Contingency Management in Achieving Maritime Supply Chain Resilience Using 4A Approach to Enhance Port Performance in Pakistan

Shahrukh Zohaib[1], Bushra Rafaqat[2], M. Jahanzaib Sultan[3]

Abstract

This study investigates the role of contingency management in enhancing maritime supply chain resilience to improve port performance in Pakistan, focusing on disruptions such as the COVID-19 pandemic. Using the 4A framework—Agility, Adaptability, Alignment, and Ambidexterity—this research explores how these capabilities mitigate operational disruptions and improve port efficiency. A quantitative research design was employed, collecting data from 320 professionals in Pakistan's maritime sector through a structured questionnaire. The data was analyzed using SPSS software, employing techniques such as reliability, correlation, and regression analysis. Results demonstrate that agility, alignment, and ambidexterity significantly influence port performance, enhancing responsiveness, stakeholder collaboration, and balance between innovation and operational efficiency. However, adaptability showed an insignificant impact due to rigid infrastructural limitations in the regional context. The study emphasizes the integration of the 4A framework to build resilient supply chains, showcasing its potential to address vulnerabilities exposed during the pandemic. By providing actionable insights, this research contributes to the academic literature and offers practical strategies for strengthening maritime supply chain robustness in developing economies.

Keywords: Maritime Supply Chain, Supply Chain Resilience, Port Performance, Agility, Ambidexterity, Alignment, Adaptability, Contingency Management, Covid 19

Introduction

In today's ever-evolving world, supply chains (SCs) are more vulnerable to disruption from both internal and external risk events. According to estimates, around 70% of businesses experience SC disruptions annually (Yoon et al., 2018). Researchers hypothesised that a company's revenues and stock returns would drop significantly within two quarters after the disclosure of an SC disruption (SEC Releases, 2001). A select group of scholars has also argued that SC resilience has the strategic and vital capacity to lessen the negative effects of disruptive events on SCs (Brandon-Jones et al., 2014; (SEC Releases, 2001) As a result, the majority of businesses are extremely worried about the stability of their SCs (Paraušić et al.,

[1] Assistant Professor, Bahria University Karachi Campus. Email: engr.h.shahrukh@gmail.com
[2] Commercial Associate , SinoTrans Logistics Pakistan Pvt Ltd.
Email: commercialops@sinotrans.com.pk
[3] Import Pricing Manager, Awan Maritime Agencies. Email: pricing@awanmaritime.com

https://doi.org/10.58932/MULG0043

2014). Although it may be difficult to prevent the effects of natural disasters, it is possible to lessen the severity of disruptions produced by the implementation of new techniques and other factors by building resilience.

This research aims to investigate what factors contribute to SC resilience and how that impacts reconfiguration in Pakistan. Supply chain risk management also has a constructive effect on the efficiency and effectiveness of supply chain management. As the world becomes increasingly interconnected, businesses are more vulnerable to sudden shifts in their surrounding environment. Supply chains need to be more resilient so that they can withstand unexpected challenges. Companies are constantly on the lookout for ways to enhance the quality, efficiency and responsiveness of SC management as a result of the rapid pace of globalisation, the uncertainty of the market, and the intense rivalry in the business world. A company's ability to acquire strategic advantage, maximise revenues, and increase market share no longer requires it to operate in isolation from its competitors; rather, it requires a collaborative strategy with partners. Companies should also build a collaborative framework to manage the supply chain and unexpected incidents effectively. Also, the globalisation of the company necessitates supply chain information integration both internally and externally, as this improves global production and marketing activity planning and inventory replenishment for more effective responses to varying demand.

The fundamental objective of this investigation is to identify more effective methods for strengthening the marine supply chain's resilience and expanding its contingency management capability in the face of unplanned catastrophes like the COVID-19 pandemic, geopolitical situations such as: Russia-Ukrain war, Palestine-Hummas conflict. Because of national lockdowns and blocked borders, the COVID-19 pandemic has recently had an increasing impact on a rising number of enterprises around the world. This event has demonstrated the susceptibility and fragility of the modern supply chain by causing widespread economic disruption and supply chain issues around the globe. Companies need to improve their ability to deal with unplanned events and lessen the impact of the COVID-19 pandemic as the first and second waves of the virus spread over the world (SEC Releases, 2001). Discovering the primary factors that constructively influence contingency management and exploring the relation between operational success and contingency management can shed light on the managerial processes to better handle similar accidental scenarios in the future.

