Global Seaport Competitiveness:
A Resource Management Perspective

A thesis submitted in fulfilment of the requirements for the degree of

Doctor of Philosophy

Shiva Madani

Master of Supply Chain and Logistics Management
Bachelor of Accounting

School of Business IT and Logistics
College of Business
RMIT University

January 2018
Declaration

I certify that except where due acknowledgement has been made, the work is that of the author alone; the work has not been submitted previously, in whole or in part, to qualify for any other academic award; the content of the thesis is the result of work which has been carried out since the official commencement date of the approved research program; any editorial work, paid or unpaid, carried out by a third party is acknowledged; and, ethics procedures and guidelines have been followed.

I acknowledge the support I have received for my research through the provision of an Australian Government Research Training Program Scholarship.

Shiva Madani

January 2018
I have been blessed with the opportunity to step in a journey of a thousand miles. This extraordinary experience would have not been possible without the words of encouragement, never-ending love, and support that I constantly received from my family. I hope they are proud.

Great appreciation and enormous thanks to my parents, Shirin and Taghi, for believing in me and instilling into me the values of education and hard work. It is my greatest sorrow that my father is no longer with me to salute my journey’s end. Though I miss him everyday, I am eternally grateful for his love, care, and guidance.

Heartfelt thanks to my husband, Wael, for being the most supportive companion and an enthusiastic travelling partner who accompanied me to various corners of the world to conduct this research. To my brother, Shaahin, for being my closest confidant and friend, whose constant and endless care and support enabled me to believe in accomplishing goals that, at times, I doubted to be achievable. Lastly, to my late grandparents, Mamajaan and Babajoon, whom I miss dearly, for their delightful memories and words of wisdom that uplifted me whenever I felt discouraged.

I would like to express my sincere gratitude and appreciation to my senior supervisor Professor Booi Kam for his continued support and guidance. His immense knowledge, passion and vision guided this research, which I am forever grateful for. Without his invaluable comments and constructive criticism, this research would have never been developed and finalized. I shall treasure all the inspiring discussions with Booi, who has been a wonderful mentor and guide throughout my journey of PhD.

I am also grateful to my second supervisor Professor Caroline Chan who continually encouraged me. I would like to convey my sincere appreciation to Dr Konrad Peszynski for his guidance and support during the course of my PhD. Special thanks to the academic and administrative staff of the School of Business IT & Logistics (BITL) for their advice and encouragement.

I would also like to thank the port informants that participated in my research for sharing their knowledge and experience. Their contributions were essential for this thesis. I hope that they will find the outcomes of this research valuable and its implications helpful for their endeavors.

I am also thankful for my friends whose company I greatly value: My dearest Mina Hedayati, Maria Alejandra Bermudez, Hoda Tarhini, Dr Elsie Hooi, Sridaran Madhavan Nair, Dr Solmaz Moghimi, Beheshteh Abroun, Dr Azadeh Ghari Neiat, Dr Nooshin Torabi, and Dr Pegah Karian. They have been the source of positive energy, affection and kindness during the course of my study.

At last, and not definitely the least, I wish to also thank Reza Panahi, for his mentorship and inspirational lessons on seaports in the earliest years of my professional life that motivated me to embark on this journey.
Dedicated to the memory of my beloved father, who was a shining example of a warm-hearted and open-minded intellect.

Daddy Joon, you are my guiding light.

This is for you.
Parts of the work presented in this thesis have been published in the following forums:

Conference Publications


Conferences


Seaport investment is lumpy, entails a long gestation period and has been referred to as a sunk cost. While seaport infrastructures have long been recognized to be a contributor of seaport performance, research on seaport competitiveness, a popular theme among mainstream maritime studies, has not directed sufficient efforts to understand the role of resource management in building seaport competitiveness. Instead, the dominant focus has been on seaport location, productivity and efficiency, price, connectivity, and organization. The manner in which global seaports manage their capital-intensive resources to develop contingent dynamic capacities and capabilities to confront the changing dynamics in the maritime market has not been systematically examined.

Using a qualitative multiple case study approach, this study traces the developmental paths of three geo-politically distinctive global seaports - Dubai, Kaohsiung, and Rotterdam - to examine how they achieved competitive advantages since the advent of containerization. Drawing on the tenets of resource-based view, organization learning, dynamic capability and contingency theories, this research reviewed and interpreted the planned actions of the three seaports from the perspective of resource structuring, bundling and leveraging to develop constructs of strategic resource management.

From the strategic actions taken by the three case seaports, the study identifies eight resource management constructs couched within four basic capability building blocks that were instrumental in helping them to achieve, and maintain, their global competitiveness: a capital-intensive regime of developing logistics support infrastructure, a parallel program of utilizing resources in a complementary manner, a dynamically agile capability of coupling, decoupling, and recoupling to renew resource utilization efficiency in response to external changes (regional market dynamics, industry trends), and a capability of re-orienting the use of tangible assets as an exit strategy to develop intangible resources to adapt to unfolding events. The judicious blend of the eight resource management constructs underpins the developmental paths of the three case seaports as they navigated the environmental contingencies posed by the dynamics of the regional competition they faced against the backdrop of the size of their hinterland and foreland.

Offering a fresh perspective on understanding how global seaports compete by developing contingent dynamic capabilities, this study presents six working propositions, opening an avenue for building a theory of global seaport competitiveness based on seaport resource management.
## Contents

ABSTRACT ......................................................................................................................... VI

CHAPTER 1 ............................................................................................................................ 1

1.1 MOTIVATION OF STUDY ............................................................................................... 1

1.2 RESEARCH FOCUS .......................................................................................................... 4

1.3 RESEARCH SIGNIFICANCE AND CONTRIBUTION ...................................................... 6

1.4 THESIS ORGANIZATION ............................................................................................... 7

CHAPTER 2 ............................................................................................................................ 9

2.1 GLOBAL SEAPORTS EVOLVEMENT ........................................................................ 10

   2.1.1 Changing Environment in Seaports and Products ............................................... 10

   2.1.2 Global Seaports: Path of Evolution ........................................................................ 14

2.2 GLOBAL SEAPORTS COMPETITIVENESS .................................................................. 18

   2.2.1 Overview .................................................................................................................. 18

   2.2.2 Factors Affecting Seaport Competitiveness ......................................................... 20

   Seaport Location ............................................................................................................... 21

   Seaport Productivity and Efficiency ............................................................................... 22

   Resources and Infrastructural Facilities ...................................................................... 23

   Pricing of Seaport Services ........................................................................................... 23

   Seaport Connectivity ...................................................................................................... 24

   Organization of Seaports ................................................................................................. 24

2.3. THEMES IN SEAPORT RESEARCH .......................................................................... 27

   2.3.1 Overview .................................................................................................................. 27

VII
2.3.2 Research into Seaport Competition ................................................................. 35

Research Stream 1: Performance of Seaports and Terminals ........................................ 35
Research Stream 2: Embeddedness of Seaports in Supply Chains .................................. 36
Research Stream 3: Seaport Policies ............................................................................ 36
Research Stream 4: Cooperation between Seaports ...................................................... 37
Research Stream 5: Seaport Selection ......................................................................... 37

2.4 Seaport Competitiveness: A Resource-Based Perspective ........................................ 39

2.4.1 Resources, Capabilities, Environmental Contingencies and Firm Performance ... 39

2.4.2 Resource-Based Studies of Seaport Competitiveness .......................................... 47

CHAPTER 3 ...................................................................................................................... 49

3.1 Research Design ..................................................................................................... 49

3.1.1 Case Study .......................................................................................................... 50
3.1.2 Multiple Case Study ............................................................................................. 53
3.1.3 Case Selection ....................................................................................................... 54

3.2 Data Collection ........................................................................................................ 58

3.2.1 Interviews ............................................................................................................ 58
3.2.2 Secondary Data .................................................................................................... 61

3.3 Data Analysis ........................................................................................................... 63

3.3.1 Within Case Analysis ......................................................................................... 63
3.3.2 Cross Case Analysis ............................................................................................ 65

3.4 Reliability and Validity of Case Study Research ..................................................... 68

3.4.1 Credibility ........................................................................................................... 69
3.4.2 Transferability ..................................................................................................... 69

VIII
CHAPTER 4

4.1 PORT OF DUBAI

4.1.1 Global and Regional Competitiveness

4.1.2 Dubai Port Authority

4.1.3 Port Planning and Provision

4.1.3.1 1960s, 1970s, and 1980’s: Developing to an Entrepôt-Port

4.1.3.2 1990s: Transition to a Regional Transshipment Hub-Port

4.1.3.3 2000s: Towards a Regional Logistics Hub-Port

4.1.4 Expansion in International Level

4.1.5 Strategic Developmental Path

4.2 PORT OF KAOSHIUNG

4.2.1 Global and Regional Competitiveness

4.2.2 Port of Kaohsiung Authority

4.2.3 Port Planning and Provision

4.2.3.1 1960s, 1970s, and 1980s: Decades of Rapid Growth

4.2.3.2 Late 1980s, and 1990s: Period of Transformation in Industrial Structure

4.2.3.3 Throughout the 2000s: Era of Global Deployment

4.2.4 Cross-Strait Economic Relations

4.2.5 Strategic Developmental Path

4.3 PORT OF ROTTERDAM

4.3.1 Global and Regional Competitiveness
4.3.2 Port of Rotterdam Authority ................................................................. 140

4.3.3 Port Planning and Provisions ................................................................. 142

  4.3.3.1 Port Plan 2010: Rotterdam a Location for European Distribution Center ........................................ 145
  4.3.3.2 Port Plan 2020: Formation of Industrial Clusters .......................................................... 151
  4.3.3.3 Port Plan 2030: Establishment of Industrial Ecosystems ................................................. 157

4.3.4 Expansion in International Level ......................................................... 162

4.3.5 Strategic Developmental Path .............................................................. 163

4.4 CHAPTER SUMMARY ........................................................................... 168

CHAPTER 5 ................................................................................................. 169

5.1 STRATEGIC DEVELOPMENT FACTORS IN SEAPORTS .................. 170

  5.1.1 1960s – 1980s .............................................................................. 170
  5.1.2 1990s .......................................................................................... 174
  5.1.3 2000s .......................................................................................... 177
  5.1.4 2010s – The Current Decade ....................................................... 181

5.2 RESOURCE MANAGEMENT CONSTRUCTS .................................... 185

  5.2.1 Resource Agglomeration ................................................................. 185
  5.2.2 Resource Agility ........................................................................... 186
  5.2.3 Resource Supplementarity ............................................................. 187
  5.2.4 Resource Differentiation ................................................................. 187
  5.2.5 Resource Fortification ................................................................... 188
  5.2.6 Resource Adaptation ..................................................................... 188
  5.2.7 Resource Connectivity ................................................................. 190
  5.2.8 Resource Alignment ..................................................................... 191
5.3 STRATEGIC DEVELOPMENT PATHS: A RESOURCE-BASED PERSPECTIVE .......................... 198

5.3.1 Dubai .................................................................................................................. 198

5.3.2 Kaohsiung .......................................................................................................... 203

5.3.3 Rotterdam .......................................................................................................... 207

5.4 GENERATING COMPETITIVE ADVANTAGES THROUGH RESOURCE DEVELOPMENT STRATEGIES: AN INTERPRETIVE DISCUSSION ......................................................................................................................................................... 212

CHAPTER 6 ................................................................................................................ 219

6.1 MAJOR CONTRIBUTIONS ..................................................................................... 220

6.2 IMPLICATIONS ...................................................................................................... 224

6.2.1 Implications for Theory .................................................................................... 224

6.2.2 Implications for Practice .................................................................................. 225

6.3 LIMITATIONS AND DIRECTIONS FOR FUTURE STUDIES ................................... 228

APPENDIX 1 ............................................................................................................... 230

APPENDIX 2 ............................................................................................................... 231

APPENDIX 3 ............................................................................................................... 232

APPENDIX 4 ............................................................................................................... 233

REFERENCES ............................................................................................................. 234
List of Figures

Figure 2.1: Number of Ports And Container Throughput (1970-2010)........................................15
Figure 2.2: Evolution Model of a Container Port System .........................................................16
Figure 3.1: Research Plan ..............................................................................................................54
Figure 3.2: Steps Involved in Cross-Case Analysis.......................................................................66
Figure 3.3: Comparison Framework of Resource Development Strategies .................................68
Figure 4.1.1: The Middle East Region Map ..................................................................................73
Figure 4.1.2: Overall Map of Dubai Ports .....................................................................................74
Figure 4.1.3: Aerial Image of Jebel Ali Port, and Location of Container Terminals .......................75
Figure 4.1.4: Dubai Logistics Corridor ..........................................................................................77
Figure 4.1.5: Dubai Ports Container Throughput, and Global Ranking (1990–2015) ...............78
Figure 4.1.6: Middle East Regional Seaports Map ......................................................................79
Figure 4.1.7: Dubai World Group Organizational Diagram (Supply Chain Relevant) ...............83
Figure 4.1.8: Development Path of PoD .......................................................................................85
Figure 4.1.9: Jebel Ali Port In 1977, 1979, 1984, 1988, And 2008 .................................................86
Figure 4.1.10: Jafza Companies And Pod Throughput .................................................................90
Figure 4.1.11: Dubai Logistics Corridor .......................................................................................96
Figure 4.1.12: Middle East Container Throughput (1990-2012) ................................................98
Figure 4.2.1: Overall Map of The Port of Kaohsiung, and Container Ports of Taiwan ..........102
Figure 4.2.2: Areas of The PoK .....................................................................................................103
Figure 4.2.3: PoK Throughput (TEU), and Global Ranking (1990–2015) ................................104
Figure 4.2.4: Change of Shipping Networks in Asia ..................................................................108
Figure 4.2.5: Development Path of PoK ......................................................................................113
Figure 4.2.6: PoK before and after Building the 2nd Harbor Entrance ............................................. 118
Figure 4.2.7: Shipping Routes of PoK Offshore Shipping Center ....................................................... 129
Figure 4.2.8: Taiwan’s Industrial Transformation .............................................................................. 131
Figure 4.3.1: Port of Rotterdam in Relation to the European Market Population ......................... 133
Figure 4.3.2: Historical Development of PoR .................................................................................. 134
Figure 4.3.3: PoR Container Throughput (TEU), and Global Ranking (1990–2015) ............... 136
Figure 4.3.4: North Europe Seaport Ranges ...................................................................................... 137
Figure 4.3.5: Hamburg-Le Havre Range Hinterland Distribution of Containerized Cargo .. 139
Figure 4.3.6: Development Path of PoR ............................................................................................ 144
Figure 4.3.7: Changing Distribution Patterns in Northern Europe .................................................. 146
Figure 4.3.8: PoR's Distriparks: Eemhaaven, Botlek, and Maasvlakte ............................................. 149
Figure 5.1: PoD Resource Based Strategies in Relation to the Major Regional Drivers...... 202
Figure 5.2: PoK Resource Based Strategies in Relation to the Major Regional Drivers...... 206
Figure 5.3: PoR Resource Based Strategies in Relation to the Major Regional Drivers...... 211
Figure 5.4: Comparison of Resource-Development Strategies of PoD, PoK and PoR ...... 213
List of Tables

Table 2.1: Factors Affecting Seaport Environment ................................................................. 11
Table 2.2: Evolution of Container Vessels ........................................................................... 12
Table 2.3: Long Waves of Containerization (1970-2010) .................................................. 14
Table 2.4: Characteristics of Seaport Products .................................................................... 19
Table 2.5: Key Determinants of Seaport Competitiveness .................................................. 26
Table 2.6: Contributions to Main Themes of Seaport Research ......................................... 28
Table 2.7: Seaport Competition and Competitiveness Research .......................................... 30
Table 3.1: Ranking of Selected Case Seaports ..................................................................... 57
Table 3.2: Informants Participating in Semi-Structured Interviews ..................................... 60
Table 3.3: Trustworthiness Criteria Used for this Study ....................................................... 71
Table 4.1.1: Spec of Container Terminals in Jebel Ali and Overall Utilization Rate .......... 76
Table 4.1.2: Global Firms Located in the Jafza - Fortune Global 500 .................................. 77
Table 4.1.3: Market Share of Main Seaports in the Middle East (1980-2010) ..................... 80
Table 4.1.4: Dubai Government Port and Free Zone IT Initiatives .................................... 93
Table 4.1.5: GCC Intra-Regional Trade (Million Dollars) .................................................... 95
Table 4.2.1: Spec of Container Terminals in PoK and Overall Utilization Rate ................. 104
Table 4.2.2: Market Share of Main Seaports in East Asia (1981-2010) ............................... 105
Table 4.2.3: Share of Intra-Asian Service in the Global Container Traffic (1990, 2012) .... 106
Table 4.2.4: Export Processing Zones in Kaohsiung, Established in 1960s and 1970s .......... 117
Table 4.2.5: Container Terminals constructed in PoK during 1960s, 1970s, and 1980s ...... 119
Table 4.2.6: National Implemented Policies related to Development of PoK in 2000s ....... 123
Table 4.2.7: Export Processing Zones in Kaohsiung area, established in 2000s ............... 126
Table 4.3.1: Economic Value of the PoR (2013) ................................................................... 135
Table 4.3.2: Leader Firms located in the PoR – Fortune Global 500 ............................................135
Table 4.3.3: Spec of Container Terminals in PoR and Overall Utilization Rate ......................137
Table 4.3.4: Big Five’s Share of Container Traffic in Hamburg – Le Havre Range ..........138
Table 4.3.5: MFG Plants and DCs of American and Japanese Companies in Europe ..........147
Table 4.3.6: Distriparks in the PoR .........................................................................................150
Table 4.3.7: Four Plausible Scenarios for Future Development of Rotterdam until 2040 ....153
Table 4.3.8: Trends Relevant to the Development of Port and Shipping Industry ............158
Table 4.3.9: International Ventures of the PoR .................................................................163
Table 4.3.10: PoR Local Participations .................................................................................166
Table 4.3.11: KPIs in the PoR ..............................................................................................167
Table 5.1: Strategic Developments between the 1960s to 1980s in PoD, PoK and PoR ......173
Table 5.2: Strategic Developments in the 1990s in PoD, PoK and PoR .............................176
Table 5.3: Strategic Developments in the 2000s in PoD, PoK and PoR ..............................180
Table 5.4: Strategic Development 2010s in PoD, PoK and PoR .................................184
Table 5.5: Competitive Resource Building Strategies of PoD, PoK, and PoR .................193
1.1 Motivation of Study

This study examines how global seaports structure, bundle, and leverage their physical resources and develop dynamic capabilities (also referred to as intangible resources) to cope with changes in the maritime industry to achieve sustainable competitive advantages. It is motivated by the lack of documented findings on the contributory role of seaport physical assets, infrastructures and superstructures in seaport performance (Da Cruz et al., 2013b), in particular how global seaports manage these physical resources to achieve and/or maintain their competitive strength.

Seaport investment has been characterised as lumpy (Donaghy, 2012) and indivisible (Ho and Ho, 2006). It also generates sizeable external costs, attributable to both the direct effects of the seaport infrastructure created as well as the indirect transport activities resulting from the operations of the seaport (Musso et al., 2006). Similar to other large-scale infrastructure developments, seaport projects also entail long gestation periods from planning to construction to operations (Rosenstein-Rodan, 1943, Nurkse, 1966, Ahmed and Donovan, 1992, Plympton and Brunker, 1992). This means that the payback period for seaport investment is exceedingly lengthy, which also implies that seaport development is a high-risk investment (Musso et al., 2006). Further, seaport developments are both location and operation specific. Once developed, seaport infrastructures and associated superstructures would be hard to be deployed for other uses within the same location or to be transported to other seaports for use. Seaport development costs, as such, have been referred to as “sunk” (Musso et al., 2006, Helm, 2009), which implies that seaport investments would be “lost whenever the investor decides to withdraw from the market”(Musso et al., 2006, p.175). Seaport developments, in short, are non-retractable investment decisions.
Wiegmans et al. (2002) viewed seaport investment as the creation of throughput capacity. They argued that seaport investments are largely related to capital goods, such as the construction of piers, wharfs, yards and breakwaters; the building of terminal superstructure, like cranes and means of transport; as well as assets used for storage or production of port services that expand throughput capacity (Wiegmans et al., 2002).

Itoh (2002) argued that port operations efficiency is contingent upon the design and maintenance of its physical infrastructures, ranging from berths to channels, cargo handling equipment to stacking areas and warehouses as well as accessibility to water-side and other land-side facilities. This argument is confirmed by Limao and Venables (2001), who found that seaport infrastructure quality strongly affects seaport efficiency and is also an important determinant of transport costs, with 40% of predicted transport costs attributable to poor infrastructure (Limao and Venables, 2001).

From the investment perspective, developments involving sunk costs would, expectedly, invite utility maximization, not to mention that global seaports have been relentlessly pressured to upscale their infrastructures by continual increase in vessel sizes (Da Cruz et al., 2013b) and reconfigure their spatial and functional logistical linkages with the persistent surge in inter-modality (Notteboom and Rodrigue, 2005). Given that cargo-handling is a seaport’s core business (Haralambides, 2002), it would be unimaginable to assume that seaports do not leverage their capital-intensive infrastructural resources to increase their throughputs, referred to by Wiegmans et al. (2002) as a seaport’s main product.

To a large extent, the apparent importance of seaport physical infrastructure in contributing to the performance of seaport has long been recognized, evidenced from the list of factors identified by UNCTAD (1992), Rugman and Verbeke (1993), and Fleming and Baird (1999) as contributing to the competitive position of seaports. In these early studies, the status of physical infrastructure has been invariably pointed in the form of hinterland networks, availability and efficiency of transportation, and port information systems (UNCTAD, 1992), related and supporting industries (Rugman and Verbeke, 1993), and seaports accessibility (land and sea) and productivity (Fleming and Baird, 1999).

Despite such early widespread recognition on the role physical resources play in seaport performance, relatively few studies on seaport competition have analyzed the contribution of seaport physical resources to enabling seaports to achieve sustainable competitive advantages.
Instead, research on seaport competition and competitiveness has tended to concentrate on efficiency evaluation and cost-benefit analysis, investigating sources of seaport competitiveness (e.g. Peters, 2001; Lirn et al., 2004; Tongzon and Heng, 2005; De Langen, 2007) and evaluating seaport competitiveness based on a variety of performance measures and benchmarking methods (e.g. terminals, and supply chains). The significance of seaport’s physical resources as a contributor to overall seaport performance has rarely been explored (Da Cruz et al., 2013b). Even when seaport’s physical resources were used as an indicator in studying seaport performance levels (Itoh, 2002, Cullinane et al., 2004, Quaresma Dias et al., 2009), Da Cruz et al. (2013b) pointed out that “this indicator was neither analysed individually nor was its contribution to the overall performance studied” (p. 589).

The lack of focus on resource-based analysis among seaport competitiveness studies may be partly attributable to the appeal of approaches adhering to Porter’s (1980) principles of competitive advantage: achieving cost reduction through scale economies, differentiation (in particular through the range of services offered), and competitor analysis (Panayides, 2003). In organizational studies, Grant (1991) had contended that regardless of the level of emphasis management has placed on issues related to strategic positioning through cost advantages and service or product differentiation, the fundamental factor underpinning these choices is deployment of resources available to the firm. In the seaport industry, Sletmo and Holste (1993) also conceded that maritime organizations would not be able to achieve competitiveness by solely relying on Porter’s (1980) three generic strategies, but have to invoke use of intangible resources (e.g., staff with tacit knowledge and specific seaport related skills) in line with tenets of the resource-based view (Rumelt, 1984, Wernerfelt, 1984, Barney, 1991). Likewise, Robinson (2005) also reasoned that a strategy is an organization’s response to external conditions using its distinctive bundle of resources and capabilities.

In organizational studies, the resource-based view (RBV) of the firm (Barney, 1991) and dynamic capability (DC) theory (Eisenhardt and Martin, 2000) have been widely used to explain how firms exploit resources to develop capabilities and competencies, leading ultimately to competitive advantage (Javidan, 1998). The theories of RBV and DC are no strangers to the logistics and supply chain literature either. For instance, Olavarrieta and Ellinger (1997) explored the applicability of RBV in strategic logistics research. Lai et al. (2008) and Wong and Karia (2010) also drew on the tenets of RBV to explain the competitive
advantage of logistics service providers. Competitiveness of airports and airlines had also been examined from a resource-based perspective by Van de Rijt and Santema (2005), Bitelmal (2010) and Jifri (2016).

Within the maritime industry, by contrast, only a few studies have applied resources and capabilities theories to examine issues related to seaport competitiveness (Panayides and Gray, 1999, Haezendonck et al., 2001, Gordon et al., 2005, Azevedo and Ferreira, 2008, Da Cruz et al., 2013b, Cho and Kim, 2015, Wong et al., 2017). In general, these studies have found that unique combination of tangible and intangible seaport resources are among the key factors contributing to seaport competitiveness and performance (Da Cruz et al., 2013b). These studies, however, are primarily single case cross-sectional analysis, such as Haezendonck et al.’s (2001) study of Antwerp, Gordon et al.’s (2005) study of Singapore, and Azevedo and Ferreira’s (2008) investigation of Sines, which renders their findings fragmentary. No attempts have been made to examine the developmental paths of global seaports using a longitudinal analysis. Little emphasis has been given to exploring the resource management strategies employed by port authorities to achieve competitiveness in respond to external circumstances. In short, the manner in which global seaports have structured, bundled and leveraged their resources to gain competitiveness within the context of evolving environmental contingencies remains largely unexplored. This study was designed to fill that void.

1.2 Research Focus

This study will extend the resource-based line of enquiry by combining four major management theories – RBV, Organization Learning, Contingency and Dynamic Capabilities theories – to examine the resource development and management paths of three global seaports – Port of Dubai (PoD), Port of Kaohsiung (PoK) and Port of Rotterdam (PoR) - to answer the following primary research question:

**How do global container seaports manage their resource base to achieve competitiveness?**

The focus on resource management is intended to be inclusive, covering the entire gamut of activities referred to in the organizational studies literature (see e.g., Rumelt, 1984; Wernerfelt, 1984; Barney, 1991; Amit and Schoemaker, 1993; Zollo and Winter, 1999; Karim and Mitchell, 2000; Barney and Arikan, 2001; Priem and Butler, 2001; Teece, 2007),
which include: planning, developing, building, bundling, using, adjusting, configuring, organizing, deploying and leveraging of resources. In developing their conceptual model of resource management process, Sirmon et al. (2007) group all these activities into three partially sequential processes: structuring, bundling and leveraging.

The research will delve into the developmental paths that had been navigated by the three case global seaports, and the strategies they deployed in building their competitive capabilities and in sustaining their competitive positions among the top container seaports in the world over the last five decades, i.e., since the advent of containerization. It will use a grounded-theory approach to qualitatively assess how global seaports attained and maintained competitiveness through strategic resource management to develop dynamic capability, and achieve fits within the contingencies of the environment in which they operated. Specifically, the analysis will use a two-dimensional framework formed by “strength of regional competition” as one dimension and “size of hinterland and foreland” as the second dimension to explore how and why the three case seaports differed in terms of their resource-based strategies. Its ultimate aim is to lay the foundation for building a theory in seaport competitiveness.

Within the broad confine of the above research question, this study will assess seaport competitiveness from two perspectives. The first perspective is based on the resource management process model of Sirmon et al. (2007), concentrating on the structuring, bundling and leveraging of resources. The second perspective is on the dynamic capabilities displayed by the case seaports to fit with the operating environment and regional market dynamics to achieve sustainable competitive advantages. These two perspectives resulted in extending the above research question into the following two sub-questions:

1. Do global seaports engage in a parallel program of complementary activities when they plan and develop their superstructure and infrastructure? If so, what are the characteristics of these parallel programs of complementary activities?

2. How do global seaports adapt their developed superstructure and infrastructure to continually align their functions to meet evolving market conditions and industry trends overtime?
1.3 Research Significance and Contribution

The most significant aspect of this research is its use of four organizational theories - RBV, Organization Learning, Contingency and Dynamic Capabilities theories – to examine the resource management process of three geo-political distinctive global seaports.

In RBV, resource strategies are internally derived (Barney, 1991). In Dynamic Capability theory, capability development is externally driven (Eisenhardt and Martin, 2000). Contingency theory focuses on the fit between resource strategy and environmental contingencies and that between capabilities and environmental contingencies (Drazin and Van de Ven, 1985, Donaldson, 2001). Organization Learning theory views a firm’s potential capacity to adapt and adjust its resources or processes to create value (through fit) as a function of new knowledge acquisition and application (Lei et al., 1996). The combined use of the four theories thus allows the resource management process adopted by the case seaports to be studied in a more encompassing manner via a longitudinal perspective based on the developmental path they had traversed. In this light, the evolvement of resource-based strategies could be discerned and understood as a path-dependent and contingent process. This, in essence, captures the complexity underpinning the dynamic capability building process.

The comparative analysis of the resource management strategies of three global seaports that are geo-politically different from each other also enables the findings to be interpreted in a coherent manner within the framework of “regional competition” and “size of hinterland and foreland”. To lay the foundation for theory building within the context of global seaport competitiveness, such a coherent comparison is imperative. This is another significant aspect of the study.

While the contributions of the study findings will be discussed later in Chapter 6, it is important to point out that the outcome of the study would have two valuable contributions to knowledge. First, findings of the study can be employed by seaports around the globe to review their current practices, and guide them through long-term strategic resource development planning. This process may be either:

- **“Creative Destruction”** (Schumpeter, 2012): For some seaports, revolutionizing their resource structure from within, by incessantly destroying the old structure and creating a new one might be an appropriate option.
Or,

- “Creative Accumulation” (Breschi et al., 2000): For other seaports, competitive strengths could be developed by deepening or reconfiguring existing resources and operational processes.

Either way, the practical implications of the study for new seaports would be a guideline on how they can excel, and for existing seaports, on how they could remain competitive.

Second, findings from this study offer a platform for building a theory on a model of competitive global seaport with a focus on resource building and capability development. This model could be a framework for new seaport development, or ports that are active in a smaller scale but planning an urban mega-project with the goal of transforming to global seaport.

1.4 Thesis Organization

This thesis is organized into six chapters. Chapter 2 will review the background literature relating to the research topic. It will first examine the literature on seaport evolution to indicate that global seaports have been investing in physical infrastructures to keep pace with changes in the maritime sector. It will then present the key factors determining seaport competitiveness since containerization, following by an analysis of the literature on seaport competition and competitiveness to show that little emphasis has been given to examining the resource-based strategies employed by seaport authorities as a means to gain competitiveness. The review will conclude by demonstrating why, and how, four classical management theories - Resource-Based View, Organization Learning, Dynamic Capability and Contingency theories – are appropriate to study how global seaports manage their resources to gain competitive advantage.

Chapter 3 will present the methodology used in this study. It will describe the process of case seaport selection, data collection and the data analysis framework based on contingent factors of “strength of regional competition”, and “size of hinterland and foreland”. This framework is designed to trace the resource development strategies of case seaports over the last five decades.
Chapter 4 will present the within-case findings, describing the case seaports background operation characteristics, including their global and regional competitive positions, governance structure, and key development ventures over a period of five decades.

Chapter 5 will discuss the results of the cross-case analysis, focusing on similar and contrasting means of strategic resource management between the case seaports. The distinctive resource management strategies employed by the three case seaports will be identified and interpreted in the form of constructs to develop working propositions for theory-building.

Chapter 6 will conclude the study, summarizing the major contributions of the salient findings and discussing their implications for theory and practice. Limitations of the study will be highlighted and directions for further studies outlined.
This chapter reviews the background literature pertaining to the research question of how global seaports achieve their competitiveness by building, bundling and managing their resources, both tangible and intangible. It is divided into four sections. It begins by reviewing the literature on seaport evolution to show that, as a historical and path-dependent process, global seaports have been investing in superstructures and seaport infrastructures to keep pace with three sets of changes: growth of shipping alliances, increasing vessel size and rise of inter-modality.

The second section presents the fundamental factors determining seaport competitiveness in the last five decades since containerization. It finds that while these factors have evolved in tune with changes in the maritime environment, they remain resource-based in characteristics.

The third section examines extant literature on seaport competition and competitiveness. It will demonstrate that, despite the resource-based nature of the competitive-bolstering factors, previous studies of seaport competition have predominantly concentrated on efficiency evaluation and cost-benefit analysis. Little emphasis has been given to examining the resource-based strategies employed by seaport authorities as a means to gain competitiveness.

The fourth section highlights why, and how, three classical management theories - Resource-Based View, Dynamic Capability and Contingency theories – are appropriate to study how global seaports gain competitive strength through an incessant process of resource planning, building, bundling, and re-configuring.
2.1 Global Seaports Evolvement

Over the last five decades, the role of seaports has progressively evolved from being a provider of the required interface for transferring goods between sea and other transport modes to logistics platforms (Rodrique, 2013b). This section presents the factors that have contributed to the transformation with a view to show that, in keeping with the changes, global seaports have been investing in superstructures and seaport infrastructures either to gain or to maintain their competitive position. It will concentrate on the path of evolution as well as mechanisms and key factors of competition in seaports.

2.1.1 Changing Environment in Seaports and Products

The dramatic transformation in the nature of seaport competition is associated with the global trends in port development, and the way seaports adapt to the changing maritime systems (Lee et al., 2008, Hung et al., 2010, Parola et al., 2017). Lee et al. (2008) and Parola et al. (2017) contended that six main trends in the maritime environment have been particularly significant in shaping the way seaports operate: shipping alliances, larger vessel size, inter-modality, governance changes, coopetition among seaports, and green and sustainability challenges (see Table 2.1).

To achieve the twin objectives of minimizing running costs and maximizing market share at the same time, many large shipping companies began taking aggressive moves in initiating take-over bids of smaller companies (e.g. Maersk Line took over EacBen Container Line Ltd.), and formed mergers (P&O Containers Ltd. merged with Royal Nedlloyd Lines) as well as loose alliances with one another (e.g. Global alliance of APL, Mitsui-OSK, Orient Overseas Container Line, Nedlloyd Lines, Malaysian International Shipping Corp. and the Grand alliance of Hapag Lloyd, Neptune Orient Lines, NYK and P&O Containers) during the mid-1990s. Since seaports are fixed in space and reliant on shipping lines, the enhancement and sustainability of their competitiveness depend on meeting greater demands from shipping lines. The consolidation of shipping lines through mergers and alliances that bolstered the position of seaport users had a major impact on seaport operations. First, as a result of alliances formed by shipping companies, cargos became concentrated on particular routes and were served directly by a number of large seaports. Second, the alliances created a stronger bargaining power for shipping lines in dealing with seaports (El Kalla et al., 2017). The service concentration increased competition among the seaports as they attempted to maintain
their ongoing traffic or to attract new flows (McCalla, 1999). In order to build and maintain customer loyalty, some seaports began to find means to deal with competition, such as awarding dedicated terminals or services to global shipping alliances (Vanelslander, 2008). By early 2000s, shipping lines rapidly increased their consolidation as a method of supporting each other and preventing bankruptcy (El Kalla et al., 2017). Toward the end of 2017, three main alliances - 2M, Ocean Alliance, and The Alliance - already controlled about 77% of the global container traffic using 60% of the world fleet of fully container vessels (El Kalla et al., 2017).

Table 2.1: Factors affecting seaport environment

<table>
<thead>
<tr>
<th>Category</th>
<th>Phenomenon</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shipping alliances (Inter-firm networks)</td>
<td>Large shipping companies have propelled mergers, alliances, and take-overs for consolidation of their shipping lines' leading role, in order to minimize running costs while maximizing market shares.</td>
<td>Shipping lines became providers of global networks. One mega-carrier or alliance can move cargos freely around the global market.</td>
</tr>
<tr>
<td>Larger Vessel size (Economies of scale in shipping)</td>
<td>Larger container ships are built to achieve economies of scale.</td>
<td>Fewer seaports are able to serve the transoceanic mega-vessels, due to depth limits.</td>
</tr>
<tr>
<td>Inter-modality</td>
<td>Inland intermodal hubs enable containers to be shipped longer distances across continents to establish greater and more connections with other seaports.</td>
<td>Expansion of hinterland and foreland of seaports.</td>
</tr>
<tr>
<td>Governance changes</td>
<td>Port authorities have experienced an institutional turn from the public to the landlord model.</td>
<td>Agile and effective decision making in seaports were promoted.</td>
</tr>
<tr>
<td>Coopetition among seaports</td>
<td>Seaports in geographical proximity increased interdependency using a mix of competitive and cooperative strategies, called “coopetition”.</td>
<td>Imbalanced competition in neighboring ports were moderated while their powers against intensified international competition strengthened.</td>
</tr>
<tr>
<td>Green and Sustainability challenges</td>
<td>Seaports have been increasingly challenged to pursue green practices and to comply with environment sustainability.</td>
<td>Ports began to conceive green strategies and planning to be in harmony with their local environment and the entire logistics chain.</td>
</tr>
</tbody>
</table>

Source: Adapted from (Lee et al., 2008) and (Parola et al., 2017)

The second trend that has greatly impacted seaport development was the evolution of container carriers (see Table 2.2). Although the deployment of larger vessels by shipping lines reduces the frequency of ship calls at seaports, larger vessels require more handling capacity when they call at seaports and also longer times for loading and unloading containers. Therefore, the dramatic increase in volume of containers aboard the latest
generation of carriers became a real challenge for major gateway seaports in terms of their terminal operation and storage facilities, as well as landside road and rail connections. For example, based on an average call size of 8,000 TEUs of inland flows generated by calls of mega-vessels in major ports in Europe (e.g. Rotterdam, Antwerp), Notteboom (2015) estimated that 30% of that volume would involve transshipment cargo and 70% gateway cargo (5,600 TEU), which needs to be distributed uninterruptedly to hinterlands. Therefore, the inland distribution platforms should be able to support the volume or up-scaled.

Moreover, the new generation of transoceanic mega-vessels can only be served by seaports that have terminals with certain lengths and drafts on offer (Table 2.2). The trend of mega-vessels imposed unprecedented operational challenges for seaports such as deeper channel, terminal water depth, longer quays, and larger terminal areas (Parola et al., 2017). With the change in site requirements, seaports either had to defend their competitiveness by coping with the essential physical conditions to keep pace with market transformations (Parola et al., 2017), or face the possibility of being dropped as regular ports of call by major shipping lines, and taking limited roles in container handling (McCalla, 1999).

### Table 2.2: Evolution of Container Vessels

<table>
<thead>
<tr>
<th>Vessel (Year)</th>
<th>Generation</th>
<th>Capacity (TEU)</th>
<th>Terminal Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Length (Metres)</td>
</tr>
<tr>
<td>A (1970)</td>
<td></td>
<td>1,000 - 2,500</td>
<td>215</td>
</tr>
<tr>
<td>B (1980)</td>
<td></td>
<td>3,000 - 4,500</td>
<td>250 - 290</td>
</tr>
<tr>
<td>C (1988)</td>
<td></td>
<td>4,000 - 8,000</td>
<td>285 - 300</td>
</tr>
<tr>
<td>D (2014)</td>
<td></td>
<td>12,500</td>
<td>366</td>
</tr>
<tr>
<td>E (2016)</td>
<td></td>
<td>15,000 - 18,000</td>
<td>397 - 400</td>
</tr>
</tbody>
</table>

*Source: Adapted from Rodrigue (2013a)*

The third major trend that has changed the face of seaport environment is inter-modality. Inter-modality has emerged as a major trend hand-in-hand with containerization, and deployment of mega-vessels that have generated a high concentration of cargo in a limited number of seaports. Sending or receiving cargos via containers over longer inland transport distances by road, rail and barge became an incentive for seaports to expand their hinterland reach (Notteboom, 2008). As Notteboom and Rodrigue (2005) argued, the success of a seaport is dependent on its capability of fitting into a regional network that shapes supply chains. They suggested that seaports should fully benefit from the synergies created by all players in the shipping network. While inter-modality expanded seaport competition from
forelands to hinterlands, the sea-sea operations were extended to sea-land and port-related logistics activities in inland intermodal hubs, enabling containers to be shipped longer distances across continents to establish more connections with other seaports (Notteboom and Rodrigue, 2005).

The fourth trend that transformed the seaport operation profoundly over that last two decades, in both advanced economies and developing countries, is institutional change. Parola et al. (2017) noted that seaports benefited from the governance shift from the public to the landlord model in a number of ways that reinforced their competitiveness. First, broader strategic decision objectives and innovative functions and activities (e.g., ICT development, communication and marketing, and customer relationship management) were promoted by the reformed port authorities (Parola et al., 2013). Second, the institutional change created a more open market in seaports, created more effective players and supported private investments (Parola et al., 2017). Third, entry of private firms and their practices in seaport operation incentivized the reformed port authorities to adopt agile, coherent and transparent managerial practices that enhanced their decision making processes (Brooks and Cullinane, 2006, Debreie et al., 2013).

The fifth trend is created by the increasing interdependency among seaports in geographic proximity that led to a mix of competitive and cooperative strategies, called “coopetition”. This trend has enhanced competitiveness of neighboring seaports by moderating imbalanced competition among them while strengthening powers against intensified international competition (Ducruet et al., 2009, Wang et al., 2012). Parola et al. (2017) highlighted a number of coopetition benefits among seaports, including: 1) joint utilization of port land and available infrastructure, 2) pooling of infrastructural and financial resources, 3) creation of a unified lobby to obtain state funds, 4) forming of communication, ICT services and marketing alliances, and 5) joining developing in common projects related to environmental protection, safety and security issues.

Finally, the most recent trend is the rise of green and sustainability concerns that represent a wave of change in seaports (Lam and Notteboom, 2014, Acciaro et al., 2014). Port users and local communities are becoming increasingly conscious over sustainability practices in seaports, which have a direct impact on the port capacity in terms of dealing with pollution (i.e., air, water, acoustic and visual) and traffic congestion (Bergqvist and Egels-Zandén, 2012). Therefore, seaport policy makers and authorities are expected to provide solutions to
environmental concerns, while maintaining their quality standards, and boosting seaport competitiveness (Parola et al., 2017).

2.1.2 Global Seaports: Path of Evolution

According to Guerrero and Rodrigue (2014), major seaport development has been interlinked with five waves of containerization (see Table 2.3). The first wave commenced at the absolute centers of the global economy (North America, Western Europe and Japan, called "the economic triad"), and lasted about 10 years before shifting to new locations within their respective spheres of influence (Guerrero and Rodrigue, 2014).

Table 2.3: Long Waves of Containerization (1970-2010)

<table>
<thead>
<tr>
<th>Period</th>
<th>First Wave (A)</th>
<th>Second Wave (B)</th>
<th>Third Wave (C)</th>
<th>Fourth Wave (D)</th>
<th>Fifth Wave (E)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overview</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overview</td>
<td>Pioneer ports setting containerized operations in the economic triad (North America, Western Europe, Japan and Australia)</td>
<td>Expansion of the triad and its trade partners (Caribbean, Latin America, Mediterranean, East Asian Tigers)</td>
<td>Large diffusion in new markets (Latin America, Middle East, South Asia, Southeast Asia)</td>
<td>&quot;The China Wave&quot;</td>
<td>Peak growth and the setting of niches</td>
</tr>
<tr>
<td>Driver</td>
<td>Early trade substitution</td>
<td>Adoption of containerization</td>
<td>Setting of global supply chains</td>
<td>Expansion of global supply chains, China and transhipment hubs</td>
<td>Spill-over effect and new transhipment hubs</td>
</tr>
</tbody>
</table>

Source: (Guerrero and Rodrigue, 2014, p.17)

In the first wave, regular transatlantic and transpacific services were established and pioneer ports adopted containerized services. The second wave was the early expansion of container services within the economic triad and its trading partners (Guerrero and Rodrigue, 2014). The third wave was driven by the rise of the global supply chains as well as the emergence of transshipment hubs, predominantly in East and Southeast Asia (Guerrero and Rodrigue, 2014). The fourth wave is also known as the China wave, with the global shipping networks taken over by the entry of Chinese ports. The container became the standard support of the
global economy, with transshipment hubs blossoming around the world. The fifth wave saw the growth of seaports with a niche role (e.g., a new transshipment hub serving a maritime network, a new gateway coping with congestion) (Guerrero and Rodrigue, 2014).

At the core of these five waves was the steady progression of logistics as a cross-sectional function (Hesse, 2008), which has transformed seaports beyond the basic model, performing as regional hubs equipped with value-added logistics services (Notteboom and Winkelmans, 2002), such as warehousing, consolidation, distribution and customs clearance. Hayuth (2008) characterized these changes as three major stages of evolution, as follows:

1. The first phase was during the 1970s when Containerization was introduced. The continuous growth of container traffic has led to a steady rise in seaport development around the world for handling containerized cargo (see Figure 2.1), from 57 ports in 1970 to 317 ports in 2010 (Guerrero and Rodrigue, 2014). This first phase marks the rise of the first and second waves.

2. The second phase, referred to as Inter-modality, occurred throughout the 1980s. The rise of inter-modality offered opportunities for seaports to strengthen their position in the global transport chain (Van Klink and Van den Berg, 1998) and resulted in expansion of the hinterlands and forelands of the ports (Lee et al., 2008). This phase coincided with coming of the third wave of containerization, which witnessed a surge in containerized traffic in the largest number of ports, spurred by the growth of transshipment hubs in East and Southeast Asia regions (Guerrero and Rodrigue, 2014).

![Figure 2.1: Number of Ports and Container throughput (1970-2010)](source: (Guerrero and Rodrigue, 2014, p.4))
3. The final phase commenced in the early 1990s with the rise of globalism. Maritime transport became one of the key drivers of globalization, with over 80% of the global trade being carried by sea (Asariotis et al., 2012). With an increasing level of global consumption, the capacity of transport infrastructure was further developed to handle higher levels of material flows. Hence, seaports were transformed through physical expansion schemes that created additional handling capacity, and upturning their functionality. This phase was linked to the fourth and fifth waves of containerization.

Each of these periods brought substantial changes to the Port-Urban interrelationships and were characterized predominantly by technological innovations, synchronization and coordination of logistics systems (Hayuth, 2008). Through technological advancements, vessel structures and cargo handling methods as well as physical layout of ports were revolutionized (Hayuth, 2008). Notteboom and Rodrigue (2005) divided the evolution in container port system into six main phases - Scattered Ports, Penetration and Hinterland Capture, Interconnection and Concentration, Centralization, Decentralization and Regionalization - as illustrated in Figure 2.2.

![Figure 2.2: Evolution model of a container port system](image)

*Source: Adopted from the original model by Notteboom and Rodrigue (2005) modified by Wang and Ducruet (2012)*
The process of converting seaports from a final stop to a link in the transport chain was the further synchronization and coordination in logistics systems (Hayuth, 2008). Following the developing trend and inevitable need of running regular transportation services within the routes of production and consumption, some seaports grew to be stronger participants (i.e. Rotterdam, Hong Kong, Singapore and Dubai). Challenges such as concentration of maritime flows with access roads, infrastructure that can cope with large vessels and increasing traffic volumes are some instances that were managed in these seaports' areas (Fremont and Soppe, 2008). The outcome of this progression was concentration of principal operators, mainly shipping lines and their strategic plans of stopping their mother vessels and feeders in these ports to increase the number of possible destinations for commodities at both regional and global levels (Fremont and Soppe, 2008). Other operators in the chain followed the trend set by the shipping lines. Gradually, the combination of services shaped a network that determined the situation of each port. In other words, the status of each seaport was determined by opportunities provided for linking the networks for various transport operators (Fremont and Soppe, 2008).

In the last two decades, the increasing advantage of agglomeration of services (Air, Land, Sea) as well as improved accessibility has revitalized the port-urban interface. Fleming and Hayuth (1994) introduced the concept of “Gateway hub”, to show that in gateway hubs port forelands became prime access points to large market areas of their hinterlands and attracted a host of maritime operators due to their high volume of traffic (Hall et al., 2011). As a result, port gateway functions had to be linked to logistics activities, such as warehousing, inventory control and distribution, to maximize the benefits of regional trade. “Logistics Gateways” were formed (Van Klink, 1995). A more progressive term, “Global Gateway City”, was later given by Berechman (2007) to describe a coastal metropolis with port access to the local hinterland and to the rest of the world, capturing a substantial share of the total regional and global trade volumes.

From the perspective of the resource-based view (Barney, 1991), physical assets, such as land, transport infrastructure, port infrastructure (berths, docks, basins, storage areas, internal connections), and port superstructure (cranes, pipes, terminals, sheds), are classified as tangible resources (Trujillo and Nombela, 1999); while human capital, structural capital (networks and information systems), and relations capital (list of clients, partners, suppliers) (Chlomoudis et al., 2009), specialized skills, such as know-how and organizational culture
(Hall, 1992), are considered as intangible resources. In this context, the evolution in container port system over the last five decades suggests that, in attempting to keep pace with changes in the larger maritime environment, global seaports have been constantly engaging in a process of building physical assets and investing in infrastructure that support their logistics operations. The next section will discuss how these resource-based changes among seaports are linked to their attempts to remain competitive.

2.2 Global Seaports Competitiveness

2.2.1 Overview

Inter-port competition can be interpreted as competition among whole ranges of seaports on a coastline, or among seaports in different countries, or among individual seaports in the same country (Goss, 1990b). The focus of this study is on the competitive position of a seaport in relation to seaports in other countries, which has the most profound influence on its national fortunes in the long run.

Historically, the competitive strength of seaports was gauged by their terminal (berth) performance (Heaver, 1995, Notteboom and Yap, 2012), a higher level of berth occupancy would lead to higher revenue, which eventually translates into profit. However, with changes in the larger maritime environment described in Section 2.1, seaports responded by transforming themselves into supply chain hubs. Revenue-generating activities were no longer limited to terminal operations and water-related functions. Supplementary functions linked to supply chain operations, such as cargo preparation, warehousing, and customs, were introduced in the port areas (De Langen et al., 2007, Notteboom and Yap, 2012).

The phenomenon has been variously described as a chain of interlinking functions (Suykens and Van de Voorde (1998) or a cluster of economic activities (De Langen, 2004a). A port became a link in the overall logistics chain (Suykens and Van de Voorde, 1998) with a large number of organizations providing services and creating a range of port products collectively. De Langen et al. (2007) presented three main categories of seaport products – cargo transfer product, logistics product and port manufacturing product (Table 2.4) - with diverse characteristics to explain the transformation of seaport competitiveness.
Since seaport products are extended to value-added logistics services and manufacturing, the indicators of port performance are no longer limited to throughput volumes and the number of ships calling at a port. It is the profitability and performance of new port products that reflect the performance in seaports, such as investment level of private firms, and the number of new establishments in a port area. This is exemplified by the emergence of dramatically different performance indicators in the Port of Rotterdam during the last few decades, from throughput volume, as the primary functionality of seaports, to the number of new firms established in the port (De Langen et al., 2007).

Table 2.4: Characteristics of Seaport Products

<table>
<thead>
<tr>
<th>Port Product</th>
<th>Service</th>
<th>Users</th>
<th>Providers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cargo Transfer Product</td>
<td>Vessel Loading, Unloading</td>
<td>Shipping Lines</td>
<td>Terminal Operators, Towage, Pilotage and Bunkering firms</td>
</tr>
<tr>
<td>Logistics Product</td>
<td>Storage, Value adding services (Packing, Re-packing, Labeling, Quality inspection)</td>
<td>Import / Export Companies</td>
<td>Logistics Service Providers, Freight Forwarders, Transport Companies</td>
</tr>
<tr>
<td>Port Manufacturing Product</td>
<td>Provision of space and conditions for investments in manufacturing facilities</td>
<td>Manufacturing companies (Multinationals)</td>
<td>Port Authority (landlord) Utility Providers for Manufacturing (Water, Energy, Heat, Telecommunications)</td>
</tr>
</tbody>
</table>

Source: Adapted from De Langen et al. (2007)

In addition to the range of products stated, a relatively new concept in supply chain management, called “Port-centric Logistics”, has also emerged, which redefines the crucial role of seaports by the provision of distribution and other value-adding logistics services at a port (Mangan et al., 2008, Monios and Wilmsmeier, 2012). This concept has been a major driving force for ports to engage in activities beyond simply providing berths for ships and other core services, and increasing profit margins made on some non-core port activities (Mangan et al., 2008). With a potential for significant revenue generation, the port-centric Logistics concept has lately become a prime consideration for reforming and evolving seaports (Pettit and Beresford, 2009).

Another concept that has also been a recent addition to seaport studies is “seaport clusters”. Haezendonck (2001) defined seaport clusters as a set of interdependent firms located in the same port region, and engaged in port-related activities, with a common strategy of creating
competitive advantages over external competition. De Langen (2004b) referred to the Port of Rotterdam as an example of a seaport cluster, identifying six sets of leader firms in the port area: freight forwarders, non-assets owning logistics service providers, shipping lines’ agents, associations, commodity traders and shipbrokers. The concept of seaport cluster indicates the presence of customers and suppliers within the same geographical locale, contributing to lowering transportation costs and reducing cargo handling times, thus enhancing seaport competitiveness.

### 2.2.2 Factors Affecting Seaport Competitiveness

One of the earliest frameworks in seaport competitiveness was given by Verhoeff (1981), who identified geographical location, level of infrastructure and industrialization, government policies and standard of operational performance are key factors affecting seaport competition. Since then, many other studies have been undertaken, concentrating in specific geographical zones and focusing on seaport selection criteria from the perspective of different users of seaport services, such as shipping lines, freight forwarders, shippers and consignees (Da Cruz et al., 2013a). These studies, as such, are considered rather limited in capturing a broad view on seaport competitiveness that would include a global assessment and consideration of factors commonly required by all seaport users.

One of the first comprehensive studies on seaport competitiveness was UNCTAD (1992), which listed the specific influences in the third generation of seaports, as geographical location, hinterland networks, availability and efficiency of transportation, port tariffs, port stability and port information systems. Rugman and Verbeke (1993) extended the list by offering a competitive port positioning structure based on Porter’s (1998) Diamond model, with six factors: 1) factor conditions (e.g. production, labor and infrastructure); 2) demand conditions; 3) related and supporting industries; 4) firm structure and rivalry; 5) chance, and 6) government intervention. Following that, further studies were conducted by Fleming and Baird (1999); Meersman et al. (2002) and Tongzon and Heng (2005). The range of factors identified by these studies supporting seaport competitiveness include: Port (terminal) efficiency level, port-handling charges, reliability and reputation, port selection preferences of carriers and shippers, depth of navigation channel, adaptability to changing market environment, cargo-generating effect, landside accessibility, and product and service differentiation. A more recent study on seaport competitiveness (Carbone and Gouvernal,
however, suggested that factors influencing port competition have evolved into the following:

1. Relationships with other actors in the supply chain;
2. Availability of port-infrastructure;
3. Proximity to major sourcing and final markets;
4. Road/Rail network configuration;
5. Transit time;
6. Number of direct connections to overseas destinations;
7. Extent of feeder service;
8. Good labor climate, and
9. Inland waterways connections

From the numerous studies carried out during the last two decades, (e.g. Fleming and Baird, 1999; Peters, 2001; Trujillo and Nombela, 1999; Lirn et al., 2004; Song and Yeo, 2004; Tongzon and Heng, 2005; De Langen, 2007; Yuen et al., 2012; Kim, 2014; Yeo et al., 2014; and Martinez Moya and Feo Valero, 2017), the leading determinants of gaining competitiveness in seaports can be categorically summarized into six main groups: seaport location; productivity and efficiency; price of services connectivity of seaport and hinterland access; port organization, and infrastructural facilities.

**Seaport Location**

Geographical location is important in positioning seaports in global supply chains, as seaports are nodes between different transport systems. A strategic location creates a competitive advantage for seaports for a number of reasons: proximity to production, distribution or consumption centers; natural deep harbors to accommodate large vessels, and being situated on the main maritime routes (UNCTAD, 1992). Studies by Fleming and Baird (1999); Song and Yeo (2004); Guy and Urli (2006); Ng (2006) and De Langen (2007) have highlighted “location” as a prime factor of seaport competitiveness. The importance of geographical location as a competitive element has been further amplified in a number of other studies, including Notteboom (1997), who examined the dynamics of load center development in Europe; Ha (2003) who compared service quality factors at major container ports; Ducruet et al. (2009) who investigated the impact of local and regional economic growth on seaport activities; Zondag et al. (2010) who modeled seaport competition, and Yuen et al. (2012) who
identified port location the most important factor determining seaport competitiveness from freight forwarders and shippers perspective. Although strategic location is a leading factor in gaining competitive advantage in seaports, it is worth mentioning that many seaports (e.g. Port of Jebel Ali - Dubai in United Arab Emirates, Port of Tianjin in China) have managed to obtain a large market share by promoting other competitive factors than merely benefiting from a favorable geographical location.

Seaport Productivity and Efficiency

Efficiency in seaports is explained by the speed of handling containers and turn-around time of vessels. A significant number of studies on seaport competition have concentrated on performance and efficiency evaluation, by either assessing or comparing performance in seaports, or benchmarking seaport operations. Marlow and Paixão Casaca (2003) suggested two-tier (qualitative and quantitative) indicators for seaport performance based on three subprocesses: interface process; transport operator process, and land infrastructure process. Estache et al. (2004) evaluated productivity changes in Mexican seaports during a process of liberalization and decentralization, and suggested that reform improved competitiveness of seaports. In the context of Italian seaports, Barros (2006) evaluated the performance of ports through operational and financial variables. Another study by Barros and Peypoch (2007) suggested that benchmarking of multi-country seaports could demonstrate how seaport performance is also reflective of culture, traditions and managerial practices in different countries.

