

# **The Impact of Modernizing a Rail Terminal on the Efficiency of Cargo Flow: a research view from the Bandar Imam Khomeini (BIK) Port**

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## MODERNIZING RAIL TERMINAL AT THE BIK PORT

### **Abstract**

This study proposes some approaches regarding the importance of modernizing rail terminal on the efficiency of cargo flow at Bandar Imam Khomeini (BIK)<sup>1</sup> port. It is one of the most important ports on the Persian Gulf and it has provided processing services for cargo owners over decades. However, one of the port's main shortcomings is the lack of an efficient railway transportation infrastructure. The railway system is old and it surpassed by the current technology and infrastructure adopted for the border port facilities. Moreover, the poor coordination among rail system and other players creates confusion among cargo owners. Some of the significant challenges include the lack of a particular terminal that connects to some of the major companies that use the port. Consequently, it affects the efficiency of cargo flow and the potential increase in the port's throughput. This project investigates whether modernizing rail terminal and adopting a new railway technology can improve the efficiency of cargo flow at the BIK port.

The thesis undertakes a mixed research strategy that incorporates both qualitative and quantitative research methodologies. The results of the study show that modernized railway infrastructure at the BIK port improves the efficiency of cargo flow at the port. Despite the cheaper costs associated with rail transportation mode, modernizing it will not cause a major decline in the use of trucks. This can be explained by unique advantages that the latter provides. The study finds that modernizing the railway infrastructure has strategic advantages for the efficiency of cargo flow and the competitiveness of the port at the BIK port.

1. BIK is abbreviation for Bandar Imam Khomeini and it is replaced by name in the rest of the thesis.

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## Chapter One: Introduction

### 1.1. Background

Seaports are the core element of maritime trade. They are the clearinghouses for a significant proportion of the world trade flows (Dwarakish & Salim, 2015). The global economy depends significantly on the flow of cargo across different destinations. Ports are crucial for the global economy due to the numerous advantages associated with water transport. In addition to being relatively cheaper than other forms of global transportation, water not only allows for massive tonnage of the vessels but also for more extensive global reach. Therefore, seaports are crucial gateways and enablers of economic growth of nations that have access to seas and oceans. In the other words, they are the nodes that connect nations to the system of global commerce.

The logistics industry has grown tremendously over the years. The data from the United Nations Conference on Trade Development shows that the global seaborne trade moved 2,529 million metric tons of cargo in 1970. The number has however risen to 10,282 million metric tons as of 2016 (UNCTAD, 2018). The data highlights the important role of maritime logistics in facilitating trade and the growth of the international economy.

Modern ships have extremely high efficiency in terms of speed and amount of cargo they can move at a time (Bange et al., 2010). For example, some Container Vessels can haul in excess of fourteen thousand twenty-foot equivalent units (TEUs) on a single trip. Therefore, efficiency in the processing of cargo is central to the overall efficiency of a port. Poor performance may cause a reduction in trade volumes at a port because shipping companies prefer to dock and process their cargo in highly efficient ports. A broad range of issues affects the efficiency of ports. They include i) the tidal movements and channel depth of a harbor, ii) the nature of labor

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relations at a port, iii) the time necessary for customs clearance, iv) the adequacy of dock facilities, and v) the connections to rail (Burdzik, Cieśla & Śładkowski, 2014).

Rail transport is crucial to the development and efficiency of a port (Nyema, 2014). It enhances the economic importance of a port as well as its competitiveness. It facilitates faster movement of cargo into and out of the port. Essentially, it influences the port's throughput, which is a crucial measure of success in the management of a seaport. A port with a substantial cargo throughput has better productivity. However, its productivity depends on the capacity of a port to load or discharge cargo onto or from ships faster (Dwarakish & Salim, 2015). This is an issue regarding the efficiency of port management. It relates to the technology in use as well as the transport network within the port. The supporting transport network is the central nerve system of any port. It affects trade in numerous ways.

For instance, it affects the costs associated with cargo movement within a port. A slow and inefficient port imposes higher costs on exporters, importers, and the cargo shipping companies. The reason is simply because 'time is money' (Dwarakish & Salim, 2015). Delays cause the disruption of plans. For example, a manufacturing company that uses a just-in-time strategy and relies on an international supply network may incur losses due to inefficiencies in the flow of cargo within a port. This affects the willingness of such importers to use a particular port. The type of transport network within a port has a major impact on the efficiency of cargo flow and the attractiveness of a port. It is important to understand the major factors that determine the efficiency of cargo flow at the BIK port and the possible outcomes of modernizing railway terminal on such efficiency.

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### **1.1.1 An Overview of the BIK Port**

BIK port is located on the Persian Gulf in Khuzestan Province. It is the second largest port in Iran and it was built in 1938. The port is 928 kilometers far from the Tehran and has a 120-kilometer internal railway line. BIK port is a transshipment point served by seven terminals with at least forty berths. The seaport enjoys the support of 10.9Km<sup>2</sup> of open storage space and 171,000M<sup>2</sup> of warehouse storage.

The port has a 23-kilometer shunting yard, which includes eleven dispatching lines with an average of 1300 meters and fifteen maneuver lines with an average of 550 meters. It has an additional fifteen-kilometer shunting yard, which includes eleven dispatching lines with an average of 500 meters and twelve maneuver lines with an average of 600 meters. Notably, the port also has several loadings and discharging equipment. For example, it has a grain, aluminum, petroleum products, edible oils, and ironware loading stations. It also has a range of grain silos to facilitate the transfer of grain cargo. The BIK port cargo throughput was about 42.5 million tones and about 1200 ship has been berthed there in 2016 ("Imam Khomeini Port Authority", 2017).

All of these facilities are served by the railway system at the port. The system also provides easy access to the numerous warehouses that serve the port, the general cargo, and the container terminals. The port management has continued to invest heavily in modernizing the facilities. For example, it is pursuing the reconstruction and equipment of the container terminals as well as the construction of mechanized terminals for loading and discharging grains and others for minerals. All these efforts seek to improve the efficiency of the port and to strengthen the use of railway transport, which can be very useful in facilitating an increase in the port cargo throughput.



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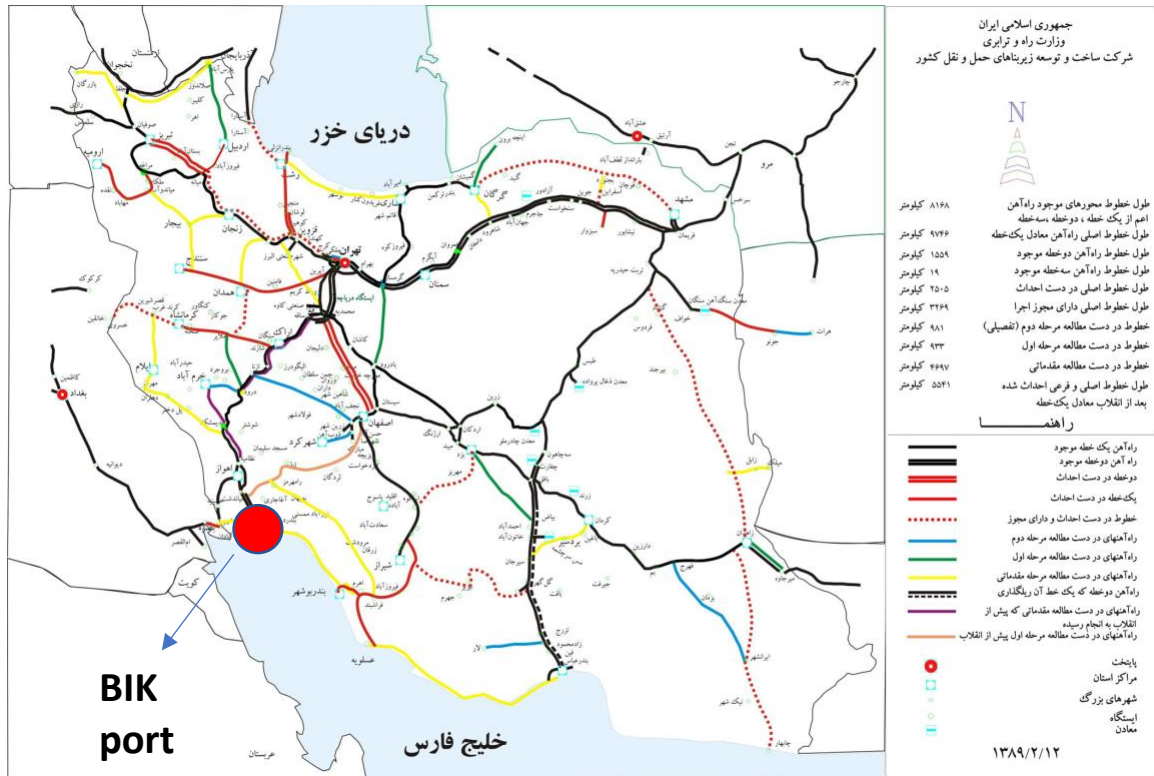


Figure 1. Map of the Iran Railway and its connection to BIK port. (At the present time just lines with black color is available and other colors are under investigation). ("Imam Khomeini Port Authority", 2017)

### 1.2. An Overview of the Importance of Rail and road Transport at BIK port

Railway transport at a port can offer numerous advantages. Firstly, it ensures reliability especially in terms of cargo delivery timelines. Most railway companies operate on a strict schedule that rarely changes unless upon prior notice. It ensures that customers can rely on the service and align their operations to those of the railway company.

Railway transport is also much cheaper due to the economies of scale involve. Wagons can transport huge amounts of cargo at a time. It helps to ensure that customers get their cargo sooner. More importantly, it helps to ensure that the cargo does not remain at the port for too long after customs clearance has been completed. Railway transport is also very efficient during periods of adverse weather conditions. It is not affected by changes in the weather.

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The current global society has increasingly focused on environmental sustainability especially in the process of business (Dwarakish & Salim, 2015). Railway transport is much more environmentally friendly especially where it relies on electric power.

Overall, an efficient railway can be a key aspect of the overall effectiveness and attractiveness of the BIK Port. Nevertheless, the costs associated with the development of the new terminal as well as new technology for the wagon has the potential to incur a large budget. Hence, there is a need to develop a cost benefit analysis to determine whether it is a viable investment for the management of the BIK Port. Moreover, railway transport is inflexible, requires extensive planning to operate effectively, and is not suitable for short distances. Such disadvantages reduce its appeal.

Currently, the BIK port relies heavily on trucks to transport inbound and outbound cargo. Trucks offer various advantages to the efficiency of a port. They offer the benefit of flexibility. Such flexibility can be viewed from the geographical, infrastructural, capacity, and time perspectives. Road transport using trucks offers the crucial possibility of delivering cargo from the port to the customer's yard or business premises (Nyema, 2014). They can also pick outbound cargo from source and deliver it straight to the port. They are not geographically constricted because they can move anywhere.

