual constructs drawn from the literature review had been validated by the data collected in the cases studies at Colombo Port and Port Klang. In each case, this chapter studies the functioning of the port and other maritime sectors within a cluster.

2) To analyse how the port cluster constituents' functioning influence the determinants of port performance.

The second objective has been achieved in Chapter 4. It shows a cluster's contribution to port performance and reflects the relationship between the cluster functionalities and determinants of port performance from the perspective of dynamic port functions. The responses drawn through interviews at the two ports are discussed in this chapter. Interviews were conducted to gain interviewees' opinions on the areas under study, based on the guiding questions detailed in the case study protocol developed. Based on the analysis of the results from the interviews, Port Colombo and Port Klang are found to gain competitive advantages due to functioning of clusters, in most of the sectors investigated. The propositions developed based on the inferences drawn from the data collected in the study had been discussed in chapter 5.

3) To explore how the Government policies influence the port cluster development.

The support and coordination by policy measures and seaport cluster development had been analysed in Chapter 4. The propositions derived, which is based on the empirical results in Chapter 4 and 5, suggests both ports and maritime services be guided by the proper governmental planning and policies and therefore achieve mutual growth and complementary development. This research provides new perspectives on the interplay between policy perspectives and seaport cluster development. With the empirical investigation taken in Chapters 4 and 5, a development path with clear goals and strategy settings can be charted. This also presents a reference for researchers and policymakers when they manage to integrate seaport clusters and regions into higher-value-generating economies.

6. 3. RESPONSE TOWARDS RESEARCH PROBLEM

Research Problem:

Although the existing literature talks about the port cluster and port performance, the constituent firms' functioning within the cluster, which result in the port performance is not known. Also, the influences of the Government policies on the development of port clusters is not known.

Response:

This research endows with vivid description to the cluster theory and cluster functionalities at a port level in an intensive industry like maritime industry. Key functionalities in a port cluster are discussed in details emphasising the features of inter-organisation linkages existing in such clusters, reasons thereof, how the constituent firms in a port cluster are benefited by the process, at the organisational level. The interlinkages between the member firms in a cluster, how the functionalities of cluster add value to the port influence the performance determinants of the port are discussed. Further, the study provides detailed discussions on the measures in Government policies developing clusters in the seaport.

6.4. REVISITING THEORETICAL FRAMEWORK

The theoretical framework for constituent functioning in clusters, cluster functionalities, influence of cluster functionalities on the determinants of port performance and the influence of government and policies on cluster development were discussed in Chapter 2 . Initial conceptual constructs and related sub-constructs were also developed. In addition, the constructs and sub-constructs identified in the literature and emerged from the study were validated by the various secondary data sources. These are presented in Table 4.6 and Table 4.12, in Chapter 4. The table 6.1, presents the conceptual framework by comprehending the findings of the research.

Table 6.1. Review of the categories and sub categories from the study w.r.t. the theoretical framework.

R O	Initial conceptual construct identified in LR	Sub-constructs identified in LR	Categories emerged out from this study	Sub-categories emerged out from this study
Constituent Functioning w.r.t. Cluster functionalities	Labour Market Pooling	Labour Engagement	Labour Market Pooling	***Labour Compositional Effect***
		Occupational Agglomeration		Labour Mobility
	Knowledge Spillover	Technological Spillover	***Learning Intensity***	Skill Upgradation
		Intellectual Spillover		Tacit Knowledge
	Entrepreneurship	Innovation Diffusion	Relational capital	Innovation Diffusion
	Supplier Specialisation	Value Chain Partnership	***Collaborative Procurement***	Institutional Linkage
	Lock-in	Inter-Firm Relationship	Neighbourhood Effects	Complementary Firms
		Path Dependence		Strategic Coherence
	Innovation	Technological Innovation	Collaborative Innovation	Technological Innovation
		Business Process Innovation		Business Process Innovation
	Business Development	Trade Promotion	Co-operative Strategies	Trade Promotion
		Value Chain Management		Value Chain Management
	Training & Education	Competency Building	Skill Upgradation	Competency Building

