A STUDY ON LOGISTICS RISK ASSESSMENT: THE CASE OF CONTAINER SHIPPING IN EGYPT

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ABSTRACT

Risk management gained more attention in the Egyptian market after the political events in January 2011. More businesses now consider risk management a priority, especially that the Egyptian market over the years experienced several political, economic and environmental shocks that negatively affected its operations. Logistics being part of the supply chain, is a critical link that is vulnerable to any unexpected changes that could result in loss of money and goods. Therefore, this research examines the risks associated with logistics services provided for container shipping in the Egyptian market. The research addresses the risk factors linked to the provision of logistics services from both the providers' and the customers' perspectives. This is a case study in which interviews and surveys were deployed to identify risk factors, examine its consequences, rank them using risk mapping and examine the correlation. The study classified the risk factors into categories and examined the perspectives of both providers and customers. The results showed strong positive relationship between risk likelihood and risk consequences for both the logistics service companies and the customer companies.

Keywords: Risk, Risk Assessment, Logistics Services, Egypt, Mediterranean, Container Shipping.

1. INTRODUCTION

Global supply chains are very sophisticated. Extensive networks of suppliers, repetitive shipping, multiple logistics activities, long transportation journeys and intensive distribution to cover large geographical regions all expose the logistics and supply chain activities to risk. Container shipping being the dominant form of freight movement worldwide, is also exposed to countless risks from the point of departure to point of destination. Each container passes through various entities i.e. the shipper, the freight forwarder, the shipping line, the port authorities and finally to the consignee. Egypt being a strategic link in global trade through the ports located in the Mediterranean Sea and the Red Sea, plays the role of an important facilitator to the flow of international freight movement. A review of the literature revealed that many researchers studied the risks associated with the supply chain and the different logistics activities, but there was a significant gap in research that focused on the examination of container shipping risks in the Middle East and specifically in Egypt.

Therefore, this research will examine the risks associated with logistics services provided for container shipping in the Egyptian market. The research will address the risk factors linked to the provision of logistics services from both the providers' and the customers' perspectives to provide a holistic view of the potential risks.

2. LITERATURE REVIEW

2.1 Logistics and Supply Chain Risk Management

The flows of the supply chain extend all over the globe from source origins to retailing stores. Consequently, these flows are subject to different types of risks that result in delays and sometimes to complete shutdown of entire chains. Waters (2007) defined supply chain risk (SCR) as any event that might affect the movement and disrupt the planned flow of materials from the initial suppliers to the final customers. He further added that risks can be presented in several forms and can appear at any point in the supply chain flows. Supply chain risk management (SCRM) was studied by many scholars who approached the concept from different perspectives, but they all confirmed the need of collaboration among supply chain partners as confirmed by Ho et al. (2015) who conducted a comprehensive literature review on SCRM. For instance, Norrman and Lindroth (2004) stated that SCRM 'involves the collaborative application of risk management process tools for the purpose of dealing with uncertainties related to logistics activities'. Handfield (2007) also confirmed the necessity of collaboration to management supply chain risk in his definition of SCRM as 'the integration and management of organisations within a supply chain to minimize risk and reduce the likelihood of disruptions through cooperative organisational relationships, effective business processes, and high levels of information sharing'. Thun and Hoenig (2011) stated that SCRM needs a 'cross-company orientation to identify and reduce risks not only at the company level, but also on the entire supply chain'. Therefore, the core of SCRM is centralized upon the collaboration between supply chain partners to detect potential risks and to be prepared to face these risks with the right strategies.

Researchers classified logistics and supply chain risks into different categories but ultimately, they are categorized into internal risks and external risks. For instance, Tang (2006) identified two categories of SCR: (1) operations risks i.e. uncertainties related to demand, supply and costs; (2) disruptions risks i.e. natural and man-made disasters. Waters (2007) also identified two categories of SCR: (1) internal risks i.e. risks related to logistics and supply chain operations like late deliveries, poor forecasts, human errors, etc; (2) external risks which originates in the external environment of the supply chain. Table 1 shows some of the additional SCR identified in the literature.