Road transport also enjoys greater infrastructural development compared to railway transport. Hence, it is more flexible from an infrastructural perspective compared to railway transport. Relatedly, using trucks to transport cargo offers time flexibility. Trucks are much faster and their timings can be adjusted to suit individual needs of the customers. It enhances the process of planning and boosts the extent of control a customer has regarding the delivery of cargo. Lastly, using trucks affords customers the crucial advantage of capacity flexibility. Trucks

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can carry large or small loads. Given the above current situation at the BIK Port it is important to investigate whether investing in modernizing railway terminal as well as newer wagons with the latest technology would enhance the efficiency in the flow of cargo.

### **1.3. Cargo Challenges at the BIK Port**

Challenges include a range of factors that affect the port's reliability and impede its efficiency. Understanding these challenges can distil the range of factors that determine the efficiency of cargo flow at the BIK port. It will also allow insights regarding the potential outcomes of a new railway terminal on the efficiency of cargo flow at the BIK port.

Despite the heavy investments in modernizing the facility and enhancing its capabilities, the railway terminal still lacks reliability. Therefore, despite being connected to the Trans-Iranian Railway, most companies prefer to use road transport. This is due to the challenge of poor coordination of the railway network, which causes confusion among different active users in the port supply chain. Some of the significant challenges include the lack of a particular terminal that connects to some of the major companies that use the port. The major impact is that the processing and delivery of cargo through railway is highly inefficient due to delays, which can affect the timeliness of cargo movement as well as increase the associated costs. Thus, companies avoid it.

The wagons also use relatively an old technology compared to other aspects of the port's operations, which causes incompatibility. They stop at the port for too long time when loading and discharging. In turn, the incompatibility between technologies becomes a barrier to the operational efficiency of the port. It is possible that modernizing railway terminal that uses the latest technology and facilitates speedier loading and discharging of cargo from the wagons can improve the overall efficiency of the BIK Port.

### **1.4. Importance of railway at the BIK port**

Port management is a complex process that involves various factors. However, the current study focuses on the importance of railway transport in improving the efficiency of cargo flow at the BIK Port. As indicated in the analysis of the current situation, the existing railway infrastructure is an impediment to the speed and efficiency of cargo flow at the port. Hence, it is important to investigate and determine whether investing in modernizing it can improve the efficiency of cargo flow compared to the current situation where the port relies heavily on trucks to move freight.

This thesis is important because the maritime industry in Iran is very crucial to the nation's economy. Moreover, there are competing ports near the BIK Port. Therefore, finding ways to improve on the efficiency of the BIK port in terms of cargo flow is a crucial exercise. The BIK Port has a strategic importance to Iran's trade activities. It enhances the nation's importance as a transit hub in the Middle East. The Persian Gulf is in the southern area of Iran. The gulf is an important transit point for oil, which is a key commodity for most of the Middle Eastern nations including Iran, which has major interests in the oil industry ("Iran's Transit Importance", 2016).

The Gulf is essentially the throat of the global energy industry. Hence, any port operating in the area has a strategic importance far beyond the borders of the nation as it serves the global oil industry. Hence, with its 40 berths and about 6,500 meters of frontage, the BIK port is very important as a transshipment port in Iran. Enhancing the efficiency of cargo flow is central to ensuring the port remains competitive and strategic not only to Iran but also to trade in the Middle East.

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Therefore, the thesis will benefit different stakeholders in distinctive ways. Firstly, it will assist the management of BIK port in determining whether investing in an overhaul of the railways transport at the port will be viable from the perspective of improved efficiency of cargo flow. Such is a crucial aspect of logistics and any improvements can translate to further enhancement of the port's attractiveness (Dwarakish & Salim, 2015).

Secondly, the study will benefit the policy makers in Iran's transport and maritime industries. Since the port as well as the railway operations are public infrastructure, the government policy makers will benefit from the insights of this study as it will help to spotlight the issues involved in railways transport at the port and its importance in enabling higher cargo throughput and efficiency of cargo flow.

The study is also important, as it will guide future research. The area of logistics especially in the management of inbound and outbound cargo at the port is very broad. There are different modes of transporting cargo. However, this study's focus on railway transport is instrumental because there has not been much research into this area specifically in the context of the Iranian maritime industry. Therefore, investigating the importance of a better railway infrastructure will provide very crucial insights that might trigger policy development in other aspects of the transport industry in Iran.

### **1.5. Research Problem**

The BIK Port is connected to the Trans-Iranian Railway. However, most shipping companies prefer to use road transport, which confers various benefits. The main reason is that the management of the railway terminal at the port is poorly coordinated. It also creates confusion especially among organizations that would otherwise use it and reduces its attractiveness as a way of moving cargo.

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One of the major challenges is the lack of a particular terminal that connects to some of the major companies that use the port. For example, the Bandar Imam Petrochemical Complex (BIPC) is a major cargo owner at the port. It handles petrochemicals such as Benzene, Ethylene, and Propylene among others. A major complex such as the BIPC should have its own modern terminal to enhance the movement of its cargo within the port. It would otherwise enhance the speed of loading, offloading, and processing cargo.

The railway wagons use old technology compared to that adopted by the port. Such a discrepancy in the technologies impedes efficiency. The reason is that although the port uses cranes and other infrastructure that adopt the latest technology, the railway infrastructure cannot keep up because the technology it relies on is obsolete (Burdzik, Cieśla & Sładkowski, 2014). The implication is that despite the modern technology of the port, relying on railway transport creates inefficiency and slow cargo flow at the port. Correspondingly, it increases the costs associated with moving cargo at the port and therefore provides an incentive for the cargo owners to prefer trucks rather than the railway.

It is possible that modernizing railway terminal that uses the latest technology and enhances the effectiveness of loading and discharging cargo from the wagons can improve the overall efficiency of the BIK Port.

The question is driven by the need to understand the factors that determine efficiency in freight management. Efficiency is a factor encompasses various issues. It involves the element of speed, the connectivity of a particular mode of transport, the fluidity of the coordination as well as communication and other elements (Nyema, 2014). Answering these questions will lead to a specific focus on the issue of efficiency at the BIK port. It will provide a basis for understanding why cargo owners prefer one mode of transport to another. Further, it will form a basis for

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discussing the current situation of the railway infrastructure at the BIK port and its role in the efficiency of cargo flow (Yang, Lin, Kennedy & Ruth, 2011).

**Research Question: What are the major factors that determine the efficiency of cargo flow at the BIK port?**

The question seeks to delve into the issues of whether new modernized railway terminal and wagons operating base on the latest technology can affect the flow of cargo positively. Road and rail transports form the independent variables, which influence the efficiency of cargo flow at the BIK Port (Woodburn, 2017). As highlighted earlier, railway transport offers numerous advantages. However, it also has several disadvantages, which limits its reliability as an important mode of transporting cargo into and out of the port (Woodburn, 2017). However, the research question seeks to understand whether modernizing the railway infrastructure can enhance the efficiency of the flow of cargo. Thus, another follow question in to support the main research question is: What possible outcomes would a new railway terminal have on the efficiency of cargo flow at the BIK port?

### **1.6. Research Objectives**

The primary objective of the study is to explore the impact of modernizing the railway infrastructure at the BIK Port. The reason is that the more efficient a port is, it becomes more attractive and important to shipping companies, cargo owners, and other stakeholders in the logistics industry (European Conference of Ministers of Transport, 2000). Hence, the goal of efficiency improvement remains consistent over time for any port management.

In line with these objectives, the literature review in chapter two assesses the importance of railway transport to the efficiency of cargo flow within a port. The objective is to provide a preliminary discussion regarding whether it would be worthwhile to upgrade the railway

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infrastructure at the BIK Port. The chapter pursues this objective by evaluating issues of the efficiency of cargo flow within ports, the need for port multimodal transport, the relevance of multimodal transport, the relationship between time and reliability and port efficiency, as well as between railway transport and the value of it in port efficiency.

The study will adopt a pragmatics research methodology in chapter three, which aligns with the goals of the study as it involves the analysis of concepts based on their ability to facilitate action. The methodology also adopts a case study approach that infuses both inductive and deductive approaches to research. The study also uses both qualitative and quantitative research methods. Accordingly, it uses both interviews and questionnaires to collect data.

The analysis and results in chapter four used quantitative and qualitative data analysis strategies to analyze the interviews results. The analysis was guided by the objectives of the study. Therefore, it sought to understand the importance of the railway transport to the BIK port.

Finally, the discussions and conclusions in chapter five analyzed the results together with the findings of the literature review. It discussed these results in several subsections. They included the state of the railway and the impact of efficiency on cargo flow, the importance of speedy delivery of cargo, the relevance of costs in understanding efficiency of a port. The conclusion found that the railway infrastructure at the BIK port is poorly coordinated and improvements are necessary to improve the efficiency of cargo flow.



## Chapter Two: Literature Review

### 2.1 Overview

The literature is organized into several different sub-topics that aim to elucidate the research questions best. The first sub-topic focuses on the efficiency of cargo flow within ports. It seeks to demonstrate the factors that affect such efficiency. It will focus on the significance of ensuring smooth flow of cargo. Such literature will contribute to the study by explaining the importance of an efficient freight system to smooth cargo flow within a port. The second sub-topic will focus on the need for multimodal transport within a port as an essential element in facilitating efficient cargo flow. The aim will be to demonstrate the need for both road and rail transport systems within a port as they offer unique advantages that can cumulatively enhance the efficiency of cargo flow. Notably, the primary objective of the study is to explore the impact of modernizing the railway infrastructure at the BIK Port. The reason is that the more efficient a port is, the more attractive and important it becomes to shipping companies, cargo owners, and other stakeholders in the logistics industry (European Conference of Ministers of Transport, 2000). Hence, the goal of efficiency improvement remains consistent over time for any port management. Accordingly, this segment offers a review of the past research especially relating to the role of transport systems in augmenting the efficiency of cargo flow and other related issues of port logistics. There is a broad array of research on issues regarding the different transport methods within a port as well as concerning the effectiveness of cargo flow.

This section of the literature review will discuss issues such as the effective integration of the port and the various opportunities as well as challenges involved. Further, the section will examine literature that focuses on the importance of railway transport to the efficiency of cargo flow within a port. The goal will be to demonstrate whether it would be worthwhile to upgrade

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the railway infrastructure at the BIK Port. Reviewing literature relating to these topics will be very crucial in providing sufficient information for comparison with the results of this study in the discussion chapter.

### **2.2 The Efficiency of Port Cargo Flow**

A variety of factors affect the efficiency of cargo flow at a port. Woodburn (2017) analyses the issues of efficiency of rail freight. Similarly, Sutomo & Soemardjito (2012) also highlight some of the issues involved in the port effectiveness and efficiency. Nyema (2014) also conducted a case study that investigated the factors affecting the efficiency of container terminals focusing on the port of Mombasa. The studies emphasized several elements like: Inadequate equipment, the processing time for cargo, dwell time and inadequate multimodal connection to hinterland as some important factors that affect efficiency of cargo flow at ports. The most important ones concerning this study include the multimodal connections to the hinterland as well as the cargo dwell time.