The concept of a "triple-A" supply chain has been celebrated for a long time as the foundation of exceptional business results (el Sayed & DeLoach, 2014) (Krijger et al., 2021) (2021), citing the COVID-19 epidemic as an example, have argued for a rethinking of supply chains (SCs) and have called for greater research into the consequences of SCs as well as new ideas for dealing with SCs in the case of an unexpected occurrence. A new work, (Laulita, 2020) emphasises that there is no need to recreate new capacity in global supply networks in the time after a pandemic.

Instead, companies must concentrate on gauging the extent to which four standard supply chain capabilities are in place: As a means of increasing resilience to external hazards (Patrucco et al., 2017). The effects of COVID-19 emphasise the urgent requirement for supply chain improvement to enable improved disaster response and to cope with supply chain interruption. Existing research has demonstrated their usefulness in establishing a sturdy and resilient business. It is not yet known how 4As supply chain activities help in post-pandemic recovery from the effects of COVID-19 disruptions.

Recent years have seen a rise in the visibility of discussions on and experiences with supply chain risk. Risk management of supply networks has received a lot of attention as of late because of how vulnerable the modern supply chain is to volatile market shifts, globalisation, natural disasters, and crises. According to (el Sayed & DeLoach, 2014), the term "supply chain risk management" refers to the process of developing and implementing a plan to mitigate both predictable and unexpected threats to a company's supply chain. The supply chain's complex structure is the result of changes in the economic climate both within and outside the supply chain, making it more vulnerable to unforeseen market conditions such as incorrect demand estimates, damaged or flawed items, and delivery delays. The need to be ready for the unexpected was established by (Krijger et al., 2021) when they defined contingency (accidental occurrences) management as a part of operational risk management in the supply chain. The global spread of the COVID-19 virus, the ongoing trade dispute involving China and the United States, as well as other crises, are all examples of unexpected and underrecognized events. Unmanaged supply chain accidents can have a major impact on the implementation of supply chain initiatives.

The manufacturing sector in Pakistan was affected by the COVID-19 epidemic in several ways (Wieland & Wallenburg, 2013). State Bank of Pakistan (SBP) data shows that in 2020, Pakistan's textile exports went down from US 13.5$ billion in 2019 to US 12.8$ billion in 2020. The decline could be attributable to government fiscal and monetary policy shifts, cancelled orders, and postponed deliveries caused by a global pandemic (Shujaat, 2021). As the COVID situation prompted Pakistan to open its borders first, the manufacturing sector enjoyed a revival and survived (Montoya & Flores, 2021). After some time, with the opening of the global economy, demand for goods and services exceeded supply.

Industrial production after the lockdown was heralded as a major contributor to economic growth because of the increased demand for finished goods ((Patrucco et al., 2017). Nevertheless, the supply chain wasn't prepared, first for the closure of ports in Pakistan, and then for the demand surge brought on by extended lockdowns around the world. (Krijger et al., 2021). The supply chain developed a bullwhip effect in response to these unforeseen changes in demand. As a result, businesses need to adopt adaptable new tactics to mitigate the effects of disruptions (Wieland & Wallenburg, 2013). If a company is worried about supply chain interruptions, it needs to be able to

quickly adapt and take preventative actions (Frederico, 2021).

Ports Maritime Supply Chain Disruption (PMSCD)

All types of ports, including those that specialise in container shipping as well as those that specialise in handling cars, liquid bulk, and dry bulk, will be discussed. Since the study's focus is on the devastating impact on cargo, passenger ports will not be examined (Bode & Wagner, 2015). The proposed management approach can be used regardless of the type of cargo being handled, where it is being handled, or how far along the development path it is. The model's general applicability provides a tangible foundation for future research that is anticipated to more precisely address the disparities between port characteristics and the outputs of the management model. Furthermore, this study outlines the factors influencing the events of PMSCD threats and challenges to consider in the implementation and practice (Azadegan et al., 2020). These aspects, together, aid in the creation of a resilient port and supply chain stability by identifying the PMSCD threats and recommending a management model. As a collective effect, the outcomes are a reduction in the frequency of PMSCD threats, the prevention or mitigation of severe repercussions, and an increase in port resilience.