With regards to efficiency in container terminals, De Koster et al. (2009) suggested that larger container terminals are more efficient and transshipment terminals are significantly more efficient in comparison with import/export or gateway terminals. Productivity and efficiency have also been highlighted as key elements of competitiveness in seaports (Fleming and Baird, 1999, Peters, 2001, Tongzon and Heng, 2005, Ng, 2006, Ugboma et al., 2006, De Langen, 2007, Saeed, 2009, Tongzon, 2009, Onut et al., 2011, Tang et al., 2011, Yeo et al., 2014, Kim, 2014, Martínez Moya and Feo Valero, 2017). The outstanding performance of a number of seaports in the top 10 global rankings, such as Hong Kong and Singapore (Merk and Li, 2013), underscores the role of port efficiency as a significant indicator in gaining competitive advantage.
Resources and Infrastructural Facilities

Improving the handling capacity of seaports (e.g., equipment, storage facilities and the number of berths), and creating inter-modal links, as the main requirements of port users, are not possible without advanced infrastructural facilities. In the early 1990s Christopher (1992) signaled that competition is no longer provided by individual firms but between supply chains. Similarly, seaport competitiveness has since been determined by the quality of the entire port, both in terms of infrastructure and services. De Martino and Morvillo (2008) argued that resources play an important role in promoting the development of inter-organizational relationships among supply chain players, ICT systems, modal-interconnections and acquisition of new areas as critical assets for seaports to gain attractiveness. Within contemporary maritime literature, however, recognition of resources as a key factor of seaport competitiveness has been limited to a few studies (Lirn et al., 2004, Carbone and Gouvernal, 2007, Ha, 2003, Onut et al., 2011, Martínez Moya and Feo Valero, 2017).

Pricing of Seaport Services

Seaport users generally favor locations with relatively lower service charges, which have a direct effect on operational costs (Tongzon and Heng, 2005). Hence, the price of services has been regarded as a predominant element of seaport competitiveness. This has been supported by Fleming and Baird (1999) who examined the influence of state aids on seaport costs; Trujillo and Nombela (1999) who assessed regulation in seaport pricing (in terms of port tariffs, cargo handling charges and concessions fees), and Meersman et al. (2003) who reviewed seaport pricing mechanisms. Lirn et al. (2004) also noted that terminal costs (e.g. handling and storage costs of containers, terminal ownership and/or an exclusive contracts policy) feature as a criterion when shipping lines select a transshipment port. Likewise, Ng (2006) found monetary costs among the key components when shippers assessed port attractiveness. De Langen (2007), Chang et al. (2008), Saeed (2009), Yuen et al. (2012), Wang et al. (2014), and Yeo et al. (2014) all indicated that shippers, freight forwarders and shipping lines consider the price of port services as a factor when selecting a seaport, confirming the importance of price as an advantage generator.
Seaport Connectivity

The rise of inter-modality in the 1980s, and globalism in the early 1990s created opportunities for seaports to strengthen their position in the global transport chain (Van Klink and Van den Berg, 1998), which resulted in expansion of the hinterland and foreland of the ports (Lee et al., 2008). Under a new business environment following trade globalization (Juhel, 2001), seaports became prominent nodes of global value chains (Robinson, 2002) and availability of intermodal terminals and facilities, such as on-dock railways, pipelines, and airport proximity, became pre-conditions of modern seaports. Rather than evaluating seaports merely as places with particular functions, the focus on ports shifted to the dynamics of connectivity and inter-port relationships in supply chains, which is reflected in research conducted since the early 2000s. Some examples of these studies are the seaport as an element of value-driven chain systems (Robinson, 2002), seaport performance from a supply chain management perspective (Bichou and Gray, 2004), transformation of seaports to global supply chain management centers (Wang and Cheng, 2010), and seaport connectivity in supply chain systems (Lam and Yap, 2011). Consequently, the capability to offer a speedy and reliable access from forelands to hinterlands, and vice versa, became an element of seaport attractiveness (Fleming and Baird, 1999, Tongzon and Heng, 2005, Guy and Urli, 2006, Low et al., 2009, Iannone, 2012, Van Asperen and Dekker, 2013, Kim, 2014, Yeo et al., 2014, Martínez Moya and Feo Valero, 2017).

Organization of Seaports

Seaport management plays a vital role in creating competitiveness by improving and regulating customs and administration, management of risk, and security and safety measures. The role of authorities in seaport management and policies pursued by them in relation to port competition has been evaluated at various levels of authorities, segregation of ownership and management. Examples of such studies include Verhoeff (1981); Heaver (1995); Van der Lugt and De Langen (2007) and De Langen and Heij (2014). These studies indicated seaport administration, management and deployment of strategies have a major impact on seaport performance. Other studies have focused on the roles port authorities play in creating advantages for seaports through pricing decisions on seaport services (Haralambides, 2002), lease agreements and concessions (Kaselimi et al., 2011, De Langen et al., 2012). Kaselimi et al. (2011) found that deciding to dedicate an existing terminal capacity to a specific customer by port authorities affects competition between remaining multi-user
terminals. De Langen et al. (2012) argued that the process of competitive bidding for granting concessions in a container terminal is a potentially attractive form of sustainable and competitive development for the port. Fleming and Baird (1999); Ha (2003) and Lirn et al. (2004) also highlighted that seaport organization, i.e. port tradition, management and administration, sales activity and marketing, security and safety as well as labor environment, is an element that differentiates seaport competitiveness.

Table 2.5 summarizes the six main groups of determinants of seaport competitiveness.

The foregoing discussion shows that a precondition in developing factors affecting seaport competitiveness is the presence of critical assets, commonly categorized into infrastructures, superstructures, human capital and information and communication technology (ICT) systems (Meersman et al., 2002). These tangible seaport resources are necessary for the conduct of value-added logistics activities (De Martino and Morvillo, 2008) and have become an integral part of port operations. Once these infrastructural investments are in place, the resources allocated, as well as the general policies designed to support their development, may not be readily overturned.

These findings reinforce the notion that port evolvement involves a long process of resource planning, selection, building, organization and utilization in response to changes in the larger maritime industry and the market environment. The changes occur through a sequence of growth and resource development. Once the physical infrastructures were in place, they are extremely hard to be reversed at later stages. In this context, port development is a path-dependent process, where future events are not independent of past events, the sequence in which these events occurred, or of the manner in which they occur (Notteboom, 2009). Path dependency, as such, explains why port systems globally have not developed in the same pattern or followed the same sequence, not to mention that seaports are generally subject to open economics founded on market-based principles and for the same reason they vary to a great extent around the world (Notteboom, 2009).
<table>
<thead>
<tr>
<th>Key Determinants of Seaport Competitiveness</th>
<th>Reason</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seaport Location</td>
<td>A strategic location creates competitive advantage in seaports due to a number of reasons. First, proximity to production, distribution, or consumption centers; second, natural deep harbors to accommodate large vessels, and third being situated on main maritime routes.</td>
<td>UNCTAD (1992), Fleming and Baird (1999), Song and Yeo (2004), Guy and Urli (2006), Ng (2006), De Langen (2007), Yuen et al. (2012)</td>
</tr>
<tr>
<td>Seaport Connectivity and Hinterland Access</td>
<td>Considering seaports as prominent nodes in integrated logistics systems their capability in offering a speedy and reliable access from port to hinterlands create a competitive advantage.</td>
<td>Fleming and Baird (1999), Tongzon and Heng (2005), Guy and Urli (2006), Low et al. (2009), Iannone (2012), Van Asperen and Dekker (2013), Kim (2014), Yeo et al. (2014), Martínez Moya and Feo Valero (2017)</td>
</tr>
<tr>
<td>Seaport Productivity and Efficiency</td>
<td>Efficiency in seaports is explained by the speed of handling containers, and turnaround time of vessels. The greater the level of efficiency, the more attractive the seaport is to the users and enhances its competitiveness.</td>
<td>Fleming and Baird (1999), Peters (2001), Tongzon and Heng (2005), Ng (2006), Ugboma et al. (2006), De Langen (2007), Saeed (2009), Tongzon (2009), Tang et al. (2011), Onut et al. (2011), Kim (2014), Yeo et al. (2014), Martínez Moya and Feo Valero (2017)</td>
</tr>
<tr>
<td>Price of Seaport Services</td>
<td>Shipping lines generally prefer seaports with relatively lower service charges, as the price of seaport services directly impacts on their operational costs. Hence the price of service is a determinant in seaport competitiveness.</td>
<td>Fleming and Baird (1999), Trujillo and Nombela (1999), Lirn et al. (2004), Tongzon and Heng (2005), Ng (2006), De Langen (2007), Saeed (2009), Yuen et al. (2012), Wang et al. (2014), Yeo et al. (2014)</td>
</tr>
<tr>
<td>Resources and Infrastructural facilities</td>
<td>Improving the handling capacity in seaports (equipment, storage facilities, number of berths, etc.), and creating inter-modal links, as the main requirements of port users, are not possible without advanced infrastructural facilities.</td>
<td>Lirn et al. (2004), De Martino and Morvillo (2008), Low et al. (2009), Onut et al. (2011), Martínez Moya and Feo Valero (2017)</td>
</tr>
<tr>
<td>Organization of Seaports</td>
<td>Seaport management plays a vital role in creating competitiveness by improving and regulating customs and administration, managing risk, and security and safety measures.</td>
<td>Fleming and Baird (1999), Ha (2003), Lirn et al. (2004), Kaselimi et al. (2011)</td>
</tr>
</tbody>
</table>
2.3. Themes in Seaport Research

2.3.1 Overview

According to Notteboom et al. (2013b), the extensive range of seaport research conducted over the last 30 years essentially fall into seven major themes: terminal studies; seaports in supply chains; seaport governance; seaport planning and development; port policy and regulation; seaport competition, and spatial analysis of the seaports (see Table 2.6). Among the seven broad themes, *seaport competition* is one of the most popular categories. During the late 1990s, studies in this stream were considerably expanded. By the late 2000s, over 20% of the total seaport research were in the subfield of seaport competition (Pallis et al., 2010). The bulk of the studies under this theme have been dominated by economics, geography and operational research disciplines. Some theoretical concepts, such as production theory, game theory and utility theory, have been widely applied and in a consistent manner since the 1980s (Woo et al., 2011).

Based on the definition given by Cullinane and Talley (2006) seaports are economic units providing a service or nodes among various transportation modes, or are facilities through which cargos pass, or are a part of logistics and supply chains. The given definition implies that efficiency, performance and profitability in seaports are significant issues as they are considered economic units where cargos pass through the supply chains. It also means that the geographical location of seaports is important in their placement in the global supply chains, as they are nodes among different transport systems. Moreover, the definition indicates that seaports are facilitators in handling global trade volumes, and their condition has a direct impact on their logistics systems. Therefore, the issues related to seaports can be perceived from different perspectives and led by various disciplines.

An analysis carried out by Woo et al. (2011) reveals that since the 1980s, three disciplines have dominated seaport research: economics (31.5%), geography (15.7%) and operation research (16.3%). Studies supported by other disciplines were mostly related to management studies with an aggregated proportion of 13.2%. However Woo et al. (2011) observed that the disciplines involved in port studies became more diverse in the 2000s with the emerging trend of the logistics-based, marketing-based and strategic management-based research.
<table>
<thead>
<tr>
<th>Themes</th>
<th>Description</th>
<th>Contributions</th>
</tr>
</thead>
</table>

Source: Own elaboration based on themes of seaport research according to Notteboom et al. (2013b)
Table 2.7 presents the range of studies carried out with the theme of seaport competition and competitiveness, revealing the focus of the studies, theoretical framework (i.e. theories employed), methods (i.e. research methodology) and techniques of analysis.
Table 2.7: Seaport Competition and Competitiveness Research - Methodological analysis

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Theories</th>
<th>Methods</th>
<th>Analysis Techniques</th>
<th>Focus / Argument</th>
<th>Reference</th>
</tr>
</thead>
</table>
| Economics  | Production Theory      | Economic Modelling | Data Envelopment Analysis (DEA) | • Comparison of the seaports' performances.  
  • Suggesting DEA as an easily adaptable approach for efficiency ratings in operation of seaports. Further study adopted DEA to measure multi-stage efficiency of seaports with the four steps of productivity, profitability, marketability and overall efficiency.  
  • Evaluating the efficiency of seaport authorities in Spain.  
  • Suggesting that ports with high complexity offered higher efficiency levels, in contrast with ports with medium complexity. Seaports with low complexity showed a negative evolution in global efficiency levels.  
  • Technical efficiency and technological change of Portuguese seaports.  
  • Suggesting that seaport authorities did not achieve total productivity improvements in the considered period. While most of them achieved improvements in technical efficiency, not all advanced in technological changes.  
  • Further study provides a comparative analysis on the seaport systems of two European countries, Greece and Portugal.  
  • Seaport performance indicators based on the multimodal process.  
  • Proposing a two-tier measurement (quantitative - qualitative) indicator, based on three sub-processes: interface process, transport operators process, and land infrastructure process.  
  • Evaluating the liberalization and decentralization process in Mexican seaports by measuring productivity changes in cargo handling operation.  
  • Results suggesting that the reform improved the competitiveness of Mexican seaports (facilitating the new adoption of technologies is an example given). | Roll and Hayuth (1993)  
  Park and De (2004)  
  Martinez-Budria et al. (1999)  
  Barros (2003)  
  Barros and Athanassiou (2004)  
  Marlow and Paixão Casaca (2003)  
  Estache et al. (2004) |
<table>
<thead>
<tr>
<th>Discipline</th>
<th>Theories</th>
<th>Methods</th>
<th>Analysis Techniques</th>
<th>Focus / Argument</th>
<th>Reference</th>
</tr>
</thead>
</table>
| Economics           | Production Theory | Economic Modelling       | Data Envelopment Analysis (DEA)                          | • Evaluating the performance of Italian seaports through operational and financial variables.  
• Suggesting that generally Italian seaports display relatively high efficiency.                                                                                                                     | Barros (2006)                      |
|                     |                   |                          | Stochastic Frontier Analysis (SFA)                       | • Evaluating the deregulation process in Spanish seaports by measuring productivity changes in cargo handling operation.  
• Results show that seaports with a relatively large traffic volume exhibit an average efficiency index larger than average of the rest. Also technical change seems to be the element that has caused an increase in productivity. | Díaz-Hernández et al. (2008)       |
|                     |                   |                          |                                                          | • Benchmarking the efficiency in container terminals.  
• Suggesting the larger terminals are more efficient, and transshipment terminals are significantly more efficient than import / export terminals.                                                   | De Koster et al. (2009)            |
|                     |                   |                          |                                                          | • Evaluating the port efficiency and suggesting port efficiency is not impacted by competition when measured at a local level. Though the study concludes that seaports efficiency in a range of 400-800km decreases with competition. | De Oliveira and Cariou (2015)       |
|                     |                   |                          |                                                          | • Evaluation of efficiency of container port industry.  
• Findings suggest that a high level of technical efficiency is associated with greater private sector participation.                                                                                               | Cullinane et al. (2006)            |
|                     |                   |                          | Descriptive                                              | • Port reorganization; new structures of the contemporary seaport industry and characteristics of the port product.  
• Suggesting that modern seaports must provide a greater variety of services to the seaport users than in the past. Critical parameters for the essential restructuring are counted as: introduction of Intra-port competition, development of strategic and regional network, and reconsideration of the role of the port authority. | Chlomoudis et al. (2003)           |
|                     |                   |                          | Luenburger Productivity Indicator                        | • Benchmarking Italian and Portuguese seaports and rationalization of their operational activities.  
• Suggesting that the benchmarking of multi-country seaports gives a different picture than the one obtained by benchmarking the seaports of a single country, reflecting different cultural traditions and managerial practices. | Barros and Peypoch (2007)          |
<table>
<thead>
<tr>
<th>Discipline</th>
<th>Theories</th>
<th>Methods</th>
<th>Analysis Techniques</th>
<th>Focus / Argument</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economics</td>
<td>Economics of Vertical Integration</td>
<td>Survey</td>
<td>Descriptive</td>
<td>• Reviewing the organizational strategies of shipping lines in relation to terminal management, intermodal services and logistics services.</td>
<td>Heaver (2002)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Suggesting a close integration with shipping in the management of dedicated terminals and intermodal services. However, the management of logistics services remains quite distinct from shipping activities.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hirfindahl</td>
<td></td>
<td>• Demonstrating that the assumption that containerization leads to further seaport concentration is no longer valid.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Coefficient / Lorenz Curve</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Economic Geography (NEG)</td>
<td>Case Study</td>
<td>Descriptive</td>
<td></td>
<td>• The New Economic Geography (NEG) is seen as a possible bridge which can explain how seaport activities impact on and are influenced by local and economic growth.</td>
<td>Ducruet et al. (2009)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Suggesting NEG can explain the fading of seaport location spatial fix, as well as the regional variations that leads to port-economic relations. Also highlights the need to understand which seaports may attract which commodity chains and why.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• The process of adaptive capacity building by port authorities in Antwerp and Hamburg is discussed.</td>
<td>Notteboom (2016a)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Suggesting that future of the ports can not be detached from the public broader public policy and stakeholder management concerns as well as the influences of retention mechanisms, power, politics and collective action by the port community.</td>
<td></td>
</tr>
<tr>
<td>Utility Theory</td>
<td>Logit Model</td>
<td></td>
<td></td>
<td>• Focusing on the containerized traffic and how seaports' developers are responding to the increasing trade volumes.</td>
<td>Zondag et al. (2010)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Suggesting a model of seaport competition by following a logistics chain approach, which is designed to calculate the impacts of a wide range of policy measures. The functioning model is demonstrated for the seaports of Rotterdam, Antwerp, Bremen and Hamburg.</td>
<td></td>
</tr>
<tr>
<td>Discipline</td>
<td>Theories</td>
<td>Methods</td>
<td>Analysis Techniques</td>
<td>Focus / Argument</td>
<td>Reference</td>
</tr>
<tr>
<td>-------------------------</td>
<td>---------------------------------------</td>
<td>-----------</td>
<td>---------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-----------------------------</td>
</tr>
</tbody>
</table>
| **Operational Research**| Game Theory                           | Case Study| Stochastic Frontier Analysis (SFA)          | • Understanding how competitor seaports respond to development at a focus port.  
• The framework (based on the investment and competition occurring in Shanghai and Pusan) suggested that the focus seaport would be able to capture or defend market share by building additional capacity. | Anderson et al. (2008)      |
|                         |                                       |           | Linear Modelling                            | • Focus on a landlord port management system with long-term concessions agreements shaping the formal relationships between the Port Authority (PA) and the private Terminal Operators (TOs) (who use the land for terminal activities).  
• Suggesting a framework for competition between multi-user terminals, and by comparing the results (expected payoffs for potential TOs and PAs) of different cases, demonstrating how the shift toward a fully dedicated terminal impacts on intra-port and inter-port competition among the remaining multi-user terminals. | Kaselimi et al. (2011)      |
|                         |                                       |           | Nash Equilibrium                            | • Focus on competition between Busan and Kobe.  
• A non-cooperative game theoretic model was constructed where each seaport selects port charges strategically in the timing of port capacity investment.  
• Focus on strong competition between ports of Hong Kong and Shenzhen  
• By examining the port decision making process, suggestions are made for future strategic actions (including future competition plan) for the two seaports. | Ishii et al. (2013)         |
| **Others**              | Theory of Contestable Markets         | Case Study| Logit Model                                 | • Investigation into factors influencing seaport selection.  
• Based on a case study in US, the research suggests that distance (in either oceanic or inland) makes a seaport less attractive. Sailing frequency and the average size of vessels do not play a significant role in selection of the ports. | Do et al. (2015)            |
|                         | Conceptual                            |           | Multi-Criteria Decision making (MCDM)       | • Dynamics of the European container handling business, as a result of vertical and horizontal integration strategies of container terminal operators.  
• Concluding that competition in seaports in gradually shifting from port authorities to private terminal operators who are building regional terminal networks. | Notteboom (2002)            |
<table>
<thead>
<tr>
<th>Discipline</th>
<th>Theories</th>
<th>Methods</th>
<th>Analysis Techniques</th>
<th>Focus / Argument</th>
<th>Reference</th>
</tr>
</thead>
</table>
| Theory of Contestable Markets | Discrete Choice   | Case Study             | Logit Model                                  | • Focusing on the port choice behavior of shippers, in China.  
• Results indicating that the distance of the shipper from port, distance to destination (in case of exports), distance from origin (in case of imports), port congestion, and a shipping line's fleet size are the selection criteria.  
Also reporting that Chinese shippers prefer Chinese shipping lines. | Tiwari et al. (2003)    |
|                            |                   | Exploratory Factor Analyses |                                             | • Factors affecting shipping companies’ port choice in Intra-Asia service routes.  
• Analysis identified five port choice categories: advancement/convenience of port;  
physical/operational ability of port; operational condition of shipping lines;  
marketability, and port charge.  
A comparison between the main trunk and feeder service providers indicated that the former face more intense competition than the latter. Moreover, the main haul shipping lines are more sensitive to seaport cost factors. | Chang et al. (2008) |
| Others                     |                   | Case Study             | Evaporating Clouds Method                    | • Focusing on spatial development as one of the main ways of gaining competitive advantage in seaports, and proposing a decision framework to determine whether a port development should be at the original site or a new site. (Taiwan case studies)  
• Suggesting core constraints affecting the spatial development in seaports as geographical and economics. Four steps for making decisions in any port spatial development are recommended: port planning, site consideration, analysis and decision-making. | Chan and Yip (2011) |
| Theory of Constraints      |                   | Case Study             | Analytical Hierarchy Process (AHP)           | • Evaluation of quality of services in container terminals in Iran.  
• Four container terminals were ranked based on physical, reliability, responsiveness, assurance and sympathy attributes. | Jafari and Batvandi (2013) |
| Servqual                   |                   | Case Study             | Exploratory Factor Analysis (EFA), Structural Equation Modeling (SEM) | • Identification of the determinants of non-price competition in the port sector in Turkey and evaluate their effect on various aspects of non-price competition.  
• Suggesting five non-price competition strategy implemented by Turkish ports such as customer care, service customization and bundling, service expansion, service diversification and auxiliary service. | Esmer et al. (2016) |
2.3.2 Research into Seaport Competition

The general inference emerging from this body of the research is that production theory has been extensively used to evaluate performance and efficiency in seaports, because seaports are economic units that utilize resources (input) to create services (output) (Roll and Hayuth, 1993). This is reflected from the large number of studies that measure inputs versus outputs, or use cost-benefit analysis and benchmarking to evaluate seaport competitiveness as indication of performance efficiency. Other theories such as Utility (Zondag et al., 2010), Economies of Scale (Notteboom, 1997), and New Economic Geography (Ducruet et al., 2009) have also been employed to investigate how seaports' activities are influenced by the global increase in trade volumes, and growth in their local economies. Seaport competition in both inter-port and intra-port levels is also examined through game theory to suggest strategies to cope with competition, such as building additional capacity in seaports (Anderson et al., 2008), shifting to dedicated terminals (Kaselimi et al., 2011), and strategic pricing of port charges (Ishii et al., 2013).

Some other theories, which have not been commonly used in seaport competition studies, include the theory of contestable markets and the theory of constraints. An example of the application of the former is Notteboom’s (2002) study of integration strategies of container terminal operators, which found that the nature of seaport competition has moved from port authorities to private terminal operators (Notteboom, 2002). A case in point of the latter is (Chan and Yip, 2011) study of how seaports dealt with increasing demand and competed with adjacent ports and found support for diversified development over concentrated development in seaports.

Despite the diverse range of approaches and methodologies adopted in studies of seaport competition, Notteboom et al. (2013b) argued that the general theme of seaport competitiveness research can be categorized into five distinct streams, as follows:

Research Stream 1: Performance of Seaports and Terminals

The first Research Stream focuses on evaluating seaport competitiveness based on a comparative analysis of the performance of seaports and terminals. The methodology most widely used in this stream is Data Envelopment Analysis (DEA), an analytical tool measuring efficiency of multiple decision-making units (DMUs) where the production process presents
a structure of multiple inputs to multiple outputs (Zhu, 2003). Under DEA, “efficiency” is represented in a variety of measures, depending on the specific set of DMUs and associated performance measures used. For instance, if the performance measures are inputs and outputs of a production process, then DEA efficiency is “production efficiency”; or if performance measures are quality indicators, then DEA efficiency would be a quality measure composite (Zhu, 2003). Referred to as “balanced benchmarking” by Sherman and Zhu (2012), DEA appears to be one the most popular approaches for efficiency ranking in seaports, evaluation of performance in seaports, and benchmarking. Comparison of seaport performance (Roll and Hayuth, 1993), evaluating the technical efficiency of container ports (Cullinane et al., 2006), benchmarking container terminals (De Koster et al., 2009), and evaluating efficiency of container ports (De Oliveira and Cariou, 2015) are examples of studies conducted in this stream.

Research Stream 2: Embeddedness of Seaports in Supply Chains

In Research Stream 2, studies moved beyond assessment of seaports in isolation to viewing seaport competitiveness from a supply chain management perspective. This stream has become popular since the late 1990s and is based on a new business environment following trade globalization (Juhel, 2001), and observing seaports as nodes of global value chains (Robinson, 2002). Consequently, studies in this stream tend to focus on the dynamics of seaport connectivity and inter-port relationships in supply chains, rather than evaluating seaports merely as places with particular functions. Examples of studies in this category include viewing seaports as elements of value-driven chain systems (Robinson, 2002); seaport performance from a supply chain management perspective (Bichou and Gray, 2004); the impact of hinterland access conditions on competition between seaports (Zhang, 2008); transformation of seaports into global supply chain management centers (Wang and Cheng, 2010); and seaport connectivity in supply chain systems (Lam and Yap, 2011).

Research Stream 3: Seaport Policies

In Research Stream 3, the role of the public authorities in seaport management and policy formulation in relation to seaport competition is evaluated. This stream examines how various levels of seaport authorities, in terms of segregation of ownership and management, led to the development of policies in a diverse manner and improved port competitiveness. This stream includes: role of authorities in seaport management and administration (Verhoeff,
1981); implications of seaport competition for port policy and management (Heaver, 1995); relationship between seaport governance structure and performance (De Langen and Heij, 2014); and decisions on pricing of the port services (Haralambides, 2002), lease agreements and concessions (De Langen et al., 2012), as well as adopting security policy (Yeo et al., 2013).

Research Stream 4: Cooperation between Seaports

Research Stream 4 explores coopetition, a combination of competition and co-operation, among seaports. This approach emerged with the internationalization of seaport users (shipping lines and terminal operators) and services required that would fit into the users’ global strategies. Traditionally, seaports have a deeply-rooted culture of competition with adjacent ports. However, in order to satisfy the user requirements, seaports were obliged to reconsider their spatial scope and, engage in cooperative practices with other seaports. Cooperation between seaports is developed in the form of joint investments, joint acquisitions and holdings, and participation in networks with ports other than neighboring ports. Parola et al. (2017) noted cooperation among neighboring ports as a prime way of enhancing their competitiveness, by means of:

“rationalisation of port spaces and available transport infrastructures, building of new infrastructures, pooling financial resources, creation of a “lobby” for getting State funds, port promotion through joint-marketing and communication activities, realisation of market studies and common projects on environmental protection, ICT services, research and development (R&D) and safety/security issues” (p.130).

Regional container coopetition and co-operation (Song, 2002); (Song, 2003); (Shinohara and Saika, 2018), and cross-border port cooperation (De Langen et al., 2009) are examples of case studies of coopetition between seaports.

Research Stream 5: Seaport Selection

Research Stream 5 comprises studies that developed models of seaport selection validated by seaport users, which are predominantly shipping lines. From the user perspective, seaport selection criteria mostly contained factors like physical and geographical location (availability of hinterland and immediacy of consumers) (Lirn et al., 2003, Lirn et al., 2004, Chang et al., 2008), terminal cost (Slack, 1985, Lirn et al., 2003, Lirn et al., 2004, Chang et al., 2008), physical infrastructure (Lirn et al., 2003, Chang et al., 2008), as well as port
management and administration (Lirn et al., 2003, Lirn et al., 2004). However, when it comes to selecting a port or terminal, shipping lines have different preferences. The general factors influencing seaport selection (Malchow and Kanafani, 2001) and selection of seaports and terminals by deep-sea container operators (Wiegmans et al., 2008) and transshipment containers (Lirn et al., 2004) are among the major studies in this research stream.

Section 2.1 shows that global seaports have been relentlessly investing in physical resources to accommodate the changing needs of the shipping industry and evolving requirements of maritime operations since containerization. Section 2.2 has also revealed that the fundamental factors determining seaport competitiveness in the last five decades have largely been resource-based in characteristics, despite the industry-wide changes over the period. Yet, the five major streams of research on seaport competition do not seem to have examined seaport competitiveness from the resource-based view. Though Streams 2 to 4 do appear to have a resource dimension, their focus have not been directed to exploring the role of resource-based strategies in achieving seaport competitiveness.

In their summation, Notteboom et al. (2013b) highlighted three outstanding issues relating to research on seaport competition and seaport competitiveness. The first is to diversify the research focus on port competition beyond container cargoes to include such segments as cruise, warehousing and advanced producer services. The second is to have more detailed analysis on reasons of port switching to include supply chain redesign, hinterland mode transfer, and carrier strategies. The third is to direct more attention to “hidden” sources of port competitiveness to examine other relevant factors, such as differences in bunker costs and efficiency, rather than taking the easy route of adopting a ‘generalized port costs’ approach.

Robinson (2005) reasoned that strategy is an organization’s response to external conditions by its unique blend of resources and capabilities. Implicit in the three research issues outlined by Notteboom et al. (2013b) are strategies and policies adopted by seaport authorities relating to deployment and management of seaport resources in response to external environmental conditions. Making provision to accommodate cruise, warehousing and advanced producer services would be a resource-based strategy to expand the use of seaport infrastructure. Likewise, redesigning seaport facilities and offering ancillary services (e.g., advanced logistics solutions) to insert seaport into the global supply chains of major products or multinational enterprises would also be a resource-based strategy to strengthen the
attraction of the seaport. Lastly, using differences in bunker costs to create a competitive advantage, such as the case of Singapore versus other seaports in the region (Lam et al., 2011) could also be considered a resource-based approach, as it exhibits an exceptional resource organization capability to create a hidden source of competitiveness for Singapore.

Within the maritime industry, a few studies have applied resources and capabilities theories to examine seaport strategies (Panayides and Gray, 1999; Wang et al., 2017), explore seaport competitiveness (Haezendonck, 2001; Gordon et al., 2005; Azevedo and Ferreira, 2008) and evaluate seaport performance (Da Cruz et al., 2013). In general, these studies suggest that unique combination of seaport resources, both tangible and intangible, are among the key factors contributing to bolstering the competitive strength of seaports (Da Cruz et al., 2013). These studies view resources as factors necessary to performing both seaport and value-added logistical activities and play an important role as they can promote development of inter-organizational relationships among various players in the supply chain network (De Martino and Morvillo, 2008). A fuller discussion of these studies will be presented in Section 2.4.2.

2.4 Seaport Competitiveness: A Resource-Based Perspective

2.4.1 Resources, Capabilities, Environmental Contingencies and Firm Performance

In mainstream management literature, RBV of the firm (Barney, 1991) and DC (Eisenhardt and Martin, 2000) are two of the popular theories that explain how firms exploit resources to develop capabilities, competencies and, ultimately, competitive advantage (Javidan, 1998).

RBV as a basis for explaining how firms gain competitive advantage is founded on the application of a bundle of strategic resources at the firm’s disposal (Rumelt, 1984, Wernerfelt, 1984). This foundation is built on the premise of Ricardo’s (1817) resource-picking mechanism of economic rent creation (Makadok, 2001, Sirmon et al., 2007). The Richardian logic (Ricardo, 1817) contends that differences between firms’ performance are attributable to their ownership of resources of dissimilar productivity (Makadok, 2001), as illustrated by his illustrious farmland example which shows that owners of scarce resources with higher production levels generate abnormal profits.
Drawing on the Richardian logic (1817), Barney (1991) argued that strategic resources should be valuable, rare, imperfectly mobile, and non-substitutable (VRIN). The premise is that VRIN resources are a source of competitive advantage and provide the basis for value creation (Sirmon et al., 2007). However, ownership of, or access to, VRIN resources does not guarantee the generation of competitive advantages (Barney and Arikan, 2001, Priem and Butler, 2001, Sirmon et al., 2007). Several researchers (e.g., Priem and Butler, 2001; Sirmon et al. 2007) have further lamented that information is scanty on how resources are employed to create a competitive advantage to the extent that some RBV research assumes that the actions needed to exploit resources are self-evident when they are not (Barney and Arikan, 2001, Sirmon et al., 2007). In this regard, Barney and Hesterly (2010) emphasized the importance of organization, i.e., a firm’s policies and procedures that support the organization of the resources for exploitation, arguing that without organization, even firms with valuable, rare and costly-to-imitate resources can endure competitive disadvantage. Indeed, it is not uncommon for valuable resources to have competitive disadvantages co-existing with competitive advantages (Powell, 2001, Bowman and Ambrosini, 2007). Presence of competitive disadvantages does not necessarily imply the non-existence of VRIN resources (Powell, 2001). Competitive disadvantages are weaknesses and inadequacies that could dampen the benefits of VRIN resources (Arend, 2004), unless competitors also experience similar weaknesses and inadequacies (West and DeCastro, 2001).

Further, even if the co-existence of competitive disadvantages does not erode the competitive advantages of VRIN resources, there is no guarantee that possession of VRIN resources would result in superior performance (Andersén, 2011). For VRIN resources to generate superior performance, Andersén (2011) argued that they have to fulfill five additional criteria:

1. Fit with resources: This criterion warrants that the acquired strategic resource fits into the overall existing resource configuration of the firm. It argues that resources interact with one another in a complex manner: a potentially strategic resource might reduce the value of other existing resources within the firm.

2. Management capability: This criterion requires that the firm possesses the managerial ability to make use of the acquired strategic resource. Its rationale is that the way a strategic resource is utilized could affect performance more so than possessing the resource could.
3. Marketing capability: This criterion highlights the importance of having the necessary (product) market experience and skills to position the products. In other words, inferior marketing capabilities may nullify the strategic value of a high-value product, if the firm fails to deploy the product in a suitable product market.

4. Firm appropriation of rent: This criterion warns that certain stakeholders appropriating the rent, i.e., profits that exceeds the average return of the industry, may not be reflected in the financial performance of the company. This could lead to a distortion in terms of assessing the relationship between strategic resources and firm performance.

5. Non-competitive disadvantages: This criterion cautions that strategic resources have both competitive advantages as well as non-competitive disadvantages, a feature that has been noted by other scholars discussed above (e.g., Powell, 2001; West and DeCastro, 2001; Arend, 2004; Bowman and Ambrosini, 2007). The important point, therefore, is to be able to develop resources that generate competitive advantages without them also resulting in competitive disadvantages.

While Andersén’s (2011) five criteria clearly point to the need to have in place a unique blend of resource management capabilities, i.e., capabilities that could utilize resources in a strategic manner to create fit among them, to market the firm’s products and/or services, to appropriate rent and to minimize the counteracting effects of competitive disadvantages, Andersén (2011) stopped short of describing how firms could use their VRIN resources to produce superior performance. The processes by which firms organize, combine, deploy and leverage those resources to produce superior performance or gain competitive advantage remain poorly understood. This, unfortunately, has been the case with most research on RBV (Priem and Butler, 2001, Sirmon et al., 2007). The “black box”, as Sirmon et al. (2007) called it, housing the processes by which VRIN resources are developed, organized, combined, deployed and managed to create value, produce competitive advantage, and superior performance, has not been adequately studied.

Grant (1996) argued that a sustainable competitive advantage can be generated by resources and the managerial capabilities that integrate the resources. Javidan (1998) has also demonstrated that competitive advantage evolved from a firm's resources over four levels: 1) conversion of resources into capabilities; 2) routinization of capabilities into competencies; 3) alternations of competencies into core competencies, and 4) transformation of core
competencies into competitive advantage. Zott (2003) further pointed out that differences in resource management process between organizations can result in disparate outcomes even among organizations holding similar resources and operating in comparable environmental contexts. These arguments echo Penrose’s (1950) view that the manner in which a resource is used is just as important as possessing or owning it. As Sirmon et al. (2007) reasoned: “heterogeneity in firm outcomes under similar initial conditions may result from choices made in the structuring, bundling, and leveraging of resources” (p.275).

Integrating the RBV with contingency theory and organizational learning theory, Sirmon et al. (2007) developed a theoretical resource management process model to show how value could be created from resources by situating resource management within the environmental context. Sirmon et al’s (2007) resource managing process model views resource management as comprising three sequentially linked components: structuring, bundling and leveraging.

- **Structuring** involves managing the firm's resource portfolio, which includes purchasing resources from strategic factor markets (acquiring), developing resources internally (accumulating) and shedding firm-controlled resources with considerable counterracting competitive disadvantage (divesting) (Sirmon et al., 2007).

- **Bundling** involves combining firm resources to construct new or alter existing capabilities. It consists of making minor incremental improvements to existing capabilities (stabilizing), extending current capabilities beyond keeping skills up-to-date (enriching); and creating new capabilities with which to address the firm's competitive context (pioneering) (Sirmon et al., 2007).

- **Leveraging** refers to the application of a firm's capabilities to create value for customers and wealth for owners. This component comprises the process of identifying the capabilities needed to support capability configurations necessary to exploit opportunities in the market (mobilizing); the process of integrating identified capabilities into effective yet efficient capability configurations (coordinating); and the process of physically using capability configurations to support a chosen leveraging strategy, which includes the resource advantage strategy, market opportunity strategy, or entrepreneurial strategy (deploying) (Sirmon et al., 2007).

Central to Sirmon et al.’s (2007) theoretical resource management process model is a temporal dimension, which suggests the three main components of resource management
process partially sequential in nature: firms must have resources to bundle into capabilities and resource leveraging can occur only when capabilities exist. With the incorporation of feedback loops, the model treats resource management as a dynamic process “*with change resulting from adapting to environmental contingencies and from exploiting opportunities created by those contingencies*” (p.275).

The conceptual foundation of Sirmon et al.’s (2007) model was the integration of RBV with contingency theory and organization learning theory. Contingency theory posits that an organizational system must fit the environmental context in which it operates in order to be efficient (Hamann, 2017). The argument is that different market conditions impose different requirements and, hence, value impact on capabilities (Penrose, 1959, Meyer et al., 1993, Levinthal, 2000). The operating environment, therefore, is important in determining how a firm should invest its resources and build its capabilities (Ruekert et al., 1985, Song et al., 2005).

According to Donaldson (2001), three core paradigms undergird the contingency approach: 1) the contingency factor and the organizational system are associated; 2) a change in the contingency factor would effect a change in the organizational system; and 3) a fit between the contingency factor and the organizational system positively affects the performance of the organization. Within the premise of contingency theory, organization design is thus a constrained optimization problem (Van de Ven et al., 2013), involving “*maximizing performance outcomes by minimizing the misfit between diverse environmental demands and internal organizational arrangements*” (Van de Ven et al., 2013, p.402). Contingency scholars (Perrow, 1967, Morgan, 1986, Scott, 2003, Fredericks, 2005) therefore, contend that development of contingent strategies, structures and resources that match environmental exigencies will result in higher firm performance since they are driven by firm-specific requirements. As no single best-resource mix exists, firms that manage to adapt to environmental preferences and align their resources accordingly have a higher chance of survival. In sum, an organizational system that fits well with its environmental context is thus expected to outperform other systems that are in misfit (Drazin and Van de Ven, 1985).

Through a systematic literature review of contingency theory, Hamann (2017) found that three different conceptual approaches to fit have been employed in empirical contingency studies: selection fit, interaction fit, and systems fit (e.g., Donaldson, 2001; Drazin and Van de Ven, 1985; Gerdin and Greve, 2004). Selection fit analyses fit as a congruence
relationship between context and structure and process (Drazin and Van de Ven, 1985) and addresses only the first core paradigm, i.e., contingency factor and the organizational system are associated (Hamann, 2017). Interaction fit views fit as conformance to a linear relationship of context and design. Deviation from this relationship will end in low performance (Drazin and Van de Ven, 1985). This view addresses the first and third core paradigms, i.e., the contingency factor and the organizational system are associated; and a fit between the contingency factor and the organizational system positively affects the performance of the organization. System fit overcomes the limitations of the other two conceptual approaches to fit (Hamann, 2017), treating fit as the internal consistency of multiple contingencies and multiple organizational characteristics that leads to improved performance (Drazin and Van de Ven, 1985). However, longitudinal data is needed to assess how a change in the contingency factor would lead to a change in the organizational system using the concept of systems fit (Dyson and Foster, 1982, Pennings, 1998, Hamann, 2017).

In dynamic environments, “fit” between context and structure in the contingency perspective is a process of adaptation. Organizational learning is an important aspect of fit through adaptation (Luo and Peng, 1999) and would become “even more critical in less munificent environments, where resource scarcity may prolong the effects of poor resource management” (Sirmon et al., 2007, p.275).

Miller (1996) defined organizational learning as the "acquisition of new knowledge by actors who are able and willing to apply that knowledge in making decisions or influencing others in the organization" (p.486). Organizational learning thus provides firms with a potential capacity to adapt and adjust to create and maintain value through constant interactions with the operating environment to find a suitable system to fit its contingencies (Lei et al., 1996). This ability to learn to adapt is, in essence, the core of dynamic capabilities, which have been described as “the capacities to change the operational capabilities to make these fit a changing environment and/or proactively affect the environment” (Vahlne and Jonsson, 2017, p.62).

Dynamic capabilities, in fact, have been defined in multiple ways. In a bibliometric analysis of the literature on dynamic capabilities, Alabort-Morant et al. (2017) singled out Teece et al. (1997b) definition as most influential: “the firm’s ability in building, integrating and reconfiguring internal and external competencies to address rapidly changing environments” (p. 516). Hodgson (2008), however, suggested that both resources and capabilities should be
conceived as capacities that enable a firm’s actions. Helfat et al. (2007), on the other hand, considered dynamic capabilities as a “capacity of an organization to purposefully create, extend or modify its resource base” (p.1). In addition, dynamic capabilities have also been described as organizational processes (skills, expertise, know-how, management) used by firms to explore their resources to obtain competitive advantage in changing environments (Cardeal and Antonio, 2012). On this note, dynamic capabilities can be disaggregated into three sub-processes: ‘sensing’ opportunities and threats, ‘seizing’ (or neutralizing) opportunities and threats via expedient investments to create new resources, and ‘transforming’ (or reconfiguring) existing core resources and capabilities in response to environmental contingencies (Teece, 2007, Weerawardena and Mavondo, 2011, Teece, 2009, Helfat and Martin, 2015, Helfat and Peteraf, 2015, Matysiak et al., 2017).

Teece (2007) summarized the concept of dynamic capability into “corporate agility” that could be achieved through creating capacity, seizing opportunities, and maintaining competitiveness by enhancing and reconfiguring assets. The basic dynamic capabilities, which are known as necessities of overcoming new challenges, are:

- Capability of building strategic assets, transforming existing assets (Amit and Schoemaker, 1993) and asset orchestration (Hitt, 2014). Asset orchestration refers to identification, selection and configuration of resources, and utilizing them in the most productive ways (Hitt, 2014).

- Capability of building assets in a unique combination, in which the tangible and intangible assets complement one another and provide a synergy. Assets are more valuable in combination than in isolation, giving a firm a more sustainable competitive advantage (Teece, 2009). Combining different assets by forming alliances (Eisenhardt and Martin, 2000) and acquisitions (Karim and Mitchell, 2000, Danneels, 2002) are identified as other forms of dynamic capability. Karim and Mitchell (2000) defined acquisitions activity as a mechanism by which firms change their mix of existing resources, by extending into areas that require substantially different resources.

- Capability of learning new patterns of activity or “routines” (Zollo and Winter, 1999). Teece (2007) described routines as patterns of interactions that represent successful
solutions to particular problems, and suggested collaborations and partnerships (i.e. mergers and acquisitions) as sources of new organizational learning.

Wang and Ahmed (2007) also identified three important components of dynamic capabilities in a firm: i) adaptive capability (the capability to align internal organizational features with external environmental dynamics); ii) absorptive capability (the capability to absorb external knowledge and combine it with internal knowledge), and iii) innovative capability (the capability to link internal resources and capabilities with the product market).

Eisenhardt and Martin (2000) argued that dynamic capabilities are necessary but not (by themselves) sufficient conditions for competitive advantage. This is because the functionality of dynamic capabilities can be duplicated across firms: competitive advantage is created from resource configurations, not from capabilities (Eisenhardt and Martin, 2000). Jurksiene and Pundziene (2016), in their conceptual study of the relationship between dynamic capabilities and competitive advantages, also found that the majority of research studies reviewed do not suggest that dynamic capabilities have a direct impact on competitive advantage. Typically, this relationship is mediated by variables that indicate resource restructuring or reconfiguration, such as new resource combinations (Teece, 2007, Weerawardena and Mavondo, 2011) or replacement of existing resources (Teece et al., 1997a, Helfat, 1997, Eisenhardt and Martin, 2000).

In recent years, empirical studies on dynamic capabilities have discovered that dynamic capabilities have more complex performance outcomes than previously assumed. For instance, Schilke (2014), in a study of alliance management capability and new product development capability, found that these two dynamic capabilities are more strongly associated with competitive advantage in moderately dynamic, than in stable or highly dynamic, environments. Likewise, Girod and Whittington (2017), in their comparative analysis of the performance effects of two forms of reorganization - organizational restructuring and organizational reconfiguration, found that, in general, restructurings tend to be associated with positive outcomes, while reconfigurations are linked to negative outcomes. However, in dynamic environments, Girod and Whittington (2017) noted that the performance outcomes reverse the general case: reconfiguration outcomes become positive, while restructuring outcomes change to negative. Both Schilke’s (2014) and Girod and Whittington’s (2017) findings imply that dynamic capabilities are environment-specific (Arend and Bromiley, 2009). Applying the right dynamic capability to the right
environmental context is thus critical. In short, by their inherent adaptive, absorptive and innovative nature (Wang and Ahmed, 2007), dynamic capabilities should be evolving, or even destroyed, to serve the purpose of sustaining competitive advantage. This argument suggests that contingency theory (Drazin and Van de Ven, 1985, Donaldson, 2001), which posits that there is no one best approach to manage an organization, depending upon the way internal organizational needs are balanced against evolving external environmental circumstances, is an appropriate theory to provide a conceptual base for this research jointly with RBV and dynamic capability theories.

2.4.2 Resource-Based Studies of Seaport Competitiveness

The earliest application of RBV in port studies was by Coeck et al. (1996). Introducing a resource-based conceptual framework, they focused on strategic planning procedures for port authorities. In a study by Panayides and Gray (1999) on relational competitive advantage in shipping industry, it was argued that establishing and maintaining relationships are considered an intangible resource, which can be utilized by maritime organizations to achieve competitiveness. Later, Haezendonck et al. (2001) utilized the RBV approach to identify the key sources of competitive advantage in the Port of Antwerp. From the results of a factor analysis, Haezendonck et al. (2001) concluded that a bundle of critical resources formed a set of competencies. Superstructure, infrastructure and internal competition, as well as internal and external co-operation between the port operators and service providers, were highlighted as the main attributes of competitiveness in Antwerp.

Gordon et al. (2005) also used the RBV framework to examine resources that contributed to competitive strength of the Port of Singapore. They argued that a combination of resources such as ample investment, supportive government policies, a well-designed information technology system and operation, along with a good location, contributed to the success of the Port of Singapore. Gordon et al. (2005) concluded that these resources not only have a direct impact on the competitiveness of that port but also indirectly compensated for some of its natural disadvantages. A successful application of information technology systems in increasing the island’s capacity for handling shipments, and overcoming the limitations of land area, is an example.

The RBV framework was also used by Azevedo and Ferreira (2008) to analyze the competitive advantages of a main seaport in Portugal (Port of Sines). The resources examined
were infrastructures, maritime accessibility, operations, and information systems. Azevedo and Ferreira (2008) found that those four resources were key contributors to the Port of Sines’ success and its international competitiveness.

Using RBV and applying the linear additive multi-criteria analysis (MCA), Da Cruz et al. (2013b) studied the relationship of logistics resources within the framework of the overall performance of 16 seaport container terminals in the Iberian Peninsula (Spain and Portugal). Da Cruz et al. (2013b) focused on two performance indicators: operational performance and physical capacity. The results of the analysis revealed that physical capacity contributed to over 51% to overall performance of the terminals.

Cho and Kim (2015) also used RBV as a theoretical framework to analyze competitiveness of container ports in 10 countries (seven Asian, two European, and one North American) with the highest volume of container traffic. Through an evaluation of qualities of port infrastructure in the selected countries, Cho and Kim (2015) concluded that infrastructure quality of container ports is positively associated with the seaports’ competitiveness.

In a more recent study, Wong et al. (2017) explored the explanatory force of RBV on seaport business operation in Hong Kong International Terminals (HIT). By examining the development of HIT, they revealed that the way the terminal operator has built a competitive advantage over two decades has changed. In a process of expansion, HIT built more resource bundles (i.e. value-added services and flexibility) for the generation of new competitive advantages.

The above studies suggest that maritime scholars have recognized the vital link between VRIN resources and competitive advantage generation in seaport operations. Though RBV has been used as a theoretical lens to examine the contributory role of resources, the manner in which resources, both tangible and intangible, were strategically planned, developed, bundled, deployed and reconfigured in response to environmental changes has not been fully examined. This study will extend the resource-based line of enquiry by combining four major management theories – RBV, Organization Learning, Contingency and Dynamic Capabilities theories – to examine the resource development and management paths of three global seaports to answer the primary research question: How do global container seaports manage their resource base to achieve competitiveness?
This chapter outlines the research methodology adopted to study how the three case seaports systematically planned, organized and managed their resources, both tangible and intangible, to maintain and gain competitive strength across five decades. The chapter comprises three main sections. First, the methods used in this research, including the justifications for adopting the case study approach are described. Second, data sources, including interviews and onsite observations, and archival materials, are detailed. Finally, the chapter describes the methods of data analysis, covering within-case and cross-case analysis.

3.1 Research Design

Understanding the dynamic complexity determining seaport competiveness is not limited to identification of the factors contributing to seaport success. Such an understanding requires an in-depth evaluation of the growth and developmental path that a seaport has traversed, and involves a significant historical component where current changes are viewed against previous practices. Guided by the tenets of RBV (Barney, 1991, Makadok, 2001, Barney and Hesterly, 2010), dynamic capability (Teece et al., 1997a, Helfat and Peteraf, 2003, Cardeal and Antonio, 2012) and contingency theories (Donaldson, 1999, Scott, 2003, Fredericks, 2005), this research examined the historical development of three global seaports, focusing on identifying the strategic action programs they undertook to build competitive capabilities through investment and exploitation of resources, both tangible and intangible. The objective is to understand how global seaports built their dynamic maritime capabilities to compete from the resource-based perspective.

Studying historical development of global seaports to detect regularities and patterns of strategies deployed, to draw general conclusions for building theories, is suggestive of following an inductive logic (Locke, 2007). It has been suggested by scholars (e.g.,
Danermark et al., 2001; Kovács and Spens, 2005) that inductive logic follows the pattern of case-result-rule. In a manner, inductive logic is to reason through a particular case (or a number of cases) that would lead to developing propositions and generalization in a theoretical framework (Kovács and Spens, 2005). Hence the process of building theory through observation of historical developments (facts) using an inductive logic (Danermark et al., 2001, Taylor et al., 2002, Alvesson and Sköldberg, 2009) is considered an appropriate approach for this study. Inductive reasoning is associated with the use of qualitative research methods (Hussey and Hussey, 1997, Locke, 2001), and is frequently operationalized as case studies (Eisenhardt, 1989, Yin, 2009). The value of the case study approach lies in its ability to construct theory from the rich stories generated by the case(s) (e.g., phenomena, organizations) studied (Hoskisson et al., 1999) using replication logic (Eisenhardt, 1989). This study thus adopted the multiple case study approach to examine how global seaports developed their competitive strength from the perspective of resource picking, building, deployment and utilization.

3.1.1 Case Study

The nature of the case study approach has been interpreted in many ways, though three distinct characteristics can be defined for it. One group of scholars, such as Stake (1995) and Schön (1985), observe that case study is not so much a choice of methodology but a choice of object to be studied. This group advocates that case study research should be conducted for analyzing any bounded social system (e.g., organization), as the method is reflective and interpretive. Another group of researchers, such as Yin (2009) and (Gerring, 2006), argue that case study research is a distinct method for social research and the object of analysis. The third group of scholars argue that case studies represent a frame (e.g., time, geography, and structure) in which social research can be conducted (Bromley, 1991, Stoecker, 1991). Despite the highlighted differences, the three approaches share a number of common elements that support the appropriateness of case study method for this research.

1. Uniqueness: The observation of Stake (1995) on selecting the case study approach as a choice of object to be studied, rather than a methodology, is essentially a recognition that case studies are normally dictated by the choice of phenomena to be studied. A phenomenon is an unusual event, one that has little precedence and is highly unlikely, or improbable, to be repeated in the same manner in a different place and time. When a researcher studies an unusual event, other methodologies, such as surveys or
experiments, will not be sufficient, as those methods are designed to isolate common characteristics of the phenomena through a comparative analysis (Rowley, 2002). Obviously, comparisons cannot be made when a phenomenon is an unlikely event, and improbable to repeat.

As pointed out in Chapter 2, current knowledge on the resource building and capability development paths of global seaports is limited. Exploring this phenomenon requires a systematic investigation on the historical growth and development of global seaports, where all the potentially important variables were unknown beforehand, to addressing a broad range of complex issues (Swanson and Holton, 2005). This calls for a case study approach to generate rich data for analysis.

2. Research Questions: The methodology of using cases to build theory typically answers research questions that addresses “how” and “why” in unexplored or less trampled research areas (Edmondson and McManus, 2007), in contrast with questions about the relative empirical importance of constructs, such as “how many” and “how often” (Helfat, 2007). The main research question of this study is to understand “how” global seaports achieve competitiveness through resource building and exploitation, which requires using a variety of evidences, such as documents, artifacts and observations, to build a coherent rich story (Eisenhardt, 1989). This again suggests that the case study research method is most suited for the purpose of this study (Yin, 2009).

3. Importance of Holistic Analysis: According to Yin (2009) and Andrade (2009) the case study method allows researchers to gain a holistic and purposeful characteristics of real-life events. Other scholars (Benbasat et al., 1987, Eisenhardt, 1989, Creswell, 2012) also elaborated on the advantages of case study research conducted in a natural setting with the intention of realizing the nature of current processes in a previously little-studied area. In this study, the unit of analysis, the seaport, is a complex entity with a diverse range of stakeholders, market regulators and state officials. The case study research allows these complexities to be unravelled in a comprehensive manner.

4. Flexibility: Case study research offers flexibility in designing research strategies and data collection methods, which may be modified to suit the circumstances as they arise (Stake, 1995, Eisenhardt, 1989, Van Maanen, 1988, Yin, 2009). The data for the current study rely on sieving through a wide range of historical records, archival
reports and published documents, in addition to semi-structured interviews and on-site visits. The uncertainties surrounding the availability of, and access to, historical records and schedule of long interviews require a flexible data collection method, which can be adjusted to suit the situation as it arises. The case study approach offers a research design that could be modified as the research proceeds (Yin, 1981).

5. Theory building: Case studies has become a common research methodology for building theories in many disciplines and across a diverse range of topics, such as organization strategies (Mintzberg and Waters, 1982), internal organization (Galunic and Eisenhardt, 2001), group processes (Edmondson et al., 2001), institutional change (Greenwood and Suddaby, 2006), logistics studies (Dowlatshahi, 2010) and seaport studies (Becker and Caldwell, 2015, Wong et al., 2017). An advantage of using case study research for theory building, as explained by Swanson and Holton (2005), is that it does not rely on previous empirical evidence.

Eisenhardt (1989) describes developing theories from case studies as a research strategy involving one or more cases to create theoretical constructs, propositions and/or a midrange theory from case-based empirical evidence. Ellram (1996) argued that the rich information gathered through case studies can reveal best practices and provide indicative evidence for theory building. Whether from historical accounts or contemporary events, cases provide a robust basis to develop theory inductively (Eisenhardt and Graebner, 2007).

In the context of logistics research, a number of logistics scholars (Mentzer and Kahn, 1995, Garver and Mentzer, 1999, Stentoft Arlbjørn and Halldorsson, 2002, Näslund, 2002, Kovács and Spens, 2007) have observed the dominance of deductive research in logistics, and called for the need for more inductive research for theory development. Acknowledging the need of using both quantitative and qualitative methods for developing advance logistics studies, Näslund (2002) recommended the case study methodology as a suitable approach for logistics research due to the applied nature of logistics investigations, that require holistic, systemic thinking, and utilizing multi-disciplinary and cross-functional perspectives. Näslund (2002) contention was echoed by Kotzab et al. (2006), who highlighted the necessity of qualitative research methods for expanding the body of knowledge in logistics and supply chain discipline.
This study intends to build a theory of competitive global seaports based on resource development and management. The inductive case study approach is thus considered most suitable.