#### **2.2.1 Dwell Time and Port Efficiency**

The dwell time relates to the time between the unloading of cargo from a ship and loading it to a truck or railway for further transportation to the hinterland (Raballand, Refas, Beuran, & Isik, 2012). Dwell time is an indication of the efficiency of a port. A shorter dwell time indicates the high efficiency of the transport system and the overall cargo flow at the port. The discussion regarding the multimodal transport systems focuses on the trucks and rail transport at the port and its impact on the efficiency of cargo flow. Notably, efficient truck and rail transport systems provide significant benefits as they reduce the dwell time and improve the overall efficiency of cargo flow at the port. Although the discussion by Nyema (2014) focuses on

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the hinterland connections, the main point regarding the need for proper transport infrastructure for efficient cargo flow within a port is highly relevant for this study.

A study by Raballand, Refas, Beuran, and Isik (2012) investigated some of the reasons cargo takes too long to go through ports in Sub-Saharan Africa. The focus was on the dwell time as an essential metric for indicating the speed of cargo flow at the various case study ports. One of the main reasons was related to the efficiency and quality of the inland transport networks. Such networks allow cargo to flow smoothly through a port, which is an essential element of productivity. The study is relevant to the current research as it demonstrates the importance of better transport networks within the seaport concerning influencing the smooth and faster flow of cargo.

Dwell time is an essential indicator of the efficiency of cargo flow at a port. Raballand, Refas, Beuran & Isik (2012) note that the cargo dwell time is the time it takes a container spends within the port before release to the cargo owners. This is an important aspect of the cargo flow efficiency of the port. It determines how well the port is managed and the efficiency of the transport systems within the port. A longer dwell time indicates poor efficiency while a shorter one is an indication of high efficiency of a port. According to Ducruet, Itoh, and Merk (2014), the transit time is a crucial indicator of the port's efficiency in enabling faster flow of cargo. The reason is that it relates closely to other time indicators such as reliability of the transport systems and other aspects of management. Different methods of transport offer different times, which affect the quality of port services from the perspective of the customers because quality also includes the element of speed in the movement of cargo within a port. Hence, time is an essential metric in estimating the overall efficiency of a port regarding the flow of freight.

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Notably, the modern port operations are very competitive because different nations have managed to improve the quality of their services. Therefore, it has provided cargo owners with more choices regarding where to route their cargo. Correspondingly, the owners of cargo focus on assessing the performance of a port concerning different factors one of which is the integration of the logistics networks that enhance the speed and efficiency of cargo flow at a port.

### **2.2.2 Port Characteristics and Efficiency**

A study by Caldeoronha, Felicio, and Dionision (2013) investigated the importance of various characteristics of a port on its overall efficiency and productivity. They include the location and specialization of a port, the quality of quay equipment, accessibility via sea, the logistical coordination, and accessibility of the hinterland. These features affect the satisfaction of cargo owners, the efficiency, and activity of the port, especially regarding the flow of cargo, in the integration of logistical networks within the port. It converges on issues such as the transport networks within the port and their connectivity with the hinterland. The main finding is that the port logistical aspects are very crucial to the efficiency of cargo flow. Logistical efficiency, especially regarding the intermodal transport systems within the port, is vital for faster and smoother cargo flow within the port. Caldeoronha, Felicio, and Dionision (2013) explore the issues that affect the efficiency of cargo flow at a port. Such include the issues of port transport and the management of cargo flow. Accordingly, it is useful to the current study as it provides a basis upon which the current research can build upon by focusing on the case of the BIK Port, its logistical networks, and their importance to the efficiency of cargo flow.

A vital factor of competitiveness of the logistics sector is the element of responsiveness and flexibility to accommodate the dynamic needs of customers. Various players in the logistics

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services such as port operators need to ensure that they incorporate flexible planning techniques that can meet the changing customer needs. Transport, especially within a port, is an integral aspect of logistics systems. The reason is that inadequate transport systems within the port can fail excellent loading and offloading infrastructure.

A study by Burdzik, Ciesla, and Sladkowski (2014) investigated the cargo offloading and loading efficiency within a multimodal transport system. The findings of the investigation allow the understanding that the quality of the port's transport system can significantly influence its speed of loading and unloading, which in turn affects the efficiency of cargo flow through a port. Excellent management, as well as the efficiency of the multimodal transport systems within the port, can enhance the overall effectiveness of cargo flow. The study by Burdzik, Ciesla, and Sladkowski (2014) is essential to the current discussion. Because, it brings the element of cargo loading and unloading and the role of efficient multimodal transport systems in enhancing such faster loading and unloading. Accordingly, there is an effect on the overall speed of cargo flow through the port. The above discussion shows that a variety of factors can affect the efficiency of cargo flow within a port. include:

- a) Inadequate equipment
- b) The processing time for cargo
- c) The dwell time
- d) Inadequate multimodal connections to the hinterland
- e) Issues of limited storage capacity

However, among the most relevant findings of the study is that the port's transport system is central to influencing the overall efficiency of cargo flow. The reason is that it shows how well the other infrastructure works. For example, the port can have excellent loading and unloading

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infrastructure such as the cranes or high-quality berths. However, after offloading the cargo, the next step involves moving the freight from the port and to the cargo owners in the hinterland. A poor transport system can impede the efficiency of cargo flow as well as the overall operational productivity of a port. The analysis has also spotlighted the fact that the transport systems can affect the cargo dwell time, which is an important performance metric for a port and an indicator of its competitiveness.

### **2.2.3 Port Operations and The Dwell Time**

Inadequate or poorly managed transport systems can contribute to the increase of the cargo dwell time, which indicates the reduced efficiency of cargo flow within a port. Conversely, highly efficient multimodal transport systems can significantly contribute to reducing the dwell time, which shows the ports capacity to move cargo with speed and accuracy (Raballand, Refas, Beuran, & Isik, 2012). Correspondingly, this section of the review of literature is very crucial to providing a basis regarding why a multimodal transport system within a port is vital in influencing the speed and efficiency of cargo flow. Notably, multimodal transport systems refer to a combination of truck and rail transport systems (Burdzik, Cieśla, & Sładkowski, 2014). The discussion shows that it is essential to have a proper, efficient, technologically current multimodal transport network within the port.

### **2.3 Multimodal Transport at a Port**

Multimodal transport refers to the use of different modes of transport such as road and rail in the management of port transport systems (Burdzik, Cieśla, & Sładkowski, 2014). Ports are critical nodes or connection points to the global system of international trade. They facilitate the cargo transshipment and spur economic development by enabling growth in international business. However, ports are only as important as the efficiency of their services. The reason is

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that from a cargo owner's perspective, efficiency affects shipping costs among other elements. At the heart of a port's ability to be efficient is multimodal transport. It has, over time, influenced the organizational structure of a port and added a new dynamic to port competitiveness due to the changing nature of connections to the internals. Notably, multimodal transport refers to a system involving at least two modes of transportation.

Containerization and palletization of cargo have been very instrumental aspects of the development of intermodal transport systems. Some of the crucial factors that characterize multimodal transport systems include better management and coordination of cargo movement, better control of cargo, modal integration, faster and more flexible physical distribution of freight and the development of multimodal organizations. Markedly, it allows the conversion of the transport system from sea to road or even air. Moreover, it is very instrumental in easing port congestion due to the combined impact of both road and rail transport, especially regarding imported cargo.

A 2012 study by Kos, Samija, and Brcic investigated the importance of multimodal transportation in improving the management of terminal operations and the coordination of participants within the port transport chain. The study notes the complex nature of activities involved in the management of a port. It focuses on the essential factors involved in intermodal transport and their impact on the quality of maritime transport services.

Kos, Samija, and Brcic (2012) suggest that the need for multimodal transportation influences the development of different elements of the container transport systems such as the terminal railway stations. Such enables the easy conversion from sea to railway transport. Moreover, it improves the efficiency of cargo flow by influencing the development of cargo hub approach within ports. Notably, based on this method, cargo is routed through either rail or

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trucks to the cargo hubs irrespective of the destinations. Once at the center, the shipments can be separated, consolidated, and loaded to different feeder vessels for smooth movement to the various destination points. It can only be effective with multimodal transport as it provides multiple advantages such as flexibility and faster cargo movement.

One of the main advantages of an efficient multimodal transport system at a port is the element of flexibility. For example, trucks provide flexibility as they can be deployed any time without the need for a particular schedule. Moreover, they can easily transport different types of cargo without being necessarily inefficient. Lastly, and overlooking the cost implications, they can cover both long and short distances with efficiency. Railway transport, on the other hand, provides various advantages, which mainly revolve around the economies of scale. Railways can transport vast amounts of cargo especially given that modern container trains can carry double-stacked containers over a long distance. Therefore, they are vastly efficient for scheduled cargo deliveries, over long distances and where cost is an essential factor. Correspondingly, the combined advantages of both types of transport modes improve the efficiency of cargo flow at a port by enhancing flexibility in the movement of cargo.

A multimodal system within a port also enhances the capacity utilization of a port by ensuring optimum use of each type of transport mode. According to Goh et al. (2008), multimodal systems provide that the cargo owners can use the optimum combination of rail and truck transport to ensure the minimize their costs while attaining their delivery period targets. For example, a container train can efficiently move cargo from the port to an inland cargo handling facility while local deliveries can be done via trucks. Such a combination can minimize costs for the cargo owners while enhancing the efficiency of cargo flow at the port.



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The primary objective of the study is to explore the impact of modernizing the railway infrastructure at the BIK Port. The reason is that the more efficient a port is, the more attractive and important it becomes to shipping companies, cargo owners, and other stakeholders in the logistics industry (European Conference of Ministers of Transport, 2000). Hence, the goal of efficiency improvement remains consistent over time for any port. Various factors can impede the efficient use of multimodal transport networks within a port. Among these is the issue of rail transport efficiency. Old infrastructure can potentially impede the efficiency of cargo flow at the port. Accordingly, the objective of this study is to investigate the impact of modernizing railway infrastructure at the BIK Port. Odeleye (2015) investigated the need for the development of multimodal transport in Nigeria. The study discussed several issues related to intermodal transportation at a port including some of the significant impediments to the efficiency of such methods. Some of them include:

1. The poor state of transport infrastructure at the port
2. Old technology
3. Inadequate railway transport facilities

The poor state of transport infrastructure at the port is one of the major factors impeding the performance of an intermodal transportation system in Nigeria. Old technology is slow, inefficient, expensive to operate and can be unreliable due to constant breakdowns. For example, inadequate railway transport facilities or weak links to the port can impede the efficiency of multimodal transport at the port. However, in a situation where the other port technology is current, upgrading the facilities for the railway or truck transport can enhance the efficiency of cargo flow at a port.

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One of the most important reasons why multimodal transport systems are crucial is that they affect the transport time and the reliability of freight transport. Faster and more reliable transportation offers various benefits to both cargo owners and carriers. Markedly, shippers face economic costs related to the cargo. In addition to the price, they pay for transport of the goods. Accordingly, carriers encounter financial expenses related to the direct costs of moving cargo such as the drivers and the vehicles used.