R O	Initial conceptual construct identified in LR.	Sub-constructs identified in LR	Categories emerged out from this study.	Sub-categories emerged out from this study.
Influence of Cluster Functionalities on port performance determinants	The efficiency of Terminal Services	Service Improvement	The efficiency of Terminal Services	Speed of Services
	Cost-Effectiveness	Scale Parameters	Cost-Effectiveness	Collaborative Procurement
	Efficiency of Processes	Service Capability	Best Practices	Process Improvement
	Hinterland Access	Transportation & Warehousing	Hinterland Access	Connectivity
R O	**Initial conceptual construct identified in LR.**	**Sub-constructs identified in LR**	**Categories emerged out from this study.**	**Sub-categories emerged out from this study.**
Influence of Govt, Policy on Port Cluster Development.	Support Measures	Incentive Schemes	Support Measures	Incentive Schemes
		Infrastructure Development		Infrastructure Development
	Govt.'s Direct Role	Regulatory Framework	Govt.'s Direct Role	Regulatory Framework
	Transparency	Planning Stability	Transparency	Planning Stability
	Constituent Management	Facilitation Measures	Constituent Management	Governance
	Engagement Process	Factors of Production	Rules of Engagement	Constituent Engagement

Further, Based on the propositions derived from the study, a frame work on the Influence of Cluster Functionalities on port performance determinants and on the influence of government and policy on port cluster development, are proposed in this research study. These frameworks are shown in Fig.6.1 and Fig. 6.2 respectively.