3.1.2 Multiple Case Study

Single-case studies are known to provide a rich description of a phenomenon (Siggelkow, 2007). To obtain a stronger base to build theories, Eisenhardt and Graebner (2007) argued that a broader exploration is required, for which multiple cases can better facilitate than single cases. Each case in a multiple case study individually would enhance the analytical power of the research (Eisenhardt and Graebner, 2007), and could offer several complementary aspects of a phenomenon (Eisenhardt, 1991). In a multiple case study, each case serves as a standalone analytical unit (Eisenhardt and Graebner, 2007) and can be considered a self-contained experiment (Ellram, 1996), offering a basis for logic replication, which sits at the core of building theory (Eisenhardt, 1989). The quality of a theoretical framework developed from a multiple case study could be significantly enriched by the analytic power of a small number of rich cases (Eisenhardt and Graebner, 2007).

Yin (2009) describes multiple cases as discrete experiments, comparable to a series of related laboratory experiments (Eisenhardt and Graebner, 2007), which serve as replications, contrasts and extensions to emerging theory (Yin, 2009). However, laboratory experiments segregate the phenomena from their context, whereas case studies highlight the real-world context in which phenomena occur (Eisenhardt and Graebner, 2007). A theory developed from multiple case studies is deeply grounded, testable, and likely to be valid empirically (Eisenhardt, 1989).

In this research, the multiple case study method was carried out over three main stages, as illustrated in Figure 3.1. The first stage was developing a conceptual base to identify which seaports will be included in the study, and designing the data collection protocol. The second stage was to collect data through multiple data sources to construct the developmental path of each seaport individually. The final stage was conducting the cross-case comparison to identify unique and common resource-based strategies adopted by the cases, leading to the development of working propositions for theory building.
3.1.3 Case Selection

Three main factors were considered when selecting suitable case seaports for this study: sampling plan, number of cases and case study boundaries.

a) Sampling Plan: In selecting cases for studies, Lee (2006) and Eisenhardt and Graebner (2007) recommended that researchers should deliberately aim for a theoretical sampling plan. In contrast with hypothesis testing studies that mostly rely on random sampling, the goal of theoretical sampling is to choose cases that are likely to replicate or extend emergent theories (Eisenhardt, 1989). For case study selection, Lee (2006) stressed that cases should be chosen either to produce similar results as a literal replication, or to construct contrasting results as a theoretical replication.

b) Number of Cases: On the number of cases to be selected, Eisenhardt (1989) suggested between four and 10, though no number can be considered as ideal due to various limitations, such as resource availability and time constraints. Eisenhardt (1989) argued that four cases would provide a convincing empirical ground for theory building. On the other hand, dealing with more than 10 cases would be problematic and complex in terms of reaching a concrete conclusion due to the large volume of data involved (Eisenhardt, 1989).
Given the limit on the number of cases to be used in case study research, Pettigrew (1990) suggested selecting cases as extreme situations and polar types in which the subject of interest is “transparently observable” (Pettigrew, 1990, p.275). Selecting cases that demonstrate high and low level of performance is an example of polar types on a study of relative firm performance (Pettigrew, 1990).

c) Case Study Boundaries: Placing boundaries are suggested by Stake (1995) and Yin (2009) to border objectives for case studies. Baxter and Jack (2008) stated that binding the case study will ensure that study remains reasonable in scope. For binding the case study different methods have been suggested, including: i) by definition and context (Miles and Huberman, 2002), ii) by time and activity (Stake, 1995), and iii) by time and place (Creswell, 2013). To select appropriate candidates for case studies, a specific time frame and geographical location were considered in this study.

- **Time:** the time frame for this study spans from late 1960s to the present, dating back to the period that containerization began to develop widely and at a global scale. Guerrero and Rodrigue (2014) identified five major waves of containerization, as the spatial and functional diffusion of the container. Each wave illustrated the periodic development of container port system in different areas across the globe. Since the focus of this study is on containerized traffic, selecting the initial date of late 1960s allows for a holistic view of seaports regardless of the wave their developments are associated with.

- **Geographical location:** with the intention of obtaining a global view, and taking possible regional differences into account, the case seaports were deliberately selected from different geographical zones. The global scope of the study provides a broader scope of analysis, which is not limited to a specific region and reflecting diversity of approaches and strategies of the authorities involved.

The research first identified six global seaports – Rotterdam, Singapore, Dubai, Shanghai, Kaohsiung and Long Beach - considered as polar types and extreme situation scenarios. The selection of the six seaports followed a purposeful sampling framework (Cavana et al., 2001) with the objective of capturing a range of variation to produce richness and depth in theory building (Coyne, 1997). The six global seaports identified have been, at one time or another, ranked among the top 10 containerized seaports in the world. The six were selected based on the following three groupings, with two seaports in each:
1. **Group 1**: Seaports that have maintained their status on the top 10 container traffic ports in the world during the last 30 years (1985-2015) and have been referred to as foci of international trade (Haralambides, 2002). Rotterdam, as Europe’s largest container port, and Singapore, a main hub port in the South Asian Pacific region, were the two selected case seaports in this group. Throughout the period of three decades, Singapore held a position on the top 10. Port of Rotterdam’s global position declined to rank number 11 since 2012, though it remained as the main player within the European region.

2. **Group 2**: Seaports that have not been major participants in earlier decades but are presently ranked among the top 10 busiest seaports on the world list. Dubai, the leading port in the Middle East region, and Shanghai, the largest port in China were identified as the case seaports belonging to this group.

3. **Group 3**: Seaports that had been on the top 10 list until mid-2000s, but have since lost that status as one of the top 10 container ports on the world ranking. In this group, the nominated case seaports were Kaohsiung, the main port of Taiwan, and Long Beach, one of the busiest container ports in the U.S.

Due to issues with obtaining adequate secondary data and data validation for ports of Shanghai, and Long Beach, the sampling plan was modified to four case studies. At a later stage, the port of Singapore was excluded from the study when establishing direct contact with the respective port authority for interviews became difficult. The research plan was finally reduced to three case studies, one from each of the original three groupings and located in different geographic zones. Thus, though the number of cases was scaled down from six to three, all three sampling groups remained intact with one case in each, providing a global scope for the research. As Dyer and Wilkins (1991) argued, the number of cases per se is not a major issue in case study research as long as a thorough understanding of the context is achieved. Yin (2009) is also of the view that three to four cases would be sufficient to invoke the replication logic.

Table 3.1 presents the rankings of the three selected seaports in terms of world container traffic from 1985 to 2015. All three case seaports are important logistics hubs in their own regions and important nodes in the global economic system. Port of Rotterdam has been a market leader in Europe since the early stages of containerization. Although its global ranking declined in mid 2000s, Port of Rotterdam still holds the position of a leading seaport.
and top logistics hub in the European region. Port of Rotterdam connects the Western Europe, Eastern Asia and South Eastern Asia trade routes (Yap, 2009).

Port of Kaohsiung, the largest international commercial seaport in Taiwan, has been a main hub in Asia since the early 1980s. Port of Kaohsiung currently links North Eastern, South Eastern and China trade routes (Cheng, 2012). Port of Dubai, compared to the other two seaports, was a late joiner to containerization. However, in a relatively short period of 20 years, Dubai seaport has emerged as the main transshipment port and logistics hub in the Middle East region. Port of Dubai connects the important east-west trade routes (Jha, 2005).

<table>
<thead>
<tr>
<th>Case Study Groups</th>
<th>Seaports</th>
<th>World Ranking (as per container traffic)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>Rotterdam (The Netherlands)</td>
<td>1, 4, 7, 11</td>
</tr>
<tr>
<td>Group 2</td>
<td>Dubai (United Arab Emirates)</td>
<td>37, 14, 9, 9</td>
</tr>
<tr>
<td>Group 3</td>
<td>Kaohsiung (Taiwan)</td>
<td>4, 3, 6, 13</td>
</tr>
</tbody>
</table>

Source: Compiled from (Rodrigue, 2010, WSC, 2017)

The distinctiveness and diverse regional contexts surrounding the three case seaports, together with the significant role they have been playing in connecting the global economic systems, provide the “polar extremes” to explore the theoretical underpinnings of seaport competetiveness on a global scale.
3.2 Data Collection

The use of multiple data sources is a distinctive feature of case study research, which is a strategy of enhancing data credibility (Patton, 1990, Baxter and Jack, 2008). This study used two main categories of data sources: 1) primary data, comprising semi-structured interviews and onsite observations; and 2) secondary data, predominantly government publications, seaports annual reports, publicly available archival records, media releases, academic research papers, and web information. Due to the historical nature of the study, this research relied heavily on published documents to construct the developmental paths of the case seaports. The semi-structured interviews conducted were generally limited to developments within specific periods of the five-decade time frame under investigation, since most informants did not generally have sufficient in-depth knowledge on the entire development history of the case seaport.

3.2.1 Interviews

Interviews are one of the primary means of data collection, and are commonly combined with observations and archival sources in case study research in building theories (Eisenhardt, 1989). According to Myers (2013), there are three main types of interviews:

- Structured interview: Questions are defined in advance (pre-formulated) and the interviewee has limited choice in answering. This is to ensure consistency across various interviews.

- Semi-structured interview: Some of the questions are pre-defined, but answers are not limited to the questions posed. Other questions can be, and generally raised during the interview, based on the responses of the interviewees. As interviews usually start with a similar set of questions, some level of consistency can be expected across several interviews.

- Unstructured interview: More open-ended questions and very few pre-formulated questions, with the intention of allowing the interviewees to narrate candidly on the case. Maintaining consistency across multiple interviews is not an objective for unstructured interviews.
This study used semi-structured interviews as the means to collect primary data. In recognition of the demand for information stretching over a period of five decades and taking cognizance of the difficulty in locating informants with adequate knowledge of the historical development of the case seaports, this study devoted considerable time to locate appropriate informants for interviews and consultations.

Informants for this research were identified through an extensive iterative search process, beginning with making contacts with top management executives of the selected case seaports (Port Authorities), followed by approaching staff at various operational levels working in organizations that have a close working relationship with the case seaports (e.g., shipping companies, freight-forwarding companies and trading companies). Other informants with specific knowledge of any of the case seaports were identified through a snowball process based on recommendations from academics, maritime industry professionals as well as global seaport officials through networking at international conferences, visits to industry sites and universities. These informants could be classified into three groups:

- **Top executives and senior management in case seaports (Port authorities)** – This group of respondents was sourced to provide information and understanding on the strategic approaches undertaken by the case seaport authorities with regards to resource planning, development, usage and management. Depending on the extent of their knowledge of the operations of the case seaport, these informants also described the challenges faced - market competition, environmental issues and social pressures - and the development directions of the whole port complex and port networks.

- **Staff at various operational levels in the maritime industry (Industrial Stakeholders)** – This group of informants comprised managers and executives of Shipping Companies, Terminal Operators, Freight Forwarders, Trucking Companies, and Customs Clearing Agents. They provided information and understanding on how the competitive environment affecting the case seaports had impacted the operations of the case seaports. Availability of seaport infrastructure, and development plans of road, rail and waterway network, proximity of sources and market, cost of port services and the labor climate were among the main topics of discussion with this group of informants.
Maritime Academic Scholars – This group of informants were identified mainly through their publications and research into the case seaports. Many were informally interviewed through coffee-break, lunch and dinner discussions at conferences. Others were contacted through emails and social media. These informants provided vital directions to published resources and shared their insights based on their research findings.

### Table 3.2: Informants participating in Semi-structured Interviews

<table>
<thead>
<tr>
<th>Port Informants</th>
<th>Number of Interviewees</th>
<th>Maritime Industry Knowledge, Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top executives at management level (Port Authorities)</td>
<td>Dubai – 2</td>
<td>The interviewees were selected from a range of port executives, including strategic and operational planners, business analysts and a harbormaster. The first-hand knowledge and experience of this group has been instrumental in understanding the developmental paths of the case seaports. This group of interviewees also provided guidance to other valuable information sources on the historical developments of the case seaports.</td>
</tr>
<tr>
<td></td>
<td>Kaohsiung – 4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rotterdam – 2</td>
<td></td>
</tr>
<tr>
<td>Staff at operational level in seaports (Industrial Stakeholders)</td>
<td>Dubai – 5</td>
<td>Interviews conducted with a number of industrial stakeholders, including managers and executives of shipping companies, and freight forwarding operators. The managerial and operational experience of this group gave insights to factors affecting competitiveness of the case seaports.</td>
</tr>
<tr>
<td></td>
<td>Kaohsiung – 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rotterdam – 3</td>
<td></td>
</tr>
<tr>
<td>Maritime Academics</td>
<td>Dubai – 3</td>
<td>Maritime scholars who have conducted extensive research on the case seaports provided direction to published resources and shared their extensive knowledge and views.</td>
</tr>
<tr>
<td></td>
<td>Kaohsiung – 5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rotterdam – 4</td>
<td></td>
</tr>
</tbody>
</table>

Formal semi-structured interviews were conducted with the first two groups of informants (see Table 3.2). The interview protocol (see Appendices 1 and 2) comprised a series of open-ended questions designed to gain an understanding of how the three case seaports selected, built, utilized, deployed and managed their resources, both tangible and intangible, to gain, or maintain, their competitive edge at different time periods in response to changes in the global market and regional economic environments. The role of the infrastructural, socio-economic, political and environmental features surrounding the three case seaports since containerization was explored. Particular attention was also directed to exploring factors that determine seaport competitiveness listed by Biederman (2007): port infrastructure,
availability of modern distribution centers, markets that can be reached within one day, as well as liner services. As the knowledge of most informants and stakeholders were limited to the period of their engagement with the case seaports, the semi-structured interviews also focused on seeking directions towards historical data resources throughout the time span of the study, apart from gaining the knowledge of seaport informants for the period they were most conversant with.

All the semi-structured interviews were conducted between October 2013 and November 2014. During the interviews, interviewees were given a brief introduction on the topic, nature and purpose of the research, and were given the opportunity to describe their experiences in the maritime industry, especially those related to the case seaport(s).

All interviews were conducted in English, and were audio recorded. The length of each interview ranged from 45 minutes to 3 hours. Interviews with personnel of the port authorities were conducted in the port area, followed by an on-site visit to understand the range and extent of the activities carried out at the respective seaports. Interviews with the industrial stakeholders were undertaken at locations chosen by interviewees, and were mainly held in the interviewees’ work premises. All the interviews were conducted in a conversational style with questions raised whenever additional clarification was considered necessary in a manner similar to what is described by Sutton and Callahan (1987).

3.2.2 Secondary Data

Secondary data formed the predominant source of information used to compile the historical resource development profiles and affairs affecting the development of the case seaports. The use of an extensive range of secondary data, which contains views from both insiders (i.e., port authorities) and outsiders (i.e., stakeholders, and media), allows multiple perspectives on similar issues be discerned. For each of the case seaports, the secondary data collected include, but are not limited to:

1. Port strategic plans, and/or government economic plans relating to port development: These documents formed the prime sources of secondary data on port development (e.g., in the case of Port of Rotterdam, Port Plan 2010, 2020, and 2030). Although the plans are by no means the sole source of strategic planning for ports, they do represent a coherent effort of the port policy makers in setting priorities. Moreover, the plans
constitute a source of systematic data that are available for the period this study encompasses (from late 1960s to 2015).

2. Port cargo statistics for containerized traffic: This research relied on port statistics for a period of 30 years (from 1985 to 2015) to review the rate of growth of containerized traffic. While focusing on the total throughput, the export, import and transshipment statistics were reviewed to identify the role of the seaports within their regions during the period of the study.

3. Port annual reports and financial statements: These documents were examined to trace the implementation of projected plans in the port, and their realization. The aim was to validate consistency as per the original plan or deviations with plausible clarifications. Considering the dynamic nature of the global economy, diversions from long-term plans and anticipating new developments are not uncommon.

4. Press releases and multimedia reports: These reports, in particular maritime news magazines, provide multiple views of stakeholders external to the case seaports on projected and executed development concerning the case seaports. They served as a source of data validation and authentication.

5. Published reports of International Organizations and publications of consultancy organizations: Publicly available reports of international agencies (e.g., UN, OECD, EU Commission) and consultancy organizations were reviewed to acquire an understanding of regional competition and market dynamics confronting the case seaports in different time periods (e.g., Northern Europe for Port of Rotterdam, Middle East for Dubai seaport, and South East Asia and East Asia for Kaohsiung).

6. Academic journals and research reports of academic institutions: These publications were systematically examined, not from the conventional perspective of performing a structured literature review although that was also done to profile the knowledge base for this study as presented in Chapter 2, but explicitly for identifying factual information that contribute to building the developmental paths of the case seaports.

These secondary data were augmented and corroborated by specific information obtained through semi-structured interviews.
3.3 Data Analysis

This research follows the inductive logic process (Miles and Huberman, 2002), with two major forms of analysis: within-case analysis and cross-case analysis. Sirmon et al. (2007) dynamic resource management model of value creation, discussed in Chapter 2, provides the substantive base on which the two forms of analysis are conducted. Mintzberg (2003) definition of strategy, i.e., “the pattern, plan, play, position or perspective that integrates an organization’s major goals, policies, and action sequences into a cohesive whole” (p.10), is the premise on which the strategic intent of the three case seaport authorities was interpreted from their resource developmental paths.

3.3.1 Within Case Analysis

This study investigates global seaport competitiveness by examining the resource development paths of the three case seaports based on the progressive proactive and reactive actions they took to attain and/or maintain a competitive position over the last five decades. In the within case analysis, the growth and development of each seaport was examined as a stand-alone entity (Miles and Huberman, 2002). The focus was on the major historical events that contributed to strategic changes in the developmental paths of the case seaports from the perspective of resource structuring, bundling and leveraging, the three main components highlighted in Sirmon et al.’s (2007) resource management process model (discussed in Chapter 2). The aim is to understand the strategic intent of the case seaports from their resource management perspective, as per Mintzberg’s (2003) view on strategy: “the pattern, plan, play, position or perspective that integrates an organization’s major goals, policies, and action sequences into a cohesive whole” (p.10).

Following Miles and Huberman (2002), the analytical process was iterative, requiring frequent movement between the various data sources, the academic literature, and the theoretical frameworks of RBV, organization learning, dynamic capability and contingency theory. In general, the analysis process was conducted over five main stages, following Ritchie and Spencer (2002):

- **Familiarization**: This is the data exploration and immersion phase in which background information was scrutinized, covering containerized traffic statistics (import, export, and transshipment), key historical events affecting seaport
development (national, regional, and international levels), major changes in hinterland and foreland characteristics, port strategic plans and development priorities (including government economic policies, and long term urban plans), changes in the seaport (terminal) ownership, and implementation of port related physical infrastructure as well as introduction (or removal) of soft cargo-generating initiatives. Simultaneous with this process, the interviews and site visits were conducted, and interviews were transcribed. For this research the interview materials were transcribed personally, over a period of about eight months. The transcripts, and the observational notes from site visits were reviewed and information relevant to understanding dynamic resource management (Sirmon et al., 2007) was identified.

- **Identification of a thematic framework:** This is the process of abstraction and conceptualization after getting familiar with the collected data. For this study, the data gathered for each seaport was compiled into a longitudinal framework to reveal a broad understanding of the operational, tactical, and strategic procedures, leading to the construction of an overall evaluation framework comprising infrastructural, political, socio-economical, and environmental competitiveness dimensions.

  The series of “event timelines” on the development of each case seaport that spanned the time period of this study, i.e., from mid 1960s when containerization was first introduced to the present date, was constructed. The purpose of the exercise was, firstly, to construct an ordering system for the collected data. Secondly, to develop a mechanism of identifying and categorizing the collected data based on their theme, and linking those themes to the competitive resource building strategies. The “set of sequences of events”, as described by Abbott (1995), provided an analytical tool for detecting frequency and pattern of the repetitive strategies amongst the case seaports. In each seaport, the specifications of container terminals, including the number of terminals, quay length, depth, total area, and overall handling capacity, were examined to reveal the scale and scope of available infrastructural resources.

- **Indexing:** This refers to the process of inferring and making decision on the meaning of the collected data. During this process the significance of different events was judged, and ordered in a way to identify patterns and contexts in which they might arise. The collected data were organized into coded categories as suggested by Miles
and Huberman (2002), with a specific focus on resource (both tangible and intangible) building, picking, usage and deployment.

- **Charting:** During this stage, the data were organized into charts according to the thematic framework with a view to identifying dimensions that could have significant impact on the data patterns (Ritchie and Spencer, 2002). The resultant chart reveals patterns of both tangible and intangible resource building, development, utilization, deployment and management, as well as economic transformations at local and regional levels.

- **Mapping and Interpretation:** This is the last stage of the within case data analysis. This phase is to locate associations emerging from data charting, providing explanations that would lead to developing strategies. For this study, the final part of data analysis was interpreting strategic intents of the case seaports based on the development path charted from the data. This part is guided less by theory than the results of previous analytic steps, as the aim is to understand how the resource development and management processes of the case seaports reflect their strategies.

### 3.3.2 Cross Case Analysis

According to Eisenhardt (1989) and Miles and Huberman (2002), identification of similar themes that emerged in multiple settings and findings from multiple cases will offer broad exploration of research questions and theoretical elaboration. The multiple settings offered by this research are the three geopolitical zones, i.e., Northern Europe (Rotterdam), Middle East (Dubai) and East Asia (Kaohsiung). Each of these three zones holds particular conditions in terms of their regional dynamics: social, political, and economic.

The first step in the cross-case analysis was comparing the infrastructural investment and resource development programs used of the three case seaports in relation to changes in both their regional environment and maritime global trends in different eras (1960s-1980s, 1990s, 2000s, and 2010s) (Figure 3.2). The insights gained from the comparative analysis guided the study to developing resource-based constructs.

The next step was associating the main themes extracted from strategic development paths to concepts drawn from RBV, dynamic capability, organization learning, and contingency theory. This led to identification of eight resource-based constructs, which form the building
blocks for interpreting the resource-based strategies of the three case seaports for the various eras.

The third step was a review of the temporal linkages between the resource-based constructs for each of the three case seaports to gain an understanding of how the resource-based strategies of the three case seaports differ. This was accomplished by tracing the recurrence of “old” (i.e., already appeared in an earlier period) resource-based constructs re-appearing in later periods and the emergence of “new” (i.e., not having appeared in an earlier period) resource-based constructs in latter periods to detect the existence of specific path-dependent resource management strategies among the three case seaports.

The last stage of the cross-case analysis extended the analysis of the third step to find answers to why the three case seaports differed in terms of their resource-based strategies. This is done by mapping the resource-based strategies of the three case seaports onto a two-dimensional framework with “strength of regional competition” as one contingent dimension and “size of hinterland and foreland” as the other (see Figure 3.3).

---

**Figure 3.2: Steps involved in Cross-Case Analysis**

<table>
<thead>
<tr>
<th>Identifying and Comparing Strategic Development Pathways</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960s - 1980s</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Developing Resource Management Constructs</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Examining Strategic Development Paths: Competitive Resource Building</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dubai</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Generating Competitive Resource Development Strategies from Perspectives of Intensity of Competition and Size of Hinterland / Foreland (Developing Propositions)</th>
</tr>
</thead>
</table>

---

66
(Martin, 2015) argued that strategy is “about both resources and positioning” (p.1). The two dimensions - “strength of regional competition” and “size of hinterland and foreland” - form the contingent contextual base on which the three case seaports positioned their resource-based strategies in response to the changing regional environment within which they operated over the period of investigation. The “strength of regional competition” lays out the relative intensity of the evolving regional market dynamics in which the case seaports competed over the five decades. The “size of hinterland and foreland” indicates the relative endowments of the case seaport – the context that determines the position of the case seaports within which they sought to develop a bundle of VRIN (valuable, rare, inimitable, and non-substitutable) resources to achieve competitive advantage (Barney, 1991, Peteraf, 1993), which is elaborated in the next two paragraphs.

The captive hinterland plays a significant role in capturing gateway cargoes and is a leading factor driving competition between seaports in a region. Zhang (2008) outlined a number of advantages for seaports with larger hinterlands, including: i) gearing a higher load factor for shipping lines, so that a port is selected by shipping lines as a main port of call and/or a load center (Heaver, 2006), ii) deriving economies of scale by allowing more frequent services by shipping lines and the use of larger vessels, iii) shaping more value-added clusters with a variety of port products (transport, logistics, and manufacturing) (De Langen, 2002, De Langen, 2004b), and iv) strengthening the role of the port in global supply chains.

The size of forelands, referred to as “the offshore zone of influence” (Roa et al., 2013, p.1058), indicates a seaport’s captive markets with regards to its transshipment cargoes. Transshipment functionality is a key element of seaport attractiveness (Ng, 2006). The rise of containerization and inter-modality over the past decades has led to a strong interdependency between seaport’s foreland and hinterland (Rodrique and Notteboom, 2010). Therefore, the joint elements of hinterland and foreland are crucial to the hub functionality of seaports.

Thus interpreting the findings of this study along the two dimensions of “regional competition”, and “size of hinterlands and forelands” is an appropriate step of making sense of the shift in the strategic intent of the case seaports. The process of mapping the resource development, utilization, and management of the case seaports in the mentioned framework underscores the rigor of the research according to four operating environments shown as Quadrants 1 to 4 in Figure 3.3. This process leads to the development of the working propositions, which are the main contributions of this study toward theory building.
3.4 Reliability and Validity of Case Study Research

Rigor and quality in qualitative studies is generally tested using a number of criteria that examine validity, reliability, and generalizability issues (Lincoln and Guba, 1986, Halldorsson and Aastrup, 2003, Ali and Yusof, 2011). In the context of logistics research, the criteria of construct validity, internal validity, external validity, and reliability have been the commonly accepted determinants of research quality (Dunn et al., 1994, Mentzer and Kahn, 1995, Ellram, 1996, Mentzer and Flint, 1997). In case study research within the logistics domain, Da Mota Pedrosa et al. (2012) suggested that, quality criteria of true-value (credibility), transferability, and track-ability are most pertinent due to a number of reasons. First, case study is different from quantitative research methods in logistics, therefore quality assessment of case study research should also be different to support the generation of new knowledge (Gammelgaard, 2004). This argument has been supported by a number of scholars (Erlandson et al., 1993, Creswell and Miller, 2000, Halldorsson and Aastrup, 2003), who argued that judgment of qualitative research and quantitative research should benefit from different criteria. Second, statistical generalization is not the main concern for case study research (Barratt et al., 2011). Third, the three criteria are based on the notion that quality has to be both “ensured and demonstrated for case study-based research to be rigorous” (Da Mota Pedrosa et al., 2012, p.278).

Figure 3.3: Comparison framework of resource development strategies based on operating environment characteristics
3.4.1 Credibility

Credibility or the “truth-value” of the research, as defined by Halldorsson and Aastrup (2003) is the match of information presented by participants and, research findings and interpretations within the same context. Thus, it is similar to internal validity, which is the extent of variations between a study’s findings and the real world (Guba and Lincoln, 1989). For case study research, Spiggle (1994) and Da Mota Pedrosa et al. (2012) highlighted a number of elements as a systematic approach to support the truth-value of the study.

These elements comprise **categorization** (identification of data units) (Glaser and Strauss, 2009), **abstraction** (identification of units into conceptual classes) (Da Mota Pedrosa et al., 2012), **comparison** (identification of similarities and differences in the data, aiming to detect patterns across case studies) (Miles and Huberman, 1994), **dimensionalisation** (identification of varied properties) (Da Mota Pedrosa et al., 2012), **integration** (development of relationships between conceptual constructs) (Corbin and Strauss, 1990), **iteration** (verification of validity of identified categories through continual data screening) (Da Mota Pedrosa et al., 2012), and **refutation** (verification of truth of interpretations) (Da Mota Pedrosa et al., 2012). These elements, in combination, contribute to nurturing the true value of research by matching the findings presented by the researchers and realities provided by informants.

3.4.2. Transferability

Transferability refers to the level that research findings and interpretations can be applied in other contexts (McCutcheon and Meredith, 1993, Halldorsson and Aastrup, 2003, Da Mota Pedrosa et al., 2012). Therefore it can be the case of generalizing the findings across random samples of a population, referred as external validity (Marshall and Rossman, 2006). A number of indicators have been suggested by scholars (Seuring, 2008, Yin, 2009) to monitor transferability of the findings, such as documenting the theoretical aim of the study (building, testing or extending), unit of analysis (providing boundaries of the case), reasoning of case study selection (providing literal or theoretical replication), and number of case studies.
3.4.3 Track-ability

Track-ability includes joint qualities of dependability (stability of data overtime) and confirmability (internal coherence of data in relation to findings, interpretations, and recommendations) (Da Mota Pedrosa et al., 2012), and relates to the process of documenting the research and its data sources (Halldorsson and Aastrup, 2003).

Track-ability entails evidence for the consistency of the research findings and duplicability of the processes potentially leading to the same results (Miles and Huberman, 1994, Stuart et al., 2002). Document of the case study protocol (Yin, 2009) enhances track-ability, in which the evidence of the case study questions, data collection guideline, number of informants and their selection, data sources and types, and any changes made during the research process, are provided (Yin, 2009, Da Mota Pedrosa et al., 2012). This protocol is also called “an audit trail” (Bowen, 2009), a technique of achieving rigor and transparency in qualitative research, to bolster confidence in the research results.

3.4.4 Test of Rigor for this Study

As a traditional test of rigor, validity of the current study is constructed through usage of multiple sources of information (Jick, 1979, Eisenhardt, 1989) to form a chain of evidence. The use of multiple sources of information to attain accuracy and precision is a recommended tactic in case study research (Sinkovics and Ghauri, 2008, Neuman and Robson, 2004). Baxter and Jack (2008) also highlighted the use of multiple data resources as a means of attaining a holistic understanding as “the various strands of data are braided together to promote a greater understanding of the case” (p.554). This research used the two most common forms of data in case studies: interviews, and secondary data (maritime business information archives, government publications, media releases, and academic research).

This study followed the criterion of trustworthiness suggested for qualitative research in logistics (Da Mota Pedrosa et al., 2012). The quality of research is assessed through tests of credibility, transferability, and track-ability. Table 3.3 provides the trustworthiness criteria used in this study, the suggested measures, and steps taken to achieve qualitative rigor.
<table>
<thead>
<tr>
<th>Criterion</th>
<th>Definition</th>
<th>Suggested Measure</th>
<th>How addressed in this study</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Credibility (Truth-value)</strong></td>
<td>Refers to the confidence in the truth of findings</td>
<td><strong>Categorization</strong></td>
<td>Identification of relevant data to build a theme for each case seaport (Timeline of development schemes, both tangible and intangible, since the advent of containerization were built in the case seaports. Regional dynamics for each seaport were featured. Role of port authorities in developing resources were highlighted).</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Abstraction</strong></td>
<td>Identification of group categories into conceptual classes (Strategic developmental path for the case seaports were identified).</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Comparison (within and/or between cases)</strong></td>
<td>Recognition of similarities and differences across groups and identification of patterns (Periodic strategic developments compared within and between the case seaports).</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Dimensionalization</strong></td>
<td>Identification of category properties that vary within the category (Competitive resource building, deployment and utilization strategies for the case seaports were identified).</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Integration</strong></td>
<td>Integration of identified resource building strategies into a framework based on two dimensions of level of regional competition and size of hinterland/foreland. Mapping the resource-based strategies onto the mentioned framework described in section 3.3.2.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Iteration</strong></td>
<td>Verification and validity of identified categories established by moving between multiple data sources gathered and alternative interpretations of the resource development strategies into resource constructs. This included a process of organizing, connecting and reconnecting the collected data with the identified strategies.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Refutation</strong></td>
<td>Verification of the correctness through discussion with informants and external stakeholders (e.g., presented four peer reviewed conference papers, preliminary findings presented to the institutions' doctoral review panel).</td>
</tr>
<tr>
<td><strong>Transferability</strong></td>
<td>Refers to the applicability of findings to other contexts</td>
<td>Theoretical aim of study</td>
<td>Aim of the study stated along with the main research question as well as sub-questions.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unit of analysis</td>
<td>Boundaries of the case seaports provided by unit of operation (containerized traffic), and timeframe of studies (historical development since introduction of containerization).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Justification of case study</td>
<td>Motivation of research and rationale of case study research explained.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Number of cases used</td>
<td>Process and criteria used for selecting case seaports systematically developed and explained.</td>
</tr>
<tr>
<td><strong>Track-ability (Traceability)</strong></td>
<td>(Dependability) Refers to the stability of findings over time</td>
<td>Justification of informant selection</td>
<td>Rationale for selection of participants explained.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Number of informants</td>
<td>Number of informants and their professional background listed in Table 3.2.</td>
</tr>
<tr>
<td></td>
<td>(Confirmability) Refers to internal coherence of the data in relation to findings, interpretations, and recommendations</td>
<td>Description of data collection guideline</td>
<td>Interview protocol used provided in Appendices 1 and 2.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Description of changes in the research design</td>
<td>Changes in number of seaport cases selected described in section 3.1.3.</td>
</tr>
</tbody>
</table>
Case Analysis

This chapter presents the case analysis of three selected seaports: Dubai, Kaohsiung and Rotterdam. The focus is on examining the development path each seaport has travelled since the advent of containerization in late 1960’s. The aim is to understand how they have navigated the competitive landscape that confronted them by structuring, bundling and leveraging, in the terminology of Sirmon et al. (2007), resources, both tangible and intangible, to develop dynamic capabilities and respond to environmental contingencies. Particular attention will be directed to identifying the strategic intent underpinning the resource building and exploitation process.

For this reason, each case is organized into four main sections. It will begin with an outline of the case seaport’s global and regional competitive position as indicated by its global rankings, container throughputs, and regional market shares. Then an overview of the governance structure of the case seaport is presented, followed by various port developing ventures throughout the five decades. Lastly, the strategic developmental path for each case seaport is described based on the strategic approaches adopted towards building infrastructure and service resources. The case analysis highlights the distinctive resource features of the three case seaports, leading to the identification of key similarities and differences in strategic resource building and utilization.
4.1 Port of Dubai

Dubai is home to the largest seaport, port of Jebel Ali, in the Middle East region. Since 2004, Jebel Ali has emerged as one of the top 10 container ports in the world. Located at the Persian Gulf (Figure 4.1.1), Dubai is one of the seven emirates that founded a federation in 1971 and formed the country United Arab Emirates (UAE) (Jacobs and Hall, 2007). In early 1900s, prior to formation of UAE, Dubai was part of a larger British protectorate system in the Middle East region established to support peaceful passage of trade between Britain and its colonies in East Asia and India (Ramos, 2010). Exploration and development of oil in Iran and Saudi Arabia in late 1930s boosted the British interest in regional affairs and led to active participation of British firms within the Middle East region (Owen, 2008). The presence of British government and firms, along with wealth generated from oil exploration, as well as aspirations of local leaders, shaped the earliest development of modern Dubai (Ramos, 2010).

![Figure 4.1.1: The Middle East Region Map](image)

Historically, Dubai has been associated with trade. During the last few decades the city-state of Dubai attained the status of a global city by taking advantage of “global spectacle” (Ewers and Malecki, 2011), which aims to gain media attention, and attract foreign investors, corporations, workers, and tourists by building infrastructure and promoting global events (Rennie-Short, 2013). In 2014, about 54 percent of UAE’s US$2,478 billion merchandise trade (WITS, 2016, DubaiCustoms, 2016) was conducted through Dubai.
Dubai’s earliest port development commenced in 1959 with a project of dredging and widening Dubai Creek to accommodate modern vessels. The project was considered ambitious and risky at the time, as Dubai was not financially capable of managing the project and had to use a few finance sources, such as imposing import tax, introducing bonds, as well as borrowing funds from Kuwait, an oil rich neighboring country (Balakrishnan, 2008). Nevertheless, as a result of creek modernization, Dubai’s trade was increased by 20 percent over a period of one year in 1960 (Sampler and Eigner, 2008).

Gradual increase of traffic alongside the creek (mostly building materials for numerous construction projects) caused long waiting times for ships, and delayed cargo discharge processes. The necessity of a deep-sea port soon became apparent for Dubai policy makers and initial plans for building Port Rashid were made in 1967. Port Rashid opened in 1972.

The Dubai free port policy, introduced as early as 1904 (Gabriel, 1988) to attract traffic from the other side of the Strait of Hormuz, was extended by offering free sea-air cargo transfer (Dubai airport was established in 1960), which was facilitated by building a ring road around the Creek, Deira tunnel, and Al-Garhoud Bridge (Wilson, 2006, Ho, 2008).

By end 1970s, additional cargo handling capacity was created in Port Rashid in parallel with another capacity expansion project, the development of a new port in Jebel Ali area to make it the largest man-made harbor in the world, a unique development at the time. Cargo loading and unloading operations in Jebel Ali port commenced in 1979 (DPWorld, 2014e) with five berths, and the first phase of port construction was completed in 1983.

![Figure 4.1.2: Overall Map of Dubai Ports](image)

*Source: Adapted from 2DAYDUBAI (2010)*
Strong performance of the twin ports (Port Rashid and Jebel Ali) in the 1980’s and 1990’s positioned Dubai as the major transshipment and logistics hub in the Middle East region (Figure 4.1.2). In 2001, cargo operation in Port Rashid officially discontinued as it became a location for cruise terminals, and ever since cargo operations has concentrated in the port of Jebel Ali (Figure 4.1.3). With formal closure of cargo operations in Port Rashid in 2008, “Jebel Ali’s position went from strength to strength” (Chapman, 2016).

![Figure 4.1.3: Aerial image of Jebel Ali Port, and location of Container Terminals](source)

With 67 berths and a size of 134.68 square kilometer, Jebel Ali has played a key role in transforming Dubai into a modern port city and commercial hub (DPWorld, 2011a). Currently Jebel Ali is the largest container hub in the Middle East region, with three deep-water terminals (see Figure 4.1.3), fully owned and operated by Dubai Port Authority (DPA). The fourth terminal is under construction and would add another 3 million TEUs to the present capacity of Jebel Ali by 2018 when it becomes operational. In 2015, over 15.5 million TEUs were handled by Jebel Ali port. With a capacity of about 19 million TEUs, the average rate of utilization has been 82% (Table 4.1.1).
Table 4.1.1: Specifications of Container Terminals in Jebel Ali and their Overall Utilization Rate, 2015

<table>
<thead>
<tr>
<th>Container Terminal</th>
<th>Quay Length (Meter)</th>
<th>Water Depth (Meter)</th>
<th>Total Area (Hectare)</th>
<th>Capacity (TEUs)</th>
<th>Capacity (TEUs) 2015</th>
<th>Annual Throughput (TEU) 2015</th>
<th>Utilization Rate (2015)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>4875</td>
<td>11 to 17</td>
<td>165</td>
<td>15,000,000</td>
<td></td>
<td>15,592,000</td>
<td>82%</td>
</tr>
<tr>
<td>T2</td>
<td>2600</td>
<td>17</td>
<td>165</td>
<td></td>
<td></td>
<td>19,000,000</td>
<td></td>
</tr>
<tr>
<td>T3</td>
<td>1862</td>
<td>17</td>
<td>72</td>
<td>4,000,000</td>
<td></td>
<td>3,100,000</td>
<td></td>
</tr>
<tr>
<td>T4 (Phase I) (Completion by 2018)</td>
<td>1200</td>
<td>18</td>
<td>72</td>
<td>3,100,000</td>
<td></td>
<td>15,592,000</td>
<td>82%</td>
</tr>
</tbody>
</table>

Source: Compiled from DPWorld (2014b)

In addition to port development, a free zone adjacent to the port land was introduced in 1985 as an intermediary trading hub between Asia and Europe as well as a gateway to the developing North African and Middle Eastern economies (Sampler and Eigner, 2008). Ever since the mid-1980s, an interdependent relationship between the port and free zone has been shaped, laying the foundation to position Dubai as a main commercial center of the Middle East region.

Jebel Ali Free Zone (Jafza) grew from a small group of 19 companies in 1985 to 500 companies within a decade of operation. As of 2016, there were over 7,000 companies from more than 125 countries registered in Jafza, about 100 of which were on the Fortune 500 list (Jafza, 2016). Firms located in Jafza supported over 144,000 jobs, handling about 50% of Dubai’s total exports and contributing to 32% of the UAE’s FDI in 2016 (Jafza, 2017b). Jafza based companies are from a wide range of sectors, and market leaders in their own right. In the logistics sector, eight out of 10 largest global logistics and supply chain service providers are present in Jafza (e.g., DHL, Keuhne + Nagel, and DB Schenker). A sample of global companies located in Jafza is presented in Table 4.1.2 with their respective industries, and ranking in the Fortune Global 500. In 2016, Jafza’s trade value was estimated at USD $80.2 billion (Jafza, 2017a), about 20% of Dubai’s GDP (DSC, 2017).

Almost three decades after Jafza’s opening, another initiative was introduced in 2010 to further strengthen Dubai’s multi-modal logistics functions (John, 2010). “Dubai Logistics Corridor” platform was launched based on the concept of embedding Jebel Ali seaport and a new airport (Al Maktoum), within a distance of 10 km, as a single customs free zone (Figure 4.1.4) (DubaiAirports, 2013). A logistics district adjacent to the new airport was also opened in 2010 as a new free zone, allowing 100% foreign ownership, zero tax regime and free capital transfer (DubaiSouth, 2016).
Table 4.1.2: Global Firms located in the Jafza - Fortune Global 500

<table>
<thead>
<tr>
<th>Industry</th>
<th>Company</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical &amp; Petrochemical</td>
<td>Shell</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Exxon Mobil</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>British Petroleum (BP)</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>BASF</td>
<td>88</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>Nestle</td>
<td>66</td>
</tr>
<tr>
<td></td>
<td>Procter &amp; Gamble</td>
<td>86</td>
</tr>
<tr>
<td></td>
<td>Sony</td>
<td>113</td>
</tr>
<tr>
<td></td>
<td>Unilever</td>
<td>147</td>
</tr>
<tr>
<td>Energy</td>
<td>Schneider Electric</td>
<td>354</td>
</tr>
</tbody>
</table>

Source: Compiled from FORTUNE500 (2016)

Figure 4.1.4: Dubai Logistics Corridor
Source: (Yuen, 2014)

4.1.1 Global and Regional Competitiveness

Large-scale infrastructural development in Dubai (e.g., roads, bridges, seaport, and airport) began in 1966, prompted by discovery of oil in UAE. With regards to port developments, the first milestone was the establishment of Port Rashid in 1972, which created a capacity for handling 100,000 TEUs in 11 berths (UAEFTA, 2017). The infrastructure was further developed and expanded to Jebel Ali area, where a bundle of port products was offered by a new seaport and a free trade zone within close proximity of 4 kms. While the port area was designed to offer the traditional seaport services (e.g., vessel loading, unloading), the free trade zone became an extension to the port and home to numerous firms active in
transportation, manufacturing and other services (Jacobs, 2007). The rapid infrastructural developments in Jebel Ali area (from late 1970s to late 1990s) transformed Dubai from a small port city to the major transportation hub in the region (Akhavan, 2017). In 1997, a decade after the establishment of Jafza, joint performance of Port Rashid & Port Jebel Ali positioned Dubai on the league of global top 10 container ports (see Figure 4.1.5), though the following year its rank took a dip. Six years later, in 2004, port of Jebel Ali managed to get back on the list of top 10 global seaports, and has remained a strong global contender since. In terms of container throughput, since 1990 Dubai ports (Port Rashid and Jebel Ali) have witnessed a steady growth with the exception of 2009, year of the Global Financial Crisis (see Figure 4.1.5).

![Figure 4.1.5: Dubai Ports Container Throughput (TEU), and Global Ranking (1990-2015), Source: Compiled from (Rodrigue, 2010, JOC, 2012, WSC, 2017)](image)

According to Akhavan (2017), during the 1980s (the earliest phase of containerization), only a few seaports in the Middle East region were capable of offering containerized services. The region was thus experiencing an imperfect competition, a case of an oligopoly between Saudi Arabian ports (Dammam and Jeddah), and UAE main ports of Dubai (Port Rashid and the Port of Jebel Ali) (Figure 4.1.6). During this period, the larger share of container traffic was owned by the Saudi Arabian ports of Dammam and Jeddah (see Table 4.1.3). Ports of Dubai (PoD) had a lesser market share, and the smallest stake in the region belonged to Port Shuwaikh in Kuwait (Shuwaikh statistics are not included in the regional market share figures due to lack of available data). However regional circumstances, in addition to conditions that were created in Dubai, which were unmatched by other ports in the region,
generated a specific situation for PoD to attract the largest part of the regional traffic from 1990s onwards.

In terms of regional occurrences, Molavi (2007) called Dubai a rare success story, particularly in an area dealing with failure and stagnation caused by major conflicts and wars in the region that occurred from early 1980s onwards. As described by Walker (1989), the disequilibrium in the Persian Gulf maritime economy began in 1979 with *the revolution in Iran*. Other outbreaks and hostilities in the region such as the *civil war in Lebanon* (1975 to 1990), *Iran-Iraq war* (1980 to 1989), the *first Gulf War* (Iraq – Kuwait) (1991 to 1992), the *second Gulf War - Iraq war* (2003), *Arab Spring* (2011) followed by the *Syrian civil war* (from 2011 till date), as well as the ongoing conflict between *Israel, Lebanon and Palestine*, are a number of contemporary events of conflict in the Middle East region with tremendous impacts on local economies.

In a region of such high political unrest and economic instability, Dubai has demonstrated its capability in offering an immune environment over the last three decades (Ewers and Malecki, 2011) and became a prime location for trade, transport and tourism. Dubai’s safe haven position within its region is further elaborated by Sigler (2013):

> “The Emirate has specialized in connecting nearby regions where free markets have been restricted by social unrest (Iraq), autocratic leadership (Iran, Saudi Arabia), red tape (India), or a combination of all three (former USSR)” (p.627).
Dubai’s status as an island of prosperity and stability, as described by Brook (2013), is the outcome of the unquestioned policies of the ruling family and a commitment to laissez-faire economics born of trading and port conditions.

Table 4.1.3: Regional Market Share of Main Seaports in the Middle East Region

<table>
<thead>
<tr>
<th>Seaports</th>
<th>1980</th>
<th>1990</th>
<th>2000</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dammam (Saudi Arabia)</td>
<td>24.8%</td>
<td>12.5%</td>
<td>6.4%</td>
<td>5.2%</td>
</tr>
<tr>
<td>Dubai Ports (UAE)</td>
<td>19.8%</td>
<td>49.2%</td>
<td>43.4%</td>
<td>44.8%</td>
</tr>
<tr>
<td>Khalfakkan (UAE)</td>
<td>Nil</td>
<td>8.7%</td>
<td>14.4%</td>
<td>11.7%</td>
</tr>
<tr>
<td>Salalah (Oman)</td>
<td>Nil</td>
<td>Nil</td>
<td>14.6%</td>
<td>13.5%</td>
</tr>
<tr>
<td>Jeddah (Saudi Arabia)</td>
<td>55.5%</td>
<td>29.5%</td>
<td>14.8%</td>
<td>14.8%</td>
</tr>
<tr>
<td>Bandar Abbas (Iran)</td>
<td>Nil</td>
<td>Nil</td>
<td>6.4%</td>
<td>10.0%</td>
</tr>
</tbody>
</table>

As for the transport sector, PoD benefited from special conditions that were not fully matched by other seaports in the region. The attributes of the PoD structure are physical, institutional and political (Jacobs and Hall, 2007). First, Dubai has the advantage of a strategic location as a bridge between east and west. However, the key to PoD success is its superior facilities that are widely recognized as state-of-the-art infrastructure and superstructure (Drewry, 2000). Second, its institutional arrangements are designed in a way (e.g., no corporate or personal taxes, full foreign ownership in free zones, and attractive tariffs and discounts to shipping lines) to confer competitive supply chain advantages to companies utilizing its cutting-edge facilities.

Third, the Emirate of Dubai is under a governance structure fully committed to a growth agenda, with encouraging and relatively easy implementation procedures (Jacobs and Hall, 2007). Dubai governance attributes are a combination of:

“an (soft) autocratic rule, strong developmental visions, a lean and efficient state apparatus, active market interference, reliance on the market mechanism and a pragmatic approach to development” (Hvidt, 2006, p.4).

Dubai’s management style bears much resemblance to a private commercial business. The so-called “Dubai Inc” is managed by a creative, active and risk-taking leadership, and its fast decision making processes (Sampler and Eigner, 2008), that institutes a pro-business attitude, and leading to formation of a strong private sector. By viewing the development path of Dubai since early 20th century, Hvidt (2009) identified nine key parameters characterizing its
growth: 1) government (ruler)-led development, 2) rapid decision making and “fast track” development, 3) flexible labor force, 4) a service economy that bypasses industrialization, 5) initiatives that create investment opportunities, 6) internationalization of service provision, 7) market positioning (via branding), 8) supply-generated demand, 9) synergistic development with international partners.

In the World Bank’s Ease of Doing Business for the 2017 report (WorldBank, 2017), Dubai was picked as the reference city for the UAE. The ranking was based on indicators of processes for starting a business, credit, taxation and resolving insolvency, dealing with construction permits, utilities, and property registration, enforcing contracts and protecting minority investors, as well as trading across borders (WorldBank, 2017). Dubai, as a representative of the United Arab Emirates, is ranked the most favorable place in the Middle East region, and its global position has improved significantly from 69th in 2006 to 26th in 2017.

4.1.2 Dubai Port Authority

PoD is managed by Dubai Port Authority (DPA), which provides a full range of services required to function the two seaports, and is entirely in charge of the ports infrastructure, superstructure, and land (Jacobs, 2007). DPA is the exclusive owner and operator of PoD. The port management model of Dubai falls under the definition of a “public service port” (i.e., port authority owns, maintains, and manages every available asset, and is fully in charge of the port operation) (WorldBank, 2007).

However, at the earlier phases of development during 1970s and the early years of 1980s, the management, operation, and development of PoD were contracted to two companies (Akhavan, 2017). Its management model then was thus a “public and private mix”. Port Rashid’s management was awarded to Gray Mackenzie Co. (company under the UK’s Inchcape group), which established a separate firm called “Dubai Port Services” for the sole purpose of running the operation. In a similar fashion, Jebel Ali’s management was granted to an American Shipping company called Sealand Shipping (Chapman, 2016). In 1984, with increasing throughput in PoD, particularly in Port Rashid, Dubai government took over the financial and investment control of the ports, and established “Port Rashid Authority” and “Jebel Ali Port Authority”. Not long after, in 1991, the two port authorities merged and formed Dubai Ports Authority (DPA) (DPWorld, 2015) which initiated a move towards
regional expansion. In 1999, Dubai Ports International (DPI), a wholly-owned subsidiary, was established to manage and operate container terminals beyond UAE domain.

Also the port organization gradually became a part of the network affiliates under the control of Dubai government. The earlier network was shaped in 2001 with the merger of DPA, Customs, and Jafza to form the Ports, Customs, and Free Zone Corporation (PCFC). PCFC was further diversified and strengthened through a number of other subsidiaries, and progressively became the most resourceful and successful state-owned enterprise of Dubai (Hall and Jacobs, 2007). Becoming a part of the network chain of firms under the umbrella of PCFC gave PoD two key advantages. First, the structure of PCFC allows mobilizing capital within the network of subsidiaries, thus PoD can rely on financial support from PCFC for development of ports. Second, due to the consolidated governance structure of PCFC, policies of subsidiary firms are aligned. This mechanism allows PoD to engage in strategic pricing in alliance with the Customs and Free Zone Authority (Hall and Jacobs, 2007).

In 2006, the PCFC became a part of a state-owned global holding company called Dubai World, that focuses on three main categories of activity: i) logistics, transportation, and maritime services, ii) urban development, and iii) investment and financial services (see Figure 4.1.7). Consolidation of a diversified range of activities under one group was advantageous for PCFC, since it could rely on investment and financial services provided by the holding company for developing (building and acquisition) diversified assets. As Ramos (2010) described it:

“While Dubai World searched the globe for port management, logistics, and real estate opportunities, the investment arm of the holding company, Istithmar, went shopping. Istithmar purchased stake in Barneys of New York, Cirque du Soleil, W and Mandarin Oriental hotels, and even the Queen Elizabeth II Luxury liner. Dubai World raised credit in both Islamic sukuk bond markets and the Western bond markets, heavily leveraging Dubai’s foundational trade assets and services for speculative investment in real estate and finance sectors to increase its international portfolio command and diversity” (Ramos, 2010, p.143).
4.1.3 Port Planning and Provision

A sequential order of major events in Dubai (within ports, and in the region) is presented in Figure 4.1.8, revealing the development path that Dubai went through since the mid 1960’s when containerization began. The growth began by a vision of Dubai’s ruler prior to the discovery of oil in 1959, that got actualized by borrowing funds to dredge the creek and making it deep and wide enough for movement of ships, along with building wharves, and warehouses (Molavi, 2007). Dubai creek was considered the focal point of trade and economic livelihood, according to the earliest development plan of modern Dubai, known as the First Master Plan proposed in 1960. However, from 1966 onwards and with anticipation of oil wealth, the government of Dubai began to invest heavily on infrastructure, building roads, modern airport and seaports aiming at underpinning the long-term economic sustainability (Baluch, 2005).

Although the process of development was continuous in 1970s, it was not until early 1980s (third wave of containerization) that the strong presence of PoD within the region was recognized. In a time span of less than a decade (from late 1970s to mid-1980s) PoD managed to build capabilities of offering cargo transfer products, logistics products and
manufacturing through the free trade zone within the proximity of Jebel Ali port. While expansion of the free zone was still ongoing in 1990s, the highlights of that decade were unification of the port authorities, and formation of a local terminal operator. In 2000s, further integration of three authorities (i.e., Port, Free Zone, and Customs) initiated, while the capacity expansion in Jebel Ali port also commenced. Meanwhile, the local terminal operator (DPI) grew steadily by winning a number of port concessions within the region, and went global through two major acquisitions of CSX Terminals and P&O (Mongelluzzo, 2004).

In 2000s a multimodal logistics platform was introduced (called Dubai South, branded initially as Dubai World Central) in Jebel Ali area. Multi functionality of the platform, as well as merger with the port and free zone, created conditions for Dubai to evolve from a transshipment hub into a more specialized logistics hub. Part of the mentioned platform was the construction of a new airport that began its cargo operation in 2010. The new airport, along with project of a rail terminal, which is already in the pipeline, would contribute to enhancing multimodality in Jebel Ali port (King, 2011).
Port of Dubai - Development Path

|--------|-------------|--------|--------|--------------|
| Local  | - First stage of Port Rashid completed with the capacity of 100,000 TEU  
- Port Rashid management awarded to Gray Mackenzie Co.  
- Port Rashid capacity expanded  
- Jebel Ali Port operation commenced  
- Jebel Ali’s management granted to an American shipping company called Sealand Shipping  
- Jebel Ali Free Zone operational  
- Jebel Ali Free Trade Zone (JAFZA) expanded  
- Jebel Ali port and Port Rashid merged and formed Dubai Ports Authority (DPA)  
- Dubai Ports International (DPI) was established. Operation of Dubai Ports moved from foreign contractors to DPI  
- Dubai ports join the rank of top 10 container ports | - DPA, JAFZA & Customs merged and formed Ports, Customs & Free Zone Corporation (PCFC)  
- Jebel Ali Terminal 2 constructed and operation commenced  
- Port Community Portal, Dubai Trade launched  
- Port Rashid’s cargo operation discontinued  
- DPI acquired the CSX Terminals  
- DPA merged with DPI and formed DP World  
- DP World acquired P&O  
- Dubai ports joined the Container Security Initiative (CSI), allowing to handle containers directly bound for the US  
- PGFC became a part of Dubai World Holding Company  
- Port customer-oriented services: e-token, e-payment and Asra’a launched | - UAE joined WTO  
- EDI Manifest submission started  
- Mirsal system implemented by Dubai Customs | - UAE joined the Customs Union for GCC states  
- Dubai Holding established  
- Dubai South (initially branded as Dubai World Central - DWC), a multimodal logistics platform in Jebel Ali Area was launched  
- Al-Maktoum International airport opened as the main part of Dubai South (DWC)  
- Dubai Logistics Cluster Platform launched, and the Virtual Freight and Logistics Corridor introduced  
- Dubai wins bid to host World Expo 2020 | - Capacity expansion in Terminal 2  
- Mirsal 2 launched (comprehensive customs declarations system)  
- Construction of an intermodal rail terminal adjacent to Jebel Ali Terminal 1 confirmed (MoU with Etihad Rail)  
- Jebel Ali Terminal 3 development commenced  
- Construction of Dubai World Central commenced  
- Operations commenced in Jebel Ali Terminal 2 expansion  
- Acquisition of Jebel Ali Free Zone  
- Construction of Terminal 4 projected, adding capacity of 3million TEU to Jebel Ali |

Figure 4.1.8: Development Path of PoD³, Source: The Author

³ The earliest commencement of development strategies is not included in the diagram as they occurred before the containerization era.
4.1.3.1 1960s, 1970s, and 1980’s: Developing to an Entrepôt-Port

Establishment of Dubai and development of roads, bridges, ports and investment in infrastructure does not go before 1966 and prompted by discovery of oil in UAE. As such, the second master plan of Dubai for fostering infrastructural development came into effect in 1971, shortly after Dubai began exporting oil in 1969 (GulfNews, 2010).