### **2.4 The Value of Time and Reliability in Logistics Management at port efficiency**

A 2010 study by Halse et al. investigated the value of transport time and the reliability of freight transport. The goal is to determine the best approach for incorporating the value of time and reliability into the cost-benefit analysis of different transport modes. However, the most crucial element of Halse et al. (2010), regarding the goals of the present study is that study shows that there is a significant value attached to the efficiency and reliability of the available transport modes as well as the time element. The findings of Halse et al. (2010) indicate that shippers and companies involved in moving cargo remain willing to pay higher prices for faster as well as much more reliable freight transport. This outcome implies that the BIK port can benefit immensely if it has a better rail transport network within the port to improve its overall competitiveness as well to enhance the efficiency of cargo flow. The combined impact of a reliable and efficient railway and truck transport system at the BIK port can significantly improve the efficiency of cargo flow.

The discussion regarding the need for multimodal transport at a port has highlighted various issues related to combining rail and road transport. It has indicated the flexibility and cost advantages associated with such modes of transport as well as the challenges posed by poor multimodal transport systems within a port. The primary importance of this discussion to the

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present study relates to the fact that the BIK Port has various challenges associated with the rail network and infrastructure available. The technology is poor and poses various challenges to the overall efficiency of cargo flow at the port.

The analysis sets the stage for the further evaluation of the role of railway transport at the BIK Port and the need for the management to invest in modernizing railway terminals and related infrastructure. The discussion and the information reviewed will help to bolster the analysis of the results of the current study and provide a reliable basis for the conclusions and recommendations.

### **2.5 Railway Transport and Port Efficiency**

The competitive ability of any port depends not only on its geographical locations but also much more significantly on its cargo handling ability. From this perspective, the capacity, as well as the promptness of shipments, remains particularly crucial. Correspondingly, a port's links to various rail and road routes increase its competitiveness. More importantly, the quality of port infrastructure influences its ability to process cargo faster and ensure prompt shipments. A railway is a central cog in the management of cargo transport, especially to the hinterland. Good railway connectivity between the port and the hinterland is crucial for the development of a port to its full potential. The reason is that railway provides several cost and efficiency advantages due to the ability to transport vast amounts of cargo and to work on a schedule.

Molemaker & Pauer (2014) provide a few examples of these advantages, which include:

1. Cheaper transport
2. Environmentally friendly (lower environmental pollution compared to trucks)
3. Larger capacity
4. Timely delivery

### **2.5.1 Integration of a Port and the Rail Networks**

The integration of rail networks and the port is very crucial to the connectivity of the port to the hinterland. It is an economic as well as competitive strategic aspect of the development of a port. An article by Matamala and Salas published in the FAL Bulletin in 2012 analyzed the opportunities as well as challenges associated with the port-rail integration in Latin America. The discussion asserts that one of the crucial prerequisites for railways to become critical sources of the competitiveness of a port include the structure of foreign trade, the geographical and economic aspects and the technical regulations of the public sector.

The main implication of the discussion is that the viability of rail-port integration depends on different variables such as the institutional framework, the structure of the industry, the geographical and economic issues as well as the nature of foreign trade. The discussion is relevant to the present study as it provides additional ways of analyzing the viability of developing the railway infrastructure at the BIK Port. It is crucial to examine the nature of foreign trade at the port to determine whether a modernized rail freight infrastructure would enhance the efficiency of cargo flow at the port.

A related study by Foolchand (2007) that focused on the rail-port integration at the port of Durban highlighted a few of the factors that hindered the importance of railway in enhancing the efficiency of cargo flow. They included:

- a) The lack of maintenance of the railway infrastructure as well as the rolling stock
- b) The unavailability of rail-worthy locomotives.

These problems reflect those currently experienced at the BIK Port. Foolchand (2007) acknowledges the complexities associated with port-rail operations. Nevertheless, the

recommendation point to the need for the development of the railway infrastructure. It would be a crucial strategy for improving the efficiency of cargo flow at the port.

The review of literature provides various insights into the issues of transport within the port. The focus is on the rail freight, which is central to the current study. The literature shows that developing and modernizing railways can enhance the efficiency of cargo flow of a port and improve its overall competitiveness.

### **2.5.2. Importance of Rail Freight in maritime Supply Chains**

A 2013 white paper by Network Rail analyzed the value and importance of rail freight. The discussion traced the expansion of rail freight in Britain and evaluated some of the significant advantages as well as unique roles of railway freight. Correspondingly, the analysis found that rail freight provided competitive prices to cargo owners reduced the impact of fuel price uncertainty (due to economies of scale), enhanced the resilience of supply chains, and improved cargo safety and security. Such are pressing concerns for cargo owners who want their cargo moved and delivered in a timely but cost-efficient mode of transport.

The 2013 discussion by Network Rail makes a concrete case for the need for railway transport as an integral aspect of modern logistics and supply chain networks. The importance of this information in the present study is that it provides a basis upon which the discussion can make a case for the improvement of the railway infrastructure at the BIK Port.

### **2.5.3 Railway Transport and Port Development (Examples of):**

#### **1) Port of Rijeka**

A 2010 study by Hlaca, Rudic, and Hirnig investigate the role of railway transport as an essential factor in the development of the port of Rijeka. The discussion highlights the importance of several railway lines in Croatia to the development of the port of Rijeka. Hlaca,

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Rudic, and Hirnig (2010) offer several elements that are crucial to the attainment of better links between the port of Rijeka and the hinterland. Firstly, they assert the need for a reliable railway connection. They also identify the need to develop railway terminals at the port, to upgrade the rolling stock, and to upgrade the railway line. The findings of their study indicate that doing so can have immense positive benefits to the development of a port. The research is relevant to the discussion of the BIK Port because of its focus on the railway infrastructure. It provides pointers that could help the analysis regarding the situation of the railway infrastructure at the BIK port and the possible recommendations that could help improve the efficiency of cargo flow at the port.

### **2) Port of Dar es Salaam**

A 2015 study by Mwakibete analyzed the role of railway transport in improving the performance of the port of Dar es Salaam. The exploratory study found that railway transport is very crucial to the development of the port. Moreover, Mwakibete (2015) asserted that railway transport not only improved the cargo handling system, it also reduced the potential port congestion, increased the average cargo traffic, enhanced customer satisfaction, helped to reduce the cost of logistics, and positively influenced the revenues of both the port and the government. However, Mwakibete (2015) also found that despite all the advantages provided by efficient railway transport, the infrastructure was still in poor conditions. The implication is that railway had low capacity could not ensure efficiency in facilitating cargo flow through the port. The primary reason for the poor state of the rail is that the government has continued to invest much more heavily in the development of road transport and neglected the railways. However, the study demonstrated the strong links between the operational performance of a port and the railway transport.

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As mentioned earlier, railway transport offers various advantages to the efficiency of port cargo flow. Accordingly, the study by Mwakibete (2015) recommends that the government of Tanzania must invest in promoting and modernizing the railway network to improve port performance. The study also introduces the idea of incorporating the private sector to such investment plans, as they are the stakeholders. Mwakibete (2015) is vital to the present study as it provides crucial insights into the various advantages of railway transport to port efficiency and the need for governments or port management authorities to invest in modernizing the facilities.

## Chapter Three: Research Methodology

### 3.1 Overview

The methodology section presents a discussion of the research approach and philosophy, the research strategy, the methods used to collect data, the approaches used in data collection and a conclusion. Such information is essential in enabling and understanding of the basis for findings and the possibility of confirmatory tests based on the methodologies employed. Mainly, it will answer two critical questions regarding how the data was collected and how it was analyzed. Moreover, it will be guided by the need to explore the impact of modernizing the railway infrastructure at the BIK Port. The reason is that the more efficient a port is, the more attractive and important it becomes to shipping companies, cargo owners, and other stakeholders in the logistics industry (European Conference of Ministers of Transport, 2000). Hence, the goal of efficiency improvement remains consistent over time for any port management.

The first research question seeks to understand the main factors that have an effect on efficiency of cargo flow at port and the second one, what possible outcomes would a new railway terminal have on the efficiency of cargo flow at the BIK port. The study uses a combination of qualitative and quantitative methods. It takes a neutral exploratory stance in the attempt to understand the potential impact of a new railway terminal at the BIK port.

### 3.2 Research Philosophy and Approach

The thesis adopts a pragmatist research philosophy. The philosophy involves the analysis of concepts based on their ability to facilitate action. The primary goal of the thesis is to explore the situation at the BIK port regarding the efficiency of cargo flow and to make propositions regarding whether modernizing railway terminal can improve such efficiency. Accordingly, the pragmatism research philosophy aligns with the goals of the thesis.



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The pragmatist philosophy has various advantages in research. Firstly, it focuses on the use of research methods that are best suited to the problem under investigation (Creswell, 2014). Correspondingly, it provides the researcher with the option to use any method procedure, or technique in undertaking research. Various research methods, both quantitative and qualitative, have their unique strengths and weaknesses (Creswell, 2014). Correspondingly, using a combination of several methods provides complementary advantages. This is very important to exploratory research as it enables the researcher to seek the best approach to understanding the research problem (Thomas, 2011). Another advantage of combining mixed methods is that it provides opportunities for the collection of more evidence. In exploratory research, more evidence improves the quality of the arguments or conclusions of the study (Thomas, 2011).

The pragmatist approach to research, however, displays some weaknesses. Firstly, it requires more resources to plan as well as implement the mixed method approach (Thomas, 2011). The reason is that interviews and observation as data collection methods can be costly to implement due to the physical movement required to meet subjects or to undertake observations at the location. Moreover, it may be difficult to reconcile results when there is a conflict arising from the interpretation. Nevertheless, mixed methods offer various advantages as well. For example, the use of quantitative methods, which are highly objective, may compensate for the subjective nature of the qualitative methods of research. Quantitative methods also miss the element of context in understanding behaviors in business or social situations (Thomas, 2011). However, this is something the qualitative methods alleviate. The overall effect is that the use of mixed methods provides a comprehensive view of the research problem compared to the use of either the qualitative or the quantitative approaches on their own.

### **3.3 Research Strategy**

A research strategy is essential in enabling a researcher to answer the research questions. According to Saunders (2009), a research strategy must be guided by the objectives of the study, which shape its flow and structure. The objective of the current study is to explore the potential of modernizing railway terminal in improving the efficiency of cargo flow at the BIK port. It requires that the researcher must analyze the current logistics situation at the BIK port, the hindrances to the use of the railway facilities at the BIK port, the potential that a modernized terminal would have positive impacts, and the likelihood that customers would embrace a better and more efficient railway service. Accordingly, the thesis will adopt a mixed approach combining both the inductive and deductive approaches. Specifically, it uses a form of case study approach by investigating the situation at the BIK port.

The inductive aspect of the research strategy will involve developing new theories based on the data collected (Johannesson & Perjons, 2014). The thesis will rely on this approach to generate ideas regarding the potential role of modernized railway terminal in improving efficiency at the BIK port based on the data collected. It will help to determine whether investing in such infrastructure is progressive in the context of the port, its operations, and the overall impact on the port's overall logistic efficiency. The deductive aspect will test the emerging ideas (Thomas, 2011). The thesis will analyze them based on the hypothesis and assesses the element of causality.

### **3.4 Data Research Methods**

Data collection is a very crucial stage of the research process. Data is the backbone of the entire research body because it forms the basis for the discussion and conclusions submitted by study. Accordingly, it is important to collect as much relevant data as possible to augment the

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findings and develops solid findings. Moreover, the accuracy of the data collected is paramount to the validity of the results. Data collection methods lie on a continuum with one end on the qualitative methods and the other on the quantitative ones (Johannesson & Perjons, 2014). The thesis relies on a combination of both qualitative and quantitative methods.