Table 1. Examples of Supply Chain Risks Identified in the Literature

Supply Chain Risks	Authors
Organizational risk, Environmental risk, Network-related risk	Jüttner et al. (2003)
Physical, financial, informational, relational and innovational risks	Cavinato (2004)
Process (production or distribution), demand, supply, control and environmental risks	Bogataj and Bogataj (2007)
Demand side, supply side, regulatory and legal, infrastructure risk and catastrophic risks	Wagner and Bode (2008)
Material flow, financial flow and information flow risk	Tang and Musa (2011)
Supply, demand, process and environmental risks	Samvedi et al. (2013)

Source: The Author

According to Waters (2007), SCRM supports organizations in being more resilient through implementing the three main elements of SCRM. The first element is 'risk identification' which focuses on analyzing the supply chain and its activities to find potential areas of risk or risk factors. According to Manuj and Mentzer (2008), risk identification is the most important step in the SCRM process as it affects the quality of the subsequent elements. The second element is 'risk analysis' which examines the possible effect of the identified risks, their severity and

consequences. The third element 'risk response' which prepares a variety of responses to the identified risks. Some of the risk mitigation strategies that were examined in the literature to reduce SCR included: managing suppliers, information sharing in the supply chain, collaborative relations between supply chain partners and increasing flexibility (Zsidisin et al., 2016; Talluri et al. 2013; Wagner and Silveira-Camargos 2012).

2.2 Container Shipping Risks – Theoretical Framework

Egypt's geographical location plays a vital role in trade traffic between East and West shipping routes. Overlooking the Mediterranean Sea and the Red Sea with a total of 48 ports in addition to the Suez Canal which saves time and cost and being the gateway to the MENA and African regions, add to the strategic importance of Egypt in the global trade networks. According to the Egyptian Maritime Transport Sector statistics for 2018, containers capacity was 11.6 million TEUs with an average annual turnover of 7 million TEUs (MTS, 2018). For the past 5 years the Egyptian government has given special attention to increase exports through a set of strategies and policies to develop the country's infrastructure, facilities and services to support a seamless flow of trade traffic.

Logistics services have a significant contribution to the Egyptian economy, and container shipping is a prime service. Container shipping is the dominant form of trade movement and passes through complex operations between various entities i.e. the shipper, the logistics service company, the freight forwarder, the shipping line, the port authorities and finally to the consignee. At each of these entities within the supply chain, there is always a probability of risk occurrence which can result in significant losses. Therefore, it is important to identify the operational logistics risk factors in the supply chain that involves container shipping which might negatively impact the performance of logistics service companies in Egypt. The identification of these risks would help in analyzing the possible impact of these risks in terms of severity and consequences in order to provide recommended mitigation strategies for logistics companies in Egypt. Moreover, as customer satisfaction is one of the fundamental goals for logistics services, it is also important to understand the customers' perception on the operational logistics risks involved in container shipping in Egypt. Studying the subject from the supply and demand sides provide a comprehensive and a holistic approach that will enrich the analysis and findings of this research.

The literature review showed that most of the research conducted focused on SCRM in general and there was a gap in research that focused on the examination of container shipping risks in the Middle East and specifically in Egypt. Therefore, this research aims to answer the following research question: What are the operational logistics risk factors in the supply chain that involves container shipping from the perspectives of the logistics service companies and their customers?

The theoretical framework of this research would focus on identifying the risk categories and the related risk factors involved in the operational logistics of container shipping. As the literature previously showed, researchers classified logistics and supply chain risks into different categories, so for the purpose of this study, the researcher will use Rao and Goldsby (2009) five sources of risk in the supply chain which was used by many researchers (Louis and Pagell, 2019; de Oliveira et al., 2019; Vanalle et al., 2019; Giannakis and Papadopoulos, 2016). Rao and Goldsby (2009) identified these five sources based on an extensive literature review on all the potential risks that might exist in a supply chain: (1) environmental risk, (2) industry risk, (3) organizational risk, (4) problem-specific risk and (5) decision-making risk. To compile a list of the potential risk factors related to container shipping in each of the previously stated five categories, the researcher reviewed 65 research papers on SCRM published from the year 2009 to 2019. The extracted risk factors were found to fit only four categories out of the five specified by Rao and

Goldsby (2009), and as a result the 'problem-specific risk' category was excluded. Table 2 presents the risk categories and potential operational risk factors in container shipping.