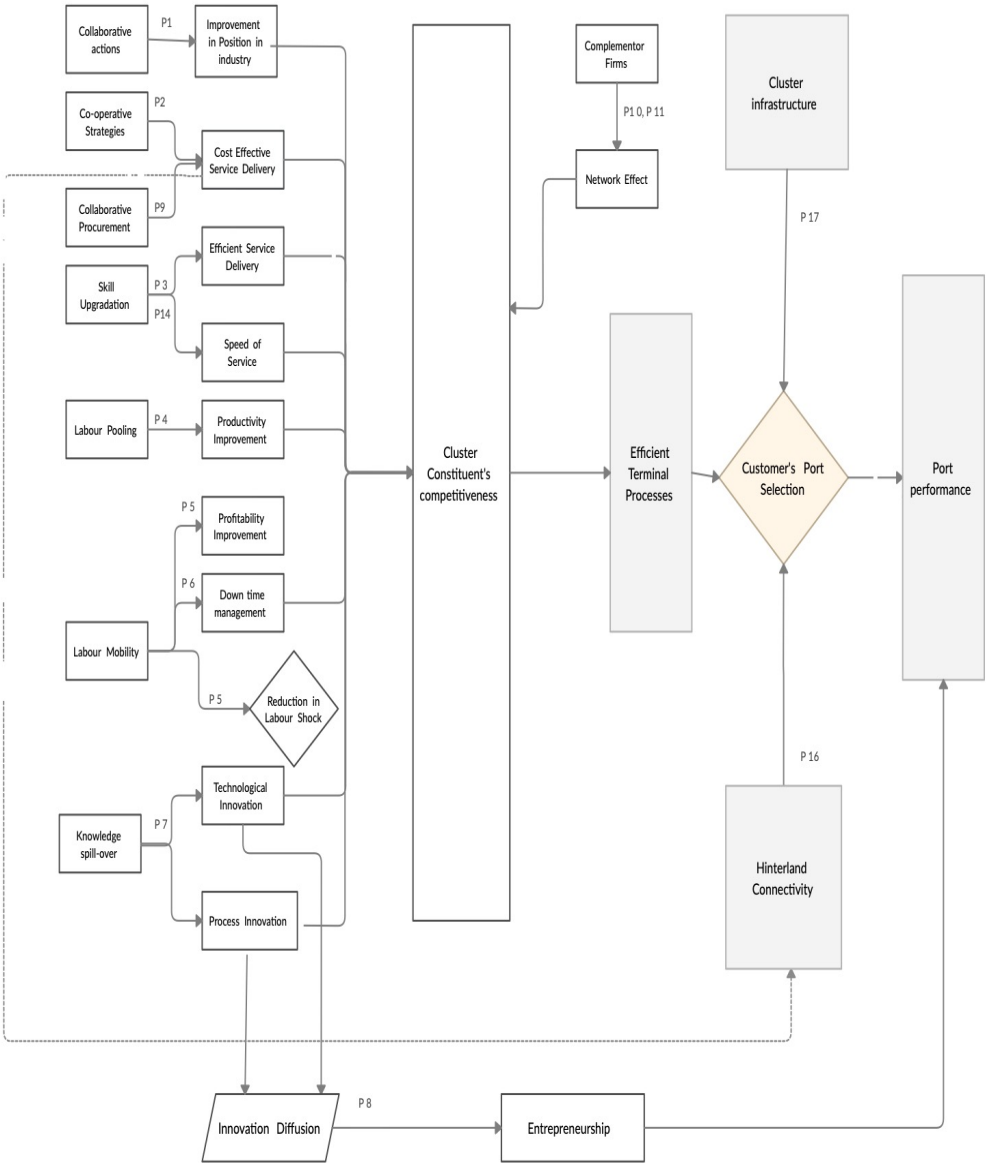

Fig. 6.1. Framework on the Influence of Cluster Functionalities on port performance determinants

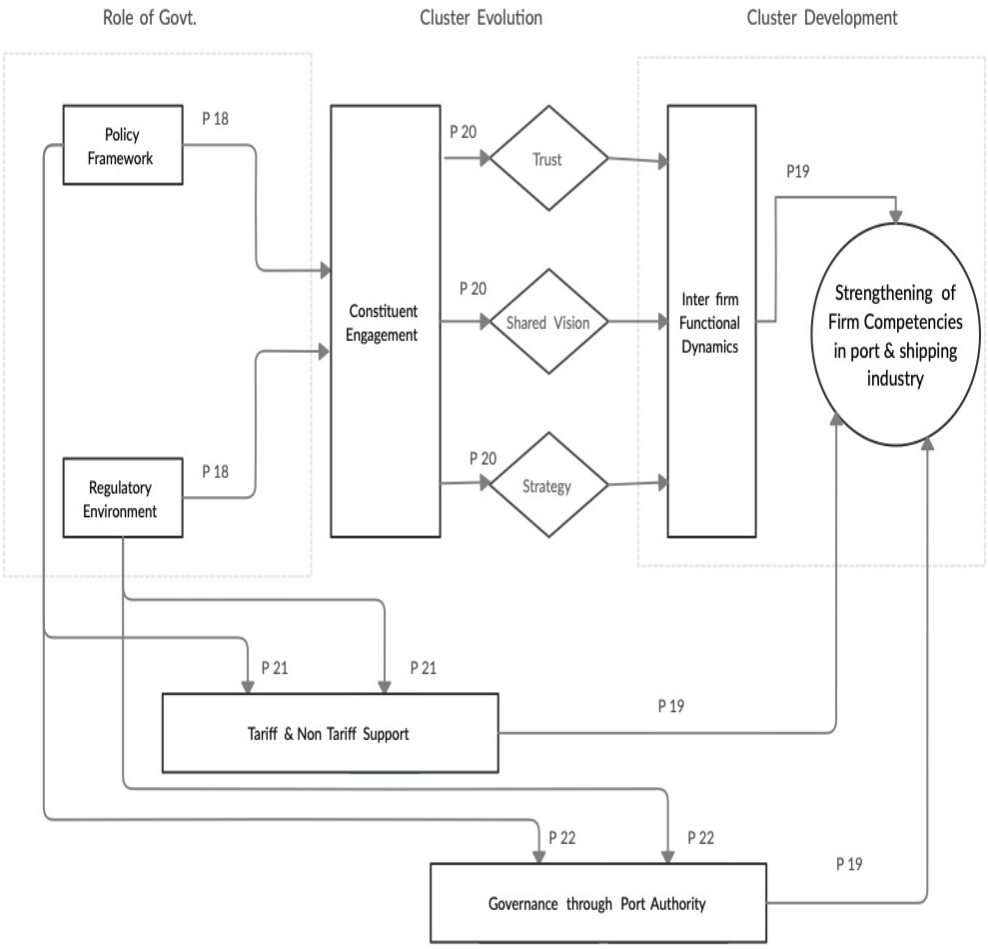

Fig. 6.2. Framework on the influence of government and policy on port cluster development.