Qualitative methods are crucial in providing information that can provide people's perceptions of the topic under study. Such methods are useful in providing context to the data collected using quantitative methods (Saunders, Lewis & Thornhill, 2009). They bolster the research design and the survey questions. Typically, the techniques used in qualitative data collection include open-ended questions with little or no structure. It enables the researcher to gain unique information from the respondent. They also rely substantially on interactive aspect of the engagement between the researcher and the respondents (Maxwell, 2013). Accordingly, and combined with other methods, they enable the researcher to apply triangulation techniques as a strategy for bolstering the credibility of the findings. Notably, results from quantitative methods cannot be generalized, which aligns with the needs of this thesis as it focuses only on the case of the BIK port.

Quantitative methods of data collection rely on structured instruments that bring together the various experiences of the respondents into predetermined categories of responses. Correspondingly, the results are typically easy to assemble, condense, compare, and generalize (Saunders, Lewis & Thornhill, 2009). Mainly, quantitative approaches provide the capacity to estimate the extent of the phenomenon under analysis. Accordingly, quantitative research will be instrumental in enabling a reliable understanding of these issues of interest.

Questionnaires will be the primary quantitative method to be used in the study. The researcher will distribute a questionnaire based on the stratified sampling approach. The different

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strata will include customers of the port as well as operational and management employees. The use of questionnaires will provide a set of unique advantages. Firstly, it is relatively cheap to administer (Creswell, 2014). Researchers usually rely on an online tool to distribute the questionnaires to the respondents. It will not only be cheap but as very fast in terms of delivery of the questionnaire to a large number of respondents. Moreover, the collation of data for analysis will be easy.

The thesis will rely on combination of literature review and face-to-face interviews as the main methods of collecting data. The researcher will conduct interviews with port employees, officers involved in operations management, and customers of the BIK port. The goal will be to collect information regarding their unique views about the efficiency of cargo flow at the BIK port and the potential impact of a new railway terminal on such efficiency.

Interviews provide various advantages in research. Firstly, they are flexible. The researcher may have notes to guide the general structure of the interview but this does not constrain the extent of discussions. Such an unstructured approach enables on collection of unanticipated information, which may bolster the quality of findings and facilitate the development of solid conclusions. Secondly, interviews allow the researcher the opportunity to clarify respondent's answers and to even rephrase questions to ensure clarity (Maxwell, 2013). Thirdly, interviews are very effective regarding the ability to collected in-depth data within a short time. The reason is that they are a respondent-driven approach to data collection. The researcher's role is only to set the environment for the respondents to express themselves regarding the subject. However, despite their numerous advantages, interviews can be costly to undertake especially where respondents are located in different locations. They can also be

ineffective if the researcher lacks adequate interpersonal skills or has a bias regarding the topic under study (Maxwell, 2013).

### **3.5 Ethical Issues in research**

The data collection process raises a range of ethical issues. The most important include the issue of informed consent, respect for the confidentiality and anonymity of the respondents as well as respect for their privacy (Gregory, 2003). It is crucial for researchers to observe the ethical standards of data collection.

The issue of informed consent is an important one in the process of data collection. It requires that participants must only provide data freely, knowingly, and in a voluntary manner. Informed consent focuses on satisfying the rights of respondents to self-determine and to protect their liberty. The researcher will seek the informed consent of the respondents by having them sign a consent form for their participation in the data collection process.

Respecting the confidentiality and anonymity of the respondents is also an essential aspect of ethical practices in research. Confidentiality and anonymity involves the need to respect the fidelity and dignity of the respondent by eliminating personal information from the responses provided (Gregory, 2003). This is especially important in business situations where the respondent may provide information that may not be public knowledge but which may be useful for the study. The researcher will include a confidentiality clause in the consent form to assure the respondents that the study will respect their confidentiality and anonymity.

### **3.6 Approach to Data Analysis**

Data analysis is an integral element of the research process. It involves interpreting the data collected to gain insights regarding the research question. The process involves cleaning the data, remodeling it and transforming it to derive conclusion based on the research question

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(Keppel & Zedeck, 1989). Typically, data analysis takes two forms. These include the quantitative and qualitative methods. Notably, the approach used in the data collection process, determines the one used in data analysis. Hence, where data was collected based on a qualitative approach, a similar approach is used in the analysis process.

Qualitative data analysis strategies seek to reduce and enable an understanding of vast amounts of data. The goal is to shed light on impression on the data that shed light on the primary research question. For example, an interview process may yield several pages of notes regarding the topic under study. Accordingly, qualitative analysis provides the approach to understanding that information in a systematic manner. The goal is to identify key themes identifiable from the data (Keppel & Zedeck, 1989). The researcher must consider the context of the information the contradiction and consistency of views, the intensity of comments, their specificity, and frequency. This helps to identify trends and key themes.

The main approaches in qualitative data include one that is explorative and another that involves the use of predefined framework of analysis (Keppel & Zedeck, 1989). In the case of this thesis, the former will considers all the data collected from interviews. The researcher will code the data and allow new impression to outline the interpretation. The use of the predefined framework involves developing an outline that highlights the goals and interests of the thesis and using it to guide the interpretation of particular answers related to these objectives. The thesis will apply both approaches of qualitative analysis, as it will ensure much of the information collected through internes is used.

The quantitative approach relies heavily on statistical methods of analysis. The latter is used to summarize the data and to describe it. Quantitative analysis provides various advantages. Firstly, it allows easy and fast analysis of a large amount of data (Keppel & Zedeck, 1989). The

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results can be generalized especially considering where they are collected based on a random sampling strategy. Moreover, it facilitates the avoidance of personal bias of the researcher.

The thesis will use questionnaires as the main quantitative data collections method. The data analysis process will involve the development of descriptive statistics to explain the general trends and features of the data. It will also undertake specialized statistical tests such as correlations and analysis of variance to understand the relationships between different ideas emerging from the data. The data analysis process will remain guided by the primary objective of the study.

**3.7 Secondary Data Sources**

The researcher reviewed data from the operational aspects of the port with a focus on cargo throughput. Firstly, the findings showed that over the past decade, the cargo throughput at the BIK port has ranged between 31 and 44 million metric tons. However, such of these has been moved using road transport. Table 1 below illustrates the percentage shares of cargo throughput moved by both road and rail transport methods.

Year	Cargo throughput	Road share	Rail`s share
2006	32,937,000	90%	10%
2007	31,338,000	91%	9%
2008	33,327,000	94%	6%
2009	33,747,000	98%	2%
2010	37,308,000	98%	2%
2011	36,109,000	97%	3%
2012	41,260,000	98%	2%
2013	33,634,000	98%	2%
2014	44,230,000	97%	3%
2015	42,000,000	93%	7%
2016	42.421,000	93.6%	6.4%

Table 1. Percentage Share of Cargo Throughput Between 2006 and 2016 ("Imam Khomeini Port Authority", 2017)

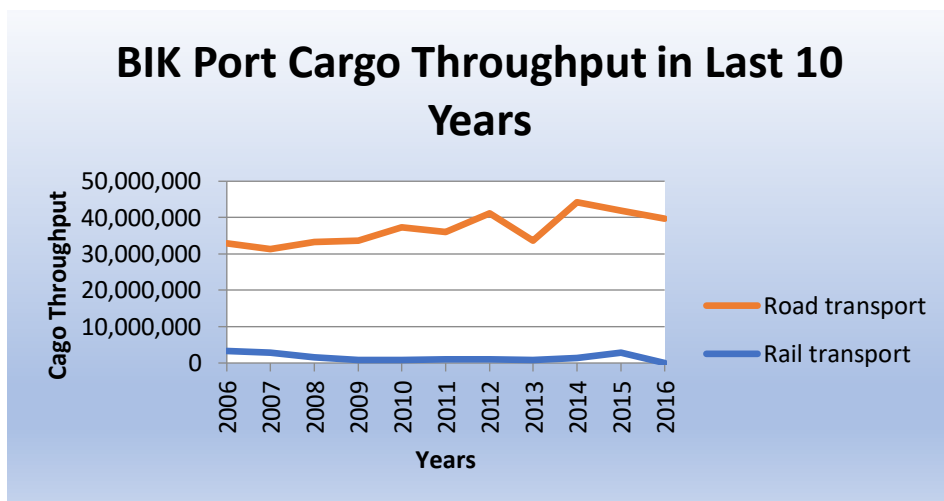


Figure 2. BIK Port Cargo Throughput Between 2006 and 2016 ("Imam Khomeini Port Authority", 2017)

The data shows that road transport has dominated the transport sector at the BIK port. Rail transport only managed 10% of the share of cargo throughput back in 2006 and has this



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share significantly declined especially between 2006 and 2014. Figure 2 (page39) also illustrated the data graphically based on the actual figures of cargo moved using both rail and road transport. The data provides a hint of the overall unpopularity of rail as a method of transporting cargo into and out of the BIK port. It provides a crucial basis for further investigation of the reasons behind the statistics. To understand the disparity in the shares of cargo throughput between the rail and road transport, one must understand the reason why customers do not want to use rail transport. It means that there are major challenges that prevent the efficiency of rail transport.

### **3.8 Summary**

This section has provided an outline of the methodology. It has analyzed and presented the research philosophy adopted by the study. It has established that the thesis will rely on a pragmatist approach. The reason is that it is best suited for the needs of the current study given that it allows the use of different methods in the collection of data and the analysis of the subject under investigation. The section has also outlined the research strategy. It has determined that the mixed approach is best suited to the needs of the study. The reason is that it provides the opportunity to develop highly objective and solid conclusions based on the use of both quantitative and qualitative approaches to research. The study will also rely on both qualitative and quantitative data collection methods. These include the use of interviews and surveys respectively. They will be instrumental in augmenting the overall quality of data collected and the ability of the study to enhance the reliability and validity of findings. The section has also described the data analysis approach, which will rely on both qualitative and quantitative methods. Overall, the methodology section has provided an outline of the upcoming sections of the paper.

## Chapter Four: Analysis and Results

### 4.1 Overview

The researcher undertook interviews with three respondents including the port operations manager, a representative for one of the largest cargo owners, as well as a representative from the railway company. The three interviews provide insights from three different perspectives, which enhances the value of the aggregate information received.

The first respondent was the port manager. He has vast experience spanning 20 years in shipping and port operations. He has held various positions at the BIK port over the years and he is currently managing the port operations for incoming bulk cargo. He has a master's degree in maritime transportation.

The second respondent was a representative of cargo owners. He has 15 years' experience as a representative and site manager for cargo owners at the BIK port. He has held the position for about 15 years since 2002. He has a master's degree in commercial management.

The third respondent was the operational manager of the rail company. He has more than 20 years' experience in the management of rail operations. He is operational manager of the most active railway company at the BIK port. He has a bachelor's degree in management.