Not long after United Arab Emirates was founded as a federation, in 1972 the earliest milestone with regards to port development in Dubai, the establishment of Port Rashid was achieved. Port Rashid’s development created capacity for handling 100,000 TEU in 11 berths initially, followed by further development of infrastructure in 1978, expanding the handling capacity to 1,500,000 TEU in 35 berths. Proximity of the port to the city center was the key of an instant success for this facility (DPWorld, 2014d). However, the major milestone for port development was in 1976, and expansion of the historical seaport of Port Rashid through establishing a new port in Jebel Ali area. Jebel Ali port was a unique development project at the time as it was “the largest man-made harbor in the world” (Economist, 2004).

Figure 4.1.9 displays the multiple aerial images of Jebel Ali port from 1977 to 2008, which demonstrate the extent of development in the Jebel Ali Port area over a period of 30 years.

*Figure 4.1.9: Jebel Ali Port in 1977, 1979, 1984, 1988, and 2008 – United Arab Emirates
Source: Adapted from DP World (2014e)*

Physical expansion was the most crucial growth element in PoD. Introduction of a range of ancillary activities, such as shipbuilding, repair and maintenance during late 1970s through establishment of Dubai Drydocks was a new form of development. It created capability for PoD to offer ship repair and maintenance services, that were not typical port products, but instrumental in building a bundle of maritime services in Dubai (Ramos, 2010). Dubai’s Drydocks added a lucrative activity to PoD by offering a safer location for servicing vessels compared to Kuwait and Iran (Zahlan, 2016). Zahlan (2016) referred to these facilities an “added bonus”: 
“Dubai dry docks - one of the largest in the world and until recently considered to be a white elephant – is busy maintaining and overhauling tankers as well as repairing those damaged in the fighting” (p.10).

When the construction of Jebel Ali port was completed in 1979, it not only complemented Port Rashid in terms of handling trade and transshipment volumes, but also introduced an industrial complex in the Jebel Ali area, which was the Jebel Ali Free Zone (Jafza). The Jebel Ali port and Free Zone complex was not an innovative model, but a distinct prototype in the region for its ambitious scale and modern facilities on offer (Ramos, 2010). Operation in Jafza officially commenced in 1985 with the launch of a platform, geared towards manufacturing, trade, and logistics services. Sampler and Eigner (2008) called Jafza a less risky undertaking as it was created only after Jebel Ali port became operative.

Proximity of the free zone to the port area, advanced facilities, and competitively priced overheads were a number of advantages of Jafza for international businesses seeking a favorable location to establish a Middle Eastern hub. Beside a tax free regime (no corporate or income taxes) that was already in practice in Dubai (Brook, 2013), new incentives, such as 100% foreign ownership, free capital inflows and outflows, and streamlined bureaucratic procedures, were introduced that made Jafza an attractive choice for Foreign Direct Investment (FDI) (Brook, 2013). Moreover, within the borders of Jebel Ali, separate laws applied. Beyond the gates of Jebel Ali, corporates were governed by the traditional Sharia Law which is stricter (e.g., under Sharia law those who cannot pay their debts would be imprisoned) comparing to corporate regulation inside the free zone (Brook, 2013).

The first major firms setting up their regional distribution centers in Jafza were Japanese electronics manufacturers (e.g., Sony and Aiwa) (Cuthbert, 2011a). Gradually manufacturing companies began to locate their facilities in the Free Zone, though overall growth in the Jebel Ali area was relatively slow, mainly due to two factors (Cuthbert, 2011a). First, the port was operated by an American shipping company, Sealand. Competing shipping lines were reluctant to use Jebel Ali. Second, the Jebel Ali area was perceived to be far away from the center of the city and local companies preferred the convenience of Port Rashid over Jebel Ali. These two issues, in addition to the fact that the two port operators were competing for the same business, created a dilemma for Dubai government. On the one hand, the overflow of cargo in Port Rashid required ample investment. On the other, the underutilized facilities in Jebel Ali was a waste of valuable resources. Other hurdle was limitation of financial
resources due to fluctuation and drop in oil revenue in 1980s. During this period, an unpredicted event in the region brought an element of luck for Dubai, the Iran-Iraq war which broke out in 1980 and lasted for 8 years.

Throughout the war, Iran and Iraq ports were no longer safe for commercial vessels as they were under attack in the Persian Gulf. This situation created an opportunity for Dubai to receive international cargo flows and re-route them for local and regional distribution (Walker, 1989, Pacione, 2005). Subsequently, Dubai’s transshipment volume increased as a large part of regional traffic was redirected to PoD that were offering safer conditions and capable of handling the increased traffic (Ramos, 2010). During this period the extensive dry docks facility opened nearby Port Rashid in 1979 received significant business from servicing vessels owned by the warring parties. Dubai dry docks facility, once called the white elephant (Krane, 2009), was benefiting from Dubai’s free port policy, and by being a safer alternative to Kuwait or Iranian ports (Pacione, 2005), provided repair service for all sides of the conflict (Early, 2015). Maintaining a good relationship with both sides of the conflict during the war was the key to attract trade diverted from zones of conflict. UAE was an exception among Arab countries in the Persian Gulf for not having a hostile relationship with Iran during the war. When the war ended in 1988, the diverted trade did not decline but entered into a new phase of growth initiated by international sanctions imposed on Iran.

Apart from ventures in ports and Free Zone, in 1985 the Dubai government founded its own airline, called Emirates (TheEmiratesGroup, 2016). In the early years of its creation, the airline was predominantly focused on passenger services through fleet development and route expansion. Cargo services were introduced within a decade of establishment and contributed to creating intermodal capabilities in Dubai.

Combination of the above resources contributed to making Dubai an “Entrepôt” port, which Ho (1996) described it as a “specialized port-of-calls serving as collective centres, where cargoes are held for collection and/or distribution” (p. 5-6).

4.1.3.2 1990s: Transition to a Regional Transshipment Hub-Port

The regional conflict in the Middle-East entered a new phase in August 1990 with the first Gulf War (Iraq’s invasion of Kuwait). Same as the previous war, PoD Authority identified the new conflict as an opportunity for their own benefit, and capitalized on the trade-related opportunities while providing facilities and policies for a smooth operation (Ramos, 2010).
Port Rashid Terminal became the distribution hub for a number of motor vehicle manufacturers as a result of the Gulf War (Jacobs, 2007). Dubai also benefitted from relocation of a significant number of businesses from Kuwait in 1991, and three years later from Bahrain due to the Shia unrest (Davidson, 2005).

Moreover, international sanctions imposed on Iran were expanded in early 1990s, which strengthened the commercial activities of Iranian traders in Dubai. The conditions created opportunities for Dubai in two ways: i) by becoming a location for hosting sanctions busting companies, and ii) by serving as a convenient transshipment point for sanctions busting transactions on Iran’s behalf during the politically unstable period (Early, 2015).

Jafza was also experiencing a substantial growth. Only 5 years after the conception, in 1990 the Free Zone was accommodating 276 firms and attracted investment of US $600 million (Ghanem, 2001). The respective figures in 1985 were 19 firms and US $50 million (Ewers and Malecki, 2011). Jafza became a location for regional offices of global and multinational corporations utilizing the port for distribution of their products to India, Iran, Iraq and the wider Middle-East region. In fact, as illustrated in Figure 4.1.10, there appears to be a close association between at PoD and the rise in number of businesses in the free zone and the container throughput, reaffirming that the port and free zone relationship is complementary.

The port and the free zone share an interdependent relationship: the port’s proximity attracts various value-added activities (e.g., assembling, labeling, and repacking) into the free zone, which safeguards the transshipment capacities of the port.

“The Free Zone and the Port clearly have a symbiotic relationship. The Free Zone’s location near the port has given Dubai a focus on transshipment, and the proximity of the port has attracted numerous businesses into the Free Zone. Almost two thirds of Dubai’s trade is re-exported, with exporters and manufacturers benefitting from tax-incentives in the Free Zone” (Jacobs, 2007, p.128).
While the regional circumstances increased PoD throughput, the dilemma of the two ports managed by two rivals remained unresolved. In 1991 Dubai government terminated the management contracts of both ports, and merged the management of the twin ports into a new single establishment – the Dubai Port Authority (DPA). A government owned entity but commercially autonomous, DPA’s primary task was to increase throughput while balancing volume in the two ports. This was achieved by encouraging shipping lines to relocate to Jebel Ali port by offering inducements. DPA allocated a fleet of trucks to move containers between the two ports free of charge for local consignees, which changed their mindset for using Jebel Ali port (Cuthbert, 2011b). PoD began to thrive with the combination of new strategies. In 1991 when the port authorities merged, the twin ports managed to handle over one million TEUs, positioning Dubai as the 18\textsuperscript{th} busiest container port in the world. Six years later, in 1997, PoD succeeded in entering the ranking of the top 10 container ports worldwide. In order to provide a streamlined flow of services, in late 1990s, manifest submission through EDI and Mirsal system (online customs declaration system) were implemented by Dubai customs (DubaiTrade, 2017).

At about the same period, entry of the global terminal operators (e.g., PSA and APM) to the Middle East region posed a major threat to DPA, which had a dream of developing into a leading hub (Jacobs and Hall, 2007). In 1998, DPA reacted by establishing an international division – DPI, and began an abroad expansion.
4.1.3.3 2000s: Towards a Regional Logistics Hub-Port

In the new millennium, the developments of PoD encompassed a range of local and international mergers and acquisitions. In 2001, DPA merged with the Jafza and founded the Ports, Customs and Free Zone Corporation (PCFC). This integration accommodated a “one-stop” idea as preference of global supply chains operators when interacting with public authorities and port operators. Another advantage was that the revenue of the custom duties flows directly to the PCFC, rather than the state treasury (Jacobs and Hall, 2007).

In 2004, Dubai Ports International (DPI) acquired CSX World, a U.S. based terminal operator, and took over management of nine container terminals worldwide with a total capacity of 14.6 million TEUs. This takeover enabled DPI to strengthen its position in Southeast Asia, China, Australia, Europe, and the Americas. As stated by Dubai Ports Managing Director:

"The acquisition of CSX World Terminals will be a strong strategic fit for DPI, bridging our terminal network between East and West" (JOC, 2004).

In 2005, DPA and DPI merged and formed “DP World”. Another acquisition followed in 2006, Dubai ports took over one of the world’s major stevedoring companies, the UK-Australian company, P&O Ports. As a global operator, P&O Ports was unique with holding terminals in all continents (Vanelslander, 2008). The acquisition provided PoD an opportunity to penetrate the stevedore markets in Europe and Australia, while expanding activities in India and East Asia (Jacobs and Hall, 2007). Expanding its portfolio through the two key acquisitions of CSX World and P&O Ports, as well as winning numerous concessions across the globe, DP World lifted its status from a regional port operator to a global port operator (DPWorld, 2014a). In 2015 DP World was placed 4th on the ranking of global terminal operators (LloydsList, 2016).

In addition to the new acquisitions, projects of physical expansion commenced in Jebel Ali port in order to expand the handling capacity as Jebel Ali was operating to the maximum capacity in 2004 (DPWorld, 2017a). Jebel Ali port was initially established with one container terminal, and ongoing development plans created facilities with handling capacity of nine million TEUs in Terminal 1. In 2001 construction of Terminal 2 began, which increased PoD capacity by another five million TEUs at the time of completion in 2006. Meanwhile Port Rashid formally ended its cargo operation in 2008 after 36 years, and

In line with the physical expansion, other initiatives were taken by PCFC in early 2000s to streamline operations throughout Dubai’s trade and logistics cluster that contained seaport operations, airport cargo operations, Jebel Ali and Dubai Airport Free Zone authorities, UAE Customs and other governmental agencies (ECC, 2012). In 2003, PCFC launched a port community portal, Dubai Trade, to facilitate online services and provide customers a higher level of productivity while reducing time and cost of transactions (DPWorld, 2017c). As a result, a number of IT initiatives were launched to support collaboration among various actors, modernizing the trade process through paperless communication (see Table 4.1.4).

In 2003, the Middle Eastern region moved into another period of turmoil, the second Gulf War, which re-enforced Dubai’s position as a safer location for commercial and maritime activities (Keshavarzian, 2010). The FDI in Dubai, particularly from Saudi Arabia, was already on the rise following the 9/11 terror attacks in 2001 (Hvidt, 2007). Once again Dubai managed to benefit from the region’s volatile conditions. The huge port complex at Jebel Ali in particular profited vastly from the trade spawned by U.S. invasion of Iraq (Davis, 2006). During the war, PoD managed to maintain their customer base despite high insurance rates, by taking a risky financial commitment, which was taking full responsibility for all vessels bound for Dubai. This strategy directly paid back as generating profit from transshipment cargos (i.e., logistics supply of allied forces in Iraq, and materials for reconstruction) in PoD (Davis, 2006). The conflict in the region resulted in some other opportunities for Dubai, such as providing bases to US military operations, as well as serving as an entrance for US goods coming into the region (Davidson, 2007).

Furthermore, economic sanctions imposed on Iran during mid-1990s were tightened progressively in early 2000s, which made direct dealings with Iran increasingly problematic for international organizations. In order to overcome the legal barriers of direct trade, Iran bolstered its economic ties with UAE, despite political tensions between the two countries. UAE became the most important connection for Iran to link its commercial activities to the
global economy (Sadjadpour, 2011). Consequently, the flow of indirect Iranian trade through PoD gradually increased. Dubai’s position in relation to Iran’s trade can be understood from a statement by an Iranian businessman “The best place to do business in Iran is in Dubai” (Early, 2015, p.113).

Table 4.1.4: Dubai Government Port and Free Zone IT Initiatives

<table>
<thead>
<tr>
<th>Period</th>
<th>Initiatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000-2005</td>
<td>- MyJAFZA, Online portal for Jafza launched</td>
</tr>
<tr>
<td></td>
<td>- MyDPA, Online portal for ports launched</td>
</tr>
<tr>
<td></td>
<td>- (electronic transaction facility for port operations)</td>
</tr>
<tr>
<td></td>
<td>- Dubai Trade portal launched through consolidation of MyJAFZA, and MyDPA services. Dubai Trade is a single window for integrated electronic services for trade and logistics providers</td>
</tr>
<tr>
<td></td>
<td>- E-Mirsal launched</td>
</tr>
<tr>
<td>2006-2010</td>
<td>- E-Token launched</td>
</tr>
<tr>
<td></td>
<td>- (providing port users a time slot for their operation)</td>
</tr>
<tr>
<td></td>
<td>- E-Payment launched</td>
</tr>
<tr>
<td></td>
<td>- (facility of payment of services online)</td>
</tr>
<tr>
<td></td>
<td>- Emirates Skycargo joined Dubai trade</td>
</tr>
<tr>
<td></td>
<td>- Mirsal 2 launched</td>
</tr>
<tr>
<td></td>
<td>- (Comprehensive Customs declaration system allowing clients to complete clearance procedures around the clock and without their physical presence, saving time and cost of operation)</td>
</tr>
</tbody>
</table>

Source: Compiled from DubaiCustoms (2010) and DubaiTrade (2017)

Based on official statistics of UAE’s Ministry of Foreign Trade, Iran was the 2nd re-export partner of UAE with approximately 17% share of total re-export trade (estimated US $8.5billion) in 2010, and ranked 1st as the re-export partner of UAE in 2014 with 16.5% share of UAE’s total annual re-export trade (Almansouri, 2015). Although unofficial estimates were way above the declared statistics, the re-export trade figures restate that the surrounding conditions of PoD have contributed significantly to its growing throughput (Sadjadpour, 2011).

Nonaggressive regional circumstances also stimulated Dubai’s traffic, such as UAE’s participation in the Customs Union of Gulf Cooperation Council (GCC) in 2003. The organization was formed over two decades earlier in 1981 to foster economic, business and scientific cooperation among six oil-exporting countries: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and UAE. The real work of GCC commenced in 2001 when its members
decided to focus on achieving economic integration by forming a customs union and a joint market (Abdulqader, 2015), which resulted in an increase in GCC inter-regional trade. As emphasized by Balakrishnan (2008), UAE’s participation in GCC’s Customs Union reinforced Dubai’s position (as the main seaport of UAE) in becoming a major port of entry to the Middle East and Africa. The GCC intra-regional trade statistics in 2013 (Table 4.1.5) confirmed that UAE held the highest market share (28%) among all states.

The combination of regional settings, and the rapid local developments shaped superb conditions in Dubai that could not be matched by any other seaports in the region. The threefold increase in number of companies established in Jafza, as well as rising container throughput in PoD from 2000 to 2010 (see Figure 4.1.10), are evidences of Dubai’s success as a commercial and maritime hub. The parallel growth and inter-connectivity of the port and free zone eventually led to their merger in 2015 when DP World took over Jafza. Significance of Jafza’s acquisition as a strategically located asset is stated by the Chairman of DP World:

“Combining the two assets makes economic and strategic sense for all parties involved, including customers, particularly in the context of a significant growth phase in port capacity at Jebel Ali and a strong economic outlook for Dubai and the wider GCC region”(WorldMaritimeNews, 2015).

Dubai’s industrial growth pole in Jebel Ali area entered into a new phase of strategic development in 2006 with the introduction of an integrated logistics platform, called the Dubai Logistics Corridor (Emirates24/7, 2010b). Officially launched by Dubai government in 2010, the corridor spreads over approximately 200 sq. km, linking sea, land and air as a single customs bonded free zone. The development is expected to create 500,000 jobs, which would further enhance Dubai’s competitiveness as a global logistics hub. At the heart of this logistics platform is the Dubai World Central (DWC) project, rebranded as “Dubai South” in a 145 sq km area encompassing eight districts (DubaiSouth, 2016), with the largest plot allotted to Al Maktoum International Airport (Figure 4.1.11). The airport, which is located less than 10 km away from Jebel Ali port was opened for cargo operations in 2010, and upon completion is expected to serve as a multimodal logistics hub for 16 million tons of freight per year (DubaiAirports, 2013).
Table 4.1.5: GCC Intra-Regional Trade (Million Dollars)

<table>
<thead>
<tr>
<th></th>
<th>Qatar</th>
<th>Saudi Arabia</th>
<th>UAE</th>
<th>Oman</th>
<th>Kuwait</th>
<th>Bahrain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qatar</td>
<td>0</td>
<td>2,454</td>
<td>8,381</td>
<td>1,571</td>
<td>1,481</td>
<td>456</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>2,454</td>
<td>0</td>
<td>8,141</td>
<td>4,623</td>
<td>2,630</td>
<td>5,051</td>
</tr>
<tr>
<td>UAE</td>
<td>8,381</td>
<td>8,141</td>
<td>0</td>
<td>15,689</td>
<td>1,692</td>
<td>1,267</td>
</tr>
<tr>
<td>Oman</td>
<td>1,571</td>
<td>4,623</td>
<td>15,689</td>
<td>15</td>
<td>0</td>
<td>386</td>
</tr>
<tr>
<td>Kuwait</td>
<td>1,481</td>
<td>2,629</td>
<td>1,692</td>
<td>778</td>
<td>0</td>
<td>279</td>
</tr>
<tr>
<td>Bahrain</td>
<td>456</td>
<td>5,051</td>
<td>1,267</td>
<td>386</td>
<td>279</td>
<td>0</td>
</tr>
<tr>
<td>Total Value</td>
<td>$14,344</td>
<td>$20,445</td>
<td>$26,790</td>
<td>$21,476</td>
<td>$5,379</td>
<td>$6,983</td>
</tr>
<tr>
<td>Market Share</td>
<td>15%</td>
<td>21%</td>
<td>28%</td>
<td>23%</td>
<td>6%</td>
<td>7%</td>
</tr>
</tbody>
</table>

Source: Adapted from Abdulqader (2015)

Dubai South project, located ideally with direct access to the Jebel Ali Port, UAE’s main trans-emirates highways and the projected Etihad Rail network, offers a unique operational speed, connectivity and flexibility (Saidi et al., 2010). This multimodal logistics platform will have the first and only integrated air-sea corridor that allows offloading containers from a ship to be airborne within a couple of hours that includes custom clearing and all administration processes (Saidi et al., 2010). Because of its easy access as an international transit hub, as well as being conveniently situated between Dubai International Airport, Abu Dhabi International Airport, and Jebel Ali seaport, Dubai South has been picked as the site for Dubai Expo 2020, the global event of exposition (EXPO2020, 2016).

In 2011, an initiative for collaboration, the Dubai Logistics Cluster Platform, was launched by the Dubai Department of Economic Development (DED). This platform was set as a public and private collaborative forum (a permanent network of experts) to strengthen the competitiveness of Dubai’s logistics (Emirates24/7, 2011). The coordination mechanisms created by the platform resulted in the introduction of a “Virtual Freight and Logistics Corridor” in 2015, which is an automated customs procedure connecting Dubai airports, seaports and free zones (TradeArabia, 2015). As stated by Rodrigue (2016):

“This corridor enables simplified customs procedures for the bounded cargo, reducing transactions costs and improving the velocity of freight.”
4.1.4 Expansion in International Level

According to Thorpe and Mitra (2011) Dubai’s economy has gone through three major phases of diversification:

1. 1980s: focus on trade, transportation, logistics and tourism;
2. 1990s and 2000s: focus on services, finance, technology and IT, media; and
3. 2005 onwards: focus on education, R&D, wireless and nanotechnology, biotechnology and pharmaceuticals

The three phases reveal a shift in Dubai’s economy from resource based industries to service and knowledge intensive industries, and the gradual migration of resource based industries (e.g., transport and logistics) to a global scale (Thorpe and Mitra, 2011). The same strategic parameters also guided DP World to become a global terminal operating company.

As a subsidiary of Dubai World holding, DP World is the marine operating division that was initially set up in 1999 (under the name of Dubai Ports International - DPI) to apply its expertise of managing ports in an international scale. The earliest project of DPI commenced in Saudi Arabia (1999), but its operation soon expanded to Djibouti (2000), India (2002), and Romania (2003). The network of DP World was expanded by two major acquisitions (CSX...
World Terminals, and P&O Ports) and became a major global terminal operator (DPWorld, 2017e).

In 2016, DP World handled 63.7 million TEUs in 77 container terminals (marine and inland) in 40 countries, scattered across 6 continents and employed 37,000 people from 110 countries (DPWorld, 2017d).

4.1.5 Strategic Developmental Path

The economy of Dubai, despite common belief, is not based on oil revenues. Dubai state oil reserves are small and expensive to produce (Hvidt, 2007). According to GulfNews (2010), Dubai oil productions have been steadily declining since 1991 and the reserves are expected to be gradually exhausted within 20 years. Hence building a developed, sustainable and non-oil reliant economy has been the long term prospect of Dubai leaders. As stated by the ruler of Dubai, Sheikh Mohammed bin Rashid Al Maktoum:

“We have continuously stressed in the past 10 years, through legislation and policies, the importance of diversifying our economy away from dependence on oil” (GulfBusiness, 2016).

During its oil heydays (during 1970s and early 1980s), Dubai created opportunities for a diversified and active economy, predominantly following the motto of its leader Sheikh Rashid; “What’s good for the merchants is good for Dubai” (Krane, 2009, p.266). The earliest initiatives took shape in late 1980s for building a non-oil reliant economy in Dubai (Elbadawi and Selim, 2016) as:

“The authorities initially turned to foreign trade as the engine of economic development but soon realized the need for diversification: foreign trade offered ample possibilities but also generated significant risks for the local economy. Therefore, they embarked on series of policies aimed at fostering the development of strategic industries, including tourism, the financial sector and retail and wholesale trade” (p.417).

Moreover, major investments in seaports, airport, and a sizable free zone adjacent to the port land were made to foster an internationally linked economy, and to diversify Dubai away from reliance of oil. The interdependent relationship between the Port and Free Zone, laid the foundation for positioning Dubai as a main commercial center of the Middle East region. Dubai’s low tax and customs regime, cheap labor, and subsidized energy prices had been
instrumental in creating commercial advantages and attracting new commerce (Garg and Gupta, 2012).

The predominant source of funding for Dubai investments in local mega projects had come from international borrowings on short term payment plans (Thomas, 2009). These developments positioned Dubai as the main transportation hub in the Middle East, ranked in 2009, after Hong Kong and Singapore, as the third most important re-export center in the world (Hvidt, 2009) with 60% of the region’s imports transiting its borders (Thorpe and Mitra, 2011). Attaining such a position, as described by Thrope and Mitra (2011), is associated with the following factors:

- **Accessibility by air, sea and land** due to prime geographical location and multimodal connectivity. Jebel Ali is connected through the main UAE / GCC road network accessible anywhere in the GCC by land transit within 2-3 days. In terms of sea connectivity, Jebel Ali offers more than 98 weekly services to over 115 direct ports of call (DPWorld, 2014c).

- **Strong local and regional economies** that demand excess logistics and distribution capacity. As Figure 4.1.12 shows, container throughput in the Middle East region increased by 250% from 2001 to 2012 (Griffith, 2013), with the Persian Gulf’s throughput having the highest level of increase in the region. In 2012, about 53% of the 25 million TEUs of throughput via the Persian Gulf area were handled by PoD.

*Figure 4.1.12: Middle East Container Throughput (1990-2012)*
*Source: (Griffith, 2013)*
- **Lack of significant regional competition.** The World Bank’s Logistics Performance Index (LPI) ranks the UAE 13th in 2016 and the top performer within its region with a track record for arranging competitively priced shipments (WorldBank, 2016b). LPI is a benchmarking tool comparing performance of logistics operations among 160 countries across the globe, based on indicators of 1) customs, 2) infrastructure, 3) international shipments, 4) logistics competence, 5) track and trace, and 6) timeliness (WorldBank, 2016b). LPI for UAE can be looked upon as a representative index for Dubai as it accounts for a major part of the logistics infrastructure in UAE (Fernandes and Rodrigues, 2011). In 2016, across the gulf region among competitor countries, Qatar ranked 30, Saudi Arabia 52, Oman 48, Kuwait 53, and Iran 96 (WorldBank, 2016b).

In terms of location, although Dubai is positioned favorably midway between Europe and Far East, it still does not own a superior locational advantage when compared with a number of other ports in the region. Seaports, such as Khor Fakkan in UAE, and Sohar in Oman, both located on Indian Ocean coast have an advantage of easy access to open sea and saving vessels detour through the Strait of Hormuz. Therefore, the key characteristics of Dubai’s success and its main competitive advantage can be attributed to its superior facilities, and the availability of different transport modes that offer easy access to the entire region (Fernandes and Rodrigues, 2011). Further interpretations drawn from the development timeline of PoD can be elaborated in three areas:

1. **Capacity Building:** Dubai’s successful anticipation of containerization in the early 1970s led to development of a seaport with ample capacity. Combination of the regional conditions, and the deliberate planning of Dubai government for nurturing business environment, transformed Dubai from a local import-oriented port to a regional transshipment-oriented hub.

2. **Logistics Cluster:** In conjunction with development of ports, a bundle of logistics services (e.g., seaports, Dry Docks, Free zones, airports, and airline) became progressively available in Dubai. The strategic clustering of infrastructure developments in Dubai began in 1970s by carrying out the visions of its leader:

   “Sheikh Rashid invested strategically throughout the decade, in reaction to regional infrastructure competition and to augment Dubai’s trade capacity and international profile. This strategic clustering found its maximum...”
The bundle introduced new sources of speed and efficiency in business transactions, which could not be matched by neighboring countries. For instance, the bundle of free zone and port, as described by Wang and Oliver (2006), allowed Dubai to insert itself into the global production chain. Since re-exports comprise about two third of Dubai’s total trade volume (Jacobs and Hall, 2007), the collaboration between port and free zone became a key element in Dubai’s success.

Moreover, by air-linking the local economy to the world, Dubai created new opportunities for trade and transport, and also supported the further advancement of seaports following the notion of expanding from stand-alone and terminal focus to linking fundamentally to the global distribution chain described by Thrope and Mitra (2011). The mix of logistics services on offer positioned Dubai as a globally integrated logistics hub. The concept of “Global Integrated Logistics Hub” has been described by a number of scholars (Al-Hajri, 1999, Tongzon, 2004) who outlined the factors contributing to the formation of a successful integrated logistics hub as: Strategic location (along the main shipping and trade routes); extensive linkages and connectivity to the world through land, sea and air; favorable capabilities in warehousing and value added services; and highly efficient and adequate infrastructure (physical, IT and financial).

Majdalani et al. (2007) argued that Dubai’s characteristics fit into the specifications of a global integrated logistics hub, offering:

- an economic environment that attracts foreign firms;
- a large free zone built around a seaport and airport with world class facilities;
- highly competitive handling charges;
- high level performance in seaport and airport in managing and operating complex processes; and
- living standards that meet demands of a large expatriate population:

“...especially by Arab standards, Dubai is remarkably open to foreigners. Of its 1.5m people, over 80% are expatriates. In the business world, Brits, Indians, Iranians and Lebanese are prominent, while for the grunt work of building artificial islands there are plenty of job-
hungry Indians and Pakistanis from across the ocean. Dubai’s easy-going style—alcohol is readily available; foreigners can even own freehold property—has made it such a positive place to live and work that success feeds on itself. In that sense, it has much in common with two other vibrant city states, Singapore and Hong Kong” (Economist, 2004).

3. **International Expansion:** DP World managed to capitalize on knowledge and expertise gained from operating the twin ports of Port Rashid, and Jebel Ali, in an international scale, and transformed itself from a local port operator to a global port operator. Fundamental aspects of this transformation were main phases of organizational unifications, and promotion of Dubai’s global port operating capabilities through acquisitions and mergers. By becoming a global port operator, DP World generates value from its current global undertakings, as well as securing long-term ventures across the globe that would potentially maintain the position of the company as a market leader for future decades. As stated in 2015 by the Chairman of DP World Sultan Ahmad Bin Sulayem:

“DP World’s concessions run for an average of 40 years, so we can invest for long term”.
4.2 Port of Kaohsiung

Kaohsiung has been one of the busiest seaports in the world since the 1980’s, serving as one of the shipping hubs in East Asia. It held its position as one of the top 10 busiest container ports in the world since 1988, though its ranking has been on the decline from 2000 onwards. Kaohsiung is also called the gateway of Taiwan, handling about 70% of the island’s containerized throughput (TIPC, 2016a). The balance of the country’s traffic is managed by three seaports - Keelung, Taichung, and Taipei (see Figure 4.2.1).

**Figure 4.2.1: Overall Map of the Port of Kaohsiung, and main container ports of Taiwan**
*Source: (Yap and Lam, 2006)*

Development of the port of Kaohsiung (PoK) can be briefly divided into two main phases. The first phase started from 1945 after the 2nd World War when Taiwan - a Japanese-ruled country - was returned to China. The Kaohsiung Harbor Bureau (KHB) was established in December 1945 to take charge of harbor restoration, which was, by and large, completed in 1955. The port stevedoring operation, exclusively handled by five Japanese firms prior to the war, was reorganized and transferred to a provincial-owned general transportation corporation (Chen and Ngo, 2011). In 1958, the KHB began a 12-year project to reclaim 544 hectares of shoreline to support increasing trade volumes (TIPC, 2016e).
The second phase of development started from 1970 up till 1999, with the progressive construction of five container terminals under a plan adapted to the new trends of Port-Urban interface, defined by Hayuth (2008) as containerization, inter-modality and globalization. These five terminals (Figure 4.2.2), with a total of 26 berths and a combined capacity of 10 million TEUs, were fully operational by 2000. Between 2000 and 2006, there appeared to be a hiatus in port infrastructure expansion in Kaohsiung. In 2007, the construction of Terminal 6 commenced, and two phases were completed in 2014, adding three million TEUs to the overall container handling capacity of PoK (KMCT, 2012, WorldMaritimeNews, 2014). In 2015, 10,260,000 TEUs were handled by PoK with the capacity of about 12,800,000, the average rate of utilization has been 80% (Table 4.2.1). Currently, construction of the 7th container terminal is underway involving five deep-water berths, which can handle vessels up to 22,000TEUs. The first phase of the project is expected to be completed by mid-2018 (Mooney, 2015).

Kaohsiung has played an important role in Taiwan’s economy and has been the supporting point of import/export commodities and industrial production. A report by Chung-Hua Institution indicated that in 2004, about half off goods traded in Taiwan was transported through the PoK, which contributed to 10% of Taiwan’s national output as well as national employment (Chia-Hong, 2013).
Table 4.2.1: Specifications of Container Terminals in PoK and their Overall Utilization Rate, 2015

<table>
<thead>
<tr>
<th>Container Terminal</th>
<th>Quay Length (Meter)</th>
<th>Water Depth (Meter)</th>
<th>Total Area (Hectare)</th>
<th>Capacity (TEU) 2015</th>
<th>Annual Throughput (TEU) 2015</th>
<th>Utilization Rate (2015)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>848</td>
<td>10.5</td>
<td>10.5</td>
<td>10,000,000</td>
<td>12,800,000</td>
<td>80.00%</td>
</tr>
<tr>
<td>T2</td>
<td>1204</td>
<td>12</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T3</td>
<td>1072</td>
<td>14</td>
<td>48</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T4</td>
<td>2533</td>
<td>14</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T5</td>
<td>2444</td>
<td>14 to 15</td>
<td>90</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T6 Phase I</td>
<td>1500</td>
<td>16.5</td>
<td>74.5</td>
<td>2,800,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T6 Phase II (Completion by 2020)</td>
<td>6515</td>
<td>16 to 18</td>
<td>422.5</td>
<td>4,000,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Compiled from (Chien-Chang et al., 2003, PoK, 2014)

4.2.1 Global and Regional Competitiveness

A large natural port in the center of the Asia-Pacific region, PoK’s container traffic had a steady growth since the introduction of containerization in late 1960s. By 1979, PoK was already on the league of the world’s top 5 container ports. Throughout the 1980s, and 1990s, its growth and global ranking remained relatively strong and stable (see Figure 4.2.3).

![Figure 4.2.3: PoK Throughput (TEU), and Global Ranking (1990-2015)](source)

In early 2000s, PoK’s global ranking began to tumble, though its container volume was still on the rise. In 2006, its global competitive position took a sharp dive that ultimately led to its
exit from the top 10 global rankings in 2008. Though PoK no longer holds a position among the top 10 global seaports, its container traffic has been rising steadily since the global financial crisis and remains an important player within the East Asia region.

In the East Asian region, PoK competes with a number of hub ports, such as Shanghai (China), Shenzhen (China), Busan (Korea), and Hong Kong (China). In 1980s with the growth of containerized traffic, Kaohsiung along with Singapore, Hong Kong, Kobe (Japan), and Busan (South Korea) were handling more than 70% of the Far Eastern region’s throughput (Table 4.2.2). However, the economic environment of the region changed within a few decades, resulting in a major loss of market share for Kaohsiung and Kobe. For Kobe, its status as a key player was severely affected in early 1990s by the declining Japanese economy, and the Kobe earthquake in 1995 (Robinson, 1998, Chang, 2000). In the case of Kaohsiung, its competitive position was eroded since early 2000s, first by complications with economic restructuring in Kaohsiung (Chien and Wu, 2010) and secondly, due to the absence of direct shipping between Taiwan and China (Wang, 2004, Wu, 2005).

Table 4.2.2: Regional Market share of Kaohsiung, Singapore, Hong Kong, Shanghai, Kobe, and Busan – Containerized Traffic (1981-2010)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Singapore</td>
<td>13.3%</td>
<td>21.9%</td>
<td>26.1%</td>
<td>14.9%</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>19.5%</td>
<td>21.3%</td>
<td>27.8%</td>
<td>12.4%</td>
</tr>
<tr>
<td><strong>Kaohsiung</strong></td>
<td><strong>14.1%</strong></td>
<td><strong>14.6%</strong></td>
<td><strong>11.4%</strong></td>
<td><strong>4.8%</strong></td>
</tr>
<tr>
<td>Shanghai</td>
<td>0.6%</td>
<td>1.9%</td>
<td>8.6%</td>
<td>15.2%</td>
</tr>
<tr>
<td>Kobe</td>
<td>16.7%</td>
<td>10.0%</td>
<td>3.5%</td>
<td>1.3%</td>
</tr>
<tr>
<td>Busan</td>
<td>9.3%</td>
<td>9.8%</td>
<td>11.7%</td>
<td>7.4%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>73.5%</strong></td>
<td><strong>79.5%</strong></td>
<td><strong>89.1%</strong></td>
<td><strong>56.0%</strong></td>
</tr>
</tbody>
</table>

*Source: Compiled from (Chien-Chang et al., 2003, IAPH, 2016)*

After World War II, the countries of East Asia (Japan, Hong Kong, South Korea, Taiwan, and China) have enjoyed a notable record of high and sustained economic growth which has been remarkably higher than other regions in the world (Wang, 2015b). As an indication, the average GDP growth per capita from 1960-1994 for East Asian countries was 6.8%, compared with a rate of 3.5% for industrialized countries (Collins and Bosworth, 1996). The economic growth was even stronger in Hong Kong, South Korea, Singapore and Taiwan, named “Asian Tigers“ that enjoyed an average GDP growth of 9% from 1960 to 1980 (Roy et al., 2013).
Transformation of the shipping environment in the East-Asian region is closely linked to the high rate of economic growth (Wang, 1997). A comparison of container flow in 1990 and 2012 in the global main trade routes (see Table 4.2.3) confirms a major increase within a period of two decades in container volume handled worldwide. However, the weight of Intra-Asian sector is immense when compared to the rest of world, which is reflective of the flourishing economies of the region, particularly the stronger players in Eastern Asia. The heavy cargo flow within East Asia is attributable to regional integration of economies of the region, which is linked to production factor endowments (e.g., Japan processing sophisticated technologies, while South Korea, Hong Kong and Taiwan process mid-level technologies, and China serving as a key market and also a provider of labor, and land), economic structures (e.g., adjustment of exchange rates, and other means of amending trade imbalances), and geographical proximity (e.g., integration of economies in Southern China, Hong Kong and Taiwan, as well as Northern China with Japan and South Korea) of the countries (Cai, 2008). Cai (2008) also highlighted a number of advantages of regional integration of economies in East Asia, such as cost benefits in movement of goods and services, direct investment, and technological exchange.

### Table 4.2.3: Share of Intra-Asian Service in the Global Container Traffic (1990 and 2012)

<table>
<thead>
<tr>
<th>Main Shipping Routes</th>
<th>1990 Million (TEU)</th>
<th>2012 Million (TEU)</th>
<th>Average Annual Growth %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe - North America</td>
<td>3.05</td>
<td>6.30</td>
<td>17.2%</td>
</tr>
<tr>
<td>Europe - Asia</td>
<td>2.89</td>
<td>19.61</td>
<td>56.6%</td>
</tr>
<tr>
<td>Asia - North America</td>
<td>5.34</td>
<td>21.92</td>
<td>34.2%</td>
</tr>
<tr>
<td>Intra-Asia</td>
<td>3.50</td>
<td>56.10</td>
<td>133.6%</td>
</tr>
</tbody>
</table>

Source: Compiled from Wang (2015b)

Among the countries in the East Asian region, China experienced the fastest sustained growth. With GDP surging nearly 10 percent a year on average, China has become the second largest economy in the world, playing an influential role in the global economy (WorldBank, 2016a). The astounding performance of port of Shanghai from 2000s onwards evidenced from its top spot on the global ranking since 2010 on the till date has been attributed to China’s strong GDP growth (Wang, 2014b). Like other major seaports in the East Asian region, PoK’s hinterlands extend beyond its continental borders (see Figure 4.2.1) and include nearby regions located offshore, due to the long coastlines with large islands in close proximity (Yap and Lam, 2006). The geographical location of PoK, and its centrality in the region, offers the shortest links to the major international harbors nearby (Singapore,
Shanghai, Hong Kong, Busan, Manila and Tokyo), by an average sailing time of 53 hours (Chen, 2002). The ideal natural advantage, in addition to modern facilities on offer, created a condition for PoK to position itself as a transshipment hub between the west coast of North America and South East Asia (Wang, 2014a).

Moreover, a set of circumstances in global trade and distribution networks since early 1980s had a major impact on the position of PoK. The most relevant circumstance to containerized traffic is the liner services networks. In East Asia, the liner services developed as a hierarchy of networks with a mix of hub and direct-call ports in the lower order networks, and high-cost but high efficiency hubs at the higher order networks (Robinson, 1998). PoK was positioned in the higher order networks, along with Hong Kong and Busan, because it was serving as a hub to regional distribution networks (Haynes et al., 1997). The framework of regional networks, however, was reshaped during the period of 1970 to 2000s and the variation affected the competitive position of Kaohsiung. Robinson (1998) outlined the changes of East Asian distribution networks into three main phases (Figure 4.2.4):

1. From 1970 to the mid-1980s: this was a period with a rather simple configuration of distribution networks with the Japanese ports, Hong Kong, and Singapore as primary key hubs in the region. Rapid development of Busan and Kaohsiung as container ports in late 1970s and early 1980s, positioned the two as major hubs in the center point of the region.

2. From mid-1980s to the mid-1990s: the development of China ports and inclusion of these ports into the regional feeder networks in this period added further complexity to the earlier pattern. Role of regional hubs was intensified due to high growth rates of traffic. By mid 1990s, all of China was served by feeder services through Hong Kong and Japanese ports, while Busan was a new comer to handle Chinese traffic. At this period, PoK was handling a sizable containerized traffic in the region, though it was excluded from China-oriented traffic, due to political reasons.

3. From mid-1990s to 2000s: at this phase direct calls by shipping lines to a number of China ports began. This was also the period when major new shipping alliances were formed. By 1997, about 70% of the East-West trade were handled by the four main strategic shipping alliances (e.g., Global Alliance, Grand Alliance, Maersk Sea-Land, and Tricon) (Wang, 2015a). These shipping alliances managed to expand their direct services throughout the region to penetrate new markets by calling at newly developed seaports, and also to capture value from ports which have surpassed the
volume threshold. By early 2000’s the share of Japanese ports was already in decline, while Hong Kong, Singapore, Busan, and Kaohsiung managed to maintain their position as major hubs. At about the same period, political conflict between Taiwan and China started easing, facilitating operation in Kaohsiung as a hub for container traffic of central and southern parts of China. Stronger presence of Kaohsiung as a transshipment hub is evident from the growth of its transshipment cargo. In year 2000, 53% of total throughput in PoK was transshipment cargo, an increase of about 15% compared to a decade earlier (Chien-Chang et al., 2003). Transshipment cargos reached a high of 55% in 2001 (Yap et al., 2006) when liberalization of direct trade with China was introduced (Chen et al., 2014).

![Figure 4.2.4: Change of Shipping Networks in Asia](Source: (Robinson, 1998, p.36))

With the rapid growth of other ports in the region, particularly those in Mainland China, which benefitted from the fast-growing Chinese economy, considerable threats were posed to the competitive strengths of PoK, gradually shaving off its share of the regional container traffic. A study by Tongzon and Yang (2016) which examined the effects of Chinese ports growth on East Asian major seaports, both in short and long run, reveals that with the shift in the center of gravity from Japan to China in 1990s, the major ports handling container traffic in East Asia gradually lost their dominance. The impacts are discussed by Tongzon and Yang (2016) as follows:
• Short run: the rise of China ports had a positive effect on Singapore and Hong Kong mostly due to the increasing trade between ASEAN countries and China and the role of two ports as transshipment hubs. In contrast, PoK and port of Keelung did not benefit from the developments in China.

• Long run (from 1980-2010): Singapore, Hong Kong, Busan and main Japanese ports were negatively affected by the rise of China ports. Though Kaohsiung and Keelung have lost their hub status, they repositioned themselves as second level hub ports.

Evidently, the ports in East Asia have been developed and operated on various strategies. In the case of Kaohsiung, implementation of growth strategies by the port authority could not lead to a competitive position. Despite experiencing continuous growth in container traffic in the early 2000s, PoK exited from the list of the top 10 container ports in the world in 2008. A number of significant factors influencing PoK’s vulnerability are identified by Su et al. (2016), such as diminishing cargo sources from Taiwan, lack of subsidy incentives, and less response resilience to market impacts by the PoK authority. The downturn of PoK in relation to its complex institutional arrangement dividing the local, regional and national priorities, was also highlighted earlier by a number of other scholars (Haynes et al., 1997, Chen, 2009, Chen and Everett, 2014). Hence understanding the port’s organizational structure as a key factor impacting competitiveness of the port is crucial for revealing barriers to the growth of PoK.

4.2.2 Port of Kaohsiung Authority

In Taiwan the port authorities, namely Harbour Bureau, are administrative organizations under the Ministry of Transportation and Communications (MOTC). As Taiwan government is the source of finance and provider of public services to the ports, the central government is considered the ultimate manager of the seaports (Chen, 2009). This port governance model is based on the perspective that seaports are public goods, and of great value to national security and safety.

Kaohsiung’s Harbor Bureau (KHB) was established in 1945, the year Japan surrendered to allied forces at the ending phase of World War II. Taiwan was returned to China, and KHB took charge of restoration of the heavily destroyed harbor, which was mostly completed by 1955. In 1954 PoK’s management and administrative authority, which was responsible for the land management, shipping services and navigation policies (Chien et al., 2014), was
delegated to the Taiwan Provincial Government (TPG) (Haynes et al., 1997). Though the Kaohsiung City Government attempted for autonomy in 1998 when TPG was abolished, the port management functions were directly transferred to the MOTC (Chien et al., 2014).

In 1989, the government of Taiwan initiated a process of port reform, which went through many phases. The reform was to facilitate the development of ports. As part of the reform, a program to deregulate dock labor, and privatize stevedoring operation was launched in 1999, resulting in privatization of most of commercial activities in PoK (except towage and warehousing). In 2003, Chen (2003) highlighted a number of shortcomings in Taiwan’s port structure hindering ports commercial activities, such as government intervention, financial constraints, bureaucracy and civil servants’ attitude towards institutional change. Although most of commercial activities in Taiwan ports were already privatized, the port authorities were still directly engaged in operations, despite their position of port regulator (Wu et al., 2007).

In 2011 a proposition by MOTC to merge the major ports of Taiwan through establishment of a state-owned port company was passed by parliament. The main objectives of this reform were to decrease inter-port competition, and promote collaboration, and co-ordination among the local ports, as well as separate the port administration and business management functions from MOTC. The new establishment called Taiwan International Ports Corporation (TIPC) was set up in 2012 with four subsidiaries formed by the former port authorities of Keelung, Taichung, Kaohsiung, and Hualian. Under the new framework, the four port authorities were consolidated into Maritime and Port Bureau (MPB) and TIPC. MPB was in charge of maritime and port related administration, whereas TIPC operates as a state-run enterprise and was tasked to handle resource integration, key strategic planning, information management and legal support (Chen and Everett, 2014). TIPC also took charge of comprehensive seaport operations to enhance operational efficiencies, raise the international profile of Taiwan’s commercial ports, and spur domestic regional economic growth (Tseng and Pilcher, 2017). Yet, this governance model does not seem to promote a high degree of autonomy for port authorities, as port land is still publicly owned.

“In fact, without control of the land itself the TIPC does not have the necessary freedom to make decisions itself about how to generate profit using it, despite the government's establishment of it to do precisely this” (Tseng and Pilcher, 2017, p.43).
Under the nation’s constitution, Taiwan Central Government has jurisdiction over all ports (Chen, 2009, Chen and Everett, 2014). Though TIPC is a commercial entity, it could not operate without reference to the central government for its budgeting and financial decisions. Hence, the move prompted by private decentralization, which aimed to create efficiency and competition, does not appear to be fully productive due to an extra layer of management that needs to be passed through prior to any decision (Tseng and Pilcher, 2017). Tseng and Pilcher (2017) refer to the governance model of Taiwan ports as:

“a unique form of landlord model, aspiring for privatization and efficiency, yet retaining public ownership of management processes and overall control.” (p.45).

4.2.3 Port Planning and Provision

As Taiwan’s largest container port, PoK’s development has always been of national interest and concern. According to the governance structure of Taiwan seaports, the port planning’s were centrally and nationally determined. PoK was no exception to this rule, and its planning followed various comprehensive governmental strategic plans throughout the decades (e.g., Six-year national development plan, Challenge 2008, i-Taiwan 12 projects, etc). Figure 4.2.5 presents a timeline of national plans of Taiwan from late 1960s to date, and major national events that had an impact on maritime environment countrywide, as well as the main phases of development in PoK.

In 1960s, following the introduction of export oriented policies, Taiwan’s first Export Processing Zone was launched in PoK. In 1970s, areas around the PoK undergone a dramatic industrialization, and construction of container terminals in the port commenced, which continued till early 1980s. The combination of infrastructural developments in the port and Taiwan’s flourishing economy, created conditions for PoK to position itself at the pinnacle of global rankings throughout 1990s. In late 1990s, major shift in Taiwan’s economy directed the manufacturing towards technology intensive industries. Following the easing of relationship with Mainland China, an offshore shipping center was established in 1997.

In early 2000s, the 50-year direct trade ban with China was lifted and direct shipping to China commenced. A new container terminal was constructed and became operative. However, due to the shift of export products to low-volume, high-value goods, the port throughput began to record a modest growth. In late 2000s Free trade zones were introduced in Kaohsiung port however they were not actively promoted until after 2010s when the port
governance was reorganized, and the Free Trade Zones targeted “Double V” (trade value + trade volume) (TIPC, 2016e). Following to approval of a comprehensive development plan for Taiwan ports in 2011, construction of new container terminals in PoK commenced.
## Port of Kaohsiung - Development Path

<table>
<thead>
<tr>
<th>Year</th>
<th>Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967-1980's</td>
<td>Double Digit Economic Growth in Taiwan</td>
</tr>
<tr>
<td>1995-2000</td>
<td>Offshore shipping centers introduced in Kaohsiung</td>
</tr>
<tr>
<td>2001-2003</td>
<td>Construction of the 5th CNTR Terminal</td>
</tr>
<tr>
<td>2004-2006</td>
<td>International Ship &amp; Port Security (ISPS) code enacted</td>
</tr>
<tr>
<td>2007-2009</td>
<td>Construction of CNTR Terminal 6 and commencement of project</td>
</tr>
<tr>
<td>2010-2012</td>
<td>Agreement for construction on CNTR Terminal 6 - Phase 2 began</td>
</tr>
<tr>
<td>2013-2015</td>
<td>Construction of CNTR Terminal 6 became operative</td>
</tr>
</tbody>
</table>

**Figure 4.2.5: Development Path of PoK, Source: The Author**
4.2.3.1 1960s, 1970s, and 1980s: Decades of Rapid Growth

Taiwan’s move from an agriculture-based economy to an industrial based economy began in 1950s. In 1962, Taiwan’s economy took-off towards industrialization (McDonnell, 1988), and within a period of a few decades, became one of the fastest growing economies of the world. Taiwan’s average double digit growth in 1970s (Copper, 2014) was supported by a strong small and medium-sized enterprises (SME) dominated economy, which was fundamentally directed towards a transition from agriculture and fishery to an export-oriented economy (Welle-Strand et al., 2011). In a period of 30 years (from 1950 to 1980) the number of factories in Taiwan increased over 11 times (McDonnell, 1988). Earlier on between 1910 and 1940 Taiwan’s trade was dominated by Japan taking 85% of country exports and 74% of all imports (Hamilton, 1983). Japan’s strong influence on Taiwan’s export trade continued throughout 1950s and mid-1960s, mainly for agricultural products.

By mid-1960’s Taiwan’s economy was modernized and industrialized with its trade relying heavily on United States and Japan. Taiwanese factories were subcontractor to Japanese companies (e.g. Sony, Canon, Mitsubishi, Mitsui, and Hitachi), importing components from Japan to re-model, assemble or process and re-export to United States and Western European countries (Cai, 2008). The triangular relationship between Taiwan, United States and Japan is labeled as the “backbone” of the speedy development of Taiwan’s economy (Hsiao and Hsiao, 2002). Hong Kong was another major trading partner of Taiwan during this era who had a large share of Taiwan’s exports after United States and Japan (Cai, 2008).

In the path of Taiwan’s modernization in early 1970s, the government implemented a growth-pole strategy to shape the development by spatial division of labor (Chou et al., 2015). High-tech industries were located in the northern part of the country, and heavy industries were developed in the south. At the time, a national plan called “The Ten Major Construction Projects” was implemented by the government to upgrade and improve the key utilities of highways, seaports, airports, and power plants that comprised three categories with an overall cost of NT300 billion (Kuo, 2015). The Ten Major Construction Projects comprised:

1. Six transportation projects: Upgrading the National highway (Keelung to Kaohsiung), Electrification of Western Line Railway and the North-link line, Chiang Kai-shek International Airport, Taichung Port, and Suao Port.
2. Three industrial projects: China Shipbuilding Corporation (CSBC), China Steel Factory (CSC) in Kaohsiung, an Oil refinery and industrial park.

3. One nuclear power plant construction project.

The high rate of government savings was the key component that conferred domestic financing for investment projects. In fact, between 1965 and 1981, Taiwan’s development was nearly all financed by domestic savings, which implies that Taiwan has a very high level of financial autonomy in shaping the growth of its economy (Welle-Strand et al. 2011).

In the national plan, the agenda designated for Kaohsiung was based on the notion of an extensive shift from a traditionally agricultural area to an industrial precinct to serve as a raw material supplier for Taiwan’s growing industries (Chou et al., 2015). The area around the PoK was among the first to experience the dramatic change (Hsu and Cheng, 2002) which soon became an industrial cluster encompassing light and heavy manufacturing, shipbuilding, oil refining and petrochemicals, as well as other industries (Chien and Wu, 2010). The Chinese Petroleum Corporation (CPC), Chinese Steel Corporation (CSC), China Ship Building Corporation (CSBC), China Petrochemical Corporation and Naphtha Cracker Plants were a number of industrial establishments in the Kaohsiung area during the booming period (Chou et al., 2015) and PoK:

“has since then functioned to reduce industrial dependency on foreign sources for intermediate and capital goods” (Chou et al., 2015, p.153).

The process of PoK’s transformation into a commercial harbor area began in 1960s when Containerization was introduced. The continuous construction projects of container terminals (see Table 4.2.4) were an immediate response of policy makers to the new trend, and their rapid actions taken to diversify the role of port functions. In addition to the construction of the terminals, three major projects were implemented by the KHB to streamline the cargo flow and expand the seaport area. The three major ventures during this period were:

1. **Establishment of Export Processing Zones (EPZ):** Setting up Export processing zones was initiated in 1950s as a response to the issues Taiwan was dealing with at the time, such as high unemployment rate, increasing population, shortage of foreign reserves, and the government’s financial difficulty. Establishment of Export Processing Zones in Taiwan was based on a strategy of reorienting existing industries from import substitution to export promotion, while avoiding the complex
bureaucratic and administrative procedures (Yuan and Eden, 1992). Amirahmadi and Wu (1995) referred the establishment of EPZs in Taiwan as a strategy of a custom-free manufacturing with the assistance of foreign investment. Major gains of EPZs in Taiwan were from employment, foreign investments, earnings of foreign exchange, and increase in domestic value added exports (Amirahmadi and Wu, 1995):

“In Taiwan’s three EPZs, local supplies of materials and equipment meet almost half of the needs of the industries in three EPZs, and technology transfer occurred largely through training of workers. In addition, the Kaohsiung EPZ has aided in modernization and development of its surrounding region” (p.835).

The first EPZ was established in PoK in 1966, with four major goals of increasing job opportunities, attracting foreign investment, exploring external trade, as well introducing modern technology. For investors (both foreign and local), a number of incentives were introduced, such as exemption from duty, tax, and Value-added tax (VAT) for imported raw materials, semi-finished materials, equipment and machinery from a foreign country, imported fuel, trade promotion service fee, and harbor service fee. In addition, other incentives were rendered to the export industries, such as access to ready plant sites with water, power supply, and warehouse at a competitive cost, and proximity to harbor facilities (Sharma, 2003). The only constraint was that products manufactured in EPZs were not permitted to be sold domestically (Crook, 2010).

The strategy of EPZ succeeded in attracting foreign investment, earning foreign exchange, and creating jobs. In terms of FDI, Kaohsiung EPZ recorded an average annual growth rate of 49.5% in the first four years of establishment, and received 22.9% on Taiwan’s total FDI (Schive, 1999). In 1973, annual growth rate of FDI in two export processing zones in Kaohsiung area (Kaohsiung EPZ and Nantze NEPZ) jointly recorded 64% or US $112.7 million in value (Yuan and Eden, 1992).

With regard to foreign exchange, a regulation was enacted in 1965 for a close monitoring of foreign currency earnings of EPZ enterprises. The statutory also set a financial mechanism for firms in EPZs, regulating them to convert their earnings to hard currencies after settlement of local costs (e.g., wages, utility and rent fees, raw materials locally obtained). The method was instrumental in leaving a substantial sum
of foreign exchange in Taiwan. As an indication, during the period between 1966 and 1980, total earnings of Taiwan’s three EPZ’s (Kaohsiung, Nantze, and Taichung) accounted for nearly 75% of the local costs (Fitting, 1982). In terms of job creation, the EPZs have been a significant source of industrial employment. In 1967, a year after the formation of Kaohsiung EPZ, 5,625 people were employed by firms in the EPZ (Crook, 2010). Two decades later, in 1980, the total number of direct employment in three EPZs in Taiwan was 81,147 people (Fitting, 1982). Establishment of EPZs in Taiwan was also a very favorable approach to poverty alleviation, as the job opportunities created contributed to improving the livelihood of those in the bottom income quintile (Tsai and Tsay, 2003).

The success of the formation of the first EPZs in Kaohsiung (Kaohsiung EPZ), a 68-hectare harbor side enclave in December 1966, which was the also first EPZ in the Asia-Pacific region (Crook, 2010), led to the establishment of other EPZs on the island, including another in the Nanzte suburb of Kaohsiung (now spelled as Nanzi EPZ) in 1971 (Crook, 2010). With the burgeoning activities of two EPZs in Kaohsiung, the role of the port as the primary gateway of Taiwan’s trade was enhanced (Table 4.2.4).