6.5. PORT PERFORMANCE DURING THE PERIOD OF STUDY

Since the port performance is universally evaluated in terms of measures of the container throughput, the same had been reviewed with regard to the Colombo Port and Port Klang, for the period of the study. It had been observed that there is incremental improvement in performance at the two ports under study, where clustering is active, during the period of analysis . The same is illustrated in Table. 6.2 and Fig. 6.3

Table 6.2 Container throughput at Port Klang and Colombo Port, (2015-2019) (source: Annual Reports of Port Kalng Authority and Sri Lanka Port Authority)

F.Y	2015		2016		2017		2018		2019	
	Million TEU / annum	*YoY Change %*	*Million TEU / annum*	*YoY Change %*	*Million TEU / annum*	*YoY Change %*	*Million TEU / annum*	*YoY Change %*	*Million TEU / annum*	*YoY Change %*
Port Klang	11.89	*8.58*	13.16	*10.68*	11.98	*-0.09*	12.32	*2.84*	13.58	*10.22*
Colombo Port	5.19	*5.7*	5.73	*10.4*	6.21	*8.38*	7.01	*12.88*	7.2	*2.71*

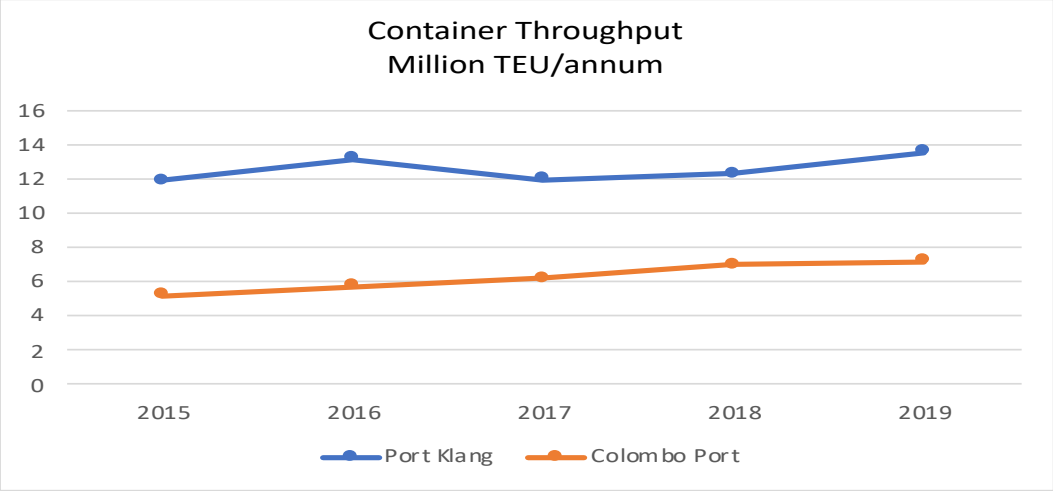

Fig. 6.3 Container throughput at Port Klang and Colombo Port (2015-2019).

6.6. THEORETICAL CONTRIBUTION.

This research study shows the functionalities of port cluster constituent. This study was based on four major themes, i.e., cluster constituent functionalities, inter-linkages of firms within the cluster, the influence of cluster functionalities on port performance and Governments policy supports in port cluster development. Propositions have been developed based on cross case Analysis in the study.