An analysis of the quantitative data collected using the survey provides insights regarding the views of different stakeholders concerning the efficiency of cargo flow at the BIK port. The goal was to analyze the data in manner that would enable the exploration of the impact of modernizing the railway infrastructure at the BIK Port. The data can indicate whether an efficient port is attractive and important to shipping companies, cargo owners, and other stakeholders in the logistics industry (European Conference of Ministers of Transport, 2000). Hence, the goal of efficiency improvement remains consistent over time for any port

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management. The majority of the respondents were employees who had more than 15 years' experience working at the BIK port. The respondents also included a significant number of customers with more than 15 years of experience working with the BIK port See figure 3 below.

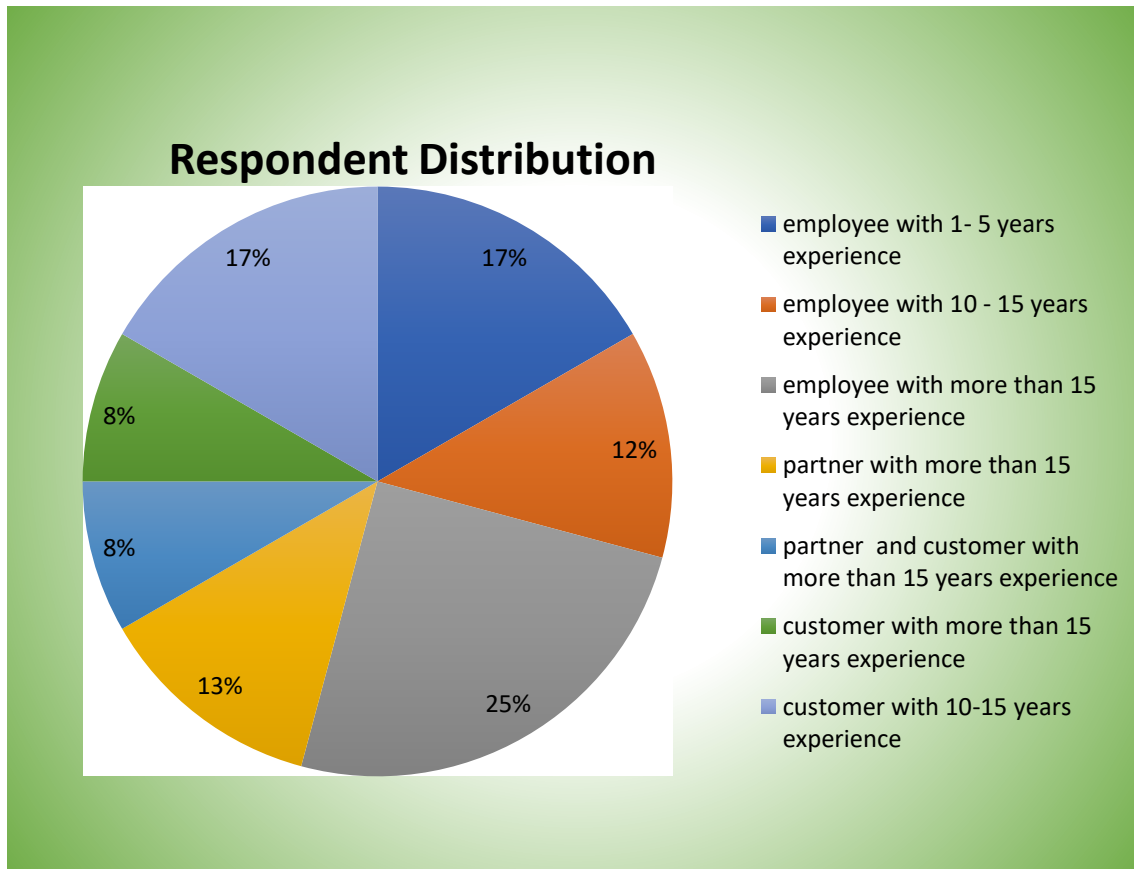


Figure 3. The Distribution of Questionnaire Respondents

### 4.2 Analysis and Results

The results provide two central issues regarding transport and logistics at the BIK port and the choice of transport method by the users. These include port management and speed of cargo movement. The proceeding section will highlight the various factors emerging from the interviews regarding the various issues associated with rail and road transport.

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Factors	Respondent	Finding
Cost	Interviewee 1: port authority operation manager	Rail transport is much cheaper than road transport
	Interviewee 2: Cargo owner representative	Rail transport is 15% cheaper than road. However, it is not cost effective (especially for short distance freight) because cargo owners have to pay freight for a minimum of 150km regardless of actual distance
	Interviewee 3: Railway operation manager at the BIK port	Rail transport is much cheaper than using road
Reliability	Interviewee 1: port authority operation manager	Rail freight is unreliable due to lack of sufficient facilities at the port and at the inland destinations
	Interviewee 2: Cargo owner representative	Unreliable because only one line is available. Also, because the nature of cargo requires long distance freight into the rural areas where rail facilities are unavailable
	Interviewee 3: Railway operation manager at the BIK port	Unreliable because rail fleet is too old with few specialized carriage facilities
Quality of Infrastructure	Interviewee 1: port authority operation manager	Poor infrastructure quality due to lack of adequate facilities for rail at the port
	Interviewee 2: Cargo owner representative	Inadequate because only one line is available, which limits the usability of rail freight
	Interviewee 3: Railway operation manager at the BIK port	Poor because the fleet is too old.
Administrative Bureaucracies	Interviewee 1: port authority operation manager	Better terminal management can improve the efficiency of cargo flow
	Interviewee 2: Cargo owner representative	The bureaucracy in the rail system for us is much more than road transport

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Factors	Respondent	Finding
	Interviewee 3: Railway operation manager at the BIK port	Administrative bureaucracy is high in rail freight. Retrogressive polices such as minimum freight distance impede cargo freight uptake by cargo owners.
Government Policy	Interviewee 1: port authority operation manager	Change in government policy regarding the import of wheat adversely affects the rail freight attractiveness. Policy on the prioritization of passenger trains affects rail freight adversely.
	Interviewee 2: Cargo owner representative	Inadequate or lack of investment in railway lines
	Interviewee 3: Railway operation manager at the BIK port	Government policies are currently unfavorable for cargo owners
Speed of Cargo Delivery	Interviewee 1: port authority operation manager	Slow speed of cargo delivery
	Interviewee 2: Cargo owner representative	The period needed to move cargo via rail is 3 time more than road transport.
	Interviewee 3: Railway operation manager at the BIK port	Slow speed hence time consuming
Access	Interviewee 1: port authority operation manager	Poor access to inland destinations
	Interviewee 2: Cargo owner representative	Lacks of rail facilities at the destinations
	Interviewee 3: Railway operation manager at the BIK port	Lack of adequate infrastructure and lines causes limited access to the inland destinations

Table 2. Breakdown of Interview Responses

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The descriptive statistics show that the majority of the respondents feel that the port is somewhat efficient in terms of the flow of cargo. It means that the majority of port stakeholders feel that more could be done to improve the efficiency of cargo flow.

Similarly, the results also show that the average respondent disagrees that the port uses modern rail operating technology to manage the flow of cargo. However, despite the facilities being obsolete, the data also show that the respondents disagree that the current state of the railway facilities impedes the efficiency of cargo flow at the port. Further, the average respondents believe the layout, facilities, and productivity of the railway at the port is somewhat optimal for the current cargo flow operations.

The analysis of the results also shows that the majority of the respondents agree that the efficiency of cargo flow at the BIK port could improve drastically with a better-managed railway facility. Similarly, they agree that modernized technology could also boost the role of the railway in ensuring the efficiency of cargo flow. The results also show that most respondents agree that railway transport at the BIK port has the capacity to cope better with increased tonnage of cargo. Moreover, the respondents believe that a new railway terminal at the port would influence a major improvement in the efficiency of cargo flow.

A descriptive statistics analysis of the data shows that the most of the respondents agree that the having an efficient railway terminal would be the most effective way of moving cargo in and out of the BIK port. However, they feel that the most important shortcoming of the current railway system at the port is its lack of speed followed by the poor management of the system. Technology and capacity are not important shortcomings of the railway system at the BIK port. Additionally, the respondents also think that while the customers rely heavily on the use of trucks to move cargo, they are only moderately efficient.

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The descriptive statistics also shows that a significant number of customers may shift towards the use of the railway in moving their cargo if a better-coordinated and technologically current terminal was built.

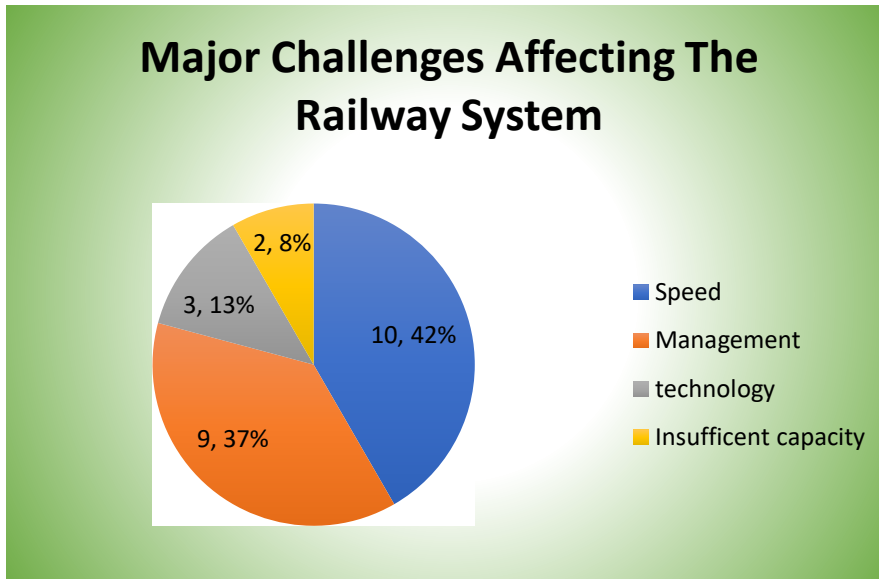


Figure 4. Major Challenges Affecting the Reliability of the Railways System at BIK port

### 4.2.1 Factors affecting port efficiency at BIK port

#### *a) Transport Cost*

The issue of cost is very prominent in the analysis of transport methods used at the BIK port. All the three respondents agree that rail transport is generally much cheaper than road transport. This is especially true where cargo owners move freight over long distances from the port. However, part of the policy framework adopted by the railway management at the country requires cargo owners to pay freight costs for a minimum of 150 kilometers. The policy makes rail transport untenable for cargo owners moving cargo across short distances of less than 150 kilometers from the port. Hence, the issue of cost is a major determinant of the choice of either rail or road as the main method of moving freight from the port. It is notable that cargo owners pursue the cheapest method of moving cargo from the port to their destinations.

### ***b) Government Policy***

Policies issues by the government are crucial in determining the management processes of the railway. The government has prioritized passenger as opposed to freight transport. Most of the railway system in Iran has one line. Accordingly, this causes delays in the movement of cargo, as freight transport has to give way at all times to passenger trains. The policy causes delays, which reduce the attractiveness of moving freight via rail. Another government policy that adversely affected the importance of rail transport relates to the ban on wheat importation. The interviews show that wheat transport was a major market for the rail transport especially because all of the storage silos had access to the rail network. The policy therefore eliminated a strong market for the rail operations at the BIK port.