<table>
<thead>
<tr>
<th>Export Processing Zone</th>
<th>Year Established</th>
<th>Area</th>
<th>Type</th>
<th>Main Features</th>
</tr>
</thead>
</table>
| Kaohsiung (KEPZ)       | 1966             | 72.4ha | Production | o Located at a section of the pier warehouse  
 o Accommodating upstream and downstream industries, and logistics facilities (warehousing, transportation, packaging, certification, testing, etc), and becoming a hi-tech and high value-added electronic industry manufacturing center |
| Nantze EPZ (EPZA)      | 1971             | 97.8ha | Production | o Located at Nantze suburb  
 o Residency of hi-tech companies and producers of integrated circuits structures, and testing process equipment |

Source: Adapted from investtaiwan.org (2017)

2. Construction of the 2nd Harbor Entrance (1967-1975): Building the 2nd harbor entrance was a project that marked a new milestone in the PoK’s history (Figure 4.2.6). Apart from overcoming national defense concerns on a single entrance port,
the 2nd entrance improved operational capabilities of the port by opening access to inner harbor area for larger vessels. Accessibility of larger vessels to PoK was also a transportation cost saver for port users, including heavy industries located adjacent to the port, and companies relying on Kaohsiung port for their transshipment activities. The project was a plan for utilizing the port land in Qijin district by constructing a number of deep water wharfs along the 2nd entrance to the port, to enhance PoK’s overall handling capacity (TaiwanToday, 1975).

![Figure 4.2.6: Arial View of the PoK before and after building the 2nd harbor entrance](image)

3. **Construction of the Cross Harbor Tunnel (1981-1984):** This was another engineering project to connect the isolated island of Qijin to the opposite bank. The tunnel, about 18 km long and 440m wide, is the only road transportation route from the port to the island (Chen et al., 2002). With a dual two-lane carriage way, each 7 meters wide and 4.6 meters high, the tunnel was designed to serve container trucks (TIPC, 2016c). The construction of the tunnel was also designed to streamline cargo traffic plying the new container terminal on Qijin Island along the 2nd entrance of the port. In other words, Cross harbor tunnel contributed indirectly to capacity growth of the port. The tunnel project was completed prior to the construction of container Terminal 4 (Table 4.2.5), the largest terminal in PoK.

Another initiative adopted by the PoK authorities for attracting cargo was leasing out container terminals to a number of strategically selected shipping lines for their
dedicated use (Chiu, 2011). This was one of business models of container terminal operation under which the port authority offered dedicated use of container berths and the affiliated facilities to container shipping companies through a long-term tenancy agreement (Lu and Chang, 2014). For port authorities, dedicated terminals are means of reducing public investment in the ports (Haralambides et al., 2002) while facilitating development of integrated services, and engaging the commitment of shipping companies (Lun et al., 2010). On the other hand, dedicated terminals provide a number of benefits for shipping lines, such as higher level of flexibility, reliability, short turnaround times, enhancing their overall efficiency in global supply chains (Haralambides et al., 2002).

Table 4.2.5: Container Terminals constructed in PoK during 1960s, 1970s, and 1980s

<table>
<thead>
<tr>
<th>Container Terminal</th>
<th>Construction Period</th>
<th>Water Depth (meter)</th>
<th>No. of Wharfs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminal 1</td>
<td>1969-1970</td>
<td>10.5</td>
<td>4</td>
</tr>
<tr>
<td>Terminal 2</td>
<td>1970-1975</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>Terminal 3</td>
<td>1976-1981</td>
<td>14</td>
<td>3</td>
</tr>
<tr>
<td>Terminal 4</td>
<td>1983-1993</td>
<td>14</td>
<td>8</td>
</tr>
</tbody>
</table>

Source: Compiled from TIPC (2016e)

4.2.3.2 Late 1980s, and 1990s: Period of Transformation in Industrial Structure

In 1987, the 38-year Martial law in Taiwan ended and a period of reform commenced. Recognizing the significant changes in the international trading environment, the Taiwan government took some measures to liberalize trade, such as easing foreign exchange controls, reducing limits on outwards investments, as well as cutting and reducing tariffs on imports. These changes were followed by a new foreign trade law passed in 1993 to facilitate Taiwan’s application to join the World Trade Organization (WTO) and develop Taiwan as an Asia-Pacific Regional Centre (APROC) (Chiu, 2007).

Beyond the borders of Taiwan, a major change was also emerging which had a profound impact on both regional and global economic dynamics. This was the Chinese economic reforms. The first phase of those reforms was initiated in late 1970s and early 1980s, with introduction of policies under which China allowed FDI into the country, and expansion of International trade (Tung, 2005). Taiwan’s economy was experiencing a strong growth, reinforced by governmental developing plans which were designed to address growth related problems. The “Six-Year National Development Plan” was the agenda of government
towards modernization of Taiwan during 1991-1996, and included introduction or completion of about 700 projects (TaiwanInfo, 1991). Approximately one third of the plan’s expenditures were allocated to transportation projects covering highway development, urban transportation, railway and aviation development, as well as a port and harbor development (Shen, 1993). At the time, Taiwan had four main international seaports (Kaohsiung, Keelung, Taichung and Hwalieng) and the government planned to spend $1.8 billion on infrastructural and cargo facilities development through expansion of docks, piers, storage areas, and cargo handling facilities (Shen, 1993).

Throughout 1990s both domestic and oversea economic investments of Taiwan underwent a rapid change. On the international level, Taiwan faced the global and regional economic integration in which the Asia-Pacific region was becoming increasingly important. Hence Taiwan’s strengthening trade links with its regional counterparts was essential. Taiwan joined the Asia-Pacific Economic Corporation (APEC) forum in 1991, anticipating a spillover effect in domestic and international politics (i.e., open regionalism) that potentially could lead to economic collaboration between Taiwan and its regional counterparts (Kueh, 2012, Cheng and Lee, 2016).

In 1995, while political enmity between China and Taiwan started easing, the Taiwan government approved a plan to develop the country as an Asia-Pacific Regional Operations Centre (APROC), which became the most important element in the government’s policy for adjustment in economic structure in the 1990s. With a vision of stimulating ongoing growth, accumulating investment capital, and industrial upgrading, Taiwan moved to develop operations center on manufacturing, transportation (sea, air), financial services, telecommunications, and media under the APROC plan (Mai and Shi, 2001). To encourage private sector investment for expanding the country basic infrastructure projects, the BOT (buy-operate-transfer) scheme was promoted. The first phase of ARPOC (1995-1997) was mostly about tuning the economy as a whole by revising the legal system, and an orderly investment. The second phase of APROC (1997-2000) focused on responding to the situation of Hong Kong’s return to China, the expansion in the scale of operations in the various operations centers and implementation of all round economic reform (Mai and Shi, 2001).

Hong Kong’s return to Mainland in 1997 coincided with the entrance of Mainland China as a formal trade partner in Taiwan (Welle-Strand et al., 2011). In response to the rising demand for cross-strait sea transport between two sides of the Taiwan Strait, which was suspended
since 1949, the Taiwanese government set up an “Offshore Shipping Center” in PoK. The purpose of Offshore Shipping Center was to handle transhipment cargo shipped between Fuzhou or Xiamen on mainland China and Kaohsiung, i.e., cargos that neither get customs clearance nor enter Taiwan. Otherwise, ships carrying regular cross-strait trade cargo had to anchor at a third place, such as Ishigaki in Japan or Hong Kong, to get customs clearance without unloading for transshipment before arriving at Taiwanese ports to avoid the direct shipping prohibition. Following the establishment of the Offshore Shipping Center, Kaohsiung’s transshipment services to China soared from 127,509 TEUs in 1997 to 630,337 TEUs in 2003 (TIPC, 2004). In 2001, the Taiwanese Government amended the regulation of the Offshore Shipping Center, introducing the sea-air transport mode to allow cargoes transported by sea from China (Xiamen, or Fuzhou) to Kaohsiung Offshore Shipping Center, and air freighted to another third area via Kaohsiung Airport (Yang, 2010).

The establishment of the Offshore Shipping Center removed the operating inefficiency, saved additional cost and time of operation, and lessened risk of detour for transporting cross-strait trade cargo (Yang and Chung, 2013). Despite the emergence of new ports in China (e.g., Shanghai and Shenzhen) in 1990s and the political disputes between China and Taiwan, China based cargo processed at Kaohsiung’s offshore shipping center rose from less than 8% between 1997 and 2004 (Chen, 2007) to 16% in 2009 (Chen, 2010). The higher rate of transshipment was a reflection of PoK’s ability to recapture what appears to be lost opportunities, despite the reduction of weekly calls at PoK between 1997 and 2002 due to industries relocating from Taiwan to China (Ducruet et al., 2010).

Container terminal operation in PoK became fully privatized in 1998 (Chiu, 2007). Although the privatization did not improve the performance of PoK (Chiu, 2011). The other major change during this period was related to the dedicated terminals. Both facilities and services on offer for vessels in the dedicated terminals were limited to the exclusive use of shipping lines leasing the terminal, making it difficult for PoK to extend services to other shipping lines. This policy was reviewed after more than two decades (Chiu, 2011) when service restriction on dedicated container terminals was lifted in 1998, and shipping lines leasing the berths were upgraded to “terminal operators” (Chen, 2007). The change enabled PoK to secure new strategic business with other international shipping lines. However, during this period, major shipping lines began to adopt different growth strategies, and capitalizing on direct calls at Chinese ports was one of their key approaches. A comparison in share of slot
capacity deployed by main shipping lines at major ports in East Asia from 1995 to 2001 reveals a drop of direct calls at PoK (Yap et al., 2006), leading to loss of traffic. PoK, however managed to benefit from loyalty of the Taiwanese shipping lines (e.g., Evergreen Marine Corporation, Yang Ming Marine Transport and Wan Hai Lines) that hold the status of terminal operators, and maintaining dedicated wharves in the port (TIPC, 2016d).

Both the removal of service restriction on dedicated container terminal and the establishment of the Offshore Shipping Center resulted in a sharp rise in transshipment cargos at PoK, from 2.18 million TEUs (43% of total throughput) in 1995 (Chien-Chang et al., 2003), to over 4.12 million TEUs (55% of total throughput) in 2001 (Yap et al., 2006).

In the national level, Taiwan was also in the process of liberalizing its maritime market. The main deregulation measures that took place between 1995 and 1999 were: 1) allowing foreign companies to establish a local firm handling warehousing and storage services, trucking, shipping agency, and freight forwarding activities, and 2) allowing foreign shipping companies to set up a branch in Taiwan (Chiu, 2007).

Furthermore, 1990s was a period that Taiwan’s economy went through a major transformation. Manufacturing was gradually shifting from high-volume and low-value goods to low-volume and high-value products (Gereffi, 2001, Liu and Shih, 2013). The industrial transformation from capital-intensive to technology-intensive industries with particular emphasis in the EPZs had, to a certain extent, affected the volume of container traffic handled by PoK. Moreover, a number of changes in regulations of EPZ were made, impacting the non-transshipment cargo at PoK. Up till 1986, all goods manufactured within the EPZs were required to be exported. The relaxation of this rule in 1987 allowing domestic sale of up to 50% of EPZ productions, and its eventual removal in 1997 (Crook, 2010) also had an impact on the volume of container traffic going through PoK, with the volume of non-transshipment cargo dropping by 0.3% between 1997 (3,187,294 TEUs) and 1998 (3,178,618 TEUs) (Chien-Chang et al., 2003).

Nonetheless, the trend of establishing EPZs remained strong in Kaohsiung area. A new EPZ called Linguang (LEPZ) was launched in 1999 that mainly focused on production of mid-to-high end key electronics components. In an area of 9 hectares with a close proximity to international airport, seaport and national highway, LEPZ was designed to cater to electronic industries, such as LCD, backlight modules, fibre optics, IC designs, and heat dissipator.
4.2.3.3 Throughout the 2000s: Era of Global Deployment

In the early years of the new millennium, the Taiwan government introduced a number of fresh policies relevant to hub port development. These included the 2002 Global Logistics Development Plan (GLP), and the National Development plan called Challenge 2008, the 2003 Free Trade Zone Plan (FTZP), and the 2009 i-Taiwan 12 projects. The main agenda of these plans were to further develop Taiwan as regional operations headquarter for Taiwanese manufactures and businesses, through infrastructural development as well as institutional revamp. A summary of the national implemented polices in 2000s is presented in Table 4.2.6, which highlights the key components related to development of PoK.

<table>
<thead>
<tr>
<th>Plan</th>
<th>Period</th>
<th>Key Plans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global Logistics Development Plan (GLP)</td>
<td>2002</td>
<td>• Establishment of Free ports, and&lt;br&gt;• accelerating development in PoK and Kaohsiung Air cargo park</td>
</tr>
<tr>
<td>Challenge 2008</td>
<td>2002-2007</td>
<td>• Developing Kaohsiung Harbor Intercontinental Container Center</td>
</tr>
<tr>
<td>Free Trade Zone Plan (FTZP)</td>
<td>2003</td>
<td>• Introduction of Free Trade Zone in PoK</td>
</tr>
<tr>
<td>i-Taiwan Projects</td>
<td>2009-2016</td>
<td>• Construction of Intercontinental Container Terminal&lt;br&gt;• Construction of a harbor eco-park and establishment of marine technology and culture center&lt;br&gt;• Redevelopment of Qijin area into an-international-class marine amusement area&lt;br&gt;• Transformation of old harbor districts&lt;br&gt;• Expansion of warehousing and logistics facilities at Kaohsiung International Airport, and improvement of peripheral transportation</td>
</tr>
</tbody>
</table>


At the core of the Global Logistics Development Plan (GLP) was the promotion of Taiwanese ports as free ports. The GLP aimed to enable Taiwanese ports to operate through a single-window administration, and facilitate free flow of goods within free ports. For companies operating in the free ports, the plan offered advantages, such as autonomous management, and free commercial activities (TIPC, 2004). Wang and Kuo (2012) described Free port as a strategy to expand the volume of re-export trade by generating profit from the trade service fees to increase income in foreign currencies. For Kaohsiung, this was another approach to augment the previous plans of “Export Free Zones” and “Offshore shipping centers”, as the free port plan was expected to improve benefits from integration with neighboring businesses and create a multiplier effect (TIPC, 2004).
The Free Port plan paved the path for PoK to launch a Free Trade Zone in the port area in 2004. The free zone plan was essentially a program of coping with the intense regional competition by deregulating prevailing operating procedures for transshipment, re-export, and utilizing capacities of seaports and airports. The plan was based on the notion of value creation for enterprises in the free zone, through their integration with supply chains, and convenience of proximity to seaports and airports. Evolution of PoK into free trade zone is described by Taiwan’s transport minister (SCMP, 2014):

"Value is more important than quantity. If we can sustain the No 13 ranking, that's good enough."

The key principal was to enable PoK to operate “within national territory but outside customs territory”, as a means of liberalizing trade as well as facilitating free flows of human resources, commodities, finance and technologies within the free trade zones (TIPC, 2016b). A few years after launching the Free Trade Zones in Taiwan, the overall economic effects of Free Trade Zones was evaluated by Yang (2009) who observed that:

“FTZs in Taiwan have yielded economic benefits that include attraction of foreign investment, increased foreign exchange earnings, job creation, promotion of technology transfer, enhancement of local industrial growth, increased port operating revenue, and encouragement of cargo consolidation and transshipment businesses” (p.286).

PoK introduced the Free Trade Zone in anticipation of upgrading the port from an Asian transshipment center to a “Logistics and Distribution” center in 2004 (TIPC, 2016f). The Free Trade Zone offers opportunities for its tenants to perform various type of trade services, such as transshipment, distribution, reassembly, consolidation of containers, as well as simple and in-depth processing (Yang, 2009). Incentives offered to the Free Trade Zone’s tenants included exemption from custom duty, tax and service fees for goods, machinery and equipment transported from overseas for their operations, and zero tax rate on goods sold to an occupant enterprise for its business operation by a business entity in a tax zone or bounded area (Yang, 2009).

Another plan in the national level that was instrumental in the evolvement of PoK was “Challenge 2008”. It was a six-year national development plan (2002-2007), setting up three categories of reform, based on the concept that Taiwan’s economic growth can no longer be dependent on contract manufacturing and low-value added processing (NDC, 2004).
Challenge 2008 comprised ten key individual plans, which included building a deep water harbor in PoK with a storage capacity of 15,000 TEUs. Construction of this terminal commenced in 2007.

The last blueprint for Taiwan’s infrastructural development for the decade was “i-Taiwan”, which consists of 12 public construction projects. Kaohsiung Free Trade and Ecology Harbor were among the 12 infrastructural plans, which projected continuous construction at Intercontinental Container Terminal, creation of a harbor eco-park in the port area, renovation of old harbor areas, and expansion plan for warehouse and logistics zones of the Kaohsiung international Airport (ITSC, 2016).

From 2000 to 2009, while the governmental plans were focused on large scale developments, a number of other ventures took place in the PoK area such as:

1. Completion of Container Terminal 5, with 8 deep water wharfs and a total storage capacity of 49,000 TEU
2. Provision of a faster and more secure service for shipping companies by completion of Vessel Traffic Service (VTS) and Vessel Traffic Centre (VTC), the online global guide systems to the vessel traffic services in ports.
4. Enactment of ISPS code to improve port and vessel security against terrorist threats.

In the Kaohsiung city area, two new EPZs were also established: ChengKung Logistics Park (CLP) and Kaohsiung Software based Technology Park (KSTP), which had a rather diverse functionality compared to those established decades ago. The export free zones formed previously were production oriented, whereas the two new zones were logistics and software centered, and in alignment with the government’s development strategy, as well as Taiwan’s industrial focus (see Figure 4.2.7). Combination of the port and related operation centers formed an industrial cluster in the Kaohsiung area.
<table>
<thead>
<tr>
<th>Export Processing Zone</th>
<th>Est</th>
<th>Area</th>
<th>Type</th>
<th>Key Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chengkung Logistics Park (CLP)</td>
<td>2002</td>
<td>8.4ha</td>
<td>Logistics</td>
<td>• One of the biggest logistics centers in south-eastern Asia, offering an automated warehouse.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Beside warehousing, processing goods and transshipment, air cargo forwarding, and international express mail services are provided.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Facilities for International convention, exhibition and business services are offered in this logistics zone.</td>
</tr>
<tr>
<td>Kaohsiung Software Industrial Park (KSIP)</td>
<td>2008</td>
<td>7.9ha</td>
<td>Software</td>
<td>• A newly developed technology park located in downtown Kaohsiung, with a focus on ICT software, digital contents and research and design.</td>
</tr>
<tr>
<td>Nantze 2nd EPZ</td>
<td>2012</td>
<td>8.5ha</td>
<td>Production</td>
<td>• Supporting the current industry chain of semi-conductors and electronic components.</td>
</tr>
</tbody>
</table>

Source: Adapted from investtaiwan.org (2017)

In 2010, PoK was the world’s 12th largest container port and Taiwan’s largest international commercial harbor. With the exit from the league of top 10 seaports, it became apparent that Kaohsiung could no longer rely on the strengths of its “convenient” location. In line with the national economic growth agenda, in 2011, a new port plan was approved by the Council for Economic Planning and Development (CEPD), which considered Taiwan’s 7 international ports as a strategic whole (Wang, 2012). This new port plan, regarded as a comprehensive blueprint (Wang, 2012), has two main objectives: 1) ongoing development of Taiwan into a competitive hub for Asia Pacific shipping, and 2) promotion of tourism and development of cruise ship. For Kaohsiung, the plan was directed towards making the port:

1. container transhipment hub port;
2. comprehensive value-added logistics port;
3. import and export centre for major energy, heavy industry and petrifaction materials and a logistics centre for petroleum products; and
4. international tourism and commercial service port” (TIPC, 2016f).

Based on the above agenda, the PoK authority decided on a set of developments under a scheme called “Port of Kaohsiung 2040 Master Plan” to address the main aspects of 1) land
development, 2) modification of port and water area facilities, 3) accessibility improvement (both berths, and hinterlands), 4) improvement of inner port connectivity and transportation network, and 5) port sustainability (TIPC, 2016f). Based on the mentioned objectives, the key components of the Master Plan comprised: 1) reconstruction projects on breakwater, wharf and warehouse facilities, 2) land development, 3) public utilities, 4) extension of the International Container Terminal – Phase II.

At the local level, in addition to the physical expansion for accommodating larger vessels and increasing port capacity, PoK authorities lowered the port tariffs, as well as reorganizing its bureaucratic procedures for cargo processing (PoK, 2013, KaoPort, 2013). At the national level, an agreement with China was reached in 2008, lifting the cross-strait ban, which suspended trade between two sides of the Taiwan Strait since 1949 (Yang and Chung, 2013). This was one of the most instrumental approaches for achieving economies of scale through direct shipping to and from China. The dynamics of cross-strait economic relations and the impact on shipping routes is elaborated further below.

4.2.4 Cross-Strait Economic Relations

China and Taiwan relations have been geopolitically characterized by limited contact, tensions and instability (Welle-Strand et al., 2011). The rise of cross-strait investment, and trading between Taiwan and China began in 2001, when both countries joined the WTO and underwent substantial economic liberalization. The annual cross-strait trade had a dramatic boost from $10 billion in year 2000 to $90 billion in 2007 (Rosier et al., 2016), and over $121 billion by 2012 (Meltzer, 2014). Since 2003 China became the largest export market, and number one trading partner of Taiwan, and the leading source of FDI in Taiwan. By end 2015, the inward FDI from China in Taiwan was $4.172 billion compared to $132.77 billion from other countries, with major investments of China in real-estate, insurance and finance sector, and in the electronic parts, computers, optical products as well as retail trade (Chow, 2016).

The intensity of economic relationship raised concerns for Taiwan, firstly its overdependence on China, and secondly the vulnerability of Taiwan’s local industries with the emergence of China’s “red supply chain”, which refers to the gradual penetration of firms from Mainland China into the global supply chain during the last 20 years. In 2013, Financial Times (Mishkin, 2013) highlighted that apart from Taiwanese firms, the Chinese “red supply chain”
has become a major threat to existing Japanese and Korean businesses. For Taiwan, electronics firms are the hallmark of its economy, contributing to 40% of exports and 15% of its GDP (Economist, 2016). At the core of the industry is the semiconductor sector, a global market leader that used to be the main source of supply for China. However, during the last few years China manufacturers started reducing their order quantities from Taiwanese firms, as they began to rely on local China-based suppliers (Rosier et al., 2016). Consequently, Taiwan recorded a major decline in semiconductor exports to China.

In terms of direct shipping links, the cross strait relationship was disrupted since 1949 due to political enmity between Taiwan and China. China’s denial of legitimacy of Taiwan government was the core of the conflict, which prevented the two countries from negotiating on equal basis (Chang and Chen, 2008). With the return of Hong Kong to China’s sovereignty in 1997, and entitlement of Hong Kong to retain a dual status called “one country, two systems”, the direct navigation became operative on a trial basis between the offshore shipping center of PoK and the Chinese ports of Xiamen and Fuzhou for transshipment cargos. Hong Kong’s dual status created an opportunity for China and Taiwan to interpret the concept of direct navigation in two different ways (Figure 4.2.7):

- China’s perspective: Navigation from Shanghai, Xiamen, Kaohsiung, Hong Kong, Kaohsiung, Xiamen, Shanghai was considered a “domestic route”.

- Taiwan’s perspective: Shipping routes of Kaohsiung’s off-shore shipping center were Xiamen, Kaohsiung, Hong Kong, Kaohsiung, Okinawa, Shanghai, Xiamen was called “Xiamen-Kaohsiung special route”.

Though the traffic volume between China and Taiwan was deemed insignificant compared to the total throughput of PoK, the 2nd phase of cross-strait relationship, called “Mini three links”, began in year 2000 with direct links between port of Kinmen in Taiwan and Xiamen in China, as well as Matsu in Taiwan and Fuzhou in China (Chiu, 2013).

The 3rd phase was in 2008, when China and Taiwan signed an official agreement and direct cross-strait shipping links were formally launched. The treaty however created new challenges for Taiwan ports, rather than helped boost its throughput (Chiu and Yen, 2015). Initially the Taiwanese authorities were keen on a direct shipping link with China based on perception of acquiring economic benefits, such as finding a new market for agricultural products (vegetables, fruits, and flowers), saving time and cost of transport, while
augmenting logistics efficiency (Chiu, 2013). However, Taiwan’s reliance on the direct shipping treaty impeded other plans for increasing its ports throughputs. Besides, the direct shipping link posed a number of potential challenges for Taiwan seaports, such as possible (non-commercial) interventions, un-favorable occurrences for Taiwanese shipping liners operating in direct-sailing markets, and intense competition between China and Taiwan ports (Chiu and Lin, 2013).

Since 2008, it has become possible to travel directly across the strait, although access is limited to Chinese and Taiwanese carriers and ships with Chinese (including Hong Kong) or Taiwanese registry, and foreign carriers have no access to transshipment containers from China. Because of diminishing cargo sources from Taiwanese ports and a lack of subsidiary incentives, large international container carriers have reduced their callings at Taiwanese ports (Su et al., 2016).

![Figure 4.2.7: Shipping Routes of PoK Offshore Shipping Center](image)

*Figure 4.2.7: Shipping Routes of PoK Offshore Shipping Center
Source: (Chang and Chen, 2008, p.510)*

### 4.2.5 Strategic Developmental Path

Taiwan’s economy has gone through major transformation in 1960s, when the island emerged as a world leader in manufacturing, and created the “Taiwan Miracle” (KaohsiungCity, 2017). Since 1960s the process of economic reorganization had been continuous, though a diverse range of development strategies were implemented throughout
the subsequent decades (Figure 4.2.8). These strategies guided the industrial focus by shifting production from labor intensive to capital intensive, and later towards technology intensive industries.

The two most significant areas for Taiwan’s industrial development are establishment of EPZs and Industrial Parks (Wu and Huang, 2003). Predominantly EPZs were developed to promote the influx of FDI and became the contributory factor to 1) increase foreign exchange earnings by exporting new products and finding markets, 2) create jobs, raise the standard of living, and upgrade the local human resource skills, 3) transmit new technology by training local people, and 4) generate linkages with the hinterland (Ota, 2003). Even half a century after the establishment of Taiwan’s first EPZ, their advantages still remain relevant for manufacturers. As stated by a senior manager of a company located at KEPZ, benefits such as lower management and rental fees, proximity to major customers and supply chains, and a convenient location for R&D are their main reasons for setting up facilities in EPZ (Crook, 2010). Convenience of the location is confirmed by another manager, saying “In terms of logistics, we’re only about 15 minutes from the airport and the harbor is right here” (Crook, 2010).

In line with the national development schemes, Taiwan’s EPZs also progressed over five main phases (Imin, 2012);


2. 1977 - 1986: Manufacturing activities upgraded to high level consumer electronics and components. The volume of garment and apparel production decreased.

3. 1987 - 1996: Products manufactured in the EPZs, which were not permitted to be sold domestically since the introduction of EPZs, were allowed for domestic sales. More than 75% of the total production consisted of electronics components.

4. 1997 - 2004: More than 80% of products were mid-to-high end key electronics components (e.g., LCD, IC and optical).

5. 2005 onwards: Increased focus on high added-value industries (e.g., LCD, IC, optical and digital contents).
As the largest seaport in Taiwan, PoK’s development has followed the path of the national export-oriented industrialization programs. The competitive position of PoK can be interpreted from its development path in three areas:

1. **External Alignment:** In 1960s and 1970s, PoK, a publicly-owned entity and a core element of Taiwan’s transport infrastructure, operated as a distribution center for domestic demand and production (Haynes et al., 1997). PoK’s rapid growth was powered by two factors, the economic growth in Taiwan, and very limited alternatives in the country. In late 1980s and 1990s, PoK began to transform into a transshipment hub. This was due to the rising production cost in Taiwan which forced local manufacturers in Taiwan to re-position their production plants to low-cost neighboring countries. Since seaport facilities in those countries (e.g., China, Thailand, Malaysia, Indonesia, and Philippines) were not capable of handling the mounting flow of goods (Chien-Chang et al., 2003), PoK evolved to become a regional transshipment hub. A comparison in share of transshipment cargoes of the total throughput in PoK in 1983 (17%) and 15 years later in 1998 (49%) (Chou, 2010) reveals the transformation of PoK. Since 2000s, maintaining the position of a regional

---

**Figure 4.2.8: Taiwan’s Industrial Transformation**  
*Source: Compiled from (EPZA, 2012, IDB, 2016)*
transshipment hub had been a primary focus for PoK. However, development of China ports had a major impact on PoK’s throughput, and its transshipment hub status. PoK upgraded its position to a regional logistics and distribution center by introducing a Free Trade Zone in the port area. With this strategy, PoK moved towards becoming a multi-functions port, offering various types of trade activities, such as transshipment, distribution, and reassembly, consolidation of containers, as well as simple and in-depth processing.

2. **Industrial Transformation:** PoK served the export driven local industries, which had a boost with introduction of EPZs in late 1960s and 1970s. The port throughput contained raw material imports, and product exports from high growth sectors, such as textile, electromechanical, electric appliances, plastics, and machinery. With the emergence of high tech industries in 1980s and 1990s, the nature and volume of goods moving through PoK began to change from low-value, high-volume to low-volume, high-value products. This trend has been sustained since early 2000s with Taiwan local industries concentrating on knowledge, technology, and innovation intensive industries, such as IC products, LCD modules, and Optoelectronics parts.

3. **Hinterlands to Forelands:** As PoK is located on an island, with no landlocked countries, its initial hinterland-based activities in 1960s and 1970s were reliant on local industries. With the expansion of transshipment trade during 1980s and 1990s, PoK moved towards foreland-based activities. In early 2000s supply chain integrations with China initiated by FDIs (Meltzer, 2014), and the direct trade with China, underpinned the movement of goods in PoK, and reinstated PoK’s position as a foreland-based regional hub. This position is anticipated to remain for a longer period, given the high level of economic integration with China and the importance of Taiwanese shipping companies (e.g., Evergreen, Wan Hai, and Yang Ming) to the local economy (Rodrigue and Notteboom, 2010).
4.3 Port of Rotterdam

Located at the northern part of Europe, with a hinterland population of 350 to 450 million people (Figure 4.3.1) (OECD, 2010), Rotterdam has been one of the busiest seaports in the world since 1960’s. It has held its position as one of the top 10 container ports in the world since 1989, though its ranking has been on the decline in general.

![Port of Rotterdam in relation to the European Market Population](image)

*Figure 4.3.1: Port of Rotterdam in relation to the European Market Population
Source: OECD (2010)*

The beginning of Port of Rotterdam (PoR) can be traced as far back as mid 1300’s, when its primary economic activities were based largely on fisheries and cargo handling. Location and political circumstances (e.g., establishment of an admiralty, and chambers of governmentally owned trading companies such as Dutch East Indies, and West Indies, and Merchant Adventurers) favored Rotterdam to flourish through trade with other European countries and even America. While the PoR experienced significant growth between 1850 and 1940, major development occurred after World War II, anchored by a reconstruction plan designed to develop a bigger and deeper port in Rotterdam to act as a gateway to Europe. Figure 4.3.2, depicts the phases of development in the PoR, showing that the port has been expanding steadily westward since the early 1900s.
Since the 1960’s development of PoR has been associated with rapid economic growth in the Netherlands. Subsequent to the economic growth, major ventures of oil refining, chemicals, and distribution were positioned around PoR. Accumulation of industries generated a unique position for the port and raised its importance to the economy of the Netherlands (Schulze, 2014).

At the national level the PoR has a substantial strategic value for the competitiveness of the Netherlands, by contributing to the direct and indirect value added, as well as direct and indirect employment (Van den Bosch et al., 2011). In 2013, the direct added value of Dutch seaports to the Dutch economy (see Table 4.3.1) was estimated as €22.2 billion (Netherlands, 2015), out of which more than half (€12.4 billion) was generated by the port area of Rotterdam (Rotterdam-Rijnmond region) (PoR, 2016c). In terms of direct employment, Rotterdam region also contribute to 55% of overall Dutch seaports employment. A comparison of the added value and employment figures of PoR, with the 2\textsuperscript{nd} largest port in the Netherlands, Amsterdam, reveals a considerable gap between scales of operation in two ports, which signifies the position of PoR at the national level. Moreover, a sizable difference between container throughputs of PoR (12.23 million TEUs) and Amsterdam (51,634 TEUs) in 2015, demonstrates a monopoly of the PoR in the Dutch container port system, and reflecting its operational advancement.
Table 4.3.1: Economic Value of the PoR (2013)

<table>
<thead>
<tr>
<th>Economic Values</th>
<th>Port of Rotterdam</th>
<th>Port of Amsterdam</th>
<th>Dutch Seaports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct added value (in million Euro)</td>
<td>12,498</td>
<td>3,610</td>
<td>22,242</td>
</tr>
<tr>
<td>Indirect added value (in million Euro)</td>
<td>7,269</td>
<td>NA</td>
<td>14,798</td>
</tr>
<tr>
<td>Direct employment (people)</td>
<td>93,759</td>
<td>33,949</td>
<td>170,489</td>
</tr>
<tr>
<td>Indirect employment (people)</td>
<td>53,014</td>
<td>32,865</td>
<td>155,336</td>
</tr>
</tbody>
</table>

Source: Compiled from (PoR, 2016c, PortofAmsterdam, 2016b, Netherlands, 2015)

During the last few decades, the focus of PoR authority gradually shifted from a traditional port operation of loading and unloading towards formation of a port complex that consists of all activities related to the handling of ships and cargo, and comprises companies active in transport, stevedoring, logistics, trade and manufacturing. Amongst all activities, stevedoring is the core, which forms a geographical linkage to all port related activities. Apart from the logistics, transport and stevedoring activities, there are manufacturing and trading companies in the port cluster that are dependent on deep water and either produce or trade goods that are maritime related. Many business entities in the PoR are part of various international groups of companies. The presence of global players in the port cluster is an indication of superior seaport conditions on offer, in addition to availability of value added operations, and strong distribution networks. While the port authority acts on behalf of all port stakeholders, as a cluster manager, it also binds firms and cargoes. These qualities can be considered a major strength and a fundamental element in achieving competitiveness (De Langen, 2004b).

Table 4.3.2 illustrates a number of global players based on their ranking in the Fortune Global 500 that are located in the PoR.

Table 4.3.2: Leader Firms located in the PoR – Fortune Global 500

<table>
<thead>
<tr>
<th>Industry</th>
<th>Company</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Container Terminal Operators &amp; Shipping</td>
<td>APM Rotterdam - Maersk Group</td>
<td>208</td>
</tr>
<tr>
<td>Chemical &amp; Petrochemical</td>
<td>Shell</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Exxon Mobil</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>British Petroleum (BP)</td>
<td>6</td>
</tr>
<tr>
<td>Energy</td>
<td>E.ON</td>
<td>22</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>General Electric (GE)</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Thyssen Krupp</td>
<td>179</td>
</tr>
</tbody>
</table>

Source: (FORTUNE500, 2016)
4.3.1 Global and Regional Competitiveness

As the largest container port in Europe, PoR’s traffic has grown steadily since 1990s when it was ranked among the top 5 container ports in world (Figure 4.3.3). The rate of growth surged in early 2000s and has been sustained since, except for 2009, the year of the Global Financial Crisis. In 2015, over 12,200,000 TEUs were handled by PoR. With a capacity of about 17,250,000 million TEUs the average rate of utilization has been 71 per cent of late (Table 4.3.3). Developing the capability to handle such a large volume of traffic requires strategic long-term planning. With regards to container traffic in specific, PoR has witnessed a series of innovations and developments (Gijt et al., 2010), e.g., operating automated guided vehicles (AGV), and introducing the first automated terminals, which propelled this port to become the largest container hub port in Europe, ranking among the top 10 ports on the global scale.

![Figure 4.3.3: PoR Container Throughput (TEU), and Global Ranking (1990 – 2015)](source)

Within the region, PoR competes with a number ports located along a stretch of 850 kilometers in North-West Europe called the ‘Hamburg – Le Havre’ range (Figure 4.3.4). The seaports within the Hamburg – Le Havre range collectively handle about half of the total European container throughput. In addition to PoR, there are four large load centers in the range that jointly control about 90% of the total range throughput (Table 4.3.4).
Within the Hamburg- Le Havre range, the two main rivals of the PoR have been Port of Antwerp (PoA) in Belgium, and Port of Hamburg (PoH) in Germany since 1980s. The market shares of container traffic of these three ports in the Hamburg – Le Havre range has risen from 59% in 1970 to almost 74% by 2010 (see Table 4.3.4). Beside an overall stronger presence of the trio, the statistics also reveal a reduced share for PoR, which appears to be captured by PoA.

Table 4.3.3: Specifications of Container Terminals in PoR and their Overall Utilization Rate, 2015

<table>
<thead>
<tr>
<th>Container Terminal</th>
<th>Quay Length (Meter)</th>
<th>Water Depth (Meter)</th>
<th>Total Area (Hectare)</th>
<th>Capacity (TEUs) 2015</th>
<th>Capacity Throughput (TEU) 2015</th>
<th>Annual Utilization Rate (2015)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waalhaven</td>
<td>300</td>
<td>6.5</td>
<td>10.1</td>
<td>200,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Botlek Terminal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short Sea Terminals</td>
<td>1800</td>
<td>11.65</td>
<td>46</td>
<td>1,440,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uniport Multipurpose Terminals</td>
<td>2400</td>
<td>11 to 14.5</td>
<td>54</td>
<td>1,200,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barge Center Waalhaven</td>
<td>225</td>
<td>9.65</td>
<td>6.4</td>
<td>200,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECT Delta Terminal</td>
<td>3600</td>
<td>16.65</td>
<td>272</td>
<td>7,500,000</td>
<td>17,250,000</td>
<td>12,235,000</td>
</tr>
<tr>
<td>Euromax Terminal</td>
<td>1500</td>
<td>16.8</td>
<td>84</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>APM Terminals</td>
<td>1600</td>
<td>16.65</td>
<td>100</td>
<td>3,350,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotterdam Container Terminal</td>
<td>400</td>
<td>10</td>
<td>17</td>
<td>500,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delta Container Services</td>
<td>1500</td>
<td>16.65 to 19.65</td>
<td>84</td>
<td>150,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotterdam World Gateway MV2 (Total Capacity 4 Million TEU)</td>
<td>1700</td>
<td>20</td>
<td>108</td>
<td>2,350,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>APM Terminal, MV2 (Capacity 4.5 Million TEU)</td>
<td>1500</td>
<td>20</td>
<td>86</td>
<td>2,700,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In PoR, containerized traffic was prompted in late 1960s predominantly by trans-Atlantic liner services, and handling American cargo that comprised about 40% of total throughput. Fremont and Soppe (2008) described the position of PoR during 1970s and 1980s “the dominant player of Northern Europe” (p.113), a position that was sustained to a certain extent throughout 1990s. While PoR was benefiting from the excellent nautical access, PoA and PoH were gaining advantages from their inland location and proximity to the European market, leading to a drop in PoR’s market share by late 1990s. The volume of American cargo dramatically declined to the rate of 18% of PoR’s total throughput, and the Asian trade gradually took over. In 1999 PoR recorded handling nearly 40% of the Asian trade in the Hamburg – Le Havre range. During the same period, PoA and PoH experienced a continual growth of container traffic that progressively shaved off PoR’s container market share (Fremont and Soppe, 2008). The shift of the market shares in Hamburg – Le Havre range denotes that shipping lines and shippers were no longer dependent on services provided by a single port.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotterdam</td>
<td>33.7%</td>
<td>37.0%</td>
<td>37.4%</td>
<td>31.2%</td>
<td>30.0%</td>
</tr>
<tr>
<td>Antwerp</td>
<td>17.5%</td>
<td>14.1%</td>
<td>15.8%</td>
<td>20.3%</td>
<td>22.7%</td>
</tr>
<tr>
<td>Hamburg</td>
<td>7.6%</td>
<td>15.3%</td>
<td>20.1%</td>
<td>21.1%</td>
<td>21.2%</td>
</tr>
<tr>
<td>Bremen</td>
<td>18.2%</td>
<td>13.7%</td>
<td>11.9%</td>
<td>13.5%</td>
<td>13.0%</td>
</tr>
<tr>
<td>Le Havre</td>
<td>10%</td>
<td>9.9%</td>
<td>8.8%</td>
<td>7.3%</td>
<td>6.3%</td>
</tr>
<tr>
<td>Total</td>
<td>87.0%</td>
<td>90.0%</td>
<td>94.0%</td>
<td>93.4%</td>
<td>93.2%</td>
</tr>
</tbody>
</table>

*Source: Compiled from (Notteboom, 2003, De Langen et al., 2012)*

Competitiveness of the “big five” seaports within the range is associated with their capabilities in dealing with container flows to the proximate and distant hinterland regions (Notteboom, 2007). A distribution of containerized cargo for the main seaports in the Hamburg – Le Havre range based on their locational hinterlands (Figure 4.3.5) shows that PoH’s throughput had been relying largely on German’s cargo and its strong manufacturing base (Notteboom, 2010). Besides, PoH’s geographical condition (draft of 14.5 meter) does not allow the port to accommodate the Ultra Large Vessels, thus limiting PoH’s role as a hub port.

The situation of PoR and PoA are rather diverse. They not only served as distribution hubs and logistics centers within their borders but throughout Europe. PoR is blessed with a
location on deep waters and unrestricted nautical accessibility. PoA’s situation as a river port was less optimal till late 1990s compared with PoR. However, two major dredging projects in late 1990s, and in 2013 enhanced the capability of the PoA in handling larger sized ships (i.e., larger than 13,000 TEU) (PoA, 2013). PoR and PoA have been jointly serving European Distribution Centers which are mostly concentrated along the border of Belgium and the Netherlands. Consequent to the common region in their hinterland, PoR and PoA are considered as one port complex (Van Klink, 2003). Because of their functional interactions PoR and PoA do form a port cluster, serving the same logistics pole that is formed by logistics zones in the common hinterland (Notteboom, 2003).

By late 1980s, the competitive environment of ‘Hamburg – Le Havre’ range was transformed by a number of events in Europe. The collapse of Soviet Union in 1989, followed by the reunification of Germany in 1990, resulted in the opening of eastern and central Europe as new hinterlands for the seaport of the ‘Hamburg – Le Havre’ range (Thorez and Joly, 2006). In 1998, Kreukels and Wever (1998) counted a number of factors that influence competition in the ‘Hamburg – Le Havre’ range in the container sector: 1) productivity and costs in the various seaports, 2) International (main roads) bottlenecks, 3) limited capacity of the rail system, and 4) increasing number of restrictions, imposed by society on the transport sector, mainly of an environmental nature (e.g., noise, contamination).

By late 1990s and early 2000s, the phenomenon of “globalization” occurred, changing the economic landscape of Europe. Consequently, flow of materials and goods were drastically increased through liberation of trade and finance, while advancements in information
technologies facilitated management of the constantly growing cargo volumes. The three major ports of Antwerp, Hamburg, and Rotterdam reacted to the changing market environment by looking for closer links to customers and inland distribution centers (Notteboom, 2008).

Unification of Europe in early 2000’s led to disappearance of trade barriers and the opening of borders in Europe. Competition extended in the ‘Hamburg – Le Havre’ range to the ‘Mediterranean’ range and territories served by five main seaports were further broadened to the non-EU members. The face of competition of ports in the Hamburg – Le Havre range was altered in a broader manner due to several other factors (Notteboom, 2003):

1. Stronger presence of UK ports in handling transshipment cargos destined for the UK, Ireland, the Baltic and Southern Europe.
2. Evolvement of Mediterranean Ports as transshipment hubs, due to changes in shipping lines networks. Further investments in Mediterranean hubs, had led to quality improvements.
3. Developments of ports in proximity (e.g., Zeebrugge, Amsterdam, and Flushing)

Development of ports in Hamburg – Le Havre range had not been built upon a single strategy. As stated by Thorez and Joly (2006) some ports have focused on specialization, while others were leaning more towards diversification. Some exemplary approaches are establishment of automated container terminals (PoR, PoH), introduction of storage and warehousing facilities as a compliment to fast transit (PoR, PoA), and developing and maintaining the distribution function by creating new container terminals (PoH, PoR, and PoA) (Thorez and Joly, 2006). Since the strategic plans of ports are essentially formulated by the port authorities, gaining an understanding on the port organization structure is the primary step to appreciate the developmental strategies that are designed and implemented.

4.3.2 Port of Rotterdam Authority

PoR authority is an unlisted public limited company with two shareholders: Municipality of Rotterdam (approx. 70%) and the Dutch government (approx. 30%). The core tasks of the PoR Authority are 1) enhancing sustainable development, management and operation of the port, maintaining safe and smooth handling of all cargoes, 2) ensuring that the port could be managed and operated in a professional manner – not necessarily the cheapest, but the best in reliability, service quality and competitiveness (PoR, 2017a).
The annual turnover of PoR authority reported for the financial year 2015 is €676 million (PoR, 2016e) which includes revenues on investments in public infrastructure (such as new port sites, quay walls, jetties, and road), traffic management systems, patrol vessels, and emergency controls, while the key revenue streams are:

1. Rental income of port land to firms, including storage and transshipment companies, petrochemical and chemical industries, and energy producers.
2. Port dues charged to vessels using the port facilities.

PoR authority is not the owner of the land portfolio nor a trustee of it, but is a master tenant leasing the approximately 10,000 hectares of land from the Municipality of Rotterdam. As a landlord, PoR authority retains the autonomy of deciding how it allocates port land and deals with contract, while stimulates intra-port competition (Verhoeven, 2015).

During 1995-2005, the institutional position of PoR authority governance structure went through a major change, from a municipal department, called Rotterdam Municipal Port Management (RMPM), to a public corporation (De Langen and Van der Lugt, 2006). Two main motives prompted the restructure. The first was linked to increasing port competition and changes in the global economy during the mid-1990s (Ng and Liu, 2014). At that period PoR was experiencing a negative growth in traffic, particularly in the container sector. Privatization of the terminal operations could have been a short-term solution to boost the business. However, to sustain competitive advantage, PoR could not rely on private terminal operators handling tasks, such as planning and executing investment projects, commercial functions of the port, and enhancing port’s reputation (Ng and Liu, 2014). Those tasks were to be undertaken by RMPM, though functionality of the port authority was mainly on traditional landlord functions and less on commercial activities.

Second, due to the integration of Europe the relationship between the PoR and national government was changed. Gradually the process of making decisions for the port became a challenge due to various effects of the European integration, which was derived by both the presence of a single European market as well as the increase in EU’s involvement in port issues (Chlomoudis and Pallis, 2002, Pallis, 2007). Considering the importance of the port to the national economy, the Dutch government became concerned about the lack of PoR’s involvement in any EU policies that could threaten its competitive position and possibly hinder national interests (Ng and Liu, 2014).
Under the new governing structure, level of independence of PoR authority was increased (De Langen et al., 2012), though the municipality remained the main shareholder (70%). In 2007, the Dutch state became the minority shareholder of approximately 30%, for a value of €700 that was invested in the expansion project of Maasvlakte2 (De Langen and Heij, 2013). The investment of the national government in PoR implied that the Dutch state would have more explicit role in matters such as investments and appointment of board members. The national Dutch government also became a liaison between the PoR and the EU, particularly on issues concerning the role of the PoR in different transport EU policies e.g., Trans-European Transport Network (TEN-T).

At its early phase, corporatization of the PoR deemed to increase the risky undertakings due to the lack of monitoring decisions made by authorities (De Langen and Van der Lugt, 2006). Though corporatization provided the flexibility required for extending the traditional functionality, the role of PoR authority was extended beyond a profit maximizing landlord to a cluster manager (De Langen, 2004b). In a more recent study, Hollen et al. (2013) described the authority of the PoR as an entrepreneurial port developer, by predominantly focusing on developing the industrial ecosystems in the port area, and supporting inter-firm connectivity and collaboration (Hollen et al., 2015). This description corresponds with the typology of landlord port authorities given by Verhoeven (2010), confirming the role of an entrepreneur for PoR authority acting as a facilitator with an outspoken commercial attitude as a service provider, investor, and consultant (Verhoeven, 2015).

4.3.3 Port Planning and Provisions

Over the last five decades, the PoR has gone through phases of development. The bundle of strategies formulated by the PoR’s authority was presented to the public as “Port Plan”. Since 1990’s, three Port Plans had been published by PoR authorities. The Port Plans, as stated by Kreukels and Wever (1996), are meant as a point of reference for fixing priorities for the investments required, and may not necessarily be a blueprint for the future. To better understand PoR’s competitiveness during the last three decades, a timeline of development in the PoR is presented (Figure 4.3.6), depicting major events affecting the port setting, along with major ventures by PoR in both local and international level.

Starting with the period of 1967-1980s that coincides with the first and second wave of containerization, PoR was among the first seaports in Europe that successfully adapted to
containerization. During 1975-84 the main Dutch urban centers were hit by international and national recessions. Though PoR managed to maintain its position as the top port in Europe, it was experiencing an operational downturn (Kuipers, 2002). Formation of European Union, and development of European Distribution Centers within proximity of the port land, shaped new opportunities for Rotterdam area. During this period, PoR authority and city administrators jointly took steps to fortify the competitive strength of the port. The outcome of this attempt was a strategic development plan, called “Port Plan 2010”, which was officially approved in early 1990s (Kreukels, 2003). The main objectives of this plan were: 1) creating optimal accessibility, 2) strengthening the commercial and service sectors, and 3) reconstructing the existing sites and development of new premises (Kreukels and Wever, 1996).

The second port plan (Plan 2020) was issued in 2004 by the newly restructured authority of PoR, with a core vision of forming an industrial cluster. Infrastructural development, strategic land allocation and introduction of international ventures were the highlights of this period.

The third port plan (Plan 2030) introduced in 2011, concentrated on the concept of Industrial Ecosystems in the port area, while bolstering the position of PoR as a Global Hub and the European Industrial cluster. Expansion in the international level was also on the agenda.
### Port of Rotterdam - Development Path

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LOCAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- First container handled in ECT terminal</td>
<td>- Two Distriparks operational (Eemhaven + Botlek)</td>
<td>- MV1 (Phase I) commenced</td>
<td>- Investment in 'PortinfoLink'</td>
<td>- MV2 projected (Process of bidding for terminal operators in MV2 started)</td>
<td>- MV1 (Phase II) completed</td>
<td>- 'Aphelium' (Inland transshipment terminal) opened</td>
<td>- MV2 Container terminal operational</td>
</tr>
<tr>
<td>- MV1 (Phase I) completed in 1971</td>
<td>- 3rd Distripark operational (Maasvlakte)</td>
<td>- Port Cluster Association 'Deltalinx' established</td>
<td>- Rotterdam City Ports Development Corporation (RCDC) established</td>
<td>- Rotterdam Climate Initiative (RCI) established</td>
<td>- MV2 bidding finalized. Construction commenced</td>
<td>- Container Transferium (CT) operational</td>
<td></td>
</tr>
<tr>
<td>- PoR invested in KeyRail (Company managing Betuwerroute – the dedicated freight rail to Germany)</td>
<td>- 'Multico' established (Underground distribution system of Pipeline)</td>
<td>- 'RC2' launched (a pipeline system connecting to port of Antwerp)</td>
<td>- 'Portbase' established (extensive logistics ICT system)</td>
<td>- 'Portbase' established (extensive logistics ICT system)</td>
<td>- 'Portbase' established (extensive logistics ICT system)</td>
<td>- Investment in 'Plug &amp; Play' in MV2 (bundled services for bio-based cluster)</td>
<td></td>
</tr>
<tr>
<td>- - Investment in 'Verkeersdemonomering' (foundation with city to improve accessibility of A15)</td>
<td>- Investment in 'Verkeersdemonomering' (foundation with city to improve accessibility of A15)</td>
<td>- Investment in 'Verkeersdemonomering' (foundation with city to improve accessibility of A15)</td>
<td>- Investment in 'Verkeersdemonomering' (foundation with city to improve accessibility of A15)</td>
<td>- Investment in 'Verkeersdemonomering' (foundation with city to improve accessibility of A15)</td>
<td>- Investment in 'Verkeersdemonomering' (foundation with city to improve accessibility of A15)</td>
<td>- Steam Grid in Botlek</td>
<td></td>
</tr>
<tr>
<td>- - Management of Port of Dordrecht</td>
<td>- NextLogic information platform</td>
<td>- - PortXL, a startup accelerator program</td>
<td>- - PortXL, a startup accelerator program</td>
<td>- - PortXL, a startup accelerator program</td>
<td>- - PortXL, a startup accelerator program</td>
<td>- - PortXL, a startup accelerator program</td>
<td></td>
</tr>
<tr>
<td><strong>INT'L</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Sohar (Oman) Concession agreement for exploitation and free-zone activities until 2025</td>
<td>- Extension of Sohar project from 2025 to 2045</td>
<td>- Nangang (China) Service agreement</td>
<td>- Qatar Petroleum agreement to promote cargo flows between Qatar, Rotterdam</td>
<td>- Agreement in Brazil (JV port exploitation)</td>
<td>- Partnership Agreement with Indonesian Port Corporation for development of a new port</td>
<td>- Agreement in Brazil (JV port exploitation)</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 4.3.6: Development Path of PoR, Source: The Author**
4.3.3.1 Port Plan 2010: Rotterdam a Location for European Distribution Center

The first draft of Port Plan 2010 was published in Oct 1991, and finalized in 1993 with three focal points:

1. Promotion of activity: Increasing value added activities and employment by creating favorable trading conditions, optimization of the hinterland connections (railway line, and inland navigation in particular), paying more attention to the trade function and industrial activities in the port, and focusing on goods flows in growth sectors (chemical industry, food and fruits distribution, container transshipment)

2. Space optimization: Clustering functions in the port area, restructuring the older port spaces, cooperating with other Dutch ports (e.g., Moerdijk, Flushing)

3. Environment Improvement: Sustainable port development concept, and imposing environmental policies

The final “Port Plan 2010” was published with the aim of “Strengthening Rotterdam as a mainport for containers, as a distriport, as a fruit port and a chemical port”. The concept of mainport was a national economic initiative, introduced by the Dutch government in 1980s with the notion of transforming the Netherlands into a “Distribution Country” (Kuipers, 2002). As the earliest strategic scheme for PoR’s development in post-containerization era, mainport was prompted by the establishment of the European Union, and was staged to consolidate Netherlands’ position within Europe, and European distribution networks. With the creation of the European Union, many non-European large enterprises, which used to have a number of plants and distribution centers scattered across Europe, consolidated their activities in a single location, resulting in the rise of main distribution centers (Klapwijk, 1996). Elements such as transportation, and total operating costs, subsidies, and living conditions, were involved in selecting a favorable location. PoR was identified as one of the main hub ports serving the northern Europe distribution centers (see Figure 4.3.7).

Under the mainport strategic plan, “Rotterdam Seaport” and “Schiphol Airport” in Amsterdam were branded as “mainports”, a concept that had three main viewpoints of transport, policy, and marketing (Kuipers, 2002). The mainport policy was revised during 1990s. In a memorandum published by the Ministry of Transport (Netelenbos, 2000) three key aims were listed for mainport Rotterdam:
“Strengthen the position of the Netherlands as an international trade and industry country, by taking the strong points of the Dutch economy as point of departure. Rotterdam mainport is an important component of that; Create the right conditions for new, opportunity-rich clusters, partly building on existing clusters; Opt for a sustainable development and constantly pay attention to the improvement of the living environment, especially in the Rijnmond-area” (Netelenbos, 2000, p.9).

Figure 4.3.7: Changing distribution patterns in Northern Europe
Source: Adapted from Klapwijk (1996)

According to Merk and Notteboom (2013), the mainport strategy was the leading force in justifying and directing a number of major infrastructure investments, such as Betuweroute (dedicated freight rail from the PoR towards Germany and into Europe) and the high-speed rail connection between Schiphol-Amsterdam and Paris. The rise of European distribution centers and centralization of European distribution function was a major attraction for foreign investments. In 1990s, particularly American and Japanese companies were investing heavily in establishing plants across Europe (Buck and Wever, 1994). The Netherlands had the highest share (54%) with regard to Distribution Centers among the counties in Western Europe (Table 4.3.5). According to Kolk and Van der Veen (2002), the Dutch government policies led to a surge in re-exporting activities, and establishment of the European distribution centers in the Netherlands.

These statistics reinforce the competitive advantage of PoR as the mainport, mostly in the provision of logistics services, in comparison with the other European locations. The Dutch policy makers also believed that investments in the European Distribution Centers would stimulate additional FDI within the Netherlands, whether in R&D or office facilities, or production (Kuipers, 2002). This assumption was based on providing a stable political
climate, a favorable fiscal policy on foreign investment, and the local population’s high level of education and knowledge of languages, and moderate trade unions, in addition to the favorable location of the Netherlands (Sluyterman, 2013). The anticipation of the policy makers was proven correct to a certain extent, when observing the rate of growth in receiving FDI flows into the Netherlands. With the steady increase of FDI, the Netherlands moved from seventh in the global ranking of countries receiving FDI in 1980 to sixth in 1999 (Sluyterman, 2013), and became the top source of FDI globally as of end 2009 (Galeza, 2011). Though only part of the total FDI affected the Dutch real economy (DNB, 2011), the flow of investment had provided a stable source of funding that contributed to advancing the competitive position of the Netherlands.