Table 2. Risk Categories and Potential Operational Risk Factors in Container Shipping

Risk Categories	Code	Risk Factors	Authors
Environmental Risk [EnvR]	EnvR1	War, terrorism and political uncertainty	Badurdeen et al. (2014); Ceryno et al. (2015)
	EnvR2	Weather conditions	Husdal and Bråthen (2010)
	EnvR3	Natural disasters	Govindan and Chaudhuri (2016); Rajesh et al. (2015)
	EnvR4	Customs documents processing	Husdal and Bråthen (2010); Yang (2010)
	EnvR5	Port Congestion	Drewry (2009); Tummala and Schoenherr (2011)
	EnvR6	Oil price fluctuation	Rao and Goldsby (2009); Husdal and Bråthen (2010)
	EnvR7	Lack of security and cargo theft from sealed containers	Rao and Goldsby (2009); Husdal and Bråthen (2010)
	EnvR8	Currency exchange fluctuation	Tummala and Schoenherr (2011); Rajesh et al. (2015)
Industry Risk [IndR]	IndR1	Supply and demand uncertainty	Shafiq et al. (2017)
	IndR2	Competitive uncertainty	Zhu et al. (2017)
	IndR3	Number of customers	Samvedi et al. (2013)
	IndR4	Product/service value	Samvedi et al. (2013)
	IndR5	Carbon dioxide emissions by chain partners, and harmful waste disposal	Govindan and Chaudhuri (2016); Shafiq et al. (2017)
Organizational Risk [OrgR]	OrgR1	Port/terminal productivity below expectations (loading/discharging)	Tummala and Schoenherr (2011)
	OrgR2	Labor productivity below expectations due to unsafe/unorganized workplace	Rao and Goldsby (2009); Husdal and Bråthen (2010)
	OrgR3	Lack of information standardization and compatibility	Tummala and Schoenherr (2011)
	OrgR4	Use of different communication channels (telephone, e-mail, fax) increase the time of information transmission	Samvedi et al. (2013)
	OrgR5	Information inaccuracy	Husdal and Bråthen (2010); Chen and Wu (2013),
	OrgR6	Inaccessible information about shipment	Bradley (2014), Rajesh et al. (2015)
	OrgR7	Information system breakdown	Tummala and Schoenherr (2011)
	OrgR8	Suppliers or shippers' bankruptcy	Qi and Song (2012)
	OrgR9	Damage to containers or cargo due to terminal operators' improper loading/unloading operations	Husdal and Bråthen (2010)
	OrgR10	Payment delay from partners or shippers	Seyoum (2009); Rajesh et al. (2015)

	OrgR11	Lack of flexibility of fleet size and schedules	Husdal and Bråthen (2010); Tummala and Schoenherr (2011)
Decision-Making Risks [DecR]	DecR1	Pricing	Zhu et al. (2017)
	DecR2	Dependency on a single supplier, and the capacity of alternative suppliers	Shafiq et al. (2017)
	DecR3	The decision maker's detailed knowledge and experience of the overall risks and the issues involved	Zhu et al. (2017)
	DecR4	Limited knowledge of culture and knowledge of the partners involved	Cagliano et al. (2012); Govindan and Chaudhuri (2016)