### ***c) Access to Hinterland***

The issue of access is very crucial to the analysis of any method of freight movement. Access refers to how well the transport method is connected to the hinterland and all the major cargo destinations. Rail transport is poorly connected. The network does not cover most of the freight destinations. For example, the interviews show that most of the cargo moved through the BIK port includes animal feeds and most of the animal farms are located in rural areas of Iran. The rail network does not extend to the rural areas. It means that cargo owners cannot use it to move their freight, as it cannot access their destinations. Hence, this is one of the main reasons that it is less popular among cargo owners as a method of moving freight. Conversely, road transport is very well connected. It can move cargo even to the remotest destinations, which makes it the first choice for cargo owners.



### *d) Time Reliability*

One of the most important encumbering factors regarding to the use of rail transport at the BIK port is the lack of reliability. The combination of the lack of sufficient coverage of popular freight destinations, the delays associated with the priority given to the passenger trains, and the negative government policies such as the need for cargo owners to pay freight costs for a minimum of 150 kilometers reduce the overall reliability of rail as a mode of moving cargo. A cargo owner cannot rely on rail to move their freight to different destinations across Iran. Moreover, it may not always be cost-effective to move freight via rail especially where the destination is less than 150 kilometers. These factors reduce the reliability of rail transport. However, the respondents noted the high reliability of road transport. It is highly flexible, can move cargo over short or long distances, and the road networks are well connected to all the major freight destinations. Hence, cargo owners overwhelmingly prefer to use road transport as shown in Figure 2. It aligns better with their operational efficiency goals.

### *e) Quality of Rail Infrastructure*

All the respondents submitted that rail infrastructure is too old to enable efficient freight transport. Firstly, the available rail facilities at the BIK port are obsolete and in conditions of disrepair. Secondly, there are no dedicated wagons for different types of cargo. Thirdly, the rail system comprises of one line for which passenger trains have priority to use. The implication is that the quality of infrastructure does not support heavy use by cargo owners who prefer reliable, high-quality logistical services. Conversely, road transport infrastructure is well developed. The major consideration is the quality of road networks, which is satisfactory for cargo owners. As a result, from an infrastructure point of view, the results show that the road is a preferable method of moving cargo.

### *f) Speed of Cargo Delivery*

The results indicate that rail is very inefficient in terms of the speed of cargo movement. As mentioned earlier, the system relies mostly on a single line. Moreover, passenger trains have priority. Hence, cargo trains have to queue before leaving which reduces the speed of moving cargo from the port. The infrastructure is also outdated, which means that the trains move slowly. Additionally, they have limited access as mentioned earlier. This results in very slow delivery of cargo. Comparatively, road transport is very fast. It is because of the flexibility, higher speeds of the vehicles moving cargo, and the diversity of this mode of transport in terms of the routes available to arrive at the destination. The overall result is cargo owners prefer road transport as opposed to rail due to the higher speeds of cargo delivery.

### *g) Administrative Bureaucracies*

The rail system in Iran is owned and managed by the government. Correspondingly, the respondents submit that the management of the rail operations is poorly coordinated and communication is unreliable. It means that cargo owners cannot depend on railway to delivery their cargo especially where time is of the essence. Comparatively, road transport is fairly well managed. It involves private firms, which must ensure efficiency and good coordination as well as constant communication with cargo owners to remain competitive. It is the reason that road transport remains the most popular method of moving freight from the BIK port.

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<b>Factors(Codes)</b>	<b>Category</b>	<b>objective</b>	<b>outcome</b>
Cost	Port management	The prime objective of any supply chain is to achieve efficiency by delineating the right amount of cargo on time at the right place and in the right quantity and right quality	While railway transport is cheaper than road and can haul much larger volumes of cargo, it is much less efficient due to challenges in speed and connectivity to the hinterland
Government Policy			
Reliability			
Quality of Infrastructure			
Administrative Bureaucracies			
	Speed of cargo delivery		
Speed of Cargo Delivery			
Access			
Reliability			
Quality of Infrastructure			

Table 3. A Streamlined Codes to Theory Model for the Interview Results

### Chapter five: Discussion and Conclusion

#### 5.1 Discussion

The results of the quantitative and qualitative data analysis provide insightful views of the railway transport situation at the BIK port. The data seeks to understand whether modernizing the railway infrastructure at the BIK Port can influence its efficiency and attractiveness to the shipping companies, cargo owners, and other stakeholders in the logistics industry (European Conference of Ministers of Transport, 2000).

##### 5.1.1 Railway and the Impact on the Efficiency of Cargo Flow

One of the notable observations especially from the quantitative results is that most of the respondents agree that the efficiency of the port is only moderate. This is accompanied by the fact that the respondents also think that the rail technology is outdated. One can infer that the respondents have the view that more could be done to improve such efficiency with regard to the flow of cargo.

One of the most interesting findings is that the majority of the respondents think that the current conditions of the railway facilities do not impede the efficiency of cargo flow significantly. This is possibly because the railway has remained outdated for a long time that the major stakeholders have adapted to the operations of the port without a reliable railway infrastructure. This is evident because during the past decade, more than 90% of the total cargo throughput at the BIK port has been facilitated by road transport. Hence, most customers, partners as well as employees do not feel that the inefficiencies of the railway transport system affect the efficiency of cargo flow at the port in any significant manner. However, the findings also indicate that the respondents do feel that a modernization of the railway facilities would further improve the efficiency of cargo flow at the BIK port.

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This is an important finding because it shows that the port stakeholders realize the advantages of a good railway system at the port. One of the most important is that this mode of transport can move significant tonnage of cargo at a time, which provides various economies of scale and can assist to ensuring that the port does not decongest or suffer capacity limitations.

### **5.1.2 The Importance of Speedy Delivery to Port Stakeholders**

The findings of the quantitative results indicate that most of the respondents cited speed as the most important impediment to the efficiency and reliability of current railway transport at the BIK port. The results point to the most important concerns of stakeholders. They want the delivery of cargo into and from the port to be speedy and reliable. However, the results of the qualitative analysis showed that the current railway system is riddled with poor management, obsolete technology, and unfavorable policies. For example, the government has prioritized the passenger trains to the cargo ones. Given that the railway system comprises of one major line, it means that the latter has to give way for the passenger trains to move first. The implication is that the speed of cargo delivery to the port and toward hinterland is very slow, and can inconvenience the cargo owners. It means that part of the solution for improving the overall system of the railway is to overhaul the policies related to railway transport.

The findings of the qualitative results also highlighted the importance of access to speedy delivery of cargo to the hinterland. The most important challenge for cargo owners who may want to rely on the railway to move cargo from the BIK port is that the railway network is severely limited. Aside from having only one line, it experiences access limitations, as it is not adequately connected to the various destinations that may be relevant to many cargo owners. Hence, this explains part of the reason why road transport has enjoyed the majority share of the transport business relating to cargo throughput at the BIK port. Accordingly, it would be very

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important for the government to ensure that it invests in an additional line to smoothen the flow of railway traffic for both cargo and passenger trains. Overall, it is clear that any recommendations for the improvement of the railway infrastructure at the BIK port and beyond should be geared towards enhancing the speed of cargo movement, as this is the most important aspect for the port stakeholders.

### **5.1.3 Importance of Transport Cost in Analyzing the Efficiency of the Railway**

The findings of the qualitative results indicated that cost is a prominent aspect in determining the method used to move cargo at the BIK port. The interview respondents mentioned that the cost of using railway transport is much cheaper compared to trucks especially in situations where the cargo transport is over long distances. Moreover, cargo owners seek to move freight using the cheapest mode available.

Road transport is costly but reliable and fast. Cargo can be delivered to any destination as long as there are passable roads. This is what makes this mode of transport to be extremely attractive to cargo owners. However, as the results indicate, cost is not the only consideration for cargo owners. This is evident based on the results of the quantitative analysis which indicates that, despite railway transport being cheap, it is scarcely used due to its reliability challenges.

Combined, the results show that cost is not most important factor in determining the type of transport method used. Instead, reliability and speed of delivery are the most essential factors. Although a cheap method of transporting cargo is desirable to cargo owners and other stakeholders of the BIK port, it is far more valuable if such a mode of transport is also fast and reliable. It is the reason the quantitative data shows that the most important impediment to the use of railway transport is not cost but speed. Correspondingly, even though it might be costly to invest in the modernization of the current railway infrastructure, the government must ensure it is

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reliable and can enable speedy delivery of cargo. Accordingly, it can recover the cost by increasing the charges slightly as this would not affect the demand for the services adversely.

### **5.1.4 Areas to Improve**

The qualitative results showed that the most important factors that determine the attractiveness of a mode of transport for cargo owners include the speed of delivery, the level of access to the hinterland, and the quality of infrastructure. Similarly, the quantitative data showed that one of the most important elements that defines reliability of a mode of transport is the speed of delivery. Correspondingly, it is clear that two main elements are the most important in terms of improving the railway transport. They include the speed of delivery and its management.

A good railway infrastructure will ensure that the railway system is at par, technologically, with the rest of the port infrastructure, which has developed significantly. This would ensure that the offloading, processing, and loading cargo onto the railway would take a very short time. Accordingly, revamping the technology would mean that the locomotives would be much more powerful which would boost the capacity of the railway as well as the speed of cargo delivery.

Currently, the railway infrastructure is too slow compared to the other aspects of the port infrastructure. Accordingly, relying on it would underutilize the capacity of the port infrastructure and possibly even lead to congestion of the port. Accordingly, a good and technologically improved railway system would be ineffective without a reliable team to manage it to the operational aspects. The management is as important as the infrastructure. Hence, the process of improving the railway system at the BIK port must be multi-pronged and two of the most important prongs must be the infrastructure and the management of the railway.

### **5.1.5 A Comparison between Road and Rail Transport**

Both qualitative and quantitative results point to the importance of road transport in ensuring the efficiency of cargo flow at the BIK port. Its most important aspects include the fact that it is highly reliable, can access remote areas with ease, and deliver varied amounts of cargo. However, it is also clear that railway transport is important especially if the government can invest in modernizing it and ensuring it works effectively. However, an important question is whether the long-term cost-benefit analysis can justify further investment in railway transport. Notably, a modern railway is a major capital investment for any nation. It is especially the case for a country focused on growing its international trade especially by boosting its exports.

Currently, Iran's most important exports are petroleum products given the nation's massive deposits. Moving such cargo to the port via railway is much more effective. It is less dangerous, less costly, and facilitates the enjoyment of certain economies of scale. Road on the other hand is less efficient from a strategic point of view. It is much more dangerous and expensive to use as the primary mode of transporting cargo. Hence, analyzing the issue from a strategic perspective, it would be tremendously important for the government of Iran and the management of the BIK port to modernize the railway facilities and systems at the port with a view to improving the reliability and the speed of delivery.

### **5.1.6 The Impact of a Modernized Railway System on Road Transport of Cargo**

The results of the quantitative analysis show that the respondents feel that a modernized railway infrastructure can be instrumental in enhancing the efficiency of cargo flow at the BIK port. However, an important question relates to whether this would mean a massive shift towards the use of railway as opposed to road transport. The data shows that this would not be the case.