Table 4.3.5: Manufacturing plants and distribution centers of American and Japanese companies in Western Europe

<table>
<thead>
<tr>
<th></th>
<th>High Tech Production</th>
<th>Other Production</th>
<th>R &amp; D</th>
<th>European Distribution Centre</th>
<th>European Head Quarters</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Netherlands</td>
<td>10%</td>
<td>12%</td>
<td>15%</td>
<td>54%</td>
<td>26%</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>36%</td>
<td>39%</td>
<td>28%</td>
<td>10%</td>
<td>29%</td>
</tr>
<tr>
<td>France</td>
<td>16%</td>
<td>22%</td>
<td>28%</td>
<td>8%</td>
<td>10%</td>
</tr>
<tr>
<td>Germany</td>
<td>9%</td>
<td>12%</td>
<td>23%</td>
<td>11%</td>
<td>10%</td>
</tr>
<tr>
<td>Ireland</td>
<td>22%</td>
<td>7%</td>
<td>2%</td>
<td>5%</td>
<td>1%</td>
</tr>
<tr>
<td>Belgium</td>
<td>6%</td>
<td>5%</td>
<td>4%</td>
<td>11%</td>
<td>23%</td>
</tr>
<tr>
<td>Luxemburg</td>
<td>1%</td>
<td>3%</td>
<td>nil</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Total number of</td>
<td>115</td>
<td>318</td>
<td>60</td>
<td>104</td>
<td>237</td>
</tr>
</tbody>
</table>

Source: Adapted from Buck and Wever (1994)

Major Port Development Projects:

During the two decades of 1980s and 1990s, the PoR went through two major phases of development within its port area, which were guided by Port Plan 2010: 1) Maasvlakte1, 2) Distriparks.

- **First Phase (Maasvlakte1, 1968-2008):** The core concept of developing Maasvlakte 1 was seaport industrialization, creating employment, and generating revenue for the port authority based on the added traffic port dues as well as rental fees. Investment in the industrial function of the port was strongly related to the political climate in the
PoR in late 1960’s, which followed the upcoming trend in Western Europe and supporting the growth of industrial clusters in the seaports. Prior to commencement of the construction in Maasvlakte 1, Rotterdam Municipal Port Management agreed to allocate the entire developing land space for the oil, chemical, and iron and steel industries. However, in 1970’s, the policy makers amended the objectives of the development, and focused on improving the environment, and the financial situation of the seaport. With the new policies, investments in chemical, iron and steel in Maasvlakte 1 were rejected, and land allotted to the large-scale container terminals, liquid and dry bulk terminals, which were producing modest levels of negative externalities compared to the oil and chemical industry.

The first phase of Maasvlakte 1 was completed in 1972, extending the total area of the port from 3,000 to 10,000 hectares. The strategic decision made in 1970s by PoR authority reflects its awareness and responsiveness to the business cycles (e.g., ending of the industrial development in the port in early 1970s) and economic trends (e.g., boom in the throughput of containers), which made Maasvlakte 1 one of the largest container terminal locations in the world (Manshanden and Jonkhoff, 2011). In mid 1980s the second phase in the development of Maasvlakte 1 was initiated, predominantly by the investment in ECT (Europe Container Terminals) setting Maasvlakte 1 as a large scale container terminal location. The final phase of development in 1998 was twofold, one on the investment of Arco Chemical in a large scale chemical plant, and the other, the settlement of Reebok European Distribution Center and Eurofrigo cold store in Maasvlakte 1.

- **Second Phase (Distriparks, 1989-1998):** The concept of “Distriparks” was introduced by the PoR authority based on the notion of centralizing the European distribution, and following the integration of Europe in 1993 (Van der Lugt et al., 2007). As of 2016, the port area encompasses three main distriparks in different districts (Figure 4.3.8), providing warehousing, distribution, and value adding activities (UNESCAP, 2013).

One of the main advantages of these distribution centers is their location and proximity to the cargo and container terminals, which translates directly into operational benefit (e.g., easy positioning, and return of empty containers to terminals) and financial merit (lower transportation costs from warehouses to
terminals). A summary of characteristics of the three distriparks is presented in Table 4.3.6.

Figure 4.3.8: PoR’s Distriparks: Eemhaaven, Botlek, and Maasvlakte  
Source: UNESCAP (2013)

Besides the above-mentioned developments, upgrading the port rail connection was on the agenda of Port Plan 2010. The 160 km double track freight railway connecting PoR to Germany, called Betuweroute, was a project of aiming to allow free access for freight trains across the entire EU without having to stop at borders or make way for passenger trains (RailwayTechnology, 2007). Although the primary role considered for Betuweroute was shifting traffic from the parallel A15 highway, where there has been serious congestion from 1990s (Zhang et al., 2009), the Betuweroute project was initially introduced in 1985 in a master plan for the future of PoR, which soon became a plan of national importance (Vrijland, 2004). The new hinterland port rail connection was essential for growth of container traffic in PoR. By investing in KeyRail, the company handling operation management of Betuweroute, PoR took a proactive action towards creating a more efficient intermodal transportation by shifting part of land transport from road to rail. KeyRail is a private company, owned by Prorail (50%), PoR (35%) and Port of Amsterdam (15%) (PortofAmsterdam, 2016a). The key responsibilities of KeyRail are: capacity allocation, scheduling and traffic control, management and maintenance, as well as promoting the use of rail transport.
Table 4.3.6: Distriparks in the PoR

<table>
<thead>
<tr>
<th>Distripark</th>
<th>Year of Operation</th>
<th>Land Space (ha)</th>
<th>Distinctive Features</th>
</tr>
</thead>
</table>
| Eemhaven   | 1989             | 65              | • Close to the city and home terminal of ECT (Europe Container Terminals).  
• Majority of the companies located in Eemhaaven are third party logistics providers (e.g., Barwil, Maersk Logistics), and have multiple modalities (Road, Rail, Inland waterways, and Sea- short sea terminals) for hinterland transportation though the predominant mode of transportation is by truck. |
| Botlek     | 1990             | 86              | • Situated in the Botlek area where most of the Chemical companies (e.g., Vopak, LyondellBasell) are located.  
• A prime location for logistics providers engaged in storage and distribution of chemical products. |
| Maasvlakte | 1998             | 125             | • Located in Maasvlakte I, this distripark accommodated a number of manufacturing companies (e.g., Reebok, Epson) that had established their European DC, as well as megacarriers and distributors (e.g., DHL/Exel, Nippon Express, Eurofrigo) to centralise their physical distribution.  
• Connected to hinterland by rail, road, inland waterways, and sea.  
• Proximity to the North Sea allows easy transfer of a large share of containers from container terminals by truck to warehouses in the distripark. |

Source: Adapted from UNESCAP (2013) and Van der Lugt et al. (2007)

The rapid growth of industrial clusters in Rotterdam, as well as other seaports of Western Europe, is dependent on four main factors: 1) strong growth of the petrochemical industry that enhanced the role of seaports in economic geography, 2) locating the basic and processing industries after World War II to benefit from economies of scale in transport sector, 3) large influx of FDI in Europe by US companies, and 4) supply of large-scale spaces in seaport areas (Manshanden and Jonkhoff, 2011). For PoR providing large-scale spaces has been a main challenge. In a SWOT analysis on the internal and external environment of the PoR, Zauner (2008) identified scarcity of space as the biggest challenge facing PoR. To overcome this challenge and maintain its leading role in Europe, PoR took proactive actions by reclaiming land in its harbor basins to create higher ground to progressive expand its port (Gijt and de Horst, 1993). In mid-1990s after the growth in demand for Maasvlakte 1, the port authorities initiated another ambitious project of land reclamation called Maasvlakte 2.
4.3.3.2 Port Plan 2020: Formation of Industrial Clusters

Port Plan 2020 was published in 2004 by the newly reformed port authority with the main objectives of:

1. Maasvlakte 2 Reclamation, Building and Exploitation
2. Redevelopment of City ports
3. Sustainable port industry cluster management
4. Improvement of highway A15 (highway to the PoR)
5. Port and city development in balance
6. Rotterdam Climate initiative

Edelenbos et al. (2008) described Port Plan 2020 “a manifesto of the privatized port authority to advocate the sustainable development of the mainport” (p.53). Traditionally the concerns over availability of port terminals and accessibility measures have been PoR’s dominant topics of development. Port Plan 2020 broadened the traditional focus by including IT plans for optimizing accessibility and initiatives for improving the living environment (Edelenbos et al., 2008). The plan also reflects an awareness of connectivity with many stakeholders (Edelenbos et al., 2008). Ng and Liu (2014) explained that Plan 2020 is reflective of the increasing freedom of PoR from political interference and exemplifies a move for the port to address its own future (and the city of Rotterdam), rather than be guided by the national political agenda. The PoR authority was more bent on strengthening the port’s competitive position, rather than how it could contribute to achieving the objectives of the national political agenda (Ng and Liu (2014).

At the national level, there was also a shift in policies from a focus on hubs to metropolitan regions, and to empower the local states to deal with competition from foreign metropolitan regions (Van Gils et al., 2009). The regional perspective envisions a combination of infrastructural development in the main business sites, the mainports, and connection between these nodes and hinterlands as well as the forelands. At this phase, the local policy makers stressed the need to provide a high quality of life as a fundamental element of attracting foreign investments into the region, which should go hand in hand with factors of accessibility and connectivity.

The Dutch national policy makers introduced a broader view for countrywide development in 2005. This plan, presented by the Netherlands Bureau for Economic Policy Analysis (CPB),
offered four plausible scenarios for the future development of Netherlands until 2040 (Huizinga and Smid, 2005). Adaptation of the four long-term scenarios of the CPB for PoR and city of Rotterdam, as elaborated by Kuipers et al. (2015), is presented in Table 4.3.7.

The role of PoR was significantly important in all four scenarios, and proposed national agendas were mostly supporting and aligned with all the objectives of Port Plan 2020, in addition to introducing a number of new growth avenues. Strategies, such as extending the mainport policy by reinforcing existing container terminals and the chemical cluster under “Global Economy scenario”, were already projected in Massvlakte 2.

The emphasis put on Rotterdam city, and parallel growth of port and metropolitan area, under “Transatlantic Market scenario”, were included in Port Plan 2020 as a redevelopment plan of city ports, and balanced development of port and city schemes. The focus on sustainability schemes (e.g., utilization of bio-based materials, renewable energy resources), rather than traditional growth strategies under “Regional Communities scenario”, were envisioned in Port Plan 2020 as sustainable port industry cluster management.

The attention drawn on 3D technology under the “Strong Europe” scenario, a relatively new concept, created fresh opportunities for PoR which were not anticipated, hence not projected. Developing Rotterdam as a global 3D and hub city would enable PoR to provide raw material for 3D printing through its petrochemical cluster, and offer value-added, storage and distribution of 3D printing commodities. Moreover, printing spare parts for shipping industry would strengthen the position of PoR as a maritime service location. These prospects were considered in the next development plan for PoR (Plan 2030) and had led to opening of the first 3D lab in PoR called RAMLAB in 2016 (PoR, 2016d), which is described by PoR’s Business Developer in Energy and Industry sector as:

“RAMLAB is not some outlandish plan dreamt up the Port Authority, but is end-user driven. It has a direct link to our core business and the potential to provide significant value-added services to some of our major customers in the form of on-demand, large, metal 3D-printed parts” (Todd, 2016).
Table 4.3.7: Four Plausible Scenarios for Future Development of Rotterdam until 2040

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Impact on PoR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Global Economy</strong></td>
<td>• Extending the position of Rotterdam’s mainport for the container sector, and Europe’s Industrial Center for the process industry</td>
</tr>
<tr>
<td>(Based on assumption of</td>
<td>• Structure of PoR remaining intact, and PoR continues to grow strongly in the traditional sense, empowered by MV2</td>
</tr>
<tr>
<td>progressive intensification of globalization, resulting in strong economic growth and a high level of global trade)</td>
<td>(a location for chemical industries connected to biochemical companies, as well as container terminals)</td>
</tr>
<tr>
<td></td>
<td>• Container logistics and industrial cluster remain key features of PoR</td>
</tr>
<tr>
<td><strong>The Transatlantic Market</strong></td>
<td>• Priority of formation of a high-quality maritime port-related service center in PoR, as an attractive location for advanced producer services and firms conducting activities in supply chain management. An ongoing progress in physical activities of PoR (cargo handling, manufacturing), are important criterion.</td>
</tr>
<tr>
<td>(Based on regional orientation, and value creation of Rotterdam as a region)</td>
<td>• Parallel development of city and port</td>
</tr>
<tr>
<td><strong>The Regional Communities</strong></td>
<td>• Trend of recycling easily degradable products and reuse of raw material production would surge</td>
</tr>
<tr>
<td>(Based on China retaining its dominant position as the global factory, and the notion of increasing transport volumes by rail from China to Europe, lessening total volume of deep-sea traffic in Europe in long-run)</td>
<td>• PoR’s position remain strong as a global hub in Europe, though growth of traffic might decline</td>
</tr>
<tr>
<td></td>
<td>• Port policy makers need to focus on sustainability strategies (transition towards bio-based materials and decentralizing energy using renewable energy resources) rather than conventional growth schemes</td>
</tr>
<tr>
<td><strong>The Strong Europe</strong></td>
<td>• The 3D technology would be core subject in the economic strategy of the city and port, forming a global cluster of 3D technology by 2040. Rotterdam would concentrate on providing logistics services for imported printers, storage, as well as input and output. PoR would benefit from the demand for (bio) chemicals needed as raw materials for 3D printing (PoR Petrochemical cluster is producing chemicals for 3D printing)</td>
</tr>
<tr>
<td>(Based on an urban vision for banking Rotterdam City a global 3D &amp; Hub City)</td>
<td>• PoR would provide value-added services, storage and distribution for commodities related to 3D printing</td>
</tr>
<tr>
<td></td>
<td>• 3D printing will create another opportunity for PoR to print spare parts for shipping industry, positioning Rotterdam as a location for high quality maritime services</td>
</tr>
</tbody>
</table>
Major Port Development Projects

1. (Maasvlakte2, 2008-2030): The Second Maasvlakte is part of the Project Mainport Development (PMD), which had three main components. One is the Second Maasvlakte. The second component is a nature development project in which 750 hectares of nature reserves will be created in the Rotterdam region as a compensation for the loss of natural habitat as a result of the second Maasvlakte. The third element of the PMD is the redevelopment of the older harbors in the existing city-area, such as the Waalharbor and Eemsharbor, into mixed-land use areas with housing, (water) recreation and small businesses. With combination of the three components, the project became an initiator of employment and value added in the region, as well as an incentive for formation of nature reserves and improvement of livability (Koppenol, 2014).

Maasvlakte 2 was projected in 1997, as the existing port was expected to run out of space by 2014. Aiming to create additional land for port activities, expansion plan of Maasvlakte 2 would extend the terminal area by 1000-hectares of which 600 hectares would be dedicated to container handling, 200 hectares for distribution facilities, and 200 hectares for the chemical industry (PoR, 2015a). Situated directly on the deep water, at a depth of 20 meters, Maasvlakte 2 would be able to accommodate the upcoming generation of deep-draught container vessels, which might be unable to dock in many other European ports (PoR, 2015a).

For this project, the PoR authority has set up an organization responsible not only for master plan reclamation, development and construction, but also communication with stakeholders throughout the project (De Langen et al., 2012). The bidding process for awarding terminal concessions in Maasvlakte 2 started two years prior to the actual construction, and has served as an important developmental tool. At the first phase of the process, interested terminal operators were prequalified by PoR authority based on volume handled in the previous year, which had to be over 2 million TEUs. This was done to indicate capability of the candidates for attracting new container volumes to PoR rather than shifting volume from already existing container terminals. Further assessments were conducted on candidate’s proposals with regard to four criteria (financial, technical, strategy, and sustainability) to reveal the agenda and priorities of terminal operators. After rounds of discussions with short listed candidates,
particularly on their hinterland strategy and emphasis on minimizing the share of road transport, the final agreement was signed in 2007. This process, called “Competitive Bidding Process” for granting container terminal concessions, illustrates the frequent and productive interactions between the PoR authority and the stakeholders, which had contributed to decisions on the terminal lay-out, and the modal split requirements prior to developing terminals (De Langen et al., 2012). The process of construction in Maasvlakte 2, as described by its project director, aims to strike a compromise between market needs and legislative requirements:

‘Maasvlakte 2 is a complex project because it is business-case driven. We are expressly making allowances for clients’ wishes. We will not start building until we actually do have clients. The contractor we appoint will have to take their wishes and requirements into account, which calls for flexibility. What’s more, we want to be able to build faster if clients say they are in a hurry. But at the same time, we have to go through the prescribed licensing procedures. So we have to achieve the optimum between what the market wants and what the government prescribes. In addition, we have to deal with the incumbent business community and the shipping industry. We don’t want to obstruct their operations while construction is in progress.’ (Kippenberger, 2012, p.8).

A number of other ventures were inducted from 2001 to 2009 by PoR authority to align with the objectives of Port Plan 2020, including:

- PortInfoLink: PortInfoLink was an extensive logistics ICT system, owned by PoR (est 2002). In 2009, PortInfoLink joined with Amsterdam PortNET (est 2000) and formed another ICT system called “Portbase”. Portbase participates in projects to improve the interface between the terminals and hinterland modes (De Langen and Chouly, 2004). PoR owns 75% of shares in Portbase.

- Deltalinqs: Deltalinqs is the Port Cluster association representing both the port and industrial companies on matters of common interest. Deltalinqs conducts negotiations with the PoR authority for annual port tariffs, and deals with public authorities for a favorable tax climate, and improvement in the entrepreneurial climate of the port area (OECD, 2014), as well as lobbying for increased hinterland connection (De Langen and Chouly, 2004).
• Multicore: Multicore is an underground distribution system of pipeline – a joint venture with Vopak. The MultiCore pipeline bundle ran past the main chemical and petrochemical industrial areas in the PoR and provides an underground distribution system (total 80 kilometers of pipes laid in 20-km route) for the chemical and gas industry. Businesses in the port area could lease sections of this pipeline infrastructure for specific periods and distances to transport their chemical products (PoR, 2016b). Multiport served as an alternative to trucks and inland shipping.

• RC2: RC2 operated a common carrier pipeline system for ethylene between PoA and PoR, the two largest port and industrial complexes in Europe. The 117-km route ran from the Maasvlakte, Europoort and Botlek via Pernis and Moerdijk to Antwerp. RC2 is a joint venture with ARG, a company operating approximately 495 km of pipeline in Germany, Belgium and Netherlands, and jointly owned by chemical companies BASF, Bayer, BP, Degussa, Sabic and Sasol (PoR, 2016b).

• RCDC: Rotterdam City Ports Development Corporation (RCDC) established in 2003 incorporating PoR (50%) and the city of Rotterdam (50%), with the task of "directing and realising the transformation of city ports into a sustainable combination of city functions, port functions and living functions", in addition to "inter-relating the actors such as private firms, knowledge institutes and inhabitants, and not only the city and the ports" (Desfor et al., 2010). The foundation of the RCDC was motivated by construction of the Maasvlakte 2 as a new location for container terminals, and shift of stevedoring companies to MV2 deeper water wharfs. RCDC is focused on transformation of the city ports to areas of urban use in the next 25 to 50 years (Daamen, 2007).

• RCI: The Rotterdam Climate Initiative (RCI) is a joint venture of the City of Rotterdam, PoR, Deltalinqs, and DCMR Environmental Protection Agency Rijnmond. The main aim of the RCI is to achieve a 50 per cent reduction of CO2 emissions in the city, the port, and the industrial complex by 2025 as compared with 1990.

• Verkeersonderneming: Verkeersonderneming is the traffic enterprise founded by the municipality of Rotterdam, Rotterdam Metropolitan Region, Ministry of Infrastructure and the Environment and, the PoR Authority to keep the PoR and the
A15-corridor accessible during the widening of the A15 highway and the construction work on the Maasvlakte.

The continuous investments in infrastructure and superstructure projects created an advanced seaport cluster in terms of size, technology and productivity in the PoR, where multiple logistics service providers and logistics department of companies congregated to benefit from the strategic location but also the agglomeration economies arising from their mutually complementary effects. In addition to the logistics service providers, the port area also hosted large industrial complexes of mainly chemical and petrochemical firms. These firms have shaped an Industrial Ecosystem as a network of legally independent companies that use one another’s residual energy and chemical waste as an input for their own production process (Hollen et al., 2015), i.e., waste products of one company would serve as a raw material for another. Hollen et al. (2015) outlines two generic policies of the PoR authorities that had been instrumental in fostering the industrial ecosystem development: i) Infrastructure development (e.g., land, pipelines, etc), and ii) Strategic land allocation.

4.3.3.3 Port Plan 2030: Establishment of Industrial Ecosystems

The Port Vision 2030 was designed and published in 2011 based on nine upcoming trends that were considered to be relevant to the development of port and shipping industry in the upcoming decades. These trends and their significant implications for the PoR are listed in Table 4.3.8. In response to the trends stated, Port Plan 2030 was designed with two primary objectives: to establish Rotterdam as a Global Hub, and to position the PoR as Europe’s Industrial Cluster:

- **Global Hub:** The global Hub aimed to enhance supply chain efficiency by i) improving global, intra-European cargo flows, ii) introducing high-end activities in the region, iii) increasing throughput capacity and extending the hub function of the port and v) minimizing the ecological footprint of logistics chains.

- **European Industrial Cluster:** The establishment of the European Industrial Cluster was to start a transition towards bio-based industry and formation of an Energy port (generate energy with more renewable resources). The European Industrial Cluster would be integrated with Antwerp Chemical Cluster and local ports of Moerdijk, Flushing and Terneuzen.
Prior to publishing Port Plan 2030, an independent research conducted by Institute for the CDA in The Hague, The Netherlands reassessed the economic position of the Netherlands based on the global development trends, and suggested that a “bio-based economy” is the path to attain a sustainable growth. The rationale of CDA researchers, Sanders and Van der Hoeven (2008), was the upcoming trend of moving traditionally strong sectors of the Dutch economy like chemical industry, agro-food, and logistics to low wage countries with considerable effect on employment. It was argued that all these sectors will be affected by high oil and gas prices. Sanders and Van der Hoeven (2008) also elaborated that the petrochemical industries based in Europe will begin to move towards Asia and the Middle Eastern countries for two main reasons: i) to access lower cost of raw material (due to their dependence on fossil fuels) that would reduce their overall production cost, and ii) a higher demand for petrochemical products in those regions.

Table 4.3.8: Trends relevant to the development of port and shipping industry

<table>
<thead>
<tr>
<th>Trends</th>
<th>Implications for the PoR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shift in balance of the world economy</td>
<td>Further globalization to trigger growth in global freight transport and cargo shipments via Rotterdam are expected to increase, as PoR links Europe with the fast emerging economies in the other parts of the world.</td>
</tr>
<tr>
<td>Scarcity of raw materials and its impact on geopolitics</td>
<td>Opportunities for PoR would be created in activities involving reuse of raw materials to generate new cargo flows</td>
</tr>
<tr>
<td>Development of the labor market and the knowledge economy</td>
<td>Knowledge and innovation would increase through importance in warranting the strengthening of relationships between business, government, and educational institutions to produce a dynamic labour market.</td>
</tr>
<tr>
<td>Increase in the scale of transport</td>
<td>Opportunities to further strengthen the PoR’s European hub function would grow.</td>
</tr>
<tr>
<td>Integration of supply chains</td>
<td>Close cooperation and data exchange between all parties in supply chain would help PoR to develop an efficient, sustainable and competitive port processes.</td>
</tr>
<tr>
<td>Climate change and Sustainability</td>
<td>PoR needs to distinguish itself as a sustainable port and also develop a hinterland transport system and intermodal hub.</td>
</tr>
<tr>
<td>ICT applications</td>
<td>Opportunities to increase the use of infrastructure and means of transport by focusing on active ICT-driven, all-round traffic management.</td>
</tr>
<tr>
<td>Changing energy and fuel mix in Europe</td>
<td>Opportunities for new cargo flows (biomass, bio fuel) and the threat of declining mineral oil products could challenge PoR’s position as a bunkering port.</td>
</tr>
<tr>
<td>Made in Europe</td>
<td>Decrease of the raw materials flows but increase in semi-finished products, could position PoR as the most vital chemical cluster in Europe along with Antwerp.</td>
</tr>
</tbody>
</table>

Source: (PoR, 2011)
In 2009 a report by KPMG for the European Commission also confirmed the vulnerability of the European chemical industry facing a new competition from the Middle East, China and India (Harnick, 2010). The reports warned new circumstances would pose a major threat to PoR, which housed the largest petrochemical industrial complex in Europe. In order to safeguard its position, PoR introduced the strategy of substituting petrochemical industries with a bio-based chemical industry, and forming a trading hub in the port for bio-mass and bio-commodities.

The first steps toward building a European bio-economy were taken in 2002, setting out actions for developing biotechnology. Many other initiatives to enforce the bio-economy in Europe followed, leading eventually to an overarching policy and strategic action plan in 2012 (Scarlat et al., 2015) as highlighted by the following statement of the EU commission:

“Bio-based industries will increase the competitiveness of the European economy through re-industrialization and sustainable growth. New value chains will be created between often unconnected sectors, ranging from primary production and processing industries to consumer brands” (EU, 2013).

The “bio-based economy” relies on green, renewable resources, such as wood, grass and feed stocks (called biomass) as its engine, instead of oil, natural gas and coal (RCI, 2016). Increasingly, Biomass appears to be an economical substitute for fossil raw materials, offering major energy savings, particularity for petrochemical industries. The Netherlands has an advantage over other European countries with a density of biomass throughput of 13 tons per hectare, compared with the global average of 1.5 tons per hectare, and 5 tons per hectare for Germany and France (Sanders and Van der Hoeven, 2008).

Rotterdam’s location and its aligned and integrated infrastructure in the harbor that was serving traditional imports of feedstock for the food and feed industry makes it an attractive spot for developing a bio-based economy, though its available infrastructure would have to be expanded and attuned to meet market demands for energy and chemical production from biomass. Considering that biomass could possibly substitute the traditional feedstock in the petrochemical industry, the investment in infrastructure would ensure a continuation of imports of feedstock for the chemical industry, hence allowing for on ongoing deployment of chemical industry in the PoR. The infrastructural development would also generate capacity for producing high-value bio-based products, which are ingredients for numerous manufacturing sectors, such as food, nutraceutical, and advanced material (CSIRO, 2016).
To take advantage of the bio-economy potentials, and regain its popularity with investors which had been declining, PoR set new strategies for infrastructural development in 2008 with the ambition of becoming the bio-port for North-western Europe (Sanders and Van der Hoeven, 2008). The new strategies, as stated by Rotterdam Climate Initiative (RCI) focused on three main applications: “biomass for energy, biomass for transport fuels, and biomass as a feedstock for the chemical industry” (RCI, 2016). All three applications offer major economic opportunities for PoR. As per Port Plan 2030, PoR has also an ambitious agenda in utilizing gas, clean coal technology, biomass, wind and sun to promote use of sustainable energy resources to replace the traditional mix of coal and oil.

**Major Port Development Projects**

In addition to the ongoing development in Maasvlakte 2, PoR had also launched a number of other ventures within the port area:

- **Alpherium**: Alpherium is an inland transshipment terminal that uses a combination of trucks and freight barges to transport cargo to and from the PoR, serving Heineken's brewery and Zeeman. The launch of the Alpherium barge terminal in 2010 stimulated modal shift in PoR. In 2011, Alpherium increased its export cargo handling from 100 TEUs to 2,000 TEUs per week, by connecting to PoR deep sea terminals with five sailings a day (GreenPort, 2011).

- **Plant One**: Plant One is an open test facility designed to cater to the sustainable process innovation needs of firms located in the port area. The presence of Plant One is beneficial for the development of industrial ecosystems. It enables firms in the PoR to test and develop new sustainable process technologies required for advancing eco-industrial collaboration without disrupting their existing processes.

- **Container Transferium (CT)**: Container Transferium (CT) is situated in the direct hinterland of PoR. It is a new logistics concept allowing the transfer of large number of containers by inland vessels in a single movement from the terminals in MV2 to the Transferium and vice versa (Van Schuylenburg and Borsodi, 2010). PoR served as a landlord, investing in land and infrastructure in exchange for a competitive rent.

- **Plug & Play**: Plug & play in Maasvlakte 2 would offer bundled services to companies, such as energy, water, pipelines, and tank storage in MV2. An initiative to create a
bio-based cluster in the port area (bio-port), the Plug & Play project would no longer require investing in supply of power networks, tank storage, waste processes, and drinking water. It would also integrate with existing businesses in the PoR industrial cluster. Plug & Play is a joint investment of energy supplier E.ON, water solution supplier Evides, regional grid operator Stedin, tank terminal operator Vopak, and PoR. All five parties, including the PoR Authority, would invest in the required basic infrastructure (such as pipelines).

- Steam Grid: The PoR Authority also became involved in the construction of a high-quality steam grid in the Botlek area. The steam grid, which has been put into use as of mid-2013, was built with the objective to distribute steam from one plant, where it is a residual energy, to surrounding plants that use this steam for production. The development started officially at the end of 2009, and the extension of this project would be partly financed through a deal with RCI, which is co-founded by the PoR Authority.

- University initiatives: PoR established a collaborative project with Erasmus University (Smart Port Center) for training, research and consultancy services linked to activities in the port. A similar co-operation was founded with the University of Delft for transportation analysis and security and safety of port by computer modeling. Rotterdam University also developed a new campus in the old port area to engage in research, design and manufacturing (OECD, 2014).

- Management of the Port of Dordrecht: PoR Authority took over a project to exploit, develop and nautically manage (as a landlord) Dordrecht, the most landward seaport in the Netherlands.

- Nextlogic: PoR joined forces with a number of stakeholders in the entire container handling chain in inland shipping (e.g., shipping companies, barge, terminal and depot operators, and the Dutch Ministry of infrastructure) to form an organization to improve operational efficiency, reliability and predictability in inland shipping. Nextlogic offers an information platform that plans rotations based on real-time information relayed by stakeholders. Its objectives were to improve integrated planning, call optimization, and performance measurement (Nextlogic, 2015). Nextlogic would also contribute to modal shift, from road traffic to barge and rail.
• PortXL: PortXL is a start-up accelerator program focused on four sectors of transport and logistics, energy, chemical and refinery, and maritime. PoR joined with a number of internationally recognized companies (e.g., Vopak, and Van Oord, Uniper) to promote sustainable growth of PoR economy through port-related start-ups (Zonneveld, 2015).

• RAMLAB: RAMLAB is the world’s first additive manufacturing lab for the maritime industry and a location for shaping the 3D printing industry in PoR. RAMLAB was set up after the successful completion of a pilot project for 3D printing by PoR.

PoR’s strategic planning, followed by continuous investments in a range of projects, appears to fit well with the influential variables of hinterland access regimes that was defined by De Langen and Chouly (2004) as: 1) infrastructure presence, 2) involvement of leader firms, 3) sense of community, 4) voice of the community, and 5) role of public organizations.

4.3.4 Expansion in International Level

Apart from investments in asset developments and in building competencies that contribute to performance of the port, PoR authority also undertook a number of ventures in an international scale as a strategy to expand their revenue-base beyond the land rate and port dues (Van der Lugt et al., 2013).

Dooms et al. (2013) viewed PoR’s international strategy as comprising four motives: 1) leveraging its port management knowledge to establish a commercial presence abroad, transferring a port specific knowhow, and equity partnership in port development abroad, 2) reinforcing the relationship of PoR with leading firms in various sectors (transport, logistics, and energy), 3) generating business opportunities for PoR authority and the PoR port business community, and 4) growing the volume and efficiency of the trade flows through Rotterdam. Other motivations, as suggested by Dooms et al. (2013), include limited growth due to physical limits of expansion in port infrastructure, as well as attractiveness of growth potential of emerging economies. A list of international ventures undertaken by the PoR since 2002 is presented in Table 4.3.9, which reveals consistency in the international strategy of the PoR, as well as a geographical diversity of the ventures.

The PoR Authority also signed a number of memorandums of understanding (MoU) with other port authorities around the world with a view of offering management service
agreements or joint ventures with other port authorities. The global strategic partnerships and acquiring participations as stated in the annual report 2012 of the PoR, *is a long-term process partly influenced by political developments* (p.43).

<table>
<thead>
<tr>
<th>Project</th>
<th>Country</th>
<th>Year</th>
<th>Venture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sohar</td>
<td>Oman</td>
<td>2002-2007</td>
<td>• Concession agreement with the Oman government until 2025. 50/50 joint venture in Sohar Industrial Port Company (Port and Freezone)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Extension of the concession agreement to 2045. Agreement for expansion of the port area from 2100 hectare to 4500 hectare</td>
</tr>
<tr>
<td>Suape</td>
<td>Brazil</td>
<td>2008-2010</td>
<td>• Agreement to develop a master plan for the port of Suape, 3000 hectare</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Establishment of a joint venture and new organization</td>
</tr>
<tr>
<td>Nangang</td>
<td>China</td>
<td>2011</td>
<td>• Service agreement with Nangang Industrial Port Complex in Beijing</td>
</tr>
<tr>
<td>Porto Central</td>
<td>Brazil</td>
<td>2014</td>
<td>• Joint venture agreement with TPK (Terminal Presidente Kennedy) for developing a new seaport</td>
</tr>
<tr>
<td>Kuala Tanjung</td>
<td>Indonesia</td>
<td>2015</td>
<td>• Partnership agreement with Indonesian Port Corporation for construction, development and management of a new seaport</td>
</tr>
</tbody>
</table>

*Source: Compiled from (Dooms et al., 2013) and (PoR, 2014a) and (PoR, 2015b)*

4.3.5 Strategic Developmental Path

According to De Langen (2005), the strategic developments of the PoR, have been following nine general trends:

- Uncertain growth prospects for freight transport;
- Commoditization of transport services;
- Production on manufacturing and logistics platforms;
- New quality levels in “industrial ecology”, sustainability and safety;
- Higher land efficiency in manufacturing (particularly chemical manufacturing), storage and terminal handling services;
- Mixed land use in the port complex;
- Increased need for an overall vision and organizing capacity;
• The need for an effective “regional innovation system”, an attractive climate for the “creative class”, and space for experiments; and
• Growth opportunities for port complexes: especially chemicals, recycling, manufacturing and logistics platforms

A list of main developmental projects in PoR during the last three decades are presented in Table 4.3.10. The nature of each venture coupled with the relevant trends, reveal that PoR’s key developments in 1980s and 1990s were limited to generating capacity and mixing of land use. Though the same trend was steadily followed throughout 2000s, a number of innovative projects were introduced to enhance the manufacturing and logistics platforms, and to shape an Industrial Cluster in the port. The further growth of the industrial cluster, and diversity of the cluster population - in terms of existence of suppliers and customers as well as the presence of knowledge spill over – created a strength which cannot be easily imitated by competing ports (Van den Bosch et al., 2011). The distinctive position of PoR is described by Haralambides (2017) as:

“the port’s value added is not created simply by the port itself, but by its port cluster, encompassing 50% of Europe’s Asian and North American European Distribution Centers (EDC); a city 50% of whose inhabitants are holders of a foreign passport, just because of the port. But not all ports can realistically aspire to such an enviable situation, developed not today but over a period of 70 years of hard work (p.16).

From 2010 onwards, further development on transportation systems, as well as investments on physical and knowledge infrastructure, became PoR’s main strategies of fostering an industrial ecosystem in the port complex. The diversity of developments in the PoR during the last few decades reflects a multifocal perspective of the authority. The perspective can also be tracked through the PoR statement of vision;

"We continually improve the port of Rotterdam to make it the safest, most efficient and most sustainable port in the world. We create value for our customers by developing logistics chains, networks and clusters, in both Europe and growth markets worldwide. As an enterprising port developer, the Port Authority is the partner for world-class clients. In this way, we are also strengthening the competitive position of the Netherlands." (PoR, 2017b).
Further interpretation can be derived from PoR’s development path, which can be broadly divided into in four areas:

1. **Industry**: Industries located at the PoR gradually shifted from oil and petrochemical industries to bio-based chemicals. This path began as early decision of allocating containers rather than oil and chemicals to Maasvlakte 1 in 1980s, and continued with transformation towards bio-based economy and formation of a trading hub in the port for bio-mass and bio-commodities in the last decade.

2. **Transport and Distribution**: Connection and coordination of distribution systems of PoR were expanded from adjacent connections to hinterland accessibility and global connectivity. PoR’s transport operations evolved from unimodal to multimodal and intermodal (initiatives such as Nextlogic, inlandlinks) and lately exploring possibilities of synchro-modal operation (e.g., synchronization of operations in different networks, and shift of cargo from one mode to another, without making pre-arrangements) (Tavasszy et al., 2015, Van Riessen et al., 2015, Zhang and Pel, 2016).
<table>
<thead>
<tr>
<th>Period</th>
<th>Project</th>
<th>Focus</th>
<th>Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980-1990</td>
<td>Maasvlakte1 (MV1)</td>
<td>• Spatial &amp; Territorial Development</td>
<td>• Overall vision and organizing capacity</td>
</tr>
<tr>
<td></td>
<td>Distriparks</td>
<td>• Promotion of Port Activities</td>
<td>• Mixed land use in the port complex</td>
</tr>
<tr>
<td></td>
<td>KeyRail</td>
<td>• Intermodal Connection</td>
<td>• Growth opportunities in the port complex</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Hinterland Connectivity</td>
<td>• Commoditization of transport services</td>
</tr>
<tr>
<td>2000</td>
<td>PortInfoLink</td>
<td>• Port Efficiency</td>
<td>• New quality levels in Industrial Ecology,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sustainability &amp; Safety</td>
</tr>
<tr>
<td></td>
<td>Deltalingqs</td>
<td>• Port Efficiency</td>
<td>• New quality levels in Industrial Ecology,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sustainability &amp; Safety</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Overall vision and organizing capacity</td>
</tr>
<tr>
<td></td>
<td>Multicore</td>
<td>• Port Cluster connectivity</td>
<td>• Higher land efficiency</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Production on manufacturing &amp; logistics</td>
</tr>
<tr>
<td></td>
<td>RC2</td>
<td>• Port Cluster connectivity</td>
<td>• Higher land efficiency</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Growth opportunities for port complex</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Production on manufacturing &amp; logistics</td>
</tr>
<tr>
<td></td>
<td>Maasvlakte2 (MV2)</td>
<td>• Spatial &amp; Territorial</td>
<td>• Overall vision and organizing capacity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Development</td>
<td>• Higher land efficiency</td>
</tr>
<tr>
<td></td>
<td>Rotterdam City Ports Development (RCDC)</td>
<td>• Balanced City &amp; Port Development</td>
<td>• New quality levels in Industrial Ecology,</td>
</tr>
<tr>
<td></td>
<td>Rtm Climate Initiative (RCI)</td>
<td>• Environment Improvement</td>
<td>Sustainability &amp; Safety</td>
</tr>
<tr>
<td></td>
<td>PortInfoLink - Portbase</td>
<td>• Port Efficiency</td>
<td>• Regional innovation system</td>
</tr>
<tr>
<td></td>
<td>Verkeersonder-neming</td>
<td>• Intermodal Connection</td>
<td>• New quality levels in Industrial Ecology,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Hinterland Connectivity</td>
<td>Sustainability &amp; Safety</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Uncertain growth prospects for freight</td>
</tr>
<tr>
<td></td>
<td>Alpherium</td>
<td>• Intermodal Connection</td>
<td>• Commoditization of transport services</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Hinterland Connectivity</td>
<td>• Production on manufacturing &amp; logistics</td>
</tr>
<tr>
<td></td>
<td>University Initiatives</td>
<td>• Research &amp; Development</td>
<td>• Regional innovation system</td>
</tr>
<tr>
<td></td>
<td>Plant One</td>
<td>• Research &amp; Development</td>
<td>• Regional innovation system</td>
</tr>
<tr>
<td></td>
<td>Container Transferium (CT)</td>
<td>• Intermodal Connection</td>
<td>• Commoditization of transport services</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Hinterland Connectivity</td>
<td>• Production on manufacturing &amp; logistics</td>
</tr>
<tr>
<td></td>
<td>Plug &amp; Play (MV2)</td>
<td>• Port Cluster Connectivity</td>
<td>• Regional innovation system</td>
</tr>
<tr>
<td></td>
<td>Steam Grid (Botlek Area)</td>
<td>• Port Cluster Connectivity</td>
<td>• Growth opportunities for Port Complex</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Production on manufacturing &amp; logistics</td>
</tr>
<tr>
<td></td>
<td>Dordrecht</td>
<td>• Strengthen port network</td>
<td>• Overall vision and organizing capacity</td>
</tr>
<tr>
<td></td>
<td>NextLogic</td>
<td>• Port Cluster Connectivity</td>
<td>• Commoditization of transport services</td>
</tr>
<tr>
<td></td>
<td>PortXL</td>
<td>• Research &amp; Development</td>
<td>• Regional innovation system</td>
</tr>
<tr>
<td></td>
<td>RAMLAB</td>
<td>• Research &amp; Development</td>
<td>• Regional innovation system</td>
</tr>
</tbody>
</table>
1. **Performance:** The PoR shifted its performance focus from throughput volume to added value created in the port, and subsequently altered to the number of firms established in the port and their profitability. The emergence of new performance indicators in the PoR (Table 4.3.11) supports its dramatic shift from the primary functionality during the last few decades. More recently, PoR has focused on strategic value creation, through international and national strategic connectivity, as well as generating demand for port land and maintaining its economic importance.

   \[\text{Table 4.3.11: KPIs in the PoR}\]

<table>
<thead>
<tr>
<th>Period</th>
<th>Key Performance Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960s to 1980s</td>
<td>- Number of Ships&lt;br&gt;- Throughput volume</td>
</tr>
<tr>
<td>1990s</td>
<td>- Port related employment&lt;br&gt;- Value added&lt;br&gt;- Port value added as a percentage of regional GDP</td>
</tr>
<tr>
<td>2000s</td>
<td>- Development in turnover&lt;br&gt;- Profitability in firms in port&lt;br&gt;- Establishment of new companies in port area</td>
</tr>
<tr>
<td>2010s</td>
<td>- Improvement of modal split&lt;br&gt;- Average journey time A15 corridor&lt;br&gt;- Larger market share of the Hamburg-Le Havre range&lt;br&gt;- MV2 realization&lt;br&gt;- Increase revenue per sqm of the port land&lt;br&gt;- Increase percentage of transshipment containers&lt;br&gt;- Realization of International milestones&lt;br&gt;- Profitability of project investments</td>
</tr>
</tbody>
</table>

*Source: Compiled from (De Langen et al., 2007, Dooms, 2014)*

2. **Role in the Cluster:** PoR’s role has evolved from being a landlord to that of a developer and entrepreneur (PortXL, Verkeersonderneming, KeyRail). PoR initiates new ventures, ties in with private sector, and eventually withdraws from the ventures once a newly established business thrives.
4.4 Chapter Summary

This chapter presents the within case findings of the three case seaports, focusing on the strategic developmental paths they had taken since the advent of containerization. The findings reveal that each case seaport had been embarking on a unique program of physical asset building, many of which were not destined for the primary function of cargo loading and unloading. Among the three case seaports, the scale and pace of development differed considerably. PoD’s asset building program had been most intensive as well as extensive, especially in the last three decades. By comparison, PoK’s physical development program was relatively modest, while that of PoR was seated in between. PoK placed a strong focus on developing its intangible resources by devising policy measures to optimize the use of its physical facilities. PoR, in turn, directed its attention to building a complementary set of tangible physical infrastructure as well as intangible capabilities to expand and enhance the range of its port product offerings. The approaches taken by the three case seaports also vary significantly across time-periods. Notably, these distinctive differences were related to the regional market dynamics each of the case seaports faced, reflecting a contingent dynamic capability building process that will be the focus of the cross-case analysis in the next chapter.
From a resource development and management perspective, the three case studies have revealed different means of structuring, bundling and leveraging resources, both tangible and intangible, in Sirmon et al.’s (2007) terminology, over 50 years. PoD (Dubai) concentrated heavily on building tangible assets and embarking on parallel developments to host mutually supportive logistics infrastructure services. PoR (Rotterdam) also defeated the main challenge of land scarcity by developing mega-projects of Maasvlakte 1 and Maasvlakte 2, and engaging in parallel investments in redeveloping city ports, and facilitating inter-modality. The case of PoK (Kaohsiung) was rather different: at a very early phase of its development in the 1970s, it invested intensively in port infrastructure, but later directed its strategy to concentrate on formulating policy measures centered on developing capabilities to capitalize on the economic and other opportunities that impacted its maritime environment.

To understand the contrasting approaches used by the three seaports to achieve competitiveness, this chapter will review the findings of the three, using a cross-case comparative analysis to identify similar and contrasting means of resource building and utilization. The cross-case analysis will also examine the competitive strategies of the three seaports by integrating two perspectives based on a model proposed by Spanos and Lioukas (2001). The first perspective is based on the resource-based view of bundling resources (assets, processes, and knowledge) in seaports. The second perspective is in bundling market-driven strategies (industry, environment and regional dynamics) that drive seaports to adapt in order to achieve sustainable competitive advantages.

This chapter is organized into four main sections. The first identifies both the common and unique development approaches adopted by the three case seaports in response to the global maritime changes in different eras (1960s-1980s, 1990s, 2000s, and 2010s). The second section presents the eight resource development and management constructs identified from a comparative analysis of the strategic intent on which the three case seaports built and utilized.
their maritime resources over the last five decades. The third section reviews the strategic resource building and development paths taken by the three case seaports from the perspectives of the resource development and management constructs identified. The fourth section maps the resource developmental paths of the three case seaports onto a theoretical framework formed by the intensity of competition as one dimension and the size of the hinterland and foreland as the other, based on the contextual circumstances surrounding their regional operating environments at different times.

5.1 Strategic Development Factors in Seaports

Findings from the three case studies suggested that PoD, PoK, and PoR have each built their competitive capabilities through development and exploitation of their respective port-related resources. The investments of resources, whether tangible (developing physical infrastructure, e.g. investment in port basin and quays, land, road, and railways, terminals, yards, warehouses, pipelines, as well as informational technology systems - Appendix 3) or intangible (developing capabilities and extending the know-how, e.g. mergers, acquisitions, and utilization programs - Appendix 4), reflect the strategic focus of the respective authorities on particular means of achieving competitiveness.

The major resource investments, revealing strategic development in the three case seaports, are next presented in separate timeframes – 1960s-1980s, 1990s, 2000s, and 2010s, - to reveal the focus of the three port authorities over the last five decades.

5.1.1 1960s – 1980s

In the early 1960s, containerization was introduced and within a few years proved its prowess as an efficient form of handling freight at ports (Baird, 1996). As a promising means of cargo transport, containerization was quickly adopted by a number of pioneer ports in US, Western Europe, Japan and Australia, and regular transatlantic and transpacific services were established (Guerrero and Rodrigue, 2014). Adoption of containerization in seaports essentially required a shift from conventional break-bulk terminals to container terminals, which affected the layout and function of seaports: container terminals’ operations demand a large terminal surface, advanced automation, planning and organization when compared with conventional terminals (Notteboom and Rodrigue, 2009). The gradual infrastructural shift occurred in the 1970s in a number of ports across the globe, and early adopter ports,
including PoR and PoK, joined the regular container services, which were on a point-to-point basis then. Although the modern development of PoD began in the same era, its traffic had minimal growth until the 1980s when transshipment services as a new function in seaports was introduced (Guerrero and Rodrigue, 2014). The transshipment function was concurrent with inter-modality, which resulted in expansion of hinterlands and forelands of seaports, when a global containerized transportation system was already in place (Rodrigue and Notteboom, 2010). Another factor that significantly pushed the global diffusion of containerization in the 1980s was construction of larger container ships, Panamax (3,000–3,400 TEU) and Panamax Max (3,400-4,500 TEU), that benefited shipping lines through economies of scale (Rodrigue, 2013a).

The within case analysis reveals that the three case seaports went through a complex process of resource building at the dawn of containerization (in the late 1960s) to build capacities (Table 5.1.). In all three cases, the building of port infrastructure was accompanied by the creation of supporting facilities (e.g. dry-docks in the case of PoD, export-free zones in the case of PoK, and distriparks in PoR’s case) to increase the usage of the super-structure and infrastructure developed for container handling. Their aim was to ensure the usage of the developed container infrastructure by generating multiplier effects. While there were similarities in creating supporting facilities, there were also attempts to adapt to the external environment in which they operated.

In PoR, infrastructure was developed to expand the port land (MV1, to stimulate industrialization at the port) and its maritime accessibility. MV1 diverted from its original blueprint and, by following the containerization trend, became a location for container terminal operations. A new distripark (Eemhaven) was introduced, followed by the centralization of European and Asian distribution centers in the Rotterdam region. This strategy brought the container terminals closer to its main cargo source.

In PoK, maritime access infrastructure (e.g. opening a second harbor entrance and construction of a cross-harbor tunnel) was built, in addition to developing four container terminals. Launching the first Export Free Zone of Taiwan (Kaohsiung EPZ) in the port was an action to re-orientate industries from import substitution to export promotion, reinforced by prohibiting products manufactured in the EPZ from being sold domestically. The EPZ provided a prime source of cargo traffic for PoK, which also offered dedicated terminals to shipping lines. Dedicated terminals offer greater flexibility, reliability and shorter turnaround
times to terminal operators, enlisting their commitment and boosting their logistics efficiency.

In PoD, substantial investments in twin ports (Port Rashid and Jebel Ali) provided maritime access infrastructure in two locations to attract cargoes to and from the Middle East region. In addition to the port infrastructure and superstructure, port ancillary services (e.g. ship building, repair and maintenance) were introduced to build a bundle of maritime services, providing a unique offering in the region.

Due to the high price of seaport infrastructure, capacity creation becomes a necessity. The need to generate sufficient returns on investments has been a constant challenge for port authorities. According to Haralambides et al. (2002), due to intense competition, seaports have a tendency to build excess capacity. Haralambides (2002) called the excess capacity in container seaports an “operational necessity” and an inevitable cost of providing rapid turnaround times demanded by shipping lines and maintaining or increasing patronage in a region. Haralambides (2002) further argued that when seaports reach a utilization rate of 70%, chances of congestion arise due to short waiting times demanded by shipping lines. This argument rationalizes the ongoing capacity creation projects in PoD, PoK and PoR as early adopters of containerization in their respective regions.
In 1972, Port Rashid was established. By the late 1970s its container handling capacity was increased from 100,000 TEUs in 11 berths to 1,500,000 TEUs in 35 berths.

A range of port ancillary services, shipbuilding, repair and maintenance services was introduced in Dubai Drydocks (1979) located south of Port Rashid to build a bundle of maritime services.

The 2nd port in the Jebel Ali area (largest man-made harbor in the world at the time) commenced construction in 1976 and became operational with 5 berths in 1979. First phase of Jebel Ali construction completed by 1983, increasing handling capacity of Dubai Ports from 1,500,000 TEUs to about 10,000,000 TEUs.

PoK’s container operation commenced with the building of Terminals 1, 2, 3, and 4 to produce a combined handling capacity of about 9,000,000 TEUs.

An Export Free Zone (Kaohsiung EPZ) was launched with the assistance of foreign investment in the port to re-orientate industries from import substitution to export promotion. Products manufactured in EPZs were not permitted to be sold domestically.

2nd harbor entrance opened to overcome national defense concerns on a single entrance port and to improve operational capabilities by making the inner harbor accessible to larger vessels. Opening the 2nd entrance and constructing several piers around it also facilitated utilization of Qijin district, raising PoK’s overall handling capacity.

Cross-harbor tunnel opened (1984) to connect Qijin district to the opposite bank to streamline cargo traffic and to increase capacity growth of the port.

PoR offered dedicated terminals to shipping lines to ensure their commitment, reduce public investment in the port and generate new traffic. Dedicated terminals offer greater flexibility, reliability and shorter turnaround times to terminal operators, boosting their logistics efficiency.

PoR commenced a land reclamation project in Maasvlakte1 (MV1) based on seaport industrialization to create employment and to generate revenue by allocating land to oil, chemical, iron and steel industries.

Environmental concerns and containerization resulted in changing development objectives for MV1. Allocation of port land to container terminals helped MV1 to become one of the world’s largest container terminal locations.

Centralization of European distribution centers in Rotterdam area led to formation of first distripark (Eemhaven) in PoR, bringing container terminals closer to its main cargo source.

<table>
<thead>
<tr>
<th>Dubai (PoD)</th>
<th>Kaohsiung (PoK)</th>
<th>Rotterdam (PoR)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PoK’s container operation commenced with the building of Terminals 1, 2, 3, and 4 to produce a combined handling capacity of about 9,000,000 TEUs.</td>
<td>PoR commenced a land reclamation project in Maasvlakte1 (MV1) based on seaport industrialization to create employment and to generate revenue by allocating land to oil, chemical, iron and steel industries.</td>
</tr>
<tr>
<td></td>
<td>An Export Free Zone (Kaohsiung EPZ) was launched with the assistance of foreign investment in the port to re-orientate industries from import substitution to export promotion. Products manufactured in EPZs were not permitted to be sold domestically.</td>
<td>Environmental concerns and containerization resulted in changing development objectives for MV1. Allocation of port land to container terminals helped MV1 to become one of the world’s largest container terminal locations.</td>
</tr>
<tr>
<td></td>
<td>2nd harbor entrance opened to overcome national defense concerns on a single entrance port and to improve operational capabilities by making the inner harbor accessible to larger vessels. Opening the 2nd entrance and constructing several piers around it also facilitated utilization of Qijin district, raising PoK’s overall handling capacity.</td>
<td>Centralization of European distribution centers in Rotterdam area led to formation of first distripark (Eemhaven) in PoR, bringing container terminals closer to its main cargo source.</td>
</tr>
<tr>
<td></td>
<td>Cross-harbor tunnel opened (1984) to connect Qijin district to the opposite bank to streamline cargo traffic and to increase capacity growth of the port.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PoK offered dedicated terminals to shipping lines to ensure their commitment, reduce public investment in the port and generate new traffic. Dedicated terminals offer greater flexibility, reliability and shorter turnaround times to terminal operators, boosting their logistics efficiency.</td>
<td></td>
</tr>
</tbody>
</table>
5.1.2 1990s

In the 1990s, maritime transport became one of the key drivers of globalism, and containerization provided the dominant support of world trade (Bernhofen et al., 2016). With a higher level of global consumption, the capacity of seaports as a core element of maritime transport had to increase to cope with increasing cargo flow. Transshipment operations also expanded and shipping lines began to utilize the hub-and-spoke networks rather than the point-to-point services (Nam and Song, 2011). Functionality of the hub-and-spoke networks further expanded with the evolution of container ships. In the 1990s, the new generation of Post Panamax I (4,000-6,000 TEU), and Post Panamax II (6,000-8,500 TEU) container vessels became operative, which triggered new challenges for seaports around the globe, such as their infrastructural capabilities, draft limitations, and integration within the configuration of shipping networks (Rodrique, 2013a). Coinciding with the introduction of Post Panamax vessels, the first strategic shipping alliances took shape, which saw vessel-sharing co-operation between shipping lines on multiple trade routes (Notteboom, 2016b). Ports had to confront the integration of shipping lines in their various forms of mergers, alliances, joint ventures and cartel agreements (Heaver et al., 2000). Moreover, the shipping lines’ role in ports became increasingly influential due to two other factors: i) their evolvement in terminal management operation, and ii) their service extension to door-door operation and gaining control over hinterlands transportation (Guerrero and Rodrigue, 2014).

During this period, the three case seaports began a transition phase from traditional ports to regional maritime hubs. Providing infrastructure and superstructure to handle ship-to-shore operations was no longer adequate, and resource building expanded towards facilitation of distribution networks (Hesse and Rodrigue, 2004). Creating conditions for transforming to a hub port became increasingly challenging with the emergence of shipping alliances with extended network coverage and scheduled frequency.

The three case seaports took diverse approaches in this transition phase to build a stronger link with their regional supply chains (Table 5.2). In PoR, value-added and logistics services in the port, which had already begun in the late 1980s, were expanded with the introduction of two new distriparks (Botlek and Maasvlakte). These accommodated chemical companies, logistics providers and a number of manufacturing companies that established their European Distribution Centers. Furthermore, PoR enhanced its land access infrastructure by investing
in KeyRail (a company managing dedicated freight rail to the European hinterland) with the aim of upgrading intermodal connectivity and strengthening its distribution networks.

In PoK, capacity creation projects continued with the anticipation of growing throughput. Offshore shipping centers were introduced to overcome the prohibition of direct shipping with China and to attract transshipment cargos that were destined to/from China via Hong Kong or Japan. Privatization of container terminal operation and lifting restrictions on dedicated container terminals were other measures taken to make PoK more appealing to a wider range of shipping lines.