4A Supply Chain Strategy

Advanced supply chain techniques with a triple-A rating for supply chains to succeed in today's challenging market climate, previous studies have identified the 3As as crucial traits that supply chain strategies should reflect (Mahajan & Tomar, 2021). It has long been understood that the 3As are crucial to the functioning of world-class supply chains. If we are to meet these difficulties, we must employ some or all of the above methods. As a means of emphasising their significance in improving firm performance generally, the integration and influence of 3As SCM strategies have been studied primarily in the SC domain. (Bode & Wagner, 2015). Recently, several researchers have investigated the relationship between the 3As and the creation of more competitive supply chains.

The 3A tactic, however, served its purpose well before the Covid-19. Research on this pandemic's global impact led to the development of the 4A strategy (Agility, Adaptability, Alignment and lastly Ambidexterity). The 4A plan is discussed along with its potential to enhance port efficiency in Pakistan.

Role of Agility in MSCR

Supply chain partners are motivated to fast adjust to changes in consumer expectations since agility is defined as the "flexibility to quickly and easily adjust to fluctuations in supply and demand" (Mahajan & Tomar, 2021). Agility relies heavily on several factors, two of which are mobility and velocity. The ever-evolving needs of the market necessitate that businesses continually reinvest in the development of more flexible supply networks (Parast, 2020). Networks require creating and maintaining agility to rapidly design, manufacture, and transport commodities and

adapt to and sustain elevated degrees of unpredictability and turbulence. Therefore, it may be posited that:

H1: Maritime Supply Chain Adaptability has a positive and significant impact on Port Performance.

Role of Adaptability in MSCR

"Supply chain architecture modifications should be made to accommodate for the structural shifts in markets, and supply network designs should be flexible enough to accommodate for variations in business strategy, product lines, and consumer preferences," on the other hand, is the definition of adaptability .To be successful in today's fast-paced and ever-changing market (marked by worldwide economic, political, and social transformations as well as demographic and consumer demand changes), the dynamic nature of modern business environments necessitates supply chains with exceptional adaptive capabilities. Organizations must maintain flexible global supply networks that can transform in response to evolving market conditions, particularly during periods of significant disruption such as health crises or international trade tensions. While supply chain adaptability focuses on long-term structural adjustments, it differs fundamentally from agility, which primarily addresses immediate responsiveness to temporary fluctuations in market supply and demand patterns. This distinction highlights the dual nature of supply chain resilience: the capacity for both strategic evolution and tactical responsiveness. Therefore, it may be hypothesized as:

H2: Maritime Supply Chain Adaptability has a positive and significant impact on Port Performance.

Role of Alignment in MSCR

If businesses can "align the interests of all firms in their supply networks," they will be better able to coordinate and integrate supply chain activities while fairly sharing costs and benefits (Lee, 2004, p. 104). Indicative of the degree to which the organisation uses risk/revenue/cost-sharing contracts with its suppliers and consumers. (Wieland & Wallenburg, 2013). The responsiveness of an organisation, both now and in the future, is the primary focus of supply chain agility and adaptation. In contrast, supply chain alignment looks at how well a company and its suppliers cooperate to meet performance targets (often using shared incentives) (e.g., responding to changes). While "alignment" isn't widely used in today's papers, the concept was developed years ago when researchers identified the possibility of mutually beneficial partnerships between buyers and sellers. These ideas may be traced back to the origins of supply chain integration, cooperation, and coordination. The SC is seen in this context as an extension of the company. Analytics in the Supply Chain necessitates concerted effort from all of its constituent parts and consistency in mission, strategy, and practice. Hence it may be stated as:

H3: Maritime Supply Chain Alignment has a positive and significant impact on Port Performance.