Every port (and terminal) has unique geographic, economic, regulatory and operational characteristics. The Efficiency of services, Logistical integration, Infrastructure and growth management and Terminal-city integration are the common challenges in all clusters. The study discusses the interlinkages of firms within the cluster, and it is observed that the strength of it increases with process complexity. "*Learning Intensity*", "*collaborative procurement*" and "*compositional effect*" are the new sub-constructs emerged from the study. This study identified the factors; trust, commitment, mutuality, dependency, relationship investment, shared values, communications, flexibility and response, and co-operation as the major the dimensions for the interfirm relationship in a cluster. The study provides detailed discussions on the measures in Government policies developing clusters in the seaport. This research endows with vivid description to the cluster theory and cluster functionalities at a port level in an intensive industry like maritime industry.

6.7. PRACTICAL CONTRIBUTION

As discussed in section 6.2 above, the research objectives set for this research have been achieved. This study's contributions are multi-faceted and summarised as below.

The contributions thorough literature review to demonstrate the concept of the maritime cluster from three aspects: conceptualisation, innovation and policies. Therein, the conceptualisation of the maritime cluster is explored through definition, formation and linkages within a maritime cluster with special consideration of port functions. The interviews conducted to draw conclusions from professional feedback regarding cluster constituent's functioning, functionalities of the clusters, and policy measures that contribute to seaport cluster development. Also observed the cluster constituents' contribution to port performance by evaluating the functioning of the maritime clusters in the two cases, the Colombo Port and Port Klang. It also paves the way to carry out further studies on the interplay between seaport clusters and port performance. This study provides a setting for policymakers to be aware and map the interaction status of maritime

sectors concerning the development of port clusters. As such, this research presents a useful reference on the formation and functioning of seaport clusters in future for the maritime industry and port regions and for existing minor clusters becoming stronger major world maritime clusters. It contributes to practical and policy suggestions on the development interplay between governmental agencies and maritime cluster.

6.7.1. Implications for Cluster Firms

Practitioners, professionals and experts in the industry and related academia appreciated the scope of this research work. The conducted research study could provide guidelines for the cluster organisations, especially in the port and shipping industry, to optimise the cluster activities. This study would assist the practitioners to set benchmarks for the cluster engagement and to utilise the cluster mechanism to optimise benefits for the firm. They can develop effective and efficient collaborative and integration strategies with other players in the cluster. In addition,, this study helps in understanding the features of the Government's involvement and policy measure for cluster development and can be used to establish necessary policy measures in new clusters in other seaports.

6.7.2. Implications for Cochin Port

The conducted study could provide guidelines for formalising a port cluster and sub-clusters in Cochin port to optimise the cluster activities by helping the managers to set benchmarks for the cluster engagement and to utilise the cluster mechanism to optimise benefits for the firm. They can develop effective and efficient collaborative and integration strategies with other players in the cluster.