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The reason is that the majority of the respondents do not think that railway would be the most effective mode of moving cargo.

The view is in line with the fact that a railway network cannot be as pervasive as a road network. It can only reach specific main terminals beyond which road networks are necessary to move the cargo to the final destination. However, sometimes that can be inconveniencing because cargo owners have to experience longer wait times before their cargo finally arrives at the final destination. The reason is that cargo clearance would take at least two steps. The first one would be at the port and the second one at the inland cargo depot where the railway delivers the cargo. Accordingly, this mode of transporting cargo can only be effective to certain types of cargo owners and not all. It is the reason the data shows that the average respondent does not think that railway would be the most effective mode of moving cargo.

Overall, the discussion highlights several issues regarding railway transport and the efficiency of cargo flow at the BIK port. It has highlighted the issues and delved into them via six sub-topics. The first one analyzed the potential impact of the railway on the overall efficiency of cargo flow at the BIK port. The second one assessed the importance of speedy delivery of cargo to the various stakeholders. The third sub-topic sought to understand the importance of costs in analyzing the efficiency of railway transport. The fourth one analyzed the potential areas to improve, while the fifth one compared the effectiveness and reliability of both road and railway transport. The last subtopic investigated whether a modernized railway system can reduce the reliance on road transport. The discussion has concluded that although the railway is important and can provide numerous advantages and economies of scale, it would not necessarily be an integral element of the overall efficiency of cargo flow at the port.

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Similarly, the discussion has found that speedy delivery of cargo is the most important factor determining the efficiency of a mode of transport at the BIK port. Hence, any improvements to the current railway infrastructure must be geared towards ensuring speedy delivery of cargo. The discussion has also found that the cost of moving cargo is not as important compared to the speed and reliability of the delivery. Hence, any improvements to the railway must be guided by the cargo owners' need for quick and reliable delivery of their freight.

### 5.2 Conclusion

The railway infrastructure at the BIK port is poorly coordinated. The port also lacks a particular terminal connecting the major cargo owners to the port via railway. These challenges reduce the potential use of railway as a mode of freight transporting. The other challenges include the fact that the railway wagons and related hardware are obsolete especially in comparison to the technology adopted by other aspects of the port. The discrepancy in the technologies renders the railway infrastructure highly inefficient. Therefore, the goal of the study is to investigate whether modernizing railway terminal that uses the latest technology and enhances the effectiveness of loading and discharging cargo from the wagons would improve the overall efficiency of the BIK Port.

The thesis conducts a review of the literature on the topic. It focuses on i) the element of time and its influence on the efficiency of cargo flow at the BIK port, ii) the impact of port characteristics, port operations and the dwell time, iii) the issue of multimodal methods of transportation among other issues. The discussion herein provides unique views regarding the role of railway transport in supply chain and logistics management. It analyzes the integration of a port to rail networks and cited examples using case studies such as the Port of Dar es Salaam and the Port of Rijeka. The review of literature provides a theoretical framework that guided the process of the current thesis. The focus is on rail freight and the underlying research question investigates potential effects of modernizing railway terminal on the overall efficiency of cargo flow at the BIK Port.

The thesis uses a combination of both the qualitative and quantitative research approaches. The research is guided by a pragmatics philosophy. It means that the analysis of concepts focused on their ability to enable or facilitate action. The study provides

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recommendations that would guide action at the BIK Port with a view to ensuring improvements in the efficiency of cargo flow. The thesis also adopts a strategy combining the inductive and deductive approaches. The former involves developing new theories based on the data collected, while the latter is to test the emerging ideas. The study also uses several methods to collect data. These included the use of both quantitative and qualitative data sources. More specifically, the methods to collect data included interviews, questionnaires, and secondary data sources from the BIK port.

The results offer different perspectives regarding the issue of railway transport at the BIK Port. Firstly, the quantitative data shows that the majority of the respondents are employees, cargo owners, customers and other partners, had more than 5 years experience working with or at the port. Hence, they have enough experience to speak authoritatively about the issues of the port and the potential importance of a high-quality railway infrastructure.

The results show that the most of the respondents agree that the port has moderate efficiency of cargo flow. Most of them indicate that the railway technology is obsolete and that the flow of cargo could be improve with a modern better-managed railway infrastructure. Although the railway facilities are in poor condition, the results show that the respondents do not believe that this has a major impact on the overall efficiency of cargo flow. Moreover, analysis shows that respondents highlighted the speed of cargo delivery as the key impediment to the use of railway at the BIK Port.

The analysis also highlighted the poor management and old infrastructure as important elements that characterized the current railway infrastructure. The results also show that even with the development of a reliable railway transport system, it would not influence a major shift from the use of trucks to the use of railway. This can be justified by the fact that despite their

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various challenges, trucks can maneuver to the final destination much more easily and faster than railway transport. Hence, it is an indication that road transport of cargo does not end with the overhaul of the management and infrastructure of the railway facilities at the BIK Port. The qualitative data also provides information regarding several issues such as the performance of the port over the past decade and enables a discussion of how it might perform with an improved railway infrastructure.

Overall, the thesis indicates that an investment in the improvement of the railway infrastructure at the BIK Port would have positive results, especially for cargo owners who move cargo over long distances. Although there will be an improvement in the efficiency of cargo flow, it will not mean that cargo owners will stop using trucks. However, cargo throughput at the port will improve significantly. Essentially, the thesis provides extensive information that may guide policy development as well as investment decisions relating to the railway infrastructure and the logistical aspects of the operations at the BIK Port. These following recommendations could be useful for practitioners at the BIK Port:

First, The Iranian government- in collaboration with the management of the BIK Port- should invest in modernizing the railway infrastructure. It is especially important to enhance the flow of cargo. It may also boost the economy by supporting trade because the railway is a cheaper mode of freight transportation.

Second, It is important for the government to increase the number of lines to enable a more effective cargo movements. This is due to the fact that having a modernized railway infrastructure without sufficient lines to support quicker cargo flows is ineffective.

Third, the government should also reevaluate its policies to ensure that a reliable cargo transportation via railway is reinforced.

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Forth, the government can also engage a private-public partnership to invest in building new terminals and improving railway infrastructure

### **5.3 Limitations of the Study**

The current study has several limitations.

First, the sample size is small for interviews. This is due to the difficulty in accessing a sufficient number of respondents for data collection because of limitation of time to interview more people. However, the presented sample size represents all potential categories such as the employees of the port, cargo owners, and members of the port's operations.

Second, access to the right people was limited due to bureaucracy in the Iran's administrative system

Third, however the objective was to get an idea about cargo operation and transportation at the Bik port, there is no previous research investigating the interface of the BIK's port and its railway facilities. Hence, there is no specific literature review relating to the port under study, which would have otherwise provided a foundation for the current study. The current study provides such a basis for future research relating to logistical issues at the BIK port.

Forth, access to the operational data of the BIK port was another limitation of this study. Therefore, the study relies on the public data, which is relatively limited. More data collected in BIK port, could have provided insights into the managerial issues of the railway infrastructure at the BIK port.

### **5.5 Future work**

The current research has investigated the role of modernizing railway terminal at the BIK port on enhancing the efficiency of cargo throughput. The issues discussed have highlighted the element of cost in determining the choice of transport mode by cargo owners. It is important that

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future research can examine this topic to determine the impact of cost on the selecting transportation modes of cargo owners. The important question is how the cost of logistics affects the business process with a focus on the BIK port and the import-export business in Iran.

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**Appendix**

provides interview guide including interview questions.

**Section One: Demographic Details**

Respondent Number:

Company Name:

Nature of Relationship with the Bandar Imam Khomeini (BIK) Port:

- Customer
- Employee
- Partner

How long have you worked at BIK Port or used its services and brief biography about respondent?

- 1-5 years
- 5-10 years
- 10-15 years
- More than 20 years

**Section Two: Efficiency of the Port**

1. How would you rate the efficiency of cargo flow at the BIK port?

                                                                                         
 1                                      2                                      3                                      4                                      5

(Key; 1 = inefficient and 5 = highly efficient)

Why?.....

2. The BIK Port uses modern rail operating technology in managing cargo flow

                                                                                         
 1                                      2                                      3                                      4                                      5

(Key; 1 = strongly disagree, 2 = Disagree, 3 = Somewhat, 4 = Agree, and 5 = Strongly agree)

Why?.....

3. The current condition of the railway facilities at the BIK Port impedes the inefficient of cargo flow at the BIK Port

                                                                                         
 1                                      2                                      3                                      4                                      5

(Key; 1 = strongly disagree, 2 = Disagree, 3 = Somewhat, 4 = Agree, and 5 = Strongly agree)

Why?.....

4. The railways layout, facilities, and productivity is optimal for the current cargo flow operations at the port

                                                                                         
 1                                      2                                      3                                      4                                      5

(Key; 1 = strongly disagree, 2 = Disagree, 3 = Somewhat, 4 = Agree, and 5 = Strongly agree)

Why?.....

5. The efficiency of cargo flow at the BIK Port could improve with a better managed railway facility

                                                                                         
 1                                      2                                      3                                      4                                      5

(Key; 1 = strongly disagree, 2 = Disagree, 3 = Somewhat, 4 = Agree, and 5 = Strongly agree)

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Why?.....

6. The efficiency of cargo flow at the BIK Port could improve with a railway facility with modernized technology

                                                                                         
1                                      2                                      3                                      4                                      5

(Key; 1 = strongly disagree, 2 = Disagree, 3 = Somewhat, 4 = Agree, and 5 = Strongly agree)

Why?.....

7. Railway transport at the BIK Port would cope better and easier with increased tonnage of cargo at the BIK Port

                                                                                         
1                                      2                                      3                                      4                                      5

(Key; 1 = strongly disagree, 2 = Disagree, 3 = Somewhat, 4 = Agree, and 5 = Strongly agree)

Why?.....

8. To what extent do you think a new railway terminal at the port would improve efficiency of cargo flow?

                                                                                         
1                                      2                                      3                                      4                                      5

(Key; 1 = No improvement and 5 = Major improvement)

Why?.....

- The railway terminal would be the most effective mode of transferring goods out of and into the BIK Port

                                                                                         
1                                      2                                      3                                      4                                      5

(Key; 1 = strongly disagree, 2 = Disagree, 3 = Somewhat, 4 = Agree, and 5 = Strongly agree)

Why?.....

9. Currently, customers rely on trucks to move cargo into an out of the port. To what extent do you think they are efficient in facilitating easy, faster and cheaper flow of cargo?

                                                                                         
1                                      2                                      3                                      4                                      5

(Key; 1 = inefficient and 5 = highly efficient)

Why?.....

10. What is the main shortcoming of the current railway system at the BIK Port?

- . Technology
- . Speed
- . Management
- . Cost
- . Insufficient capacity

11. If a better-coordinated and technologically current railway terminal was built at the BIK port, to what extent do you think the port customers would shift towards using railway transport?

                                                                                         
1                                      2                                      3                                      4                                      5

(Key; 1 = None would shift, 2 = A few would shift, 3 = Some may shift, 4 = A significant number would shift, and 5 = All would shift)

Why?.....

Thank You for Your Time!

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