Role of Ambidexterity in MSCR

To maintain long-term performance goals and both short-term efficiency, businesses and organisations need to be ambidextrous, or capable of balancing exploitation and exploration. In his review of the literature, (Tuan, 2016) identified three distinct ways of thinking about and describing ambidexterity. To begin, the structural ambidexterity method is a type of organisational design that divides exploration and exploitation into their distinct structural units (Aslam et al., 2018)

The exploration function falls under the purview of the marketing and sales departments, whereas the exploitation function is the purview of the purchasing department and other upstream organisations. This strategy proposes alternating periods of exploration and exploitation as preferable to constant pursuit of both (Ojha, Acharya, & Cooper, 2018).

Second, according to the contextual ambidexterity theory, ambidexterity is rooted in the specifics of each organisational unit (Aslam, Khan, Rashid, & Rehman, 2020). With this method, the entire company, not just the departments or divisions in charge of new business growth, has a deeper appreciation for the procedures necessary to facilitate efficient exchange. This strategy is widely used in the operations and supply chain management literature, so it may seem more practical and long-lasting than the temporal separation and structural models discussed before. Understanding ambidexterity as a greater concept that originates inside the exploitative and exploratory accomplishments of the organisation or business unit is the third major idea of this study (Tuan, 2016).

In contrast to structural and contextual ambidexterity, this view maintains that ambidexterity consists of the accomplishments of both exploitative and inquisitive types, which are only terms for the means by which this ambidexterity is achieved. An organization's or business unit's ambidexterity can be measured by its capacity to demonstrate both exploitation and exploration, an argument that has recently gained momentum in the operations and supply chain management literature (Aslam et al., 2020). Supply chain level contextual ambidexterity is viewed as a blend of SC-Alignment and SC-Adaptability. The ability to change supply chain architecture in response to shifts in the market while keeping all parties involved in the supply chain motivated is what we mean when we talk about "SC-Ambidexterity." Researchers have acknowledged the challenge of balancing alignment with adaptability, but they have maintained that doing so is the key to achieving sustainable competitive advantage (Tuan, 2016). Hence, it may be posited that

H4: Maritime Supply Chain Alignment has a positive and significant impact on Port Performance.

RESEARCH METHODOLOGY

This is a quantitative study. The precision of this research makes it useful. The raw numbers can be converted into meaningful statistics. The collected data is then utilised to test hypotheses drawn from the analysis. This research employs both primary and secondary sources of data. The primary data was acquired using the self-reported questionnaire (attached as Appendix A), while secondary data was gathered via a literature analysis of papers related to the independent and dependent variables. Fig 1 depicts the direct and indirect variables of our research.