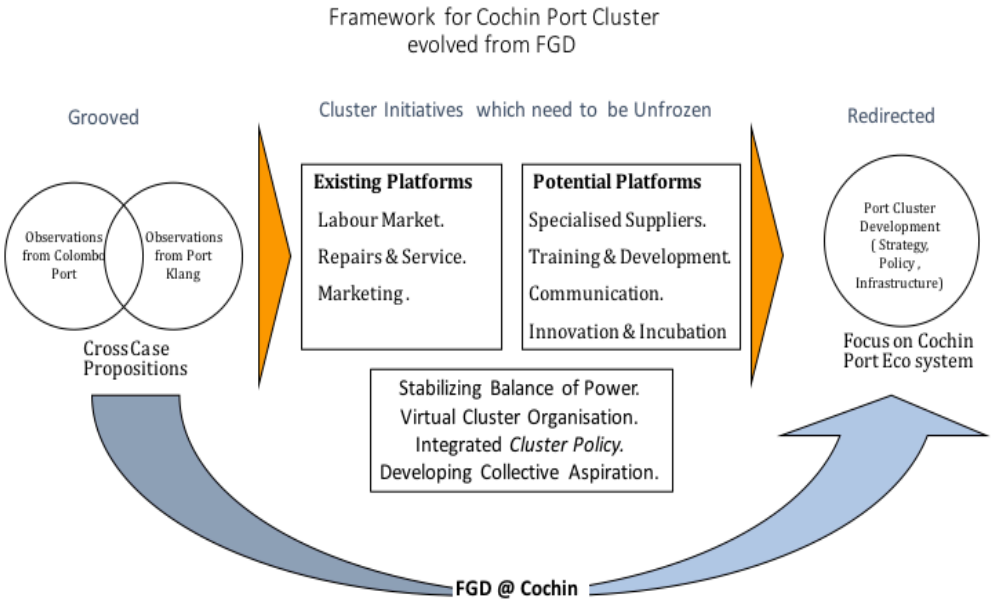

Figure 6.4. Framework for development of Cochin Port Cluster

From the evidences derived from the interviews at Colombo Port and Port Klang and from the focus group discussion of the professionals associated with the port industry at Cochin port, the following strategic options are being suggested to be adopted with respect to developing an initial framework for a cluster development at Cochin Port.

- Establish a formal structure which provides support to augment cluster dynamics.
- Define milestones and establish planning stability.
- Since there is no standalone cluster policy, develop a policy framework resolve inconsistency in provisions of different policies applicable to clusters.
- Outline the specific functions and tasks of various groups of constituents.

- Raise awareness and reinforcing cluster dynamics in all stakeholders by initiatives like establishing leadership groups, open calls for proposal, cluster institutionalisation
- Establish systems for management of operations and governance of cluster programs.
- Institute a scheme and criterion for funding to cluster initiatives.
- Promote the development of stakeholder collaborations based on their specialisations.
- Facilitate public-funded and collaborative strategic research and development projects.
- Establish an inclusive environment promoting innovation by the stakeholders of the cluster.

6.8. LIMITATIONS OF STUDY and SCOPE FOR FURTHER RESEARCH

As with all research, this study also had its limitations. The conclusions arrived in this study are on the basis of a detailed analysis of the cluster dynamics in the seaports of Colombo and Port Klang. The conclusions are arrived at using an interpretive approach of a qualitative study, as a research methodology in this research. Usually, this approach is contemplated as subjective and have a limited degree of generalisability (Klein and Myers, 1999). The dynamics of cluster constituents functioning, cluster functionalities and its influence on the port determinants of port performance analysed in this study to a great extent are dependent on the perception of respondents, which could be very much subjective. To minimise the subjectivity of responses, data were also collected from documents and records from both internal as well as external sources, and direct observations by the investigator in the case studies, as suggested by Yin (2009) and Eisenhardt (1989). These are regarded as sources of more objective data.

A maritime cluster comprises an array of linked maritime sectors. It is possible that the development and functioning of seaport clusters might be influenced by these

sectors as well. However, this research is focusing on the interplay between the cluster constituents, its functionalities and the determinants of port performance. The interplays between other influential sectors, its functionalities and the cluster, are not the main consideration of this research, although they might have some impact on cluster development. However, the research objectives regarding the constituent functioning of the port cluster and its influence on the determinants of port performance from the port's perspective have been met, mainly because the findings in the study are on the grounds of sound conceptual framework that had been developed after an elaborate review of literature followed by the semi-structured interview and field study involving professionals, practitioners and experts who have deep knowledge on the subject matter, associated with an extensive range of organisations in the sector, at different levels and periods. The findings of this research offer a detailed awareness into the dynamics of cluster constituents functioning, cluster functionalities and its influence on the determinants of port performance and the influence of Government policies on cluster development. Further research projects can design and conduct studies within the maritime industry to elaborate the propositions developed in this research and to evaluate the strength of influence of the cluster functionalities on the performance of the seaports and on reciprocal influences between port clusters and other maritime sectors.