PoD’s approach was rather different. The unification of port authorities (Port Rashid and Jebel Ali) balanced utilization of capacities in the two ports that had been hindered by the competition of two separate port authorities. This unification was also directed towards the twin ports co-functioning rather than competing for the same traffic. Moreover, PoD established a self-governing terminal operator, DPI, which initially took charge of operations in the twin ports and within a short time expanded substantially throughout the wider region.
Table 5.2: Strategic Developments in the 1990s in PoD, PoK and PoR

<table>
<thead>
<tr>
<th>Dubai (PoD)</th>
<th>Kaohsiung (PoK)</th>
<th>Rotterdam (PoR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Dubai Port Authority” (DPA) formed by merging Port Authorities of Rashid and Jebel Ali to increase overall throughput while balancing volume in the two ports.</td>
<td>• Offshore shipping center established to receive transshipment cargos from mainland China without the need for such cargos to anchor at a third port (such as Japan or Hong Kong) to overcome the prohibition of direct shipping with China, thus removing operational inefficiency, extra handling costs, loss of time and risk of transporting cross-strait trade cargo.</td>
<td>• MV1’s final phase of development commenced with the construction of a large scale chemical plant and two European distribution centers (Reebok and Eurofrigo).</td>
</tr>
<tr>
<td>A division of DPA - Dubai Ports International (DPI) - started operating the twin ports of Port Rashid and Jebel Ali, removing foreign contractors (terminal operators) from ports’ operations.</td>
<td>• Container terminal operations in Kaohsiung fully privatized (1998).</td>
<td>• Botlek and Maasvlakte, two new distriparks, were created in PoR to accommodate chemical companies, logistics providers and a number of manufacturing companies that established their European Distribution Centers there.</td>
</tr>
<tr>
<td>Port Rashid was operated by a company owned by Gray Mackenzie (part of UK’s Inchcape group). Jebel Ali’s port operator was an American shipping company (Sealand). Other shipping lines were reluctant to use Jebel Ali as it was managed by a competitor. Also, the two port operators were competing for the same business, making it hard to optimize the use of facilities and capabilities on offer.</td>
<td>• PoK lifted service restriction on dedicated container terminals to extend services to more shipping lines.</td>
<td>• PoR invested in KeyRail (company managing dedicated freight rail to the European hinterland) as part of Port Plan 2010 to upgrade intermodal connectivity to the hinterland. KeyRail is charged to ensure optimal use of the line through capacity allocation, scheduling and traffic control, management and maintenance as well as promoting use of rail transport.</td>
</tr>
</tbody>
</table>
5.1.3 2000s

During the 2000s, the new Post Panamax (Panamax III, 11,000-15,000 TEU) vessels were introduced which placed extra pressure on ports to overcome their draft constraints while expanding their infrastructural capacity (Rodrique, 2013a). Besides, ports had to face the challenge of ongoing alliances of shipping lines (e.g. New World, Grand Alliance, CKYH), which were aiming to expand their global coverage to reduce operating costs (Notteboom, 2004). In addition to horizontal integration, shipping lines created a powerful position for themselves through vertical integration with stevedoring entities and third party logistics service providers (3PL) (Altunas and Gocer, 2014). For shipping lines, landside logistics became a source of differentiation, as well as a cost control center and revenue base, since the shipping industry was running competitively at the lowest margins (Notteboom, 2004). These changes demanded a higher level of flexibility in seaports in distributing goods and in providing value-adding logistics services, giving rise to port-centric logistics (Mangan et al., 2008, Pettit and Beresford, 2009).

Moreover, the globalization of trade that had begun a decade earlier was burgeoning. The container transportation system became progressively linked with complex logistics chains, supporting global production networks (Henderson et al., 2002, Coe et al., 2004). Seaports integration with supply chains intensified competition among adjacent ports due to their overlapping hinterlands (Zhang, 2008). Further integration of seaports with global supply chain networks required a higher level of participation by port authorities that extended their traditional roles of managing land use, developing concession policies and ensuring operations safety.

During this period, traditional operation performance measures in seaports were replaced with other determinants, such as product differentiation and adaptability to changing market environments (Tongzon and Heng, 2005) (e.g. an emerging trend of ultra large container vessels, the introduction of new trade lanes with the advent of China’s industrialization and development of Chinese ports, as well as more complicated networks of maritime services).

The three case seaports reacted to market variations in a number of ways (Table 5.3). Most notably, formation or reinvigoration of port clusters was on the agenda, and capacity creation projects were either continued or newly commenced. In PoD, the merger of DPA, Jafza and Dubai Customs into a single entity called Ports, Customs, Free Zone Corporation (PCFC)
created a one-stop platform for port users to interact with public authorities. The operation of this platform, as Dubai’s trade and logistics cluster, was streamlined by developing a number of e-services (e.g. Dubai Trade, e-token, and e-payment). In light of a sharp rise in the number of Jafza companies, PoD ended cargo operations at Port Rashid, making Jebel Ali the single location for port cargo services. During this period Dubai’s terminal operating firm, DP World, lifted its status from a regional operator to a global operator through two major acquisitions (CSX World, and P&O Ports). For PoD, the global participation of DP World was a means of integrating with global logistics chains, while extending the traditional roles of its port authority.

When comparing it with PoD, the PoR’s attention to developing its port cluster is reflected in a number of similar and contrasting approaches. The similar methods of resource building were infrastructural developments, such as a dedicated ICT system (PortInfolink), and a land reclamation project (MV2). The distinctive resource building schemes in PoR were developing underground distribution systems (e.g. Multicore and RC2) that fortified the port cluster connectivity and the establishment of a traffic enterprise (Verkeersonderneming) aimed at promoting PoR’s hinterland accessibility. Corporatization of PoR in 2003 provided the flexibility required for extending its traditional functions, transforming its authority to a cluster manager. This resulted in substantial improvement of port performance (e.g. reducing operating costs and increasing capital investment, market share and overall profits) (Saragiotis and De Langen, 2016). Other attempts were made through PoR’s participation in a number of ventures to stimulate the growth of the port cluster in a number of ways. This was done either by enhancing the relationship between PoR and industries located inside the port land (Deltalinqs) or collaborating with the City of Rotterdam for transforming the city harbors (RCDC), and combatting CO2 emissions in the city, port and industrial complex (RCI).

Moreover, PoR took an initial step towards embarking on an international venture in a project of exploitation and management of port and freezone in Sohar – Oman. Although this project was on an ad-hoc basis, it was an attempt by PoR to explore opportunities beyond its traditional functions, by integrating its operations into an extended global supply chain network.

In comparison, PoK’s cluster activity was augmented with the launch of Free Trade Zones in the port area, aiming to expand volume of re-export trade to generate revenue from trade
service fees, and to increase income in foreign currencies. Other developments were made to improve the navigation operation in PoK (VTC and VTS), and to increase port security against terrorist attacks (ISPS). PoK’s quality certification (ISO9002 and 14001) were steps taken to raise the port’s image as a quality service port operator.
<table>
<thead>
<tr>
<th>Dubai (PoD)</th>
<th>Kaohsiung (PoK)</th>
<th>Rotterdam (PoR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• DPA, Jafza and Customs merged to form Ports, Customs Free Zone Corporation (PCFC) to create a “one-stop” platform for port users to interact with public authorities and port operators and to provide a mechanism for a direct flow of custom duties to PCFC, rather than the state treasury.</td>
<td>• A navigating center, called Vessel Traffic Centre (VTC), and a Vessel Traffic Service (VTS) were introduced to provide a faster and safer service for shipping lines.</td>
<td>• PoR invested in a dedicated logistics ICT system (PortInfoLink / PortBase) to improve ICT’s interface between terminals and the hinterland.</td>
</tr>
<tr>
<td>• DPA Invested in e-services (port community, Dubai Trade, e-token, e-payment, and Asara) to streamline operations throughout Dubai’s trade and logistics cluster, comprising seaport operations, air cargo operations, Jafza, and Customs.</td>
<td>• Free Trade Zones in the port area were launched to expand the volume of re-export trade to generate revenue from trade service fees, and to increase income from foreign currencies.</td>
<td>• PoR undertook an international venture in Sohar - Oman to expand its revenue base beyond land rent and port dues. Agreement was made for exploitation and management of the port and freezone (initially until 2025, extended in 2007 until 2045).</td>
</tr>
<tr>
<td>• DPI acquired CSX Terminals, transferring management of nine container terminals worldwide (total capacity of 14.6 million TEUs) to strengthened its position in South-East Asia, China, Australia, Europe and America</td>
<td>• Construction of Container Terminal 5 began, expanding PoK’s capacity to 10,000,000 TEUs.</td>
<td>• PoR founded a port cluster association (Deltalinqs) to enhance the relationship between the port and the industries located within the port land to promote an entrepreneurial climate in the port area and to lobby for hinterland connections.</td>
</tr>
<tr>
<td>• DPA and DPI merged to form DP World.</td>
<td>• International Ship &amp; Port Security (ISPS) systems were implemented to improve port and vessel security against terrorist threats.</td>
<td>• PoR built an underground distribution system for the chemical and gas industries (Multicore &amp; RC2) to improve port-to-cluster connectivity.</td>
</tr>
<tr>
<td>• DP World acquired P&amp;O (one of world’s major stevedoring companies) to expand its network into India, East Asia and Europe. The two acquisitions strengthened DP World and lifted its status from a regional port operator to a global port operator</td>
<td>• PoK obtained ISO 9002 and 14001 quality certifications; raising the port’s image as a quality service port operator.</td>
<td>• PoR launched 2nd land reclamation project (Maasvlakte 2 – MV2) to overcome the threat of space shortage by 2014.</td>
</tr>
<tr>
<td>• Capacity expansion in Jebel Ali Terminal 2 commenced in 2007, as Dubai’s twin ports (Port Rashid and Jebel Ali) were operating close to their maximum capacity of 10,000,000 TEUs.</td>
<td>• Port Rashid ended its cargo operations and became a cruise ship terminal (2008). All Dubai’s cargo operation became concentrated at Jebel Ali port.</td>
<td>• PoR formed Rotterdam City Ports Development Corporation (RCDC) with City of Rotterdam to transform the city harbours into a sustainable combination of balanced port, city and living functions development.</td>
</tr>
<tr>
<td>• Port Rashid ended its cargo operations and became a cruise ship terminal (2008). All Dubai’s cargo operation became concentrated at Jebel Ali port.</td>
<td>• Jebel Ali port participated in the Container Security Initiative (CSI) (launched by the U.S. Customs Bureau of Customs and Border Protection in 2002) as the first Middle Eastern port to join the initiative for handling cargoes directly bound for USA.</td>
<td>• PoR formed a joint venture with City of Rotterdam, Deltalinqs, and the local environmental protection agency - Rotterdam Climate Initiative (RCI) to combat CO2 emissions in the city, port, and industrial complex.</td>
</tr>
<tr>
<td>• Jebel Ali port participated in the Container Security Initiative (CSI) (launched by the U.S. Customs Bureau of Customs and Border Protection in 2002) as the first Middle Eastern port to join the initiative for handling cargoes directly bound for USA.</td>
<td></td>
<td>• PoR established a traffic enterprise (Verkeersonderneming) to promote hinterland accessibility by widening A15 (the only highway from MV2 to the hinterland).</td>
</tr>
</tbody>
</table>
5.1.4 2010s – The Current Decade

Since 2010, new strategic shipping alliances have taken shape. As a result, in 2017 the world container shipping fleet became dominated by three main alliances (i.e. The Alliance, Ocean Alliance, and 2M), which in combination, handles about 77% of the global container traffic (Sanchez and Mouftier, 2017). The alliance reshufflings had an impact on seaports as some locations (e.g. Singapore, and Rotterdam) managed to maintain the number of weekly calls at the expense of their neighboring ports (iContainers, 2017). Another challenge that ports had to encounter was the service of New-Panamax (12,500 TEU), and Tripe E (18,000 TEU) container vessels. The introduction of larger vessels posed a number of problems for ports including: i) availability of port infrastructure and equipment to accommodate mega-vessels, ii) availability of inland transportation systems to distribute gateway cargos, and iii) availability of substantial amount of cargo to be considered commercially feasible as a port of call for shipping lines (Rodrique, 2013a).

An additional factor that had impacted seaports, particularly in the Asian region, was the massive development of Chinese ports to the extent of dominating the global list of top 10 container ports. In 2010, Shanghai became the top port in the global ranking, a status that has since been maintained. The rise of Chinese ports adversely affected the market share of many other Asian ports (e.g. Kaohsiung, Busan, Keelung) despite the continuous growth of throughput in those ports during the last few decades (Tongzon and Yang, 2016).

Most recently, port cluster activities became an integral part of the port operation, as the concept of port-centric logistics became more significant (Mangan et al., 2008, Monios and Wilmsmeier, 2012). When compared to the last few decades, the success of seaports is influenced even more by their ability to exploit synergies within the port community, transport nodes, as well as other players in the logistics networks (Notteboom, 2010). This is amply demonstrated by the three case seaports, which embarked on a number of developing schemes with a rather diverse approach, apart from their ongoing capacity creation programs, as Table 5.4 reveals.

In PoD, the acquisition of Jebel Ali Free Zone (Jafza) by DP World was an important step towards strengthening the Dubai port cluster. Although the port and free zone authorities were already operating under the same group (PCFC), the acquisition was taken to boost the
throughput of the port by combining the two assets, port and free zone. As stated by the Chairman of DP World, Sultan Ahmed Bin Sulayem:

“Acquiring a strategically located asset integral to Jebel Ali’s continued success enhances our competitive advantage and aligns with our strategy of providing port-centric integrated logistics solutions at key gateway locations” (WorldMaritimeNews, 2015).

Another development that would enhance the clustering effect of PoD was finalizing construction plan for an intermodal rail terminal adjacent to Jebel Ali Terminal 1 to promote the port intermodal connectivity. Expansion of DP World, currently one of the largest terminal operators in the world, continued. DP World operates with a portfolio of tangible assets (property, plant and equipment) and intangible assets, including human capital (an international experienced and professional team of 37,000 people), structural capital (technical and professional knowledge, culture and databases), relational capital (established relationship with customers overtime), and brand reputation (customer recognition on the global scale).

In PoK, the port reform process was finalized with the aim of creating efficiency. The focus of PoK authority was largely on land reclamation and capacity creation. Phase 2 of container Terminal 6, and projection of Terminal 7 were two large-scale construction plans for accommodating mega-vessels, as well as dredging along the waterline in Terminal 4 for deepening wharfs to provide access for larger vessels. Moreover, an Eco-port certification verified PoK’s environmental-friendly infrastructure and operation as the first seaport in the Asia-Pacific region being certified. PoK initiated an aggressive promotion of free trade zones that were introduced in 2004, although its efforts only had a marginal impact on container throughput (see Figure 4.2.3).

In PoR, a wider range of developments were staged to strengthen the port cluster. Port infrastructural developments continued, although in an unconventional way as they were aligned with the requirement of transforming the port industrial cluster to a bio-based cluster (e.g. Plug and Play, Steam Grid). Intermodal connectivity of the port cluster was further enhanced by launching an inland transshipment terminal (Alpherium), and introducing a new logistics concept to bulk transfer containers via inland vessels in a single movement (Container Transferium). Setting up an information platform based on the concept of synchro-modality (NextLogic) as a means of optimizing operation of the inland container
shipping was another method to improve its cargo distribution networks. A number of other schemes were introduced by PoR to encourage and enrich innovative practices (e.g. collaborative project with universities, launching an open test facility in the port, and a field lab to promote 3D printing, and forming a start-up accelerator program).

PoR expanded its participation in management and exploitation of other ports (both local and international). At the local level, PoR took over the development of the port of Dordrecht to connect with other Dutch ports as one network. The international participation of PoR, which had already began in the early 2000s in Oman, was expanded to a wider region (e.g. Brazil, China, and Indonesia) to strengthen the relationship of PoR authority with leading firms in different sectors. By leveraging on port management and knowhow, PoR is aiming to generate financially attractive business opportunities, and to increase volume and trade flows through Rotterdam.
Table 5.4. Strategic Development 2010s in PoD, PoK and PoR

<table>
<thead>
<tr>
<th>Dubai (PoD)</th>
<th>Kaohsiung (PoK)</th>
<th>Rotterdam (PoR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Container handling capacity in Jebel Ali was expanded to 19,000,000 TEUs through expansion of Terminal 2 and development of Container Terminal 3.</td>
<td>Port land expanded through land reclamation to construct deep water wharfs, giving PoK the ability to handle vessels up to 22,000 TEUs</td>
<td>• PoR launched an inland transshipment terminal (Alpherium) to enable the combined use of trucks and freight barges, to facilitate modal shift.</td>
</tr>
<tr>
<td>Construction contracts for Container Terminal 4 signed (2016), adding 3,100,000 TEUs to the handling capacity of Jebel Ali port.</td>
<td>Phase 1 construction of Terminal 6 commenced, adding 2,800,000 TEUs to capacity. Terminal 6 is expected to increase capacity by another 4,000,000 TEUs when Phase II construction is completed.</td>
<td>• PoR invested in a new logistics concept (Container Transferium, CT) to bulk transfer containers via inland vessels in a single movement, thus promoting intermodal transport and hinterland connectivity.</td>
</tr>
<tr>
<td>DP World acquired Jafza to strengthen the port industrial cluster (2015).</td>
<td>Planning to construct a new Container Terminal (Terminal 7) is finalized.</td>
<td>• PoR established collaborative projects with universities (e.g., Smart Port, Generation R, RCIP) to offer training, research, and consultancy services linked to port activities.</td>
</tr>
<tr>
<td>Construction plan for an intermodal rail terminal adjacent to Jebel Ali Terminal 1 to promote Intermodal connectivity commenced.</td>
<td>Kaohsiung became the first Asian commercial port certified as an Eco-port verifying its environmental friendly infrastructure and operations, boosting the port’s social image, and increasing its international visibility and recognition.</td>
<td>• PoR launched an open test facility within the port (Plant One) to enable firms in the port to test and develop new sustainable process technologies without disrupting their existing operations.</td>
</tr>
<tr>
<td>• Port land expanded through land reclamation to construct deep water wharfs, giving PoK the ability to handle vessels up to 22,000 TEUs</td>
<td>• Port land expanded through land reclamation to construct deep water wharfs, giving PoK the ability to handle vessels up to 22,000 TEUs</td>
<td>• PoR invested with four other parties to promote a bio-based port cluster within the port by offering bundled services of energy, water, pipelines and tank storage in MV2 (Plug&amp;Play), and distributing steam as residual energy between plants for industrial usage (Steam Grid).</td>
</tr>
<tr>
<td>• DP World acquired Jafza to strengthen the port industrial cluster (2015).</td>
<td>• Planning to construct a new Container Terminal (Terminal 7) is finalized.</td>
<td>• PoR took over management and development of the Port of Dordrecht to strategically connect with other Dutch ports as one network.</td>
</tr>
<tr>
<td>• Construction plan for an intermodal rail terminal adjacent to Jebel Ali Terminal 1 to promote Intermodal connectivity commenced.</td>
<td>• Kaohsiung became the first Asian commercial port certified as an Eco-port verifying its environmental friendly infrastructure and operations, boosting the port’s social image, and increasing its international visibility and recognition.</td>
<td>• PoR undertook a number of other international ventures (e.g. Brazil, China and Indonesia). The international strategy of PoR is to strengthen relationships of the port authority with leading firms in various sectors, to leverage the port management and knowhow, to generate financially- attractive business opportunities for PoR and port business community, and to increase volume and trade flows through Rotterdam.</td>
</tr>
<tr>
<td>• PoR set up NexLogic, an information platform based on concept of synchro-modality using real-time information relayed by stakeholders, to optimize operations of inland container shipping.</td>
<td>• PoR set up NexLogic, an information platform based on concept of synchro-modality using real-time information relayed by stakeholders, to optimize operations of inland container shipping.</td>
<td>• PoR set up NexLogic, an information platform based on concept of synchro-modality using real-time information relayed by stakeholders, to optimize operations of inland container shipping.</td>
</tr>
<tr>
<td>• PoR set up a field lab within the port as a location for 3D printing of marine parts to shape the growth of 3D printing industry in port.</td>
<td>• PoR set up NexLogic, an information platform based on concept of synchro-modality using real-time information relayed by stakeholders, to optimize operations of inland container shipping.</td>
<td>• PoR set up a field lab within the port as a location for 3D printing of marine parts to shape the growth of 3D printing industry in port.</td>
</tr>
<tr>
<td>• PoR formed a start-up accelerator program centered on sectors of transportation, energy, chemical and refinery, to promote sustainable growth of port economy through port-related start-ups (PORTXL).</td>
<td>• PoR set up NexLogic, an information platform based on concept of synchro-modality using real-time information relayed by stakeholders, to optimize operations of inland container shipping.</td>
<td>• PoR formed a start-up accelerator program centered on sectors of transportation, energy, chemical and refinery, to promote sustainable growth of port economy through port-related start-ups (PORTXL).</td>
</tr>
</tbody>
</table>
5.2 Resource Management Constructs

The varying paths that the three case seaports have traversed over the last five decades suggest that eight different strategic resource-based strategies had been used. These strategies are presented as eight resource-based constructs below: resource agglomeration, resource agility, resource supplementarity, resource differentiation, resource fortification, resource adaptation, resource connectivity and resource alignment. Illustrative evidences on the use of the eight constructs for each case seaport are summarized in Table 5.5.

5.2.1 Resource Agglomeration

One of the most prominent resource-based strategies that all three case seaports have employed is resource agglomeration. This strategy focuses on locating related (both competing and complementary) resources (e.g. free trade zones, economic processing zones and logistics parks) near one another to create both economies of scale and economies of scope with the aim of generating strong multiplier effects to increase resource usage. As pointed out in Chapter 2, bundling resources that complement one another present opportunities for developing new capabilities and enhance learning (Harrison et al., 2001), leading to the generation of value beyond the sum of those created individually (Dyer and Singh, 1998, Lippman and Rumelt, 2003, Adegbesan, 2009). Further, resource agglomeration could create a “clustering effect”, where activities placed near a particular facility (e.g. container terminals and logistics parks) could benefit from its spill-over effects (Rodrigue, 2017).

There are many examples of resource agglomeration in the case of PoD, one of which is its investments in two seaports (Port Rashid, and Jebel Ali) with a vision of developing an entrepôt port in the Middle East. While the two ports did compete with each other, their resources were paired to complement each other. PoD’s capacity expansion programs (Terminal 4) in Jebel Ali port, which became the single location for cargo freight services, and the projection of an inter-modal rail terminal adjacent to Jebel Ali Terminal 1 to augment PoD’s regional accessibility are also examples of resource agglomeration.

In the case of PoK, resource agglomeration was evident in its construction of four container terminals in the 1960s-1980s period, which created a combined capacity of about 9,000,000
TEUs, complemented by the launch of Taiwan’s first export processing zone in the port land (KEPZ). The introduction of Free Trade Zones, an addition to the bundle of port services to provide an impetus to stimulate container traffic growth at the port, was also an act of resource agglomeration. Likewise, the construction of the 5th terminal (completion) and the 6th terminal (commencement) to expand PoK’s handling capacity were also instances of resource agglomeration.

In the case of PoR, the combination of two reclamation projects (MV1 and MV2), and three distriparks to accommodate European Distribution Centers and house a range of industries is a clear case of locating related resources to take advantage of “clustering effect” (Rodrigue, 2017) of common infrastructure and accessibility to transportation systems, and exhibits a situation of resource agglomeration.

5.2.2 Resource Agility

As a strategy, resource agility was only found in the experience of PoR among the three case seaports. As a construct, resource agility has been variously defined in the literature. In general, agility has been equated to responsiveness that requires specific capability (Van Hoek et al., 2001), visibility of demand, flexible changes, and synchronized operation (Aitken et al., 2002). Paixao and Marlow (2003), who viewed agility as a knowledge-based strategy that helps organizations to navigate quickly in a new setting, argued that developing agility requires: i) creating value for customers; ii) cooperating to improve competitiveness; iii) organizing change in a manner to adapt, and iv) leveraging people and the impact of information.

This strategy was evident in PoR during the MV1 development, which initially was aimed at generating revenue in the port by allocating land for oil, chemical, iron and steel industries in the 1960s. Following the growing trend in containerization, PoR amended the development objectives of MV1, which became the largest container terminal location in the world. The shift in utilization of MV1 was a rapid response to external circumstances that exhibits PoR’s specific capability to respond flexibility to changing external circumstances based on visibility of demand to strengthen its operations.
5.2.3 Resource Supplementarity

The third resource-based strategy identified in the cross-case analysis is resource supplementarity. Studies that gave reference to resource supplementarity commonly attribute the concept to value creation in strategic alliances (Das and Teng, 2000, Lin et al., 2008, Wassmer and Dussauge, 2011, Huang et al., 2013). This study views resource supplementarity as a strategic move to build peripheral resources to supplement existing core resource bases in seaports (Baltazar and Brooks, 2007) with the aim of creating new, valuable capabilities.

In PoD, the introduction of a range of port ancillary services (Dubai Drydocks offering ship building, repair, and maintenance services) in proximity to Port Rashid is an illustration of using resource supplementarity to create a new capability.

In PoK, opening the second harbour entrance as a means of improving its operational capabilities, and raising its overall handling capacity, is an example of building a peripheral resource to supplement an existing core resource.

5.2.4 Resource Differentiation

In organization studies, a differentiation strategy refers to the way in which firms make their products different from that of their competitors (Mosakowski, 1993) to create extra value in the eyes of customers (Baltazar and Brooks, 2007) and is considered a mean of providing competitive advantage (Aragón-Correa and Sharma, 2003). Akio (2005) identified two methods of resource differentiation: i) creating differentiation of resource value, and ii) adjusting the differentiation of resource value. In the context of seaports, Baltazar and Brooks (2007) described a differentiation strategy as having:

“... an effectiveness focus ... seeking to create a sustainable, differentiated set of product offerings in a particular part of the market that sets it apart from the others against which it competes”(p.389).

In this light, this study defines resource differentiation as a strategic approach to differentiate the conditions relating to the use of available resources from those of competitors to optimize their rate of utilization.
Among the three case seaports, PoK is the only case that displays the strategy of resource differentiation. By developing the policy of leasing out terminals to a few selected shipping lines for their dedicated use, PoK managed to make its port products different from those of their competitors as a mean of gaining competitive advantage. By granting several selected shipping lines exclusive use of a terminal, PoK adopted differentiated its terminal resource to “exploit the factor markets disequilibrium” (Akio, 2005, p.141). Through this strategy, PoK was able to create extra value in the eyes of its customers (i.e., the shipping lines) “that set it apart from others against which it competes” (Baltazar and Brooks, 2007, p.389) and gained their commitment for the period of lease. In addition to optimizing the utilization rate of container terminals, PoK, a landlord port authority, also managed to rely on investments from shipping lines in container terminals and reduce the public investments in port superstructures.

5.2.5 Resource Fortification

Another resource-based strategy that all three case seaports have been engaged in is resource fortification. The main characteristics of this strategy are the introduction of features with the aim of refining and bolstering the utilization of available resources. In PoD, DP World was formed (through the merger of DPA and DPI) which unified the port governance and its operational division. Later, PoD strengthened the port industrial cluster by acquiring Jafza, which anticipated further utilization of port resources as a process of resource fortification. In PoK, building the cross-harbor tunnel that connected Qijin Island to the opposite bank to boost the utilization of the port land was a case of fortifying PoK’s existing resources.

PoR also introduced a number of innovative schemes to fortify its resources. It set up collaborative projects with universities (e.g Smart Port, Generation R, RCIP) to promote innovation. PoR also launched an open test facility (Plant One) for firms in the port to facilitate development of new sustainable process technologies. In addition, PoR formed a start-up accelerator program (PORTXL) to promote sustainable growth of the port economy through port-related start-ups to further increase the use of its port infrastructure.

5.2.6 Resource Adaptation

Resource adaptation is another resource-based strategy employed by all three case seaports. A distinctive feature of the strategy is quick and flexible adaptation to dynamic market
changes, which require firms to have the capability and capacity to modify processes and resources in a way to create competitive advantage for themselves (Szymaniec-Mlicka, 2014). The ability to learn and to modify resource configuration rapidly is a crucial element in a firm’s performance in dynamic situations (Chun and Montealegre, 2007). This study thus views resource adaption as a strategy to respond flexibly to external circumstances to add value to customer needs in a dynamic market.

Illustrative evidence of PoD’s resource adaptation strategy can be discerned from its participation in the container security initiative (CSI) launched by the U.S. Bureau of Customs and Border Protection, allowing Dubai (as the first Middle Eastern port in the early 2000s) to handle cargos directly bound for U.S. PoD’s capability to reconfigure its operation processes and reorganize its resources within a short time according to the requirements of CSI exemplifies the distinctive feature of the resource adaptation strategy.

Likewise, PoK’s establishment of an offshore shipping center, a case of modifying resource configuration (Chun and Montealegre, 2007), to overcome the restrictions imposed on cross-strait traffic between Taiwan and Mainland China is an instance of resource adaptation. PoK’s success in obtaining a number of quality certifications (e.g. ISO9002, and ISO14001) during 2000s to raise its image as a quality service port operator also reflects PoK’s capability in reconfiguring its resources to meet the quality management standards demanded by the maritime industry then.

PoR practiced different methods of reviewing its resources and competences, depending on the situations encountered, and reconfigured those resources to create competitive advantage. A case in point is PoR’s second land reclamation project (MV2), which was proposed to overcome space shortage. The actual planning, however, was made through communication with stakeholders. Since development choices of MV2 (managing uncertainties about growth of the container industry, transport, surrounding policy and urgency) were made according to the requirements of stakeholders, this process reflects a case of resource adaptation. In fact, PoR had been adapting its resources and developing capabilities to meet stakeholder requirements, respond to market trends and blend in with technological advancements. This included: 1) forming a joint venture with the City of Rotterdam to combat CO2 emissions in the port, city, and industrial complex as well as transforming the city’s harbors by merging the port, city, and their living functions; 2) adapting to the trend of bio-based economies and investing in bundled services (e.g. Plug&Play, Steam Grid) to strengthen the port bio-based
cluster; and 3) introducing a field lab to shape the growth of a 3D printing industry within the port area.

5.2.7 Resource Connectivity

In the maritime industry, connectivity is a core capability and a key intangible asset. It reflects the ability of a seaport to connect with targeted customers, whether nautical (Cullinane and Wang, 2009, Lam, 2011), intermodal (De Langen and Sharypova, 2013) or even industry communal where independent firms cluster together in port regions (De Langen and Haezendonck, 2012). Port connectivity affects the transport and distribution of both port logistics products and port manufacturing products. This study defines resource connectivity as a strategic capability of seaports to develop resources (tangible and intangible) and their corresponding coordination capabilities to improve port connectivity. This strategy was visibly present in the case of PoD and PoR.

In PoD, merging authorities through the creation of a one-stop platform, including the Dubai Ports, Free Zone and Customs Authorities (PCFC), as a cluster of independent firms (De Langen and Haezendonck, 2012), was a method of connecting resources. This strategy also served a second purpose of providing a system of direct flow of custom duties to PCFC rather than to the state treasury. PCFC per se became the initiator of a number of IT systems (e.g. Port Community, Dubai Trade, e-token, e-payment) that were instrumental in enhancing connectivity, streamlining Dubai’s trade and logistics cluster operations. DP World’s extensive internationalization program, which connects PoD with container terminals under the DP World umbrella, is also an integral part of PoD’s resource connectivity strategy.

Similarly, PoR invested in a dedicated logistics ICT system to improve connectivity between port terminals and its hinterlands. Also by founding a port cluster association (Deltalinqs), PoR managed to enhance the relationship between the port and its industrial cluster, each owning a unique set of resources and capabilities, which influences their territory (Hervás-Oliver and Albors-Garrigós, 2007). As distribution channels connecting PoR to the European hinterland were an essential element in attracting container traffic, PoR’s investment in KeyRail, the company managing the dedicated freight rail, and the traffic enterprise (Verkeersonderneming) reinforced its accessibility to hinterlands and its intermodal connectivity (De Langen and Sharypova, 2013). Most recently, PoR commenced another project (NextLogic) to promote connectivity based on the newly introduced concept of
synchro-modality. In addition, PoR took various approaches towards elevating physical connectivity of the port industrial cluster by investing in pipeline distribution systems (MultiCore & RC2). It also facilitated inter-modality in the port through other connectivity projects (i.e. Alpherium, Container Transferium).

In a rather different approach to resource connectivity, PoR participated in international ventures (e.g. with Oman, Brazil, China and Indonesia) to develop a “World Port Network” by leveraging its port management capability and knowhow (PoR, 2017c). According to Meyer et al. (2009b) in a foreign entry context, resource development involves applying the existing knowledge of a firm by transferring and utilizing its specific advantages in foreign operations. By shaping the foreign entry network, PoR aimed to expand its revenue base beyond the local land rent and port dues, while generating financially attractive business opportunities for itself, and its port business community, as well as boosting volume and trade flows through Rotterdam.

PoR implemented the same strategy in the local context by connecting to Dordrecht seaport (the most landward seaport in the Netherlands) through an agreement of port exploitation, development, and management.

5.2.8 Resource Alignment

Understandably, not all resources are perfectly tradable, as they are either blended with other resources or deeply rooted in other organizations (Chi, 1994). Thus, to access non-tradable resources owned by partner organizations and to create the most value for one’s existing resources, firms develop resource alignment schemes by aggregating, sharing or exchanging valuable resources with others, which come in different forms of partnerships (e.g. mergers, acquisitions and strategic alliances) (Das and Teng, 2000). From the resource-based view, the rationale of these partnerships is “value creation potential of resources that are pooled together” (Das and Teng, 2000, p.31).

Both PoD and PoK exhibited evidence of using resource alignment strategy to merge their tangible and intangible resources with those of others to create value and spur growth.

In PoD, the build-up of a resource bundle was realized through a process of “accumulation and trade” (Das and Teng, 2000). Thus, in order to access those resources, PoD established resource alignment schemes with its partners to create value. For instance, PoD tackled the
challenge of balancing the deployment of two pool of resources in the dual locations (Port Rashid and Jebel Ali) by two mechanisms: the merger of two separate port authorities (DPA), and the formation of an entity to operate the two ports (DPI). Integration of the twin ports in terms of their governance and operation was an instance of aligning resources, which accommodated and stimulated the overall throughput of PoD. Shortly afterwards, the decision to end Port Rashid’s cargo operation and to concentrate on Jebel Ali port as the single location for freight shipping activities represents another instance of aligning resources in PoD.

Another example of resource alignment in PoD is its acquisitions of two major stevedoring companies (CSX Terminals and P&O Ports) to upgrade the status of its operating division (DPI, later called DP World) from a regional participant to a global operator. Acquiring new assets became instrumental for DP World as a global terminal operator and helped PoD to gain value from its strategic global participations and partnerships. DP World’s global participation as a form of foreign entry is a way of providing access to complementary resources (Anand and Delios, 1997, Meyer et al., 2009a). The foreign entry, as stated by Meyer et al. (2009b), is a means of augmenting a firm’s resource-base in two ways: i) exploring its existing knowledge through organizational learning (internal), and ii) accessing complementary knowledge (external).

In PoK the full privatization of container terminal operations was a step taken towards improving its operational efficiency. Port operation efficiency can be maximized with the injection of private finance, operation and management knowledge, and the regulatory control of port authorities (Tongzon and Heng, 2005). Privatization thus exemplifies PoK’s strategy to align its available resources with the deeply rooted capabilities of the private sector to increase operations efficiency and spur growth.
### Resource Building and Utilization Constructs

**Illustrative Evidence**

<table>
<thead>
<tr>
<th>Resource Building and Utilization Constructs</th>
<th>Dubai (PoD)</th>
<th>Kaohsiung (PoK)</th>
<th>Rotterdam (PoR)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Resource Agglomeration</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Locating related (both competing and complementary) resources near one another to create both economies of scale and economies of scope with the aim of generating strong multiplier effects to increase resource usage.</td>
<td>• In 1972 Port Rashid was established. By the late 1970s its container handling capacity had increased from 100,000 TEUs in 11 berths to 1,500,000 TEUs in 35 berths.</td>
<td>• PoK’s container operation commenced with the building of Terminals 1, 2, 3 and 4 to produce a combined handling capacity of about 9,000,000 TEUs.</td>
<td>• PoR commenced land reclamation project in Maasvlakte1 (MV1) based on seaport industrialization to create employment and to generate revenue by allocating land for oil, chemical, iron and steel industries.</td>
</tr>
<tr>
<td></td>
<td>• The 2nd port in the Jebel Ali area (largest man-made harbour in the world at the time) commenced construction in 1976 and became operational with 5 berths in 1979. First phase of Jebel Ali construction was completed by 1983, increasing handling capacity of Dubai Ports from 1,500,000 TEUs to about 10,000,000 TEUs.</td>
<td>• An Export Free Zone (Kaohsiung EPZ) was launched with assistance of foreign investment in the port to re-orientate industries from import substitution to export promotion. Products manufactured in EPZs were not permitted to be sold domestically.</td>
<td>• Formation of first distripark (Eemhaven) in PoR, bringing container terminals closer to its main cargo source.</td>
</tr>
<tr>
<td></td>
<td>• Container handling capacity in Jebel Ali was expanded to 19,000,000 TEUs through expansion of Terminal 2 and development of Container Terminal 3.</td>
<td>• Free Trade Zones in the port area were launched to expand volume of re-export trade to generate revenue from trade service fees, and to increase income from foreign currencies.</td>
<td>• MV1 final phase of development commenced with construction of a large-scale chemical plant and two European distribution centers (Reebok, and Eurofrigo).</td>
</tr>
<tr>
<td></td>
<td>• Construction contracts for Container Terminal 4 signed (2016), adding 3,100,000 TEUs to the handling capacity of Jebel Ali port.</td>
<td>• Construction of Container Terminal 5 began, expanding PoK’s capacity to 10,000,000 TEUs.</td>
<td>• Botlek and Maasvlakte, two new distriparks were introduced in PoR to accommodate chemical companies, logistics providers and a number of manufacturing companies that established their European Distribution Centers.</td>
</tr>
<tr>
<td></td>
<td>• Construction plan for an intermodal rail terminal adjacent to Jebel Ali Terminal 1 to promote Intermodal connectivity</td>
<td>• Phase 1 construction of Terminal 6 commenced adding 2,800,000 TEUs to capacity of PoK. Terminal 6 is expected to increase port capacity by another 4,000,000 TEUs when Phase II construction is completed.</td>
<td>• PoR launched 2nd land reclamation project (Maasvlakte 2 – MV2) to overcome threat of space shortage by 2014.</td>
</tr>
</tbody>
</table>

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource Building and Utilization Constructs</td>
<td>Illustrative Evidence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>-----------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dubai (PoD)</strong></td>
<td><strong>Kaohsiung (PoK)</strong></td>
<td><strong>Rotterdam (PoR)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Resource Agility</strong></td>
<td>Utilizing existing resources to respond quickly to external circumstances</td>
<td>Not evident</td>
<td>Not evident</td>
</tr>
<tr>
<td><strong>Resource Supplementarity</strong></td>
<td>Building additional port-related infrastructure in close proximity as a supplement to port products to create new capabilities in port</td>
<td>A range of port ancillary services, shipbuilding, repair and maintenance services were introduced in Dubai Drydocks, located south of Port Rashid to build a bundle of maritime services.</td>
<td>2nd harbor entrance opened to overcome national defense concerns about a single entrance port and to improve operational capabilities by making the inner harbor accessible to larger vessels. Opening 2nd entrance and constructing several piers around it also facilitated utilization of Qijin district, raising PoK’s overall handling capacity.</td>
</tr>
<tr>
<td><strong>Resource Fortification</strong></td>
<td>Introducing features to refine and enhance utilization of available resources</td>
<td>DPA and DPI merged to form DP World. DP World acquired Jafza to strengthen the port industrial cluster.</td>
<td>Cross-harbor tunnel opened to connect Qijin district to opposite bank to streamline cargo traffic and increasing capacity growth of port. A navigating center, called Vessel Traffic Centre (VTC), and Vessel Traffic Service (VTS) were introduced to provide a faster and safer service for shipping lines. International Ship &amp; Port Security (ISPS) systems were implemented to improve port and vessel security against terrorist threats.</td>
</tr>
<tr>
<td>Resource Building and Utilization Constructs</td>
<td>Dubai (PoD)</td>
<td>Kaohsiung (PoK)</td>
<td>Rotterdam (PoR)</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>-------------</td>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td><strong>Resource Differentiation</strong></td>
<td></td>
<td></td>
<td>Not evident</td>
</tr>
<tr>
<td>Differentiating the conditions relating to the use of available resources to optimize their rate of utilization</td>
<td>Not evident</td>
<td>• PoK offered dedicated terminals to shipping lines to ensure their commitment, to reduce public investment in port and to generate new traffic. Dedicated terminals offer greater flexibility, reliability and shorter turnaround times to terminal operators, boosting their logistics efficiency.</td>
<td>Not evident</td>
</tr>
<tr>
<td><strong>Resource Adaptation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exploiting existing resources to respond flexibly to external circumstances and add value to customer needs</td>
<td>Jebel Ali port participated in the Container Security Initiative (CSI) (launched by the U.S. Bureau of Customs and Border Protection in 2002) as the first Middle East port to join the initiative for handling cargos directly bound for USA.</td>
<td>• Offshore shipping center established to receive transshipment cargos from mainland China without the need for transshipment cargos to anchor at a third place (such as Japan or Hong Kong) to overcome the prohibition of direct shipping with China, thus removing operations inefficiency, extra handling costs, downtime and risk of transporting cross-strait trade cargo.</td>
<td>• Development of MV2 project; MV2 was an uncertain project in terms of growth of container transport, surrounding policy, and its urgency. PoR managed to explain the uncertainty to stakeholders and made choices accordingly.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• PoK obtained ISO 9002 and 14001 quality certification, raising the port’s image as a quality service port operator.</td>
<td>• PoR formed a joint venture with City of Rotterdam, Deltalinqs, and local environmental protection agency - Rotterdam Climate Initiative (RCI) to combat CO2 emissions in the city, port, and industrial complex.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• PoK became the first Asian commercial port certified as an Eco-port, verifying its environmental friendly infrastructure and operations, boosting the port’s social image, and increasing its international visibility and recognition.</td>
<td>• PoR formed Rotterdam City Ports Development Corporation (RCDC) with City of Rotterdam to transform the city harbors into a sustainable combination of balanced port, city and living functions development.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Port land expanded through land reclamation (International Container Terminal - ICT Project Phase II) to construct 5 new deep water wharves (serviceable depth of 18m) giving PoK the ability to handle vessels up to 22,000 TEUs</td>
<td>• PoR invested with four other parties to promote a bio-based cluster within the port by offering bundled services of energy, water, pipelines and tank storage in MV2 (Plug&amp;Play) and distributing steam as residual energy between plants for industrial usage (Steam Grid).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• PoK lifted service restriction on dedicated container terminals to extend services to more shipping lines.</td>
<td>• PoR set up a field lab within the port as a location for 3D printing of marine parts to shape the growth of a 3D printing industry in port.</td>
</tr>
<tr>
<td>Resource Building and Utilization Constructs</td>
<td>Illustrative Evidence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dubai (PoD)</td>
<td>Kaohsiung (PoK)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Devon (PoD)</td>
<td>Rotterdam (PoR)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Resource Connectivity**
Developing resources (tangible and intangible) and their coordination to improve port connectivity

- DPA, Jafza and Customs merged to form Ports, Customs Free Zone Corporation (PCFC) to create a “one-stop” platform for port users to interact with public authorities and port operators and to provide a mechanism for a direct flow of custom duties to PCFC, rather than to the state treasury.
- DPA Invested in e-services (port community, Dubai Trade, e-token, e-payment, and Asara) to streamline operations throughout Dubai’s trade and logistics cluster, comprising seaport operations, air cargo operations, Jebel Ali Free Zone, and Customs.
- DP World developed from a local port operator to a regional port operator and further to a global port operator.

- PoR invested in KeyRail (company managing dedicated freight rail to European hinterland) as part of Port Plan 2010 to upgrade intermodal connectivity to PoR’s hinterland. KeyRail is responsible to ensure optimal use of the line through capacity allocation, scheduling and traffic control, management and maintenance as well as promoting use of rail transport
- PoR invested in a dedicated logistics ICT system (PortInfoLink / PortBase) to improve ICT interface between terminals and the hinterland.
- PoR founded a port cluster association (Deltalinqs) to enhance relationships between port and industries within the port land to promote an entrepreneurial climate in the port area and to lobby for hinterland connections.
- PoR built an underground distribution system for chemical and gas industries (Multicore & RC2) to improve port-to-cluster connectivity.
- PoR established a traffic enterprise (Verkeersonderneming) to promote hinterland accessibility by widening A15 (the only highway from MV2 to the hinterland).
- PoR launched an inland transshipment terminal (Alpherium) to enable the combined use of trucks and freight barge, to facilitate modal shift.
- PoR invested in a new logistics concept (Container Transferium, CT) to bulk transfer containers via inland vessels in a single movement, thus promoting intermodal transport and hinterland connectivity.
- PoR took over management and development of port of Dordrecht to strategically connect with other Dutch ports as one network.
- PoR set up NextLogic, an information platform based on the concept of synchro-modality using real-time information relayed by stakeholders, to optimize operations of inland container shipping.
- PoR undertook its first international venture in Oman (Sohar) (2002)
- A number of other ventures in international scale (e.g. Brazil, China, Indonesia) to expand its revenue base beyond land rent and port dues. The international strategy of PoR is to strengthen relationship of the port authority with leading firms in various sectors, leverage the port management and knowhow, generate financially attractive business opportunities for PoR and port business community, and increase volume and trade flows through Rotterdam.

Not evident
<table>
<thead>
<tr>
<th>Resource Building and Utilization Constructs</th>
<th>Illustrative Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dubai (PoD)</strong></td>
<td></td>
</tr>
<tr>
<td>• “Dubai Port Authority” (DPA) formed by merging Port Authorities of Rashid and Jebel Ali to increase overall throughput while balancing volume in the two ports.</td>
<td></td>
</tr>
<tr>
<td>• A division of DPA - Dubai Ports International (DPI) - started operating the twin ports of Port Rashid and Jebel Ali, removing foreign contractors (terminal operators) from ports’ operations.</td>
<td></td>
</tr>
<tr>
<td>• Port Rashid was operated by a company owned by Gray Mackenzie (part of UK’s Inchcape group). Jebel Ali port operator was an American shipping company (Sealand). Other shipping lines were reluctant to use Jebel Ali as it was managed by a competitor. Also the two port operators were competing for the same business, making it hard to optimize use of facilities and capabilities on offer.</td>
<td></td>
</tr>
<tr>
<td>• Capacity expansion in Jebel Ali Terminal 2 commenced in 2007, as Dubai twin ports (Port Rashid and Jebel Ali) were operating close to their maximum capacity of 10,000,000 TEUs.</td>
<td></td>
</tr>
<tr>
<td>• Port Rashid ended its cargo operations and became a cruise ship terminal (2008). All Dubai’s cargo operations became concentrated at Jebel Ali port.</td>
<td></td>
</tr>
<tr>
<td>• DPI acquired CSX Terminals, transferring management of nine container terminals worldwide (total capacity of 14.6 million TEUs) to strengthen its position in South East Asia, China, Australia, Europe and America</td>
<td></td>
</tr>
<tr>
<td>• DP World acquired P&amp;O (one of the world’s major stevedoring companies) to expand its network to India, East Asia and Europe. The two acquisitions strengthened DP World and lifted its status from a regional port operator to a global port operator.</td>
<td></td>
</tr>
<tr>
<td><strong>Rotterdam (PoR)</strong></td>
<td>Not evident</td>
</tr>
</tbody>
</table>
5.3 Strategic Development Paths: A Resource-Based Perspective

The developmental paths undertaken by Dubai, Kaohsiung and Rotterdam Ports in relation to their competitive resource building, usage and deployment strategies are next examined with a view to understanding their impetus to resource development and management at different times. The rationale for this analysis is inspired by Akio (2005), who argued that:

“... the ultimate attribute of the competitive advantage of the firm is the firm’s skill (accuracy) at perceiving the future value of resources” (p.139).

5.3.1 Dubai

The 1960s was a period of extensive oil exploration and production in the Middle East. UAE became a member of OPEC in 1967 and Dubai started to export oil in 1969, sparking the need to develop an entrepôt port in the Middle East. PoD’s strategy of building resources was centered on resource agglomeration and resource supplementarity. The fortune generated from export of oil allowed Dubai to make ample and simultaneous resource investments in two seaports (Port Rashid and Jebel Ali) and to build an international airport. As the two seaports complemented each other in terms of handling capacity, while competing to attract the same traffic, their development illustrates PoD’s strategy of resource agglomeration.

In the mid 1980s, during a major regional conflict (Iran-Iraq War), Dubai introduced two other important elements to its development plan, which complemented the rich port-related resources of PoD, anchoring it as the distribution hub of the region. First, a Free Trade Zone (Jafza) adjacent to Jebel Ali port hosting regional production and distribution centers of global and multinational corporations stimulated Dubai’s economic growth. Second, an airline (Emirates Airline) air-linking the economy to the wider (Middle East) region and to the rest of the world, contributed to building intermodal capabilities in Dubai. PoD introduced a range of port ancillary services (e.g. ship building, repair and maintenance) in Dubai Drydocks that were supplementary to its primary maritime services, thus exhibiting the use of a resource supplementarity strategy.

In the 1990s and 2000s as the Middle-East region became engulfed in a series of conflicts (e.g. 1st Gulf War and economic sanctions imposed on Iran), PoD was fortunate to be immune from the turmoil, and developed to be the regional transshipment and distribution
hub through opportunities created from those regional tensions. To ensure the utilization of its available resources, PoD embarked on a strategy of aligning its port and maritime resources. PoD integrated the governance and operation in the two ports of Jebel Ali and Port Rashid to stimulate their overall throughput. Since that time, the growth of PoD has been fully orchestrated by the DPA, with full control and decisions over all aspects of the port development and operations, from pricing of custom duties and setting of terminal tariffs to the imposition of restriction on dedicated terminals for shipping lines (Jacobs and Hall, 2007). As Jacobs (2007) observed, the DPA institutional arrangement provides strategic financial incentives to attract container traffic.

“It can engage in strategic pricing through considerable discounts on the terminal tariffs and the custom duties that, in combination with efficient procedures and operations, allow the shipping lines and their clients to capture value” (p.137).

In the early 2000s, PoD was driven by aspirations of operating as a regional main port, while exploring opportunities created by the 2nd Gulf War. PoD extended the strategy of resource agglomeration by constructing a new container terminal at Jebel Ali port, and the strategy of resource re-alignment by ending the cargo operation in Port Rashid, concentrating all Dubai’s cargo operation at Jebel Ali. A number of new strategic decisions were made by PoD for alleviating its operations: resource connectivity, resource fortification and resource adaptation. PoD merged with Dubai Customs and Free Zone authorities (PCFC) as a one-stop platform, and launched IT systems (e.g. Port Community, Dubai Trade, e-token, e-payment) to improve connectivity in the port industrial cluster. The PCFC merger became a key strength in positioning PoD as a main port of entry for the Middle Eastern and African cargos, when UAE joined the Customs Union of Gulf Co-operation Council in 2003. PoD underwent another merger, this time between its port authority (DPA) and its operating entity (DPI), which realized the strategy of resource fortification to strengthen the capabilities of both organizations through the newly-formed company, DP World. Furthermore, PoD participated in the Container Security Initiative (CSI), as the first port in the Middle-East to introduce the initiative after the 9/11 terrorist attacks, thus creating a competitive advantage by adapting its resources to the external circumstances. In mid 2000s, PoD developed the strategy of resource alignment, when its terminal operating division (DPI, later called DP World) was thriving. Two major acquisitions (CSX Terminals and P&O) aligned its resource base beyond international borders and upgraded the operating entity of PoD to a global operator.
Dubai’s logistics enclave began a transition towards a new era in 2005 with the introduction of an integrated multimodal transport platform (Dubai Logistics Corridor) connecting sea, land and air as a single bonded free zone. The platform, which was launched in 2010, became a new engine for further industrial transformation in Jebel Ali, with the construction of a new airport (Al Maktoum Airport) at its core, supported by a logistics district and a free zone (DLC) designed to provide value-added services and to facilitate fast-cycle businesses. The new logistics platform brought strategic prospects for further developments in PoD, which can be identified as resource agglomeration and resource fortification. The PoD’s capacity expansion plan (Terminal 4) and an inter-modal rail terminal to be established adjacent to Jebel Ali Terminal 1 are further enhancements and incremental to PoD’s resource usage, which are also a strategy of resource agglomeration. The launch of Mirsal 2 (comprehensive e-customs declaration system) and formation of a logistics cluster platform as a permanent network fostering collaboration between stakeholders, were other means of increasing growth and competitiveness in Dubai’s logistics cluster. In a similar attempt to further strengthen the port industrial cluster, PoD took over Jafza in 2015, which augmented a strategically located asset, to fortify its resources. PoD’s global terminal operating company (DP World) has continued its global expansion since 2010 with new concession agreements (e.g. London Gateway - UK, Canada, India, Egypt and Turkey), indicating the extension of PoD’s international strategy.

For most of the last 50 years, Dubai’s entire mega-project development, comprising port planning, physical expansion and further advancement, was coordinated. The infrastructural investments were not limited to ports, maritime, free zones and road transport facilities. The aviation industry and information technology systems were equally fundamental, as Saidi et al. (2010) put it.

“Dubai is entering and creating a new geography where infrastructure and logistics with institutional trade facilities will multiply opportunities for trade and provide international connectedness for a region that has been, so far, on the periphery of global supply chains” (p.24).

PoD’s investment to expand its port-related physical infrastructure underscores a far-sighted vision of resource agglomeration, which spans the decades. Equally, its development path also suggests a continuous resource alignment: developing parallel tangible and intangible resources to spur, and accommodate, anticipated growth throughout the 1990s and 2000s.
Another recurrent strategy of PoD in building resources since 2000 is *resource fortification*, either by mergers and acquisitions, or participation in programs (e.g. CSI) to ensure the optimal utilization of its expanding physical resources. The resource-based strategies of PoD in relation to its major regional drivers are presented in Figure 5.1.
Figure 5.1: PoD Resource Based Strategies in relation to the Major Regional Drivers

<table>
<thead>
<tr>
<th>Major Regional Drivers</th>
<th>Resource Based Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960 – 1980</td>
<td>Regional conflicts in Middle East, Iran-Iraq War (1980s), 1st Gulf War and Economic sanctions on Iran (1980s), and 2nd Gulf War (2000s) created trade related opportunities for Dubai, resulting in Dubai ports (Port Rashid and Jebel Ali) becoming transhipment and distribution hub in the Middle East. Dubai started to export oil in 1969 (not long after UAE became a member of OPEC in 1967) and began to develop an entrepot port in the Middle East region (1970’s, 1980). Dubai Airport was developed (1970) and Emirates Airline founded (1985) to air link local economy to wider region and rest of the world, contributing to building intermodal capabilities in Dubai. Formation of a Free Zone adjacent to Jebel Ali port (1985) kick-started Dubai’s economic growth. Jebel Ali Free Zone became a thriving business community, accommodating over 7,000 companies by end 2016.</td>
</tr>
<tr>
<td>1990 – 2000</td>
<td>UAE’s participation in the Customs Union of Gulf Cooperation Council (GCC) (2003) reinforced Dubai’s position as a main port of entry for Middle East and Africa cargo. Introduction of an integrated multimodal transport platform connecting sea, land, and air as a single custom bonded free zone - Dubai Logistics Corridor - further transformed port area around Dubai into an industrial growth pole and regional logistics hub-port (2008). Dubai launched the first free zone directly related to information technology - Dubai Internet City - (1999), which became a model for opening other free zones specialized in specific sectors such as Dubai Media City, Dubai International Financial Centre, and Dubai Maritime City.</td>
</tr>
<tr>
<td>2000 – 2010</td>
<td>Dubai Customs launched a comprehensive electronic Customs declaration system - Misrati 2 - in 2010 to facilitate trading activities. The new system allows traders to submit declaration forms online prior to arrival of goods in Dubai, saving operational costs and time. Dubai government introduced a logistics cluster platform (2011) serving as a permanent network that fosters collaboration between stakeholders in logistics and related services with the aim to increase economic growth and competitiveness. Dubai government launched “Virtual Freight and Logistics Corridor” (2015) to connect the operations of Dubai seaports, airports, and free zones through a single platform to streamline the entire process.</td>
</tr>
<tr>
<td>2010s</td>
<td>Resource Supplantarity</td>
</tr>
<tr>
<td></td>
<td>Resource Connectivity</td>
</tr>
<tr>
<td></td>
<td>Resource Adaptation</td>
</tr>
<tr>
<td></td>
<td>Resource Alignment</td>
</tr>
<tr>
<td></td>
<td>Resource Agglomeration</td>
</tr>
<tr>
<td></td>
<td>Resource Fortification</td>
</tr>
</tbody>
</table>
5.3.2 Kaohsiung

Between the mid-1960s and late 1980s, PoK’s development was driven by the national economic agenda to transition from an agricultural and fishery economy to an industrialized economy with a focus on manufacturing, processing and assembly, driven by an export-oriented policy that formed a trade triangle partnership with Japan, and U.S. (and Western Europe). The earliest strategies deployed by PoK for developing resources are recognized as resource agglomeration, resource fortification and resource complementarity, as well as resource differentiation. PoK created ample handling capacity of about 9,000,000 TEUs that equipped the port with facilities in line with services used by Taiwan’s main trade partners (Japan and U.S.). This was effected in combination with hosting the first export processing zone of Taiwan (KEPZ) that initiated a custom-free manufacturing zone in the port area. That, in turn, provided an impetus to container traffic growth. These moves are all in line with the strategy of resource agglomeration. By leasing out terminals to a few strategically-selected shipping lines for their dedicated use, PoK managed to reduce the financial burden of investments and optimized the container terminals utilization rate, which exhibited a strategy of resource differentiation. Meanwhile, the rapid growth of Taiwan’s manufacturing industries reinforced the position of the Kaohsiung region as an industrial cluster, encompassing manufacturing, petrochemicals, oil and steel, and ship-building industries. Hence, other strategies of streamlining cargo traffic were in place in PoK as Taiwan’s main trade gateway. The first construction project of PoK was to open a second harbor entrance, which supplemented its resources by improving the port operational capabilities and raised the overall handling capacity. In the second project, PoK built the cross-harbor tunnel that connects Qijin Island. That enhanced utilization of port land and illustrates the strategy of resource fortification.