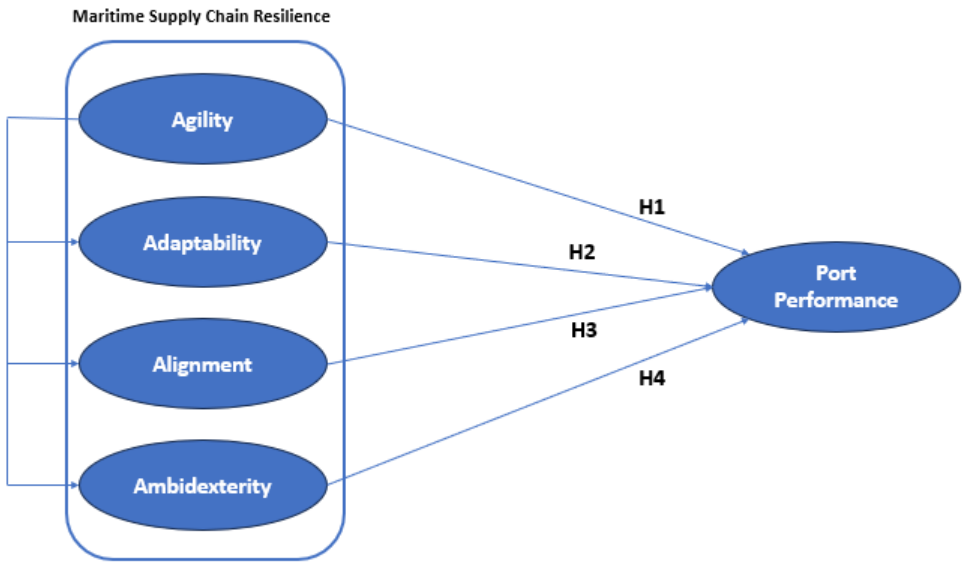

Figure 1: 4A (MSCR) impacting the port performance of a maritime supply chain

The demographic of interest was limited to Pakistanis employed in import/export and international trade roles within the Maritime Supply Chain sector. The majority of Pakistan's population is made up of supply chain industry experts. The information was gathered from 320 participants using an online survey. Participants were instructed to use a Likert scale ranging from 1 to 5 to record their opinions. After the survey was posted on Google Forms, I emailed each respondent with a link to the survey. At the very outset of the survey, we made sure to get the participants' permission to utilise their responses for research by asking a specific question (Alshurafat, al Shbail, & Mansour, 2021). With these two sections, a questionnaire with a five-point Likert scale was developed to collect the necessary information. In the first half of the research, demographic parameters such as age and

socioeconomic status were assessed; in the second half, 22 questions were used to analyse the factors determining maritime SC resilience.

A demographic breakdown of the research participants reveals distinct patterns in the study population. Analysis of the demographic distribution, performed through SPSS statistical tools, shows that men comprised the majority at 180 individuals, representing 56.25% of participants, while women accounted for 43.75% with 140 respondents. The study population displayed a notable youth concentration, with nearly three-quarters (70.3%) of subjects falling within the 18-25-year age bracket. Regarding professional background, more than half of the respondents (54.68%) possessed professional experience under five years. This distribution pattern offers valuable insights into the composition of the study group, highlighting its predominantly young, early-career characteristics with a slight male majority.

Table 1. *Demographic Table*

Demographic		**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
Gender	**Male**	180	56.25	56.25	56.25
	Female	140	43.75	43.75	100
Age	**18-25**	225	70.3	70.3	70.3
	25-35	95	29.7	29.7	100
Work Experience	**< 5 years**	175	54.68	54.68	54.68
	5-10 years	65	20.31	20.31	74.99
	10-20 years	50	15.62	15.62	90.61
	>20 years	30	0.093	0.093	100

Data Analysis

Before proceeding with statistical analysis, researchers must first establish the trustworthiness of their collected data through reliability testing. A fundamental metric in this process is Cronbach's alpha coefficient, which serves as a key indicator of measurement consistency. This statistical measure operates on a scale where 0.6 represents the minimum threshold for acceptable reliability. In practical terms, this translates to a requirement that the data demonstrate at least 60% consistency in its measurements. Should the alpha coefficient fall below this critical threshold, the dataset would be deemed unsuitable for meaningful analysis. In this research context, the computed Cronbach's alpha exceeded the 0.6 benchmark, thereby validating the dataset's suitability for comprehensive statistical examination and future research applications.

Table 2: *Coefficient of Reliability of Research Tool's Constructs*

Constructs	Items	Cronbach's Alpha
Agility	4	0.819
Ambidexterity	4	0.794
Alignment	4	0.816
Adaptability	4	0.679
Port Performance	6	0.657

Pearson Correlation Analysis

In statistical analysis, the measurement of variable relationships relies heavily on the correlation coefficient methodology, specifically through the implementation of Pearson's correlation technique. This mathematical approach examines data patterns through matrix computations, yielding numerical values within a defined spectrum of -1 to +1.

The interpretation of these coefficients follows a systematic framework: maximum positive association occurs at +1, indicating variables move in perfect synchronization. As coefficients trend toward +1, the direct relationship strengthens proportionally. Conversely, values approaching -1 demonstrate increasingly strong inverse relationships, where variables move in opposite directions. The midpoint of 0 represents complete independence between variables, signifying no discernible linear relationship.

Statistical significance in correlation analysis hinges on the p-value, denoted as the significance level. When this value falls below the critical threshold of 0.05, it confirms the statistical validity of the observed relationship. The correlation matrix demonstrates predominantly positive associations among the study variables, with coefficients clustering toward the positive end of the spectrum, suggesting moderate to strong positive relationships. The accompanying significance values, all registering below 0.05, validate these relationships as statistically meaningful rather than products of random chance.