Source: The Author

The 'Environmental Risks' category includes the risk factors which impact the overall market and the different business sectors (Rao and Goldsby, 2009). This category includes political risks, natural/weather related risks, fluctuation of oil prices, currency exchange fluctuations, general lack of security, governmental policies which affect customs procedures and port operations. The 'Industry Risks' category includes the risks which impact a specific business sector. Risks in this category includes supply and demand uncertainty in the logistics service sector, number of customers, competitive uncertainty among the competing firms and product/service value risk which is presented in an unexpected change in the demand of the company's product/service. In addition to sustainability issues which include carbon dioxide emissions by chain partners, and harmful waste disposal. The 'Organizational Risks' category includes the risks at the company's internal environment and scope of operations. Risks include productivity levels in loading and discharging at ports/terminals, labor productivity, risks related to information transmittal i.e. lack of standardization/compatibility between partners, use of different communication channels, information inaccuracy, inaccessible information about shipments and information system breakdown. This category also includes financial risks such as payment delay/bankruptcy of supply chain partners, container/cargo damage and lack of flexibility in fleet size and scheduling. The 'Decision-Making Risks' refer to the risks related to 'an individual or to a decision-making group within an organization' (Rao and Goldsby, 2009). Risks in this category includes setting the pricing of the services offered, the company's policy in dealing with a single or multiple supplier, the decision maker's detailed knowledge and experience of the overall risks and related issues.

3. RESEARCH METHODOLOGY

This research is empirical in its nature as it focuses on the case of assessing the logistics operational risks of container shipping in Egypt. This research follows different approaches and data collection tools to provide in-depth analysis of the risks involved in container shipping. Before conducting the risk analysis to the targeted segments, the risk categories and the risk factors previously presented in the theoretical framework needed to be validated. The researcher conducted a pilot interview with 10 business experts in logistics companies to review the risk categories and their related factors with the purpose of ensuring that they are applicable to container shipping. After changes were made according to the experts' opinions, an online survey was conducted to the targeted two groups: (1) logistics services companies (2) customer companies. The purpose of this survey was to describe the probability of risk occurrence and its consequences. The survey included the list of risk factors validated by the business experts in the

pilot stage, and respondents were asked to describe the probability of occurrence using Yang's (2010) five point Likert scale 1-rare, 2-unlikely, 3-possible, 4-likely, and 5-almost certain and to determine the level of consequences for each risk using Chang et al.'s (2015) scale: 1-insignificant, 2-minor, 3-moderate, 4-major, and 5-catastrophic. After the data collection, the researcher conducted the risk analysis using the Average Risk Scale (ARS) of Chang et al. (2015). The ARS method assists in calculating a risk scale for each risk factor by multiplying the probability of risk occurrence with its consequence for each respondent then calculate the average of the scales across all respondents (Chang et al., 2015). The formula for ARS:

$$ARS_r = \frac{1}{N}\sum_{i=1}^{N}(l_{ri} \times c_{ri})$$

Where:
N = the total number of respondents;
l_{ri} = the probability of risk factor occurrence *r* by the respondent *i*;
c_{ri} = the consequence of risk factor *r* by the respondent, *i*.

The ARS method also helps in creating a risk map to compare the relative importance of the risk factors under study.

4. RESEARCH FINDINGS AND ANALYSIS

The researcher conducted the pilot interview with 10 business experts working in different logistics service companies in Alexandria. The experts confirmed the risk factors found in the literature and suggested to add 'the sudden changes of government laws and policies' (EnvR9) to the Environmental Risk category as it has happened several times before in Egypt and has affected business operations significantly. They also suggested to change the wording for 'customs documents processing' to 'customs procedures' as it is more inclusive than just the documents processing. For the 'Organizational Risk' category they suggested to delete 'lack of flexibility of fleet size and schedules' as they mentioned that there is a surplus of trucks in Egypt, thus it is not a risk to be included. Therefore, the list of risk factors was updated according to the experts' opinions and the survey was sent to the targeted groups.

The survey was sent to a sample of 200 logistics service companies and 200 customer companies in Egypt. The total number of respondents was 120 valid responses from logistics service companies representing a response rate of 60% and 95 valid responses from customer companies with a response rate of 47.5%. The ARS formula was used to calculate the risk scales of the 28 risk factors. Table 3 shows the mean values, standard deviations and scale ranking for the logistics service companies responses and the customer companies' responses.

The top five risks in container shipping from the logistics service companies and the customer companies' perspectives shared two main risks from the environmental risks category: 'customs procedures EnvR4, 9.23' ranked number one risk from the logistics service companies perspective and ranked number two '8.71' from the customer companies' perspective and; 'port congestion EnvR5, 8.87' ranked number three by logistics service companies and ranked number four '8.23' by the customers companies. Moreover, the organizational risk category has the highest mean score of 6.81 compared with the other risks' categories.