In the 1990s when PoK’s capacity was deemed sufficient, it implemented two other resource-based strategies: resource alignment and resource adaptation. Following the nationwide process of liberalization and introduction of BOT scheme for overcoming the financial burden of infrastructural developments which had previously been financed by the State, PoK aligned its resources by: i) privatizing its container terminal operation as a strategy to improve operational efficiency and to maximize the growth of container traffic, and ii) implementing the BOT scheme when developing the new container terminals in PoK, offering long term exclusive leases (e.g. 10 years) of container berths to persuade shipping
lines of its BOT scheme. Since container terminal investment is a major strategic decision based on cost-benefit analysis, not many deep-sea container carriers were financially capable and interested in participating (Wiegmans et al., 2008). PoK also managed to adapt to the changing market demand by reviewing its policy about dedicated terminals that had prevented PoK from extending services to other shipping lines. In addition, PoK adapted to the new political circumstances following an easing of Taiwan’s political enmity with China, by establishing an offshore shipping center to overcome the restrictions imposed on cross-strait traffic between Taiwan and Mainland China. As explained in Chapter Four, the initiative did have an effect in boosting the transshipment traffic at PoK, which was vital for a seaport that did not have a sizeable physical hinterland. Eventually, the direct trade ban was lifted and direct shipping services between Taiwan and China started in 2009.

In the 2000s, PoK extended three strategies that had been implemented in earlier phases of development: resource agglomeration, resource adaptation and resource fortification. Following the policy of “free ports” presented by the Taiwanese government offering port users the benefit of operating through a single window administration and facilitating free flow of goods within free ports, PoK launched a free trade zone to create value for enterprises through their integration with supply chains, and proximity to seaport and airport. In addition to expanding the notion of Free Trade Zones throughout the port area, PoK commenced projects to expand its handling capacity (completion of the 5th terminal, and commencement of the 6th terminal), which created a new bundle of port services. These demonstrate the strategy of resource agglomeration. PoK introduced other features (e.g. a navigating center and vessel traffic service to provide a faster and safer service for shipping, implementing ISPS systems to improve port and vessel security against terrorist threats). These enhanced usage of its facilities, portraying a strategy of resource fortification. PoK also managed to raise its image as a quality service port operator by acquiring quality certifications (e.g., ISO9002 and ISO 14001), which was a case of adapting its resources to meet the needs of new industrial trends.

In 2011, Taiwan’s major ports were merged through the establishment of a state-owned company (TIPC) with the object of promoting collaboration, coordination and decreasing inter-port competition. In PoK, the new port governance initiated construction of the 2nd phase of Container Terminal 6 in 2011, a large scale land reclamation project. Upon its completion in 2019, this project would enable PoK to serve the latest generation of mega-
vessels (resource adaptation). On TIPC’s agenda, another scheme was called “Greening the Ports Action Plan”, which prompted EcoPort certification in PoK in 2014 as the first Eco-Port in Asia-Pacific. By obtaining this certification, PoK adapted its resources to the call for environmentally friendly infrastructure and operation procedures, which is expected to attract port users (shipping lines, shippers and logistic providers) to expand their operations in PoK, thus boosting PoK’s overall business performance.

The development path taken by PoK over the last 50 years reveals continuous implementation of resource agglomeration, by locating tangible and intangible resources (terminals, EPZ, Free Trade zone) within close proximity to each other to enhance the usage of its physical assets. Further development of available resources in PoK was made through resource fortification schemes across the decades. As processes of responding to external circumstances and adapting to new competitive environment, PoK began to use methods of resource adaptation in the 1990s. The resource-based strategies of PoK in relation to its major regional drivers over the last five decades is shown in Figure 5.2.
## Major Regional Drivers

### 1960 – 1980
- Taiwan transitioned from an agriculture and fishery economy to an industrialized form (mid 1960s - mid 1970s). Taiwanese factories became subcontractors of Japanese industries (mainly consumer electronic products) importing components from Japan to process, assemble or re-model and re-export to Western Europe and US.
- Export-oriented industrialization policy supported by a SME-dominated economy led to double-digit economic growth in Taiwan (1960s to 1980s).
- First Export Processing Zones (EPZ) launched in port of Kaohsiung in 1966.
- Taiwan’s heavy industries began to develop in southern part of the country in early 1970s. Kaohsiung region became an industrial cluster encompassing light and heavy manufacturing, shipbuilding, oil, steel and petrochemicals.
- Manufacturing activities changed from garment and apparel production to high level consumer electronics and components from mid-1970s to mid-1980s.
- Taiwan government liberalized trade by easing foreign exchange controls and reduced limits on outward investment and import tariffs.

### 1990 – 2000
- Taiwan shifted its economy (1990s) from production of low-value products (e.g., consumer electronics products, garments) to high value products (e.g., LCD, IC, optical and digital contents).
- Taiwan government introduced a BOT (buy-operate-transfer) scheme to encourage private sector investment in the island’s infrastructure projects.
- Taiwan maritime market underwent a process of liberalization between 1995 and 1999, allowing foreign companies to: - establish warehousing, storage services, trucking, shipping agency, and freight forwarding in Taiwan (as local firms); and - set up branch offices in Taiwan.
- Regulations of Export Processing Zones (EPZ) were amended, allowing goods manufactured in EPZs for domestic sale in 1997. More than 80% of products manufactured in EPZs (1997-2004) were mid-to-high and key electronics components.

### 2000 – 2010
- Taiwan’s relationship with China eased. Direct trade ban with China was lifted (2000s), and cross-strait sea transport agreement signed (2008), enabling direct shipping services between China and Taiwan to proceed.
- Taiwan government promoted its ports as “free” ports (2002), i.e., to benefit from operating through a single window administration, and facilitate free flow of goods within free ports.

### 2010s
- Taiwan Port went through a major organizational reform (2010s) to improve operational efficiency, enhance competitiveness, reduce costs and increase port revenue.
- Taiwan International Ports Corp (TIPC) launched the “Taiwan Greening the Ports Action Plan” in 2018 initiating several programs that focus on its cargo operation, cruise terminal, environmental quality and community outreach. The plan is leading Taiwan’s major ports to go beyond compliance and pursue sustainability.

---

**Figure 5.2: PoK Resource Based Strategies in relation to the Major Regional Drivers**

---

206
5.3.3 Rotterdam

In the 1960s, seaport industrialization in PoR began with the first land reclamation project (MV1) from the North Sea, aiming to generate revenue in the port by allocating land for oil, chemical, iron and steel industries. Following the trend of containerization, PoR swiftly amended the objectives of MV1 by allotting the developed land to container terminal operations. The shift in utilization of MV1, which made PoR one of the largest container terminal locations in the world, was a rapid response to external circumstances and can be identified as a strategy of resource agility.

In the 1980s, concurrent with the growth of container terminals, PoR developed its first distribution park (Eemhaven), bringing container terminals closer to its main cargo source as a strategic choice of locating related resources with the aim of generating a strong multiplier effect. This was a strategy of agglomerating resources following the Dutch national strategic plan: it branded PoR as a main-port and a location to stimulate foreign direct investments and proved to be a success. The Netherlands’ net inflows of FDI increased significantly (3.5 times in the 1970s and 1980s, and more than 4.5 times over the next decade) with a significant surge in re-exports.

In the 1990s, the era of European Union integration, more than half the European distribution centers were located in the Netherlands. During this period, PoR extended its strategy of resource agglomeration by introducing two new distribution parks (Botlek and Maasvlakte) which were capable of offering comprehensive facilities (e.g. warehousing, forwarding, documentation, packing, labeling, assembling, sampling and providing quality control) (Van der Lugt et al., 2007) in three different districts of the port. For PoR, distribution channels connecting it to the European hinterland was an essential element in attracting container traffic. Consequently, PoR made the decision of investing in the company (KeyRail) that managed the dedicated freight railway (Betuweroute), which links Rotterdam to the European hinterland via Germany. This reinforces the connectivity of its distribution channels.

In the 2000s, PoR extended both strategies of resource connectivity and resource agglomeration. The resource connectivity strategy was motived by the Dutch national development policies (promoting connections between nodes, hinterlands, and forelands) and was realized by the newly reformed authority of PoR. This broadened the traditional focus of development through strengthening the port industrial cluster and applying sustainable
practices. PoR used various approaches to meet the new objectives of elevating physical connectivity of the port industrial cluster by investing in pipeline distribution systems (MultiCore & RC2), reinforcing road accessibility to the hinterlands by founding a traffic enterprise (Verkeersondernemings), improving ICT interface between terminals and hinterlands (PortInfoLink) and enhancing the relationship between the PoR authority and industries located within the port area with the formation of the port cluster association (Deltalinqs). In addition, PoR established a commercial presence abroad by entering into a partnership of seaport development project, as a reaction to the intense regional competition between seaports in Northern Europe. PoR sought options for expanding business beyond national boundaries, particularly in high-growth areas, as an entrance strategy into sustainable, and difficult-to-imitate partnerships. By capitalizing on its knowhow, PoR’s finalized its first ad hoc concession agreement for construction and management of Port of Sohar (a free zone) in Oman until 2045. PoR has since further extended its resource base by developing a “World Port Network” (PoR, 2017c) by participating in collaborative initiatives with other countries (e.g. Brazil, China and Indonesia). The main objectives of these participations, as revealed by Dooms et al (2013), were to attract overseas customers, to improve the position of the port by bolstering the physical transport network (both inland and maritime), and to develop and improve competencies by building long-term strategic relationships. In this regard, Jansen (2013) also elaborated that a stronger network is created when more companies are strategically connected to port authorities at both ends of the supply chain.

By taking advantage of these objectives, PoR further connected its resource base through international participation with a geographical spread since the 2000s (see Table 4.1.8), and has created advantages such as:

- Unparalleled business opportunities in growth markets;
- A transparent, competitive and safe business environment;
- Acclaimed and proven port management system based on the landlord principle;
- Good hinterland connections, sufficient scale, and diversification in terms of activities, including a mix of container logistics, petrochemical industry and energy industry, and
- Consistent application of world class standards in contracts and rules & regulations (PoR, 2017c)
With regard to resource agglomeration, PoR launched the second land reclamation project (MV2) to overcome space shortage in the port area that had been anticipated to occur by 2014, while the final phase of development on MV1 was on track. However, MV2 was an uncertain project in terms of growth of container traffic, and its urgency. PoR managed to overcome that uncertainty through effecting good communications with its stakeholders, and making development choices according to their requirements. This process reflects a strategy of resource adaptation. Furthermore, PoR commenced sustainable practices in the form of a partnership with the City of Rotterdam (RCDC), which is also considered a strategy of resource adaptation, aiming to balance the port, city and living functions by transforming the city harbors.

Since 2010, PoR has extended its resource agglomeration, resource adaptation, and resource connectivity strategies. The ongoing development of MV2 was a case of resource agglomeration strategy. PoR began a transition towards utilizing bio-based materials and renewable energy resources by adapting to the Dutch national future development scenarios. The offering of bundled services of energy, water, pipelines, and tank storage in MV2 (Plug & Play), and a stream distribution system between plants for industrial usage (Steam Grid), promoted a bio-based cluster in the port. PoR also started a field lab in the port for 3D printing of marine parts, shaping the growth of 3D printing industry. This is another instance of means of resource adaptation to the Dutch national agenda of forming a 3D technology global cluster in the Rotterdam area as a core element of future economic strategy. PoR’s innovative developments did not put its traditional growth mechanisms on hold. While the ongoing expansion of MV2 was on track, PoR re-emphasized its position as a main-port through investments in hinterland connectivity projects (Alpherium, Container Transferium) to facilitate inter-modality. More recently, PoR has commenced another project (NextLogic) to promote connectivity based on the newly-introduced concept of synchro-modality. In addition, PoR has initiated innovative features aimed to provide firms in the port with applicable knowledge, including the following examples: launching collaborative projects with universities; opening a test facility (Plant One), and forming a start-up accelerator program (PortXL) to fortify the use of its resources. The resource-based strategies of PoR in relation to its key regional drivers over the last five decades are depicted in Figure 5.3.

The development path of PoR over the last 50 years consists of large scale and ongoing spatial expansion programs for creating excess capacity: Maasvlakte1 (1968-2008) and
Maasvlakte2 (2008-2030) in parallel with restoration of the city terminals to increase efficiency, and the launch of three distriparks. This is an obvious case of resource agglomeration. The spatial developments are based on the business model approach, with the PoR bearing all the costs and risks of reclaiming, building, and exploitation. In order to minimize the risk of developing these mega-projects, the PoR authorities have deployed a number of strategies to align the expansion projects with market trends and requirement of stakeholders. In MV1, the quick shift in allocation of land from oil, chemical and steel industries to container, bulk and liquid terminals illustrates resource agility. In MV2, the continual engagement with stakeholders to minimize uncertainties reflects a process of resource adaptation. Connectivity of the port cluster to the hinterlands has also been a matter of great significance for PoR, and which has been promoted through numerous initiatives uninterruptedly since the 1990s. Lastly, PoR has continued its resource adaptation schemes by investing in bio-based industries in line with the growing trend of developing a bio-based economy in the Netherlands. These are also depicted in Figure 5.3.
Figure 5.3: PoR Resource Based Strategies in relation to the Major Regional Drivers
5.4 Generating Competitive Advantages through Resource Development Strategies: An Interpretive Discussion

This study examines how seaports plan, build, organize and utilize their capital-intensive resources to grow their gateway, and to capture transshipment, container traffic. As discussed in the previous sections, the resource development and management paths undertaken by the three ports represent a situation of strategically and agily adapting, agglomerating, aligning, connecting, differentiating, fortifying and supplementing resources to expand their hinterlands and forelands in a dynamically competitive environment. In the context of seaport competition, the foregoing findings suggest that interpreting them in the two contingent dimensions of “regional competition” and “sizes of hinterlands and forelands” seem appropriate in terms of making sense of the shift in strategic intent by the three ports over five decades.

Regional competition is an indicator of the intensity of rival pressure among seaports operating within a market where their services could extend. Size of hinterland and foreland is the captive market of a focal seaport. It is a prerequisite to growth in seaport traffic and a core element in the formulation of competitive strategies, as Rodrigue and Guan (2009) contended:

“the future of a gateway port is increasingly decided over what takes place over its hinterland” (p.4).

Mapping the resource development and management paths of the three ports over four periods (1960s-1980s, 1990s, 2000s, and 2010s) into these two dimensions based on their operating environment characteristics and the intensity of their regional competition and extent of hinterlands and forelands thus offers an opportunity to develop a theoretical framework for interpreting how resource-based strategies could be staged to increase seaport competitiveness. Figure 5.4 shows the outcome of this mapping exercise.

Quadrant 1 of Figure 5.4 illustrates a situation of limited regional competition and limited hinterland and foreland. PoK and PoR were in such a situation during the 1960-1980 period. Both seaports were among the pioneer seaports in embracing containerization within their zones of operations (i.e. Hamburg-Le Havre range in the case of PoR and East Asia in the case of PoK) and faced very limited competition. This situation also applied to PoK between 1990 and 2000.
Figure 5.4: Schematic comparison of resource-development strategies of PoD, PoK and PoR based on their operating environment characteristics
Quadrant 2 characterizes a situation of limited regional competition but extensive hinterland and foreland. PoD essentially fell into this category from 1960 until 2010, being the busiest port in the Middle-East. During the period 1990-2000, PoR could also be grouped in this quadrant, given its position as a dominant player in Northern Europe.

Quadrant 3 depicts the case of seaports with limited hinterland and foreland operating in an environment of intense competition. PoK has been in such a position since 2000.

The last quadrant (Quadrant 4) is applicable to seaports with extensive hinterland and foreland operating in an intensely competitive environment. The case of PoD in the recent decade and the situation facing PoR since the turn of the century fit these characteristics.

Figure 5.4 shows that of the eight resource-based constructs identified from the cross-case analysis, three - resource agglomeration, resource adaptation, and resource fortification - are present in all four quadrants. This suggests that they are the basic building blocks of resource development and management strategies.

First, container terminal facilities are basic infrastructural resources required of seaport developments (Baird, 2002). However, providing basic seaport infrastructure means that a seaport would only be offering the basic port product (i.e. cargo transfer product). To offer a range of logistics and manufacturing products, a seaport needs to develop other resources to complement its basic port product and augment its cargo handling capabilities. This process of creating synergies by combining resources that can complement each other is evident in PoD, PoK, and PoR throughout the five decades. In all three seaports, building container terminals had gone hand-in-hand with ongoing developments of free trade zones (PoD), export free zones (PoK) and distriparks (PoR) in close proximity to create the resource agglomeration effect.

Second, because seaport development involves building mega-infrastructure, which is exceedingly capital intensive, seaport organizations, expectedly, would tend to be vigilant in establishing processes, policies and means to bolster the utilization of these high-cost facilities. By introducing processes, features or policies to increase the utilization of available infrastructural resources, port authorities fortify their resource base. PoK, for instance, fortified the utilization of its resource base by embarking upon a construction project of a cross-harbor tunnel in the period 1960-1980, and by introducing a navigating center as well
as implementing the ISPS system between 2000 and 2010. PoD has also fortified its resources since 2000: it has unified the port governance and its operating division (2000-2010) and strengthened the port industrial cluster by acquiring Jafza (2010s). PoR, likewise, utilized this strategy recently by adopting an innovative approach (e.g. collaborative projects with universities, PlantOne, and PortXL) as a means to increase the utilization rate of its terminal facilities.

Like all business organizations, seaports are required to constantly adapt to environmental and industrial dynamics. Adaptation is a strategic posture that helps organizations to respond flexibly to changes in external conditions, which is a sign of organizational readiness. While none of the three ports utilized resource adaptation as a strategy during the period 1960-1980, this strategy has featured prominently in the case of PoK since the 1990s and the PoR since the turn of the century. PoD also utilized this strategy in the 2000-2010 period when it participated in the Container Security Initiative (CSI).

Taking note of the strategic dominance of the three resource-based constructs in the four quadrants of the “regional-competition - size of hinterland-foreland” framework, the following first working proposition is offered.

**Proposition 1:** Resource agglomeration, resource fortification and resource adaptation are the three basic building blocks of a resource-based strategy for seaport development.

Seaports are composed of a bundle of assets and resources that are geographically bound. When these resources are in close proximity, they create an agglomeration effect. When they are far apart, they require efficient systems of transport infrastructure to link them so that their complementary effects can be harnessed to advantage. This suggests that resource connectivity, as a resource-based strategy, is only useful when resources that are geographically separated from a seaport have the potential to augment the utilization of seaport infrastructure. In this sense, resource connectivity can also be viewed as a specific form of resource adaptation, which requires existing resources be re-configured, e.g. through policy or process change, in response to external changes to increase their rate of utilization. Resource connectivity is, to a certain extent, also a strategy to respond to the presence of external opportunities. The difference is that such opportunities are present in geographically
separated locations away from a seaport and requires, not re-configuration of existing resources, but the construction of transport infrastructure to access them.

Reviewing the resource development paths of the three ports, it was observed that PoK, with a limited hinterland and a politically inaccessible foreland, never invoked a strategy of resource connectivity. PoD, however, did use it during the period 2000-2010 to streamline its logistics and trade cluster operations. PoR, on the other hand, has been employing resource connectivity as a strategy to extend its hinterland since 1990. These observations lead to the second proposition.

**Proposition 2:** Resource connectivity offers a means to connect a seaport to geographically distant resources to extend its hinterland and foreland and to augment the utilization of its capital infrastructure.

Bundling seaport products can go beyond conventional product offerings (cargo transfer, logistics and manufacturing). Introducing additional port-related resources generates fresh opportunities for seaports to develop new capabilities. These supplementary resources are typically developed in close proximity to ports to expand the range of their port product offerings. Resource supplementarity was deployed by PoD and PoK at the earliest phase of their development (1960s -1980) when their regional competition was rather limited. Both ports invested heavily during this period (DryDocks for ship-building, repair and maintenance services in the case of PoD, and opening the second harbor entrance in the case of PoK) to expand their port-related product offerings in anticipation of growing competition in their respective regions.

**Proposition 3:** Resource supplementarity can help seaports to expand their range of port-related product offerings and to develop new capabilities to meet anticipated growth in competition.

To build up a resource bundle, ports occasionally require non-tradable resources embedded in other organizations. To gain access to those resources, seaports join in strategic alliances, mergers or acquisitions and create value for themselves by pooling resources. PoD embarked on such a strategy during the 1990s by integrating the twin ports of Port Rashid and Port Jebel Ali, both in terms of their governance and operation to stimulate throughput growth. It again resorted to such a strategy in the 2000s by acquiring two major stevedoring companies (CSX Terminals and P&O Ports) to upgrade the status of its operating division (DPI, later
called DP World) from a regional participant to a global operator. PoK likewise employed this strategy when it fully privatized its container terminal operations during the 1990s to improve operational efficiency.

Both PoD and PoK utilized this strategy at a time when their regional competition was relatively limited. In both instances, the strategic intent was to streamline operations and to increase efficiency. The combination of circumstances suggests the following.

**Proposition 4:** Resource alignment helps to strengthen a seaport’s operations and increases its efficiency, thus bolstering its resilience to face greater competition in future.

Seaports’ infrastructural resources are essentially built in a similar manner worldwide. Physically, these resources cannot be readily differentiated. But conditions of use could alter their functions. Among the three ports, PoK, which had a limited hinterland and foreland compared with the other two ports, was the only one to utilize resource differentiation as a strategy. PoK leased its container terminals to a few selected shipping lines for their dedicated use to guarantee utilization during the 1960-1980 period, when it faced limited regional competition. As that competition intensified almost two decades later, PoK found itself in a disadvantageous, locked-in position and removed the policy. The experience of PoK suggests that resource differentiation, as a competitive seaport strategy, has limited value. Using resource differentiation to attract some particular groups of clientele to the exclusion of others creates the risk of alienating the majority of customers, especially when competition is rife. The strategy, in short, could be counter-productive in the face of increasing competition. Accordingly, the following proposition is put forward.

**Proposition 5:** Resource differentiation, while offering privileges for some high-value clients, could unintentionally exclude seaports from opportunities to service the majority of customers, especially in times of intense competition.

Infrastructural development in seaports requires a huge investment, and a relatively long period of planning and building. Once completed, changes are almost irreversible. Port authorities require foresight and vision to modify their infrastructure programs to respond rapidly and flexibly to external changes. The experiences of the three ports show that PoR was the only seaport to have adopted such a strategy of resource agility once in the last five decades. PoR amended the development objectives for MV1, initially intended for oil,
chemical, iron and steel industries, to become a location for container terminals following the prevailing trend of containerization during the 1960-1980 period. In organizing change to adapt, PoR had leveraged awareness of business cycles and economic trends to respond, giving rise to the next proposition.

**Proposition 6:** Resource agility requires foresight, vision and information to modify seaport infrastructure rapidly to match external demands.
Conclusion

This study was motivated by an attempt to understand how global seaports plan to optimize the use of their capital-intensive superstructures and infrastructures, given that these resources are, once developed, use-specific and irreversible. Despite the growing importance of seaports, and hence their infrastructures, in facilitating global trade in the last five decades since containerization (Notteboom and Rodrigue, 2013, Guerrero and Rodrigue, 2014), the review of literature on seaport competitiveness (in Chapter 2) suggests that only a limited number of studies have examined seaport competitiveness from a resource-based perspective. These studies focus largely on identifying the role of resources in contributing to competitive advantages for the seaports studied, such as Antwerp (Haezendonck et al., 2001), Singapore (Gordon et al., 2005), and Sines (Azevedo and Ferreira, 2008). Being single cases, their findings remain fragmentary. As no attempts have been made to carry out a longitudinal analysis of the developmental path of seaports, the manner in which global seaports have structured, bundled and leveraged their resources to gain competitiveness remains largely unexplored. This study was designed to fill that void.

Using a multiple case study approach, this research examined the developmental paths of three case seaports – PoD, PoK and PoR - located in three geopolitically contrasting regions to understand how they planned, developed, utilized and leveraged their physical resources to gain strategic advantage. The research questions posed was:

*How do global container seaports manage their resource base to achieve competitiveness?*

Within the broad confine of the above research question, this study assessed seaport competitiveness from two perspectives. The first perspective is based on the resource management process model of Sirmon et al. (2007), concentrating on the structuring, bundling and leveraging of resources. The second perspective is on the dynamic capabilities displayed by the case seaports to confront the operating environment and regional market
dynamics to achieve sustainable competitive advantages. These two perspectives resulted in extending the above research question into the following two sub-questions:

1. Do global seaports engage in a parallel program of complementary activities when they plan and develop their superstructure and infrastructure? If so, what are the characteristics of these parallel programs of complementary activities?

2. How do global seaports adapt their developed superstructure and infrastructure to continually align their functions to fit evolving market dynamics and industry trends overtime?

The literature on RBV (reviewed in Chapter 2) argues that firms capable of utilizing and leveraging their VRIN resources to create value can obtain competitive advantages (Barney, 1991, Sirmon et al., 2007, Andersén, 2011). The processes which could lead to such an occurrence require the development of dynamic capabilities that fit the environmental contingencies confronting the organizations through a process of organizational learning (Sirmon et al., 2007). Drawing on the tenets of RBV, Dynamic Capability, Organization Learning and Contingency theories, this thesis examined the strategic development paths of three selected seaports (PoD, PoK, and PoR) since the introduction of containerization to seek answers to the research questions.

This chapter concludes the thesis by highlighting the major contributions flowing from its salient findings in Section 6.1. It is followed by a discussion on the implications of these findings in Section 6.2, both theoretical and practical. Limitations of the study and suggestions for further research are identified in Section 6.3.

### 6.1 Major Contributions

Examining the developmental paths of the three case seaports from the perspective of resource management, this study found that eight resource-based strategies (referred to as “resource constructs”) were used in various combination, depending on the intensity of the competition within the region of operations and the size of the hinterland and foreland of the seaport. The resource constructs include resource agglomeration, resource agility, resource supplementarity, resource fortification, resource differentiation, resource adaptation, resource connectivity, and resource alignment. From the strategic actions taken by the three case seaports, the different combinations of the eight resource-based constructs can be viewed as
couching within four basic dynamic capability building blocks that were instrumental in helping them to achieve, and maintain, their global competitiveness: a capital-intensive regime of developing logistics support infrastructure (CIR Capability); a parallel program of utilizing resources in a complementary manner (PP Capability); a dynamically agile capability of coupling, de-coupling, and recoupling to renew resource utilization efficiency in response to external changes (regional dynamics, industry trends) (CDR Capability); and a capability of re-orienting the use of tangible assets as an exit strategy for intangible assets to adapt to unfolding events (E Capability). In this context, E Capability can be regarded as the decoupling and re-coupling components of CDR Capability.

Two main features flowing from the findings are noteworthy as a contribution, both to the literature of resource management and maritime operations.

First, of the eight resource-based strategies identified, three were found to prevail in all four settings defined by the two contingent factors of regional competition and size of hinterland and foreland. Namely, resource agglomeration, resource fortification and resource adaptation.

The dominant use of resource agglomeration as a strategy suggests that global seaports make deliberate attempts to engage in a parallel program of developing complementary activities (e.g. free trade zones, economic processing zones and logistics parks) while planning and building their superstructure and infrastructure. Resource agglomeration encompasses both the CIR and PP Capabilities. It enables seaports to create both economies of scale and economies of scope to generate strong multiplier or clustering effects in order to optimize the usage of their capital-intensive resources. These effects have been amply demonstrated in the developmental paths of three case seaports. PoD’s pairing the functions of Port Rashid and Jebel Ali to complement each other in terms of resource usage and its capacity expansion programs (Terminal 4) in Jebel Ali port to became the single location for cargo freight services; PoK’s developing Taiwan’s first export processing zone in the port land (KEPZ) when it commenced construction of four container terminals in the 1960s-1980s period; and PoR’s move to combine two reclamation projects (MV1 and MV2), and three distriparks to accommodate European Distribution Centers and house a range of industries are evidences of resource agglomeration.

The use of resource fortification, a reflection of CDR Capability, points to the importance of introducing features to reinforce the utilization of available seaport resources. This is
exemplified by PoD’s acquisition of Jafza to strengthen its industrial cluster; PoK’s building the cross-harbor tunnel to connect Qijin Island to boost the utilization of the port land; and PoR’s introduction of various innovative schemes (e.g., Plant One and PORTXL) to promote sustainable economic growth within the port precinct to further increase the use of its port infrastructure. Resource fortification illustrates the development of dynamic CDR capability to extend the use of seaport infrastructures beyond its core function of loading and unloading.

Resource adaptation represents another instance of CDR dynamic capability development. Focusing on responding quickly and flexibly to external circumstances to add value to customers in a dynamic market, resource adaptation requires that seaport develop the capacity to reconfigure its operation processes and reorganize its resources. Illustrative evidences of exercising resource adaptation dynamic capabilities to gain competitiveness in a fast-changing operating environment include PoD’s participation in the container security initiative (CSI) of the U.S. Bureau of Customs and Border Protection in the early 2000s, which allowed Dubai to become the first Middle Eastern port to handle cargos bound directly for the U.S.; PoK’s establishment of an offshore shipping center to overcome the restrictions imposed on cross-strait traffic between Taiwan and Mainland China in 1990’s; and PoR’s investing in bundled services (e.g. Plug & Play, Steam Grid) to strengthen the port bio-based cluster and introducing a field lab to shape the growth of a 3D printing industry within the port area.

To a significant extent, all three constructs (i.e., resource agglomeration, resource fortification and resource adaptation) encompass the three sequentially linked components – namely, structuring, bundling and leveraging – in Sirmon et al.’s (2007) resource management process model. In other words, this study has found is that it is essential to simultaneously consider all three sequentially linked processes in formulating resource-based strategies to gain competitive advantage. Although the three steps form distinct sequential stages in the management process, the strategic use of resources to build dynamic capabilities to meet environmental contingencies requires that a long-term vision on the utilization and deployment of complementary resources be formed even at the stage of building and development. This is a major contribution of the findings from the perspective of augmenting Sirmon et al.’s (2007) resource process management model.

The second noteworthy finding relates to the use of resource agility and resource differentiation as a strategy to gain competitive advantages. PoR used resource agility (i.e.
another CDR Capability) to amend its development objectives for MV1, which was initially intended for oil, chemical, iron and steel industries, to become a location for container terminals following the prevailing trend of containerization during the 1960-1980 period. As seaport infrastructural development is a capital intensive venture requiring a relatively long period of planning and building, and almost irreversible once complete, port authorities need to have the foresights to modify their seaport infrastructure programs to respond rapidly and flexibly to external changes. PoR had the vision and capacity to decisively alter MV1’s development objectives. Its agility in modifying the intended use of a major physical asset reaffirms the notion that using tangible resources to build dynamic capabilities to fit market contingencies demands appreciation of the possibilities of reconfiguring the physical resources at the stage of planning and development.

With regard to the use of resource differentiation (i.e. another CDR Capability) as a strategy, this study found that PoK’s policy of leasing out container terminals to a few selected shipping lines for their dedicated use during the 1960-1980 period became a competitive disadvantage in the following decades. While PoK was able to increase the utilization rate of its container terminals, including securing container terminal investments from customer shipping lines during the period of lease, PoK found itself in a disadvantageous and locked-in position two decades later when competition intensified. Consequently, a significantly less restrictive policy was employed in the following decades. The experience of PoK suggests that resource differentiation, as a competitive seaport strategy, could be counter-productive. Resource differentiation could attract some specific groups of clientele to the exclusion of the majority of customers, creating a major resource disadvantage. This is another significant contribution to the resource management and strategy literature, which hails differentiation as one of the corner stones (together with cost reduction) of competitive advantage.

Lastly, because of its resource-based focus, this study also contributes to a re-interpretation of seaport competitiveness strategy. The implications stemming from this re-interpretation are discussed in the next section.
6.2 Implications

While some of the eight resource-based constructs identified in this study have been discussed in general management and resource-based literature within the context of organizational performance, their role and significance in maritime transport and logistics have not been unearthed in the way this research has managed to unfold. The approach used by this research and the findings resulting from the case investigation carry significant implications for theory development and practice in seaport operations.

6.2.1 Implications for Theory

Exploring the strategic developmental paths of the three case seaports from the resource-based view is a departure from the conventional approach to studying seaport competitiveness based on locational advantages (Song and Yeo, 2004, Guy and Urli, 2006, De Langen, 2007, Yuen et al., 2012), operational efficiencies (Peters, 2001, Tongzon and Heng, 2005, Ugboma et al., 2006, Saeed, 2009), price of services and tariff (Lirn et al., 2004, Ng, 2006, Wang et al., 2014, Yeo et al., 2014), and connectivity and hinterland access (Tongzon and Heng, 2005, Low et al., 2009), among others. While examining seaport competition from the RBV perspective has been attempted (e.g., (Haezendonck et al., 2001, Gordon et al., 2005, Azevedo and Ferreira, 2008), using a multiple case study that allows for logic replication, analyzing the findings through the joint lens of four organization theories, and exploring the strategic developmental paths of the case seaports via a longitudinal perspective, this research has opened a new horizon to studying seaport competitiveness. The approach adopted and the ensuing findings have major implications for theory development in seaport competition.

First, this study relates the resource-based strategies of the three case seaports to changes in the maritime industry. It differentiates the common and unique resource development and utilization approaches of the case seaports based on the market dynamics and intensity of the competition of their regional hinterlands and forelands that formed the contextual circumstances surrounding their distinctive operations. This analytic framework presents a fresh perspective not only on how seaports compete from the resource-based view but also how resource-based strategies are continuously re-formulated in accordance with the dynamic complexities of the regional operating environments at different time periods.
Second, this study examines the resource development paths of the three case seaports, commencing from the introduction of containerization. A longitudinal view allows the flow-on effects of strategic resource building programs to be followed through to their utilization and management. This approach goes beyond strategy identification and development intention mapping, allowing the evolution, extension, alteration and discontinuation of strategies to be tracked and understood.

Third, the eight resource-based constructs generated from the interpretation of the cross-case findings suggest that there are considerable variations in the way seaport resources could be developed, fortified, re-configured, adapted to suit market changes or aligned with external environmental conditions. Insights into these variations help provide a deep understanding of how intangible resources could be dynamically sourced, speedily built or progressively modified to support the optimal use of the immobile, capital intensive physical resources. They also highlight the significance of intangible resources as an agent of resource adaptation (e.g., offshore shipping center in PoK, distriparks in PoR), a facilitator of resource reconfiguration (e.g., merger of DPA and DPI in PoD, industrial eco system in PoR) and a catalyst of change (e.g., export processing zone in PoK, bio-based cluster in PoR).

Lastly, this study has demonstrated the complementary roles of RBV, organization learning, dynamic capability and contingency theories in studying seaport competitiveness. Tenets from RBV of the firm, organization learning and dynamic capabilities theories were used to explain how seaports combine tangible and intangible resources to develop, bundle and leverage capabilities and competencies to gain competitive advantage. Contingency theory was then employed to inject an element of context-specificity into the analysis, complementing RBV and DC theories by relating the resource strategies used to the evolving nuances of contrasting socioeconomic and geopolitical settings. This research thus offers a precedence where combination of organizational theories could be used to enrich the phenomenon of seaport competitiveness. The six working propositions developed from the interpretation of the within and cross-case findings from such a joint theoretical lens offer a starting point for building theories on seaport competition.

6.2.2 Implications for Practice

Maximizing the utility of their capital-intensive seaport superstructure and infrastructure is one of the main preoccupations of global seaport authorities. Through the developmental
paths of three global seaports, this research has uncovered some valuable insights on how these capital assets had been optimally utilized, capturing them in eight resource-based constructs. The operational features underpinning the eight constructs contain insightful information on how the utilities, and competitive values, of capital-intensive seaport infrastructure could be increased.

First, this study has found that in all the three case seaports, a program of complementary resource developments was always staged, either in parallel or through a minor time-differential (i.e., lead or lag), with the planned development of new terminal facilities to increase capacities. These complementary resources could take various forms, the most common of which is the implementation of Free Trade (or Free Economic) Zones or Distripark. Locating these zones in close proximity to seaports creates an agglomeration effect that enable the seaport and the Free Trade Zone to complement one another – the former providing a gateway for enterprises located in the latter to import their raw materials and component parts as well as export their finished goods, while the latter feeds the former with cargo flows.

Second, all three case seaports had been in constant pursuit of various forms of “soft” approaches to build their dynamic capabilities, such as tapping into resources of allied services or formulating new policy measures, to augment the attractiveness of their physical resources. Examples of such soft dynamic approaches include the merger of DPA, Jafza and Dubai Customs in PoD, which created a one-stop platform for port users to interact with authorities; the introduction of dedicated container terminals in PoK to shipping lines as means of boosting their operational efficiency; and investment in Keyrail, the company that manages the double track dedicated freight rail towards Germany and Europe by PoR to promote the use of rail transport.

Third, this study has found that the regional context within which a seaport operates has a profound impact on their development strategies. PoD capitalized on the geopolitical unsettling situations in the Middle-East region to establish itself as the seaport of choice by engaging in a massive program of resource building, both within the port area as well as in its vicinity. On the other hand, PoK, which had been facing high level of regional competition, focused on resource consolidation by devising policies centered on developing capabilities to boost utilization of the built resources. PoR, by contrast, diversified its resource bases in various fronts, from developing mega-infrastructural projects, to parallel investments in
redeveloping city-ports, facilitating inter-modality as well as forming an industrial eco-

system in the port area. Facing increasing regional competition from rival ports in the
Hamburg-Le Havre triangle, PoR implemented a strategy of expanding port products by
developing ancillary tangible seaport assets (e.g., inland transshipment terminals, bundled
services of pipelines, water and energy within the port) to build dynamic capabilities (e.g.,
promoting inter-modality, bio-based cluster).

These examples underscore the need to view a seaport as an operating unit within its region,
offering a useful pointer for seaport planners to reflect beyond the port internalities when
planning a development agenda. They suggest that seaports executives should plan
infrastructure development schemes with provision to adjust their capacities to accommodate
changing market demands for port products as well as capabilities to adapt strategically and
flexibly to their regional economic, social, and political dynamics.

Fourth, the review of historical resource developments in the three case seaports suggests that
creating competitive capabilities through resource investments (and divestments) contains
phases of coupling, decoupling and re-coupling. Knowing when to couple, decouple and re-
couple with entities within the overall regional seaport system based on an understanding of
the seaport value chain dynamics had enabled the three global seaports to constantly renew
their resource utilization efficiency. The process of introducing, modifying and re-packaging
port product offerings by PoR (e.g., amendment of development objectives of MV1,
adaptation of MV2 development project, shaping port industrial cluster and bio-based
cluster), PoK (e.g., opening 2nd harbor entrance, building cross harbor tunnel, launching
offshore shipping center), and PoD (e.g., merging DPA and DPI, merging DPA, Jafza and
Dubai Customs, and acquisition of Jafza) reflect such an understanding. These coupling,
decoupling and re-coupling processes underpinned the resource fortification, agility,
differentiation, adaptation, connectivity and alignment postures of the three case seaports as
described in Chapter 5. They offer a guide for seaport managers to continually readjust the
attractiveness of the seaport infrastructure to optimize their utilization in accordance with
industry trends and market competition.

Lastly, findings of this study also reveal the importance of having an “exit” strategy
predicated on abandoning intangible resources. An exit strategy for seaports intangible assets
offers a pragmatic solution towards re-orienting the use of tangible resources in line with
market changes. PoK’s removal of dedicated terminals is an exemplary case of an exit
strategy that rejuvenated the non-optimal utilization of available container terminals. Having
in place an exit strategy thus means that seaport infrastructure would not be locked into
positions that would hinder their transformation in response to evolving market needs.

6.3 Limitations and Directions for future studies

This research relied heavily on the use of secondary data based on published information. As
with all studies based on the use of published data, there is always the chance of having
omitted vital information that could have affected the interpretation of historical events and
actions. While considerable efforts had been expended to identify appropriate stakeholders to
seek their advice on key data sources, there is no guarantee that all relevant information had
been accessed and reviewed, despite the very lengthy search process conducted over three
years. Further, the knowledge of port informants and industrial stakeholders consulted was
also limited to their engagement period with the case seaports. This limitation could have
affected the validation and authentication of some of the secondary data collected.

As all historical studies are necessarily incomplete in terms of information (Danto, 2008),
there seems to be little else that could be done, except to conduct further search and increase
the number of stakeholder consultation. Given that limitation, this study suggests extending
the same research to include more global seaports operating under either similar or different
gеopolitical contexts to further explore the role of resource-based strategies in bolstering
seaport competitiveness to validate the present findings. This study is grounded on the
experience of three seaports selected from the major trade and shipping routes, and are
confined geographically to Northern Europe, Middle-East and Asia. Extending the case study
to a wider range of contexts, such as Americas and Africa, would augment the present
findings, enhancing our understanding of how global seaports build their competitive strength
through resource management: selection, development, utilization, bundling, deployment and
leveraging. Extending this present study to other contexts would also be opportune with the
rapid changes looming in the maritime industry, including the One-Belt, One-Road (OBOR)
initiative, a long-term development plan of the government of China for expanding land and
maritime transport links between China and Europe (Ferdinand, 2016).

A second limitation of this study is its predominant focus on developments relevant to
containerized traffic. Freight operation in global seaports contains both the bulk and container
sector services. Competitive strategies of seaports are determined by actions taken to attract
the highest possible level of freight carried by container and bulk carriers. Seaports as gateways of trade are increasingly developing towards formation of port complexes, where bundle of cargo products are on offer. In an increasingly competitive maritime environment, a port complex could no longer thrive without offering the two core cargo transfer products. Developing resources and capabilities for providing logistics services in both bulk and container sector are equally essential (Notteboom and Rodrigue, 2005). Further research along this vein would benefit by extending the investigation to include non-containerized traffic to reflect the entire spectrum of port operation.

Third, this research has grounded its interpretation on the resource-based strategies of the three case seaports primarily on qualitative information. While this focus is justified on grounds of ensuring richness to developing a historiography profile of their developmental path, the analysis and interpretation could be further enhanced by also exploring quantitative historical information linked to the utilization of seaport resources. Future studies on the resource-based strategies of global seaports would therefore benefit from including pertinent quantitative information to supplement the analysis, and hence enrich interpretation.

Fourth, while this research has identified the resource building and utilization strategies in the three case seaports, the decision making process in terms of who decided the policy, and how the decisions were made, had not been examined in this study. Including the decision making processes in future studies would enhance our understanding of the dynamics of resource development from a power perspective.

Resource selection, planning, development, utilization, bundling and deployment are important processes in seaport management. Issues relating to these processes would continue to confront seaport authorities as seaport competition intensifies when new trading blocks emerge, new institutional constraints surface, new maritime technologies are developed and new stakeholders enter into the maritime industry. This study has opened an avenue to study the resource-based approaches of high-performing global seaports to advance our understanding of the role of resources in aiding seaport competitiveness.
Interview Protocol, Port Authorities, and Managers

Name of Organization: 
Position of Person Interviewed: 
Time interview Commenced: 

Date of Interview: 
Interviewer: 
Time Interview Completed: 

Competitiveness of Global Seaports

Global Seaports have been achieving competitiveness over the last five decades by taking advantage of opportunities and making their locational disadvantages irrelevant. The role of your organization in the process of capability building for Port of … in competing with other seaports around the world to attract cargo traffic is being viewed to gain an overall understanding of its developmental path.

☐ Can you please outline how the organizational structure of your port has changed over the last five decades?

☐ How many phases of change in the organizational structure can be highlighted? What generated those phases of change? What were the key features and outcomes of the change in each phase? How long did each phase last?

☐ Is your port management particularly concerned with the ranking of your port in terms of container traffic handled? Please indicate the concerns and the reasons for such concerns.

☐ In your opinion what have been the predominant causes of variation in your port’s position on the world ranking since mid-1980s?

☐ What are the main strategic and operational measures adopted to attract container traffic? Have these strategies drastically changed over the last five decades? Please outline the key features of these changes.

☐ How was each one of those strategies implemented? What has been the impact of those strategies on the ongoing operational processes (e.g., changes in security measures and increase in cost of services)?

☐ In your opinion what have been the impacts of regional dynamics on your port’s strategic and operational planning?

☐ Currently are there any initiatives undertaken by your organization toward maintaining the competitive strength of your port (e.g., introduction of new IT systems, infrastructural/superstructural adjustments)?

☐ Are there any strategies in place for sustaining or increasing the competitive position of your port for the next 5-10 years?

☐ Can you please give some direction in finding other sources of information on historical development of your port?

Thank you for your time and participation.
## Interview Protocol with Industrial Stakeholders

<table>
<thead>
<tr>
<th>Name of Organization:</th>
<th>Date of Interview:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position of Person Interviewed:</td>
<td>Interviewer:</td>
</tr>
<tr>
<td>Time interview Commenced:</td>
<td>Time Interview Completed:</td>
</tr>
</tbody>
</table>

### Competitiveness of Global Seaports

Global Seaports have been achieving competitiveness over the last five decades by taking advantage of opportunities and making their locational disadvantages irrelevant. The process of capability building for Port of … in competing with other ports across the globe to attract cargo traffic is being viewed to gain an overall understanding of its development path.

- What, in your view, have been the major forces driving port competitiveness at present? How do these forces differ from those at the turn of the century as well as those in the early 1990s? What were the key global events that had triggered the change in factors affecting port competitiveness?

- Can you please outline the specific events that had affected the competitive strength of Port of … over the last five decades? In what way had each of these events influenced the volume of container traffic handled by Port of … during this period?

- How, in your view, did Port of … respond to the changes brought about by each of these key events in the last two decades? Please elaborate the actions taken by Port of … from both a strategic as well as an operational perspective.

- In your opinion, were the strategic and operational measures adopted by Port of … over the last five decades linked to some of the development policies introduced at the City, State or National level? If yes, please provide examples.

- What impacts (both positive and negative) did the change in operational strategies by Port of … over the last five decades have on the supply chain actors that utilized this port? Please provide specific examples.

- What impacts (both positive and negative) did the change in operational strategies by Port of … over the last five decades have on the economy of the city (or region supported by or supporting this port)? Please provide specific examples.

- In your opinion, what have been the impacts of regional dynamics on the strategic and operational planning of Port of …?

- In your view, what operational adjustments could Port of … adopt to increase its current level of competitiveness (e.g., introduction of new IT systems, infrastructural/superstructural adjustments)? Please provide specific examples.

- Can you please give some direction in finding other sources of information on historical development of Port of …?

**Thank you for your time and participation.**
<table>
<thead>
<tr>
<th>Tangible Resource Building</th>
<th>Dubai (PoD)</th>
<th>Kaohsiung (PoK)</th>
<th>Rotterdam (PoR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Jebel Ali Free Zone (Jafza) constructed around the Jebel Ali port area, and operational (1985)</td>
<td>• Terminal 4 (1985-1991)</td>
<td>• Investment in “Keyrail” (2007) company that manages the double track dedicated freight rail towards Germany, and Europe</td>
<td></td>
</tr>
<tr>
<td>• Dubai Trade (Port community portal) launched (2003), Customer-oriented services introduced: e-Token, e-Payment and Asra’a</td>
<td>• Terminal 5 (1995-2000)</td>
<td>• Investment in “Verkeersonderneming” (2008), a traffic enterprise promoting hinterland accessibility</td>
<td></td>
</tr>
<tr>
<td>• DP World acquisition of P&amp;O, expanding their portfolio of terminals (2006)</td>
<td>• Construction of the Cross Harbor Tunnel (1981-1984), linking Container Terminal 4 and Qijin district to the rest of the port, increasing annual capacity of the port by more than 2 million TEU</td>
<td>• Introduction of Plug &amp; Play (2013), an initiative creating a bio-based cluster in the port</td>
<td></td>
</tr>
<tr>
<td>• Construction of a multimodal logistics platform in Jebel Ali area - Dubai World Central (DWC – under development since 2012)</td>
<td>• Construction of Container Terminal 6 (Intercontinental Container Terminal) - Phase I (2007-2011) - Phase II (2011-2014)</td>
<td>• Undertaking a number of International ventures (Oman, Brazil, China, Indonesia) for development and management of ports</td>
<td></td>
</tr>
<tr>
<td>• Acquisition of Jafza (2015)</td>
<td>• Dredging along waterline in Terminal 4 (2014) deepening wharfs to provide access of larger vessels</td>
<td>• Agreement for exploitation, development, and management of Dordrecht seaport</td>
<td></td>
</tr>
<tr>
<td>• Construction of an Intermodal Rail Terminal in Jebel Ali Port confirmed (Projected with Etihad Rail)</td>
<td>• Construction of Container Terminal 7 (MoU signed with DP World to develop a new terminal accommodating 2.25 TEU)</td>
<td>• Setting up information platform (NextLogic) based on syncromodality concept</td>
<td></td>
</tr>
</tbody>
</table>

2 References were provided in Chapter 4.
### Intangible Resource Building in PoD, PoK, and PoR

<table>
<thead>
<tr>
<th>Intangible Resource Building</th>
<th>Dubai (PoD)</th>
<th>Kaohsiung (PoK)</th>
<th>Rotterdam (PoR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unification of port authorities (Jebel Ali and Port Rashid) and formation of Dubai Port Authority (DPA)</td>
<td></td>
<td></td>
<td>Introduction of Distriparks in the port area</td>
</tr>
<tr>
<td>DPA, Jafza and Customs merged and formed Ports, Customs, Free Zone Corporation (PCFC) (2001)</td>
<td></td>
<td></td>
<td>- Botlek (1990)</td>
</tr>
<tr>
<td>Dubai Ports International (DPI) merged with DPA (Dubai Port Authority) and formed DP World (2005). Merger of DPI with DPA (Dubai Port Authority) and formation of DP World (2005). DP World developed to one of the largest terminal operators in the world, with a portfolio of more than 78 marine and inland terminals across 6 continents, handled more than 64 million TEU in 2016.</td>
<td>Establishing long term relationship with shipping lines by offering dedicated container terminals (1970s)</td>
<td>Establishing an Offshore Shipping Center (1997)</td>
<td>Formation of a port cluster association (Deltalinqs) to enhance relationship between port and the industries located within the port land (2001)</td>
</tr>
<tr>
<td></td>
<td>Introduction of Export Processing Zone in the port area (1980s) targeting “Double V” (trade value + trade volume)</td>
<td>Lifting the limitation of dedicated container terminals and upgrading the shipping lines to “Terminal Operators”, offering opportunities for higher volume of transshipment cargoes (late 1990s)</td>
<td>Formation of Rotterdam City Ports Development Corporation (RCDC) to transform the city harbors and promote sustainable combinations of city functions, port functions, and living functions (2004)</td>
</tr>
<tr>
<td></td>
<td>Privatization of Container terminal operation</td>
<td>Introduction of Free Trade Zone in the port area, Terminals 2,3,4 and 5 approved as Free Trade Zones (2004)</td>
<td>Collaboration with Universities (Smart Port, Generation R, RCIP) for training, research and consultancy services linked to port activities</td>
</tr>
<tr>
<td></td>
<td>Obtaining ISO 9002, and 14001 quality certifications</td>
<td>Implementation of International ship and port security (ISPS) systems to improve port and vessel security against terrorist threats</td>
<td>Forming a start-up accelerator program (PORTXL) to promote sustainable growth of port economy through port related for start ups</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Opening the first 3D lab in port called RAMLAB (2016)</td>
</tr>
</tbody>
</table>

3 References were provided in Chapter 4.
References

2daydubai 2010. Dubai City Map *Dubai Geography* 2DAYDUBAI.


Carbone, V. & Gouvernal, E. Supply Chain and Supply Chain Management: Appropriate Concepts for Maritime Studies. International Workshop on Ports, Cities and Global Supply Chains 2007 Hong Kong, China


Crook, S. 2010. Taiwan's Export-Processing Zones: Shifting Roles Through the Decades *Export-Processing Zones* The American Chamber of Commerce in Taipei.


Dpworld 2011b. Role of Ports in the Economy. DP World


Dpworld 2017b. DP World UAE Region Handbook Media Centre Downloads


Dubaicustoms 2010. The Comprehensive Customs Electronic System Launched by Dubai Customs. Dubai Customs


Dubaisouth 2016. Corporate Fact Sheet. Dubai South


Economist 2016. The Island's Electronics Firms are in Need of an Upgrade. *The Economist*


Emirates24/7. 2010a. Jafza Adds 415 Firms in 10 Months *EMIRATES 24/7*.

Emirates24/7 2010b. Logistics Corridor Links Jebel Ali Port, Jafz, DWC. *EMIRATES 24/7 News*


Expo2020 2016. About EXPO. EXPO 2020, Dubai United Arab Emirates


Greenport 2011. Rotterdam Barge Terminal Strategy Pays Environmental Dividends *News, Projects & Initiatives* Green Port


Griffith, I. 2013. Middle East Containerport Markets to 2025. Ocean Shipping Consultants


Harnick, P. 2010. The Future of the European Chemical Industry. KPMG International


Hvidt, M. 2006. Governance in Dubai: The Emergence of Political and Economic Ties Between the Public and Private Sector, Centre for Contemporary Middle East Studies, University of Southern Denmark.


Itsc 2016. i-Taiwan 12 Projects Business Opportunities, Industrial Outline InvesTaiwan Service Center, Department of Investment Services, Ministry of Economic Affairs, R.O.C.


Kaoport 2013. Transshipment Cargo Incentive. *KaoPort Newsletter #54*. Port of Kaohsiung


Kippenberger, T. 2012. The Port of Rotterdam and Maasvlakte 2. APMG.


Kuipers, B., Manshanden, W. & Huijs, M. 2015. Rotterdam: Port City, Port with a City or City with a Port?


Liu, D. N. & Shih, H. T. 2013. The Transformation of Taiwan’s Status within the Production and Supply Chain in Asia. *BROOKINGS*.

Lloydslist 2016. Top 10 Box Port Heavyweights *Ports and Logistics*


Mcdonnell, F. 1988. The Taiwan Economic Miracle pp.49-60.


Merk, O. & Li, J. 2013. The Competitiveness of Global Port-Cities: The Case of Hong Kong, China.


Myers, M. D. 2013. Qualitative Research in Business and Management, Sage.


Oecd 2010. Port of Rotterdam Case Study In: OECD (ed.) Transcontinental infrastructure needs to 2030 / 2050, North - West Europe Gateway Area OECD.


Owen, E. R. 2008. One Hundred Years of Middle Eastern Oil Middle East Brief. Crown Center for Middle East Studies, Massachusetts: Brandeis University


Por. 2016a. Business Presentation Port of Rotterdam. *The Port* Port of Rotterdam


265


The emiratesgroup 2016. Our History. Our Company. The Emirates Group


Tipc 2004. Essential Points of Kaohsiung Free Port Plan Port of Kaohsiung Taiwan International Ports Corporation


Tipc. 2016f. Port of Kaohsiung 2040 Master Plan Executive Summary. Comprehensive Planning and Development. Port of Kaohsiung, Taiwan International Ports Corporation, Ltd.


Todd, S. 2016. Rotterdam Sets Sights on Becoming a 3D-Printing Hub. Lloyd's Loading List, Maritime intelligence informa


Tradearabia 2015. Dubai launches 'Virtual Freight and Logistics Corridor'


Tung, C.-Y. Overview of Chinese Economic Reforms: Initiatives, Approaches and Consequences. Is There an Economic Orthodoxy for Developing Nations? organized by National Chengchi University (Taiwan) in conjunction with the South African Institute of International Affairs (Johannesburg) and the Pent Foundation (Buenos Aires), 2005 Taipei.


Uaefta 2017. UAE Federal Transport Authority. Land & Maritime


Unescap 2013. Cases of The Leading Ports in Developing Logistics Centre Study on Commercial Development of Regional Ports as Logistics Centres. UNESCAP.


Van Der Lugt, L. & Van Der Langen, P. W. Port Authority Strategy; Beyond the Landlord, A Conceptual Approach International Association for Maritime Economists (IAME), 2007 Athens, Greece.


Verhoeven, P. 2015. *Economic Assessment of Management Reform in European Seaports*. Antwerp University


Wits 2016. United Arab Emirates Trade Statistics World Integrated Trade Solution


Worldmaritimcnws 2014. Port of Kaohsiung to Boost Container Capacity World Maritime News


Wsc 2017. Top 50 World Container Ports Globe Trade World Shipping Council


Yang, Y.-C. 2010. Future Prospect of Sea-Air Transport Logistics across the Taiwan Strait via the Kaohsiung Offshore Shipping Center. Journal of Marine Science and Technology, 18(4), pp.546-552.


Yuen, J. 2014. Trading with MENA: Leveraging Dubai's Advantages Hong Kong Trade Development Council


Zonneveld, R. 2015. Port of Rotterdam Launches Startup Accelerator PORT XL. News Innovation Quarter, Investeren & Innoveren in Zuid-Holland