Table 3. *Data Analysis Using Pearson Correlation*

		AG	AM	AL	AD	PP
AG	Pearson Correlation	1	.669**	.454**	.558**	.460**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	320	320	320	320	320
AM	Pearson Correlation	.669**	1	.702**	.633**	.330**
	Sig. (2-tailed)	.000		.000	.000	.000

	N	320	320	320	320	320
AL	Pearson Correlation	.454**	.702**	1	.658**	.221**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	320	320	320	320	320
AD	Pearson Correlation	.558**	.633**	.658**	1	.327**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	320	320	320	320	320
PP	Pearson Correlation	.460**	.330**	.221**	.327**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	320	320	320	320	320

Regression Analysis

Regression analysis is used to study the linear relationship between dependent and independent variables. It defines the extent to which a dependent variable is affected by the independent variable. It is an essential statistical test that leads to the conclusion of the research analysis. There are three main tests covered in the regression analysis, which are model summary, ANOVA, and co-efficient table.

Considering the model summary table the connection between the model summary and the dependent variable can then be determined. In the result table, the important result value is the R-value which shows the multiple correlation coefficient that highlights the variation within the dependent variable. A stronger variation is indicated by a higher R-value as stated by (Xu et al., 2020). Ideally, the R-value must be greater than 30% i.e., 0.3. Since the table below shows an R-value greater than 0.3, it shows that a substantial variation is developed in the dependent variable.

Table 4. *Model Summary Table*

Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.622[a]	.387	.377	.63586

a. Predictors: (Constant), AG, AD, AL, AM

Furthermore, research model significance is determined using the ANOVA table's significant value calculation and analysis. In order to conclude that a study model is significant, the sig value should be lower than 0.05.

Table 6. *Data Analysis Using ANOVA*

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	80.160	5	16.032	39.652	.000[b]
	Residual	126.955	314	.404		
	Total	207.115	319			

a. Dependent Variable: PP

b. Predictors: (Constant), AG, AD, AL, AM

The below coefficient table is used to examine the association between the independent and dependent variables. Beta values and sig values are taken into account in this table. Each independent variable's association with the dependent variable can be investigated by looking at the direction of the beta value. If beta is negative, then there is a negative or inverse connection between the independent and dependent variables. Similar to how a positive beta number indicates a direct and positive association between variables, a negative beta value indicates the opposite. A sig value is also included in this table. If the sig value is smaller than 0.05, it means that the association between the variables is statistically significant. The significance and direction of the link between variables are displayed in the table below;

Table 6. *Standardized and Non-Standardized Coefficients*

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.925	.204		4.527	.000
	AG	.176	.056	.207	3.170	.002
	AM	.065	.074	.067	8.880	.040
	AL	.020	.067	.020	2.290	.032
	AD	-.054	.073	.050	-.742	.458

a. Dependent Variable: PP

In the Table 7, the following results are deduced:

Table 6 shows that the significant value of Agility is 0.002 which is less than 0.05, which demonstrates a correlation between port performance and Agility. This tells us that with increasing agility the port performance can be enhanced as well. This means that an agile supply chain structure which is fast and efficient can improve port operations. Hence, it can be put as "the speed with which a port may make adjustments to its supply chain in response to new possibilities or threats." SC-Agility is an effective way to produce this quick and timely response. By implementing SC-Agility, ports can reduce instabilities and enhance their capacity for response in a dynamic environment.

The Sig value of Adaptability is 0.45 which is greater than 0.05. This shows that there is an insignificant relationship between adaptability and port performance. Therefore, its operational definition can be put forth as "the ability of a port to modify supply chain design to accept market structural changes and update the supply network." This tells us that for individuals working in the supply chain field, adaptability has little or no effect on Port performance in Pakistan. In the case of Pakistan according to the survey, ports are less equipped to adjust to new circumstances because they are less adaptable and more rigid than other infrastructures in the country, therefore adaptability does not have a significant impact on port performance.