Table 3. Risk Scale of Container Shipping

Risk Factor	Logistics Service Companies			Customer Companies		
	Risk Scale	Standard Deviation	Rank	Risk Scale	Standard Deviation	Rank
EnvR1	5.32	5.11	21	4.21	3.32	25
EnvR2	3.1	2.12	27	3.89	2.11	27
EnvR3	2.01	2.49	28	1.98	1.5	28
EnvR4	9.23	8.3	1	8.71	7.68	2
EnvR5	8.87	7.2	3	8.23	7.98	4
EnvR6	6.89	5.43	12	8.52	7.2	3
EnvR7	7.56	6.09	8	7.61	6.9	6
EnvR8	6.89	3.93	13	7.32	6.4	10
EnvR9	7.87	7.21	6	8.91	7.2	1
Mean score of Environmental Risks	6.41			6.59		
IndR1	5.43	4.31	18	4.21	3.32	26
IndR2	8.33	6.21	5	4.31	3.45	24
IndR3	5.31	5.42	22	5.53	4.59	18
IndR4	4.22	4.35	23	6.25	5.33	16
IndR5	3.21	3.1	26	4.33	3.11	22
Mean score of Industry Risks	5.30			4.92		
OrgR1	8.61	7.34	4	7.42	6.01	8
OrgR2	7.54	6.79	9	6.34	5.25	15
OrgR3	9.15	8.21	2	6.98	5.74	13
OrgR4	7.32	6.54	11	7.12	6.22	11
OrgR5	6.51	5.38	14	7.34	6.15	9
OrgR6	6.34	5.76	16	6	5.35	17
OrgR7	7.58	6.32	7	5.48	4.12	19
OrgR8	4.12	3.98	25	7.98	6.16	5
OrgR9	5.35	4.3	20	4.32	3.8	23
OrgR10	5.61	4.41	17	4.45	3.54	20
Mean score of Organizational Risks	6.81			6.34		
DecR1	7.33	6.21	10	6.54	5.88	14
DecR2	4.21	3.29	24	4.39	3.21	21
DecR3	6.51	5.32	15	7.56	6.93	7
DecR4	5.39	4.65	19	7.1	6.13	12
Mean score of Decision-Making Risks	5.86			6.39		
Total Average	24.38			24.26		

The remaining top 5 risks by the logistics service companies included: 'Lack of information standardization and compatibility OrgR3, 9.15' ranked number two, 'Port/terminal productivity below expectations (loading/discharging) OrgR1, 8.61' ranked number four and 'competitive uncertainty IndR2, 8.33' ranked number five. As for the customer companies, 'the

sudden changes of government laws and policies EnvR9, 8.91' ranked number one, 'Oil price fluctuation EnvR6, 8.52' ranked number three, and 'Suppliers or shippers' bankruptcy OrgR8, 7.98' ranked number five. The environmental risk category has the highest mean score of 6.59 among the other risks' category from the customer companies' perspective.

To further analyze the relative importance of the container shipping risk factors, the researcher used Waters (2007) scale for risk mapping which is divided into four categories: low-risk (for risk scale < 3), moderate-risk (3 < risk scale < 6), high-risk (6 < risk scale < 9) and extreme-risk (9 < risk scale). Table 4 shows the risk mapping for container shipping risk factors according to the logistics service companies.

Table 4. Risk Mapping for Container Shipping Risk Factors – Logistics Service Companies