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Appendix A : List of Interview /FGD Participants

Sl. No.	Respondent Code	Designation	Industry	Location
1	P 01	Former CEO & Advisor	Port Authority	Port Klang
2	P 02	Chief of Operations	Terminal Operator	Port Klang
3	P 03	Professor	Maritime Academy	Kuala Lumpur
4	P 04	Principal Consultant	Maritime Consultancy	Port Klang
5	P 05	Consultant	Maritime Services	Port Klang
6	P 06	General Manager	Logistics Co	Port Klang
7	P 07	Sec. General	Maritime Association	Port Klang
8	P 08	Gen. Secretary	Freight Forwarder Assn.	Kuala Lumpur
9	P 09	Mg. Director	Freight forwarding	Port Klang
10	P 10	Operations Manager	Terminal Operator	Port Klang
11	P 11	Chief Operating Officer	Shipping Co	Port Klang
12	P 12	Mg. Director	Transport Services	Port Klang
13	C 01	Director Logistics	Port Authority	Colombo
14	C 02	Chairman	Shipping Agents Assn	Colombo
15	C 03	Former Mg Dir	Port Authority	Colombo
16	C 04	Mg. Director	Terminal Operator	Colombo
17	C 05	Planning Engr	Port Authority	Colombo
18	C 06	CEO	Intl. Trading	Colombo
19	C 07	Sec. General	Exporters Assn	Colombo
20	C 08	Mg Director	Shipping Co	Colombo
21	C 09	Secretary	Labour Union	Colombo
22	C 10	Gen Secretary	Transporters Assn.	Colombo
23	C 11	Dean	Maritime Academy	Colombo
24	C 12	Mg. Director	Clearing & Forwarding	Colombo
25	K01	Director	Terminal Operator	Cochin
26	K02	Former President	Chamber Of Commerce	Cochin
27	K03	Director	Shipping	Cochin
28	K04	Professor	Maritime Academy	Cochin
29	K05	Sr. Vice President	CHA Assn.	Cochin
30	K06	Mg. Director	Freight forwarding	Cochin
31	K07	President	Steamer Agents Assn.	Cochin
32	K08	Secretary	Labour Union	Cochin

Appendix B : Profile of the Scholar

Baiju R

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Email: baijurnair@gmail.com

Mr. Baiju R, is a Group Director of the SCMS Group of Educational Institutions, Kochi, Kerala and an adjunct faculty of Strategic Management and International Business at SCMS Cochin School of Business. He has his B.Tech in Mechanical Engineering from University of Calicut, MBA from MS University, PG Diploma in Innovation and Design Thinking from Emeritus Institute of Management (a consortium of MIT, Columbia Business School and Tuck Business School), PG certifications in international business from IIM- Calcutta, in Strategic Planning from Edinburgh Business School, UK, in Management Consultancy from CDC, New Delhi, and in Disruptive Strategy from Harvard Business School Online. He has over 30 years of corporate experience in varied domains, including international business development, strategic planning and corporate consultancy. Started professional career in tyre industry in 1990, and he has held senior management/ CXO positions in corporate houses in India and abroad during 30 years of his career in international business, strategic planning and global logistics. He is a member of Institution of Engineers (India) and Academy of International Business (USA) and an affiliate professional member of Chartered Institute of Marketing (UK). A passionate teacher in strategic management, he is a visiting faculty at few business schools in India, Bangladesh and Malaysia.

The research publications of Mr. Baiju are as under:

- Baiju, R., Raju, Totakura B., Dhingra, Tarun.(2019). "Identification of factors affecting Port cluster performance". *International Journal of E-Navigation and Maritime Economy,* 13, 30-42.

- Baiju, R., Raju, Totakura B., Dhingra, Tarun. (2020). "Cluster Policy: Perspectives on Practices in the Maritime Sector". I*nternational Journal of E-Navigation and Maritime Economy,* 14, 46-54

Both the above papers were published in UGC listed (CARE II: Web of Science Core Collection ; Elsevier Journal)

PLAGIARISM CERTIFICATE

1. We, **Dr. T Bangar Raju** (Internal Guide), **Dr. Tarun Dhingra**, (Co Guide) certify that the Thesis titled, **"Port Cluster Constituents' Functioning and its Relationship with Port Performance : A Case Study Approach"**, submitted by Scholar **Mr. Baiju R**, having SAP **ID 500042919**, has been run through a Plagiarism Check Software and the Plagiarism Percentage is reported to be **6** %.
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_____

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