Alignment has a lower Sig value than the threshold of 0.05, coming in at 0.032. This demonstrates the relation between port performance and alignment. This tells us that for individuals working in the supply chain field alignment of the supply chain has a significant effect on Port performance in Pakistan. Hence, it can be put forward as "how much the port uses risk sharing with its stakeholders to achieve its performance goals." This means that when ports are aware or aligned with the upcoming supplies coming to the ports, it can enhance their performance by prior planning of receiving, storing and clearing those consignments to their respective owners.

Ambidexterity has a lower Sig value than the threshold of 0.05, coming in at 0.002. This demonstrates the relationship between port performance and Ambidexterity. This tells us that for individuals working in the supply chain field, ambidexterity in the supply chain has a significant effect on Port performance in Pakistan. This means ports in Pakistan promote an ambidextrous environment for their operations. "Targeting new possibilities and include search, risk-taking and invention, involving exploration aim long-term success whilst those targeting exploitation are focused on short-term outcomes," is one way to describe ambidexterity. Which refers to ports working simultaneously with firms to develop exploitation of their current exploration and competences of new opportunities.

Conclusion and Recommendations

The purpose of this research was to provide a glimpse of supply chain disturbances and resilience approaches by presenting a review of the relevant literature. Initially, we conducted a thorough literature review via which relevant studies were identified. In the paper's second section, constructs were realized building up maritime supply chain resilience that may impact the port's performance. With the data collected and after analysis it can be concluded that in Pakistan context, agility, ambidexterity, and alignment play a significant role in building maritime supply chain resilience. Some of the researchers do consider adaptability plays an important role, therefore its influence on the supply chain cannot be neglected and as has been mentioned this domain still requires a lot of attention and research in Pakistan.

Adaptability in terms of alignment, flexibility, and the ability to lessen the blow of a disaster seem to be the pillars on which a future supply chain network will be built. To what extent 4As supply chain operations aid post-pandemic recovery from the consequences of COVID-19 disruptions is a vast topic and although researchers have conducted research in this field, there remain unexplored domains which still require to shed some light upon. This research paper fills a knowledge gap by investigating the role of contingency management in boosting port efficiency in Pakistan through the maritime supply chain. State Bank of Pakistan (SBP) data shows that in 2020, Pakistan's textile exports will total USD 12.8 billion, down from 2019.

Four capabilities including ambidexterity, alignment, adaptability, and agility (4As) were identified by (Patrucco et al., 2017) as being important to the potential of an emerging supply chain network in mitigating the impact of calamities.

Many supply chains will need to develop special modernized strategies in preparation for the future, even though at the moment supply chain organizations in Pakistan feel free to work and are pretty much working to some extent on the alignment, ambidexterity and agility, they must also promote adaptability to achieve resilient supply chain model. The 3As (Adaptability, Alignment and Ambidexterity) are crucial traits that supply chain strategies should reflect. If we are to meet these difficulties, we must employ some or all of the above strategies. Supply chain adaptability is a rapid response to short-term shifts in supply and demand. Agility relies heavily on several factors, two of which are mobility and velocity (Swafford et al., 2008). To design, manufacture, and move goods quickly while also dealing with and sustaining high levels of turbulence and unpredictability, networks require the development and maintenance of agility. The outcomes are a reduction in the frequency of artificial hazards, the prevention or mitigation of severe repercussions, and an increase in port resilience against natural hazards

References

Alshurafat, H., al Shbail, M. O., & Mansour, E. (2021). Strengths and weaknesses of forensic accounting: An implication on the socio-economic development. *Journal of Business and Socio-Economic Development, 1*(2). https://doi.org/10.1108/jbsed-03-2021-0026

Aslam, H., Blome, C., Roscoe, S., & Azhar, T. M. (2018). Dynamic supply chain capabilities: How market sensing, supply chain agility and adaptability affect supply chain ambidexterity. *International Journal of Operations and Production Management, 38*(12). https://doi.org/10.1108/IJOPM-09-2017-0555

Aslam, H., Khan, A. Q., Rashid, K., & Rehman, S. ur. (2020). Achieving supply chain resilience: The role of supply chain ambidexterity and supply chain agility.