Risk Mapping Categories	**Risk Factor**
Extreme Risk (9 < risk scale)	Customs procedures [EnvR4]
	Lack of information standardization and compatibility [OrgR3]
High-Risk (6 < risk scale < 9)	Port Congestion [EnvR5]
	Port/terminal productivity below expectation (loading/discharging) [OrgR1]
	Competitive uncertainty [IndR2]
	The sudden changes of government laws and policies [EnvR9]
	Information system breakdown [OrgR7]
	Lack of security and cargo theft from sealed containers [EnvR7]
	Labor productivity below expectations due to unsafe/unorganized workplace [OrgR2]
	Pricing [DecR1]
	Use of different communication channels (telephone, e-mail, fax) increase the time of information transmission [OrgR4]
	Oil price fluctuation [EnvR6]
	Currency exchange fluctuation [EnvR8]
	Information inaccuracy [OrgR5]
	The decision maker's detailed knowledge and experience of the overall risks and the issues involved [DecR3]
	Inaccessible information about shipment [OrgR6]
Moderate-Risk (3 < risk scale < 6)	Payment delay from partners or shippers [OrgR10]
	Supply and demand uncertainty [IndR1]
	Limited knowledge of culture and knowledge of the partners involved [DecR4]
	Damage to containers or cargo due to terminal operators' improper loading/unloading operations [OrgR9]
	War, terrorism and political uncertainty [EnvR1]
	Number of customers [IndR3]
	Product/service value [IndR4]
	Dependency on a single supplier, and the capacity of alternative suppliers [DecR2]
	Suppliers or shippers' bankruptcy [OrgR8]
	Carbon dioxide emissions by chain partners, and harmful waste disposal [IndR5]
	Weather conditions [EnvR2]
Low-Risk (for risk scale < 3)	Natural disasters [EnvR3]

As shown in Table 4, logistics service companies indicated that the majority of the risk factors which represents 14 risks out of 28 are considered as high-risk (6 < risk scale < 9), followed by 11 moderate risks (3 < risk scale < 6), 2 extreme risks (9 < risk scale) and 1 low risk (for risk scale < 3). The researcher conducted 6 semi-structured interviews with business experts to provide more insights into the findings of the risk factors survey. Starting with the extreme risk category, the experts agreed that 'customs procedures' in Egypt is indeed a considerable impediment to the flow of goods resulting in loss of time and money. Examples of containers not being cleared for a period of 3-4 weeks and containers that remained at the customs for several months with materials approaching its expiry date are common stories of the customs authority at Egyptian ports. The long and sophisticated customs procedures are implemented by the government to reduce smuggling of products or chemicals that can be a threat to national security. 'Lack of information standardization and compatibility' is also considered an extreme risk by logistics service companies as it results in loss of time and money in attempts to process information required between the involved parties in the shipping operations.

The business experts noted that the high-risk category includes many risks belonging to the environmental risks and organizational risks. They stated that environmental risks are of course difficult to control but the organizational risks can be examined, assessed and rectified by administrative and follow up procedures. Examples of rectification can include company policies to use specified and approved communication channels for information transmission, investing in more robust information systems that would not slow or break down the system and apply kaizen principles to promote a more organized and safer workspace to increase productivity. In the moderate risks category, most risks were industry risks and the experts agreed with the findings, stating that the likelihood and consequences of these risks are not of high significance to the container shipping sector. And lastly the experts commented on the 'natural disasters' risk which was the only risk in the low-risk category, stating that Egypt is in a safe geographical location that does not face any natural disasters compared with other ports in Asia.

Table 5 shows the risk mapping for container shipping risk factors according to the customer companies. There are no risks in the extreme risk category, and the high-risk category included the majority of risks (17 out of 28 risks). The moderate risk category included 10 risks and the low risk category included only one risk.

The business experts compared between the findings of both the logistics companies and the customer companies. They highlighted that the two extreme risks that were identified by the logistics companies are now in the high-level risks for customer companies. They stated that this is true because the likelihood and consequences of these two risks are much higher and redundant in the logistics service companies' operations because they deal with a large base of customers. But the customer companies may encounter these risks once every long period of time therefore they are not considered extreme from their side. In the high-risk category, the majority of the risks were found to be organizational risks, followed by environmental risks. The experts stated that the organizational risks identified by the customer companies can also be examined, assessed and rectified by administrative and follow up procedures like the logistics service companies. They further added that the existence of these risks in container shipping for customer companies are due to many reasons: the lack of competence of the personnel handling the shipping operations in the customer companies and lack of integration in logistics operations at the customer companies specially if the company has several depots or locations. For the moderate risks' category, most risks were also industry risks same as the findings from the logistics service companies and the experts conquered with the findings, stating that the likelihood and consequences of these risks are not of high significance to the container shipping.