Journal of Manufacturing Technology Management, 31(6). https://doi.org/10.1108/JMTM-07-2019-0263

Ahmad, S., Ahmad, A., Shair, W., & Bhatti, M. A. A. (2022). Unlocking Pakistan's Youth Potential: A Comprehensive Analysis of Youth Development Indices and Strategic Alignment with the UN Sustainable Development Goals. *Journal of Professional Research in Social Sciences, 9*(2), 80-95.

Akbar, A., Ahmad, S., Nadim, M., Bhatti, M. A. A., & Khan, H. (2024). Affect of Hrm on Employee Motivation Towards Green Creativity and Initiatives. *Center for Management Science Research, 2*(3), 197-216.

Azadegan, A., Mellat Parast, M., Lucianetti, L., Nishant, R., & Blackhurst, J. (2020). Supply chain disruptions and business continuity: An empirical assessment. *Decision Sciences, 51*(1). https://doi.org/10.1111/deci.12395

Bode, C., & Wagner, S. M. (2015). Structural drivers of upstream supply chain complexity and the frequency of supply chain disruptions. *Journal of Operations Management, 36*. https://doi.org/10.1016/j.jom.2014.12.004

Creswell, J. W. (2010). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (4th ed.). Pearson Merril Prentice Hall.

el Sayed, S. A., & DeLoach, C. (2014). Re: Author - An empowering narrative art therapy program for adolescent survivors of childhood abuse. In *ProQuest Dissertations and Theses*.

Gomez, F. C., Trespalacios, J., Hsu, Y. C., & Yang, D. (2022). Exploring teachers' technology integration self-efficacy through the 2017 ISTE standards. *TechTrends, 66*(2). https://doi.org/10.1007/s11528-021-00639-z

Khan, S. A., Kusi-Sarpong, S., Naim, I., Ahmadi, H. B., & Oyedijo, A. (2022). A best-worst-method-based performance evaluation framework for the manufacturing industry. *Kybernetes, 51*(10). https://doi.org/10.1108/K-03-2021-0202

Krijger, P. H. L., Hoek, T. A., Boersma, S., Donders, L. I. P. M., Broeders, M. M. C., Pieterse, M., Toonen, P. W., Logister, I., Verhagen, B. M. P., Verstegen, M. J. A. M., van Ravesteyn, T. W., Roymans, R. J. T. M., Mattiroli, F., Vandesompele, J., Nijhuis, M., Meijer, S., van Weert, A., Dekker, E., Dom, F. J., … Tanenbaum, M. E. (2021). A public–private partnership model for COVID-19 diagnostics. *Nature Biotechnology, 39*(10). https://doi.org/10.1038/s41587-021-01080-6

Laulita, N. B. (2020). Influence of organizational culture on supply chain performance by moderating the effect of transformational leadership in manufacturing companies in Riau Island Province. *Journal of Business Studies and Management Review, 3*(2). https://doi.org/10.22437/jbsmr.v3i2.9760

Lotfi, M., & Saghiri, S. (2018). Disentangling resilience, agility, and leanness: Conceptual development and empirical analysis. *Journal of Manufacturing Technology Management, 29*(1). https://doi.org/10.1108/JMTM-01-2017-0014

Mahajan, K., & Tomar, S. (2021). COVID-19 and supply chain disruption: Evidence from food markets in India. *American Journal of Agricultural Economics, 103*(1). https://doi.org/10.1111/ajae.12158

Montoya, C. J. R., & Flores, J. L. M. (2021). Contingency plan in the supply chain of companies in the retail industry in the face of the impacts of COVID-19. *Advances in Science, Technology, and Engineering Systems, 6*(1). https://doi.org/10.25046/aj060191

Ojha, D., Acharya, C., & Cooper, D. (2018). Transformational leadership and supply chain ambidexterity: Mediating role of supply chain organizational learning and moderating role of uncertainty. *International Journal of Production Economics, 197*. https://doi.org/10.1016/j.ijpe.2018.01.001

Pallant, J. (2001). *SPSS survival manual: A step-by-step guide to data analysis using SPSS for Windows* (version 10). Open University Press.