Table 5. Risk Mapping for Container Shipping Risk Factors – Customer Companies

Risk Mapping Categories	Risk Factor
High-Risk (6 < risk scale < 9)	The sudden changes of government laws and policies [EnvR9]
	Customs procedures [EnvR4]
	Oil price fluctuation [EnvR6]
	Port Congestion [EnvR5]
	Suppliers or shippers' bankruptcy [OrgR8]
	Lack of security and cargo theft from sealed containers [EnvR7]
	The decision maker's detailed knowledge and experience of the overall risks and the issues involved [DecR3]
	Port/terminal productivity below expectation (loading/discharging) [OrgR1]
	Information inaccuracy [OrgR5]
	Currency exchange fluctuation [EnvR8]
	Use of different communication channels (telephone, e-mail, fax) increase the time of information transmission [OrgR4]
	Limited knowledge of culture and knowledge of the partners involved [DecR4]
	Lack of information standardization and compatibility [OrgR3]
	Pricing [DecR1]
	Labor productivity below expectations due to unsafe/unorganized workplace [OrgR2]
	Product/service value [IndR4]
	Inaccessible information about shipment [OrgR6]
Moderate-Risk (3 < risk scale < 6)	Number of customers [IndR3]
	Information system breakdown [OrgR7]
	Payment delay from partners or shippers [OrgR10]
	Dependency on a single supplier, and the capacity of alternative suppliers [DecR2]
	Carbon dioxide emissions by chain partners, and harmful waste disposal [IndR5]
	Damage to containers or cargo due to terminal operators' improper loading/unloading operations [OrgR9]
	Competitive uncertainty [IndR2]
	War, terrorism and political uncertainty [EnvR1]
	Supply and demand uncertainty [IndR1]
	Weather conditions [EnvR2]
Low-Risk (for risk scale < 3)	Natural disasters [EnvR3]

And lastly the experts commented on the 'natural disasters' risk which was also the only risk in the low-risk category as the logistics service companies findings, emphasizing Egypt's safe geographical location.

To examine the strength and correlation between the risk likelihood and risk consequence from both the logistics service companies and the customer companies, the researcher performed a correlation analysis. Table 6 shows the results of the correlation analysis.

Table 6. Correlation Analysis

	Logistics Service Company – Risk Likelihood	Logistics Service Company – Risk Consequence	Customer Companies – Risk Likelihood	Customer Companies – Risk Consequence
Logistics Service Company – Risk Likelihood	1			
Logistics Service Company – Risk Consequence	0.821***	1		
Customer Companies – Risk Likelihood	0.421[a]	0.312	1	
Customer Companies – Risk Consequence	0.198	0.167	0.721***	1

Notes: *** Statistically significant at the 0.1% level or lower; a statistically significant at the 6.1% level

The correlation results show that there is a strong positive relationship between the responses of the logistics service companies and the customer companies for risk likelihood and risk consequence and low reading for risk consequence between logistics service companies and customer companies. Thus, it can be concluded that they interpret consequences of risks differently.

5. CONCLUSIONS AND FURTHER RESEARCH

Supply chain risk management (SCRM) is essential to strengthen supply chain operations against potential risks. A key flow in supply chain processes is container shipping which encounter numerous risks due to the involvement of several entities in container movement. The literature showed that collaboration is highly important between supply chain partners to detect potential risks and work on strategies which would limit the impact of the identified risks. This is indeed an important fact since the risks that exist in container shipping in Egypt belong to different risks categories that will require the input of different perspectives as the research showed. As container shipping is an essential driver of trade flows in Egypt, it was important to assess the potential risks from the logistics service companies and users/customer companies. Mitigation strategies should focus on the risks that had the highest scores by allocating the required resources and setting a regular plan of risk monitoring to protect against any unforeseen risk.

This research was an attempt to shed some light on a highly important topic that suffer from a substantial gap in supply chain literature in the Middle East. Future research should focus on studying SCRM on different business sectors, examining the best practices of SCRM and its applicability to the emerging markets of the Middle East.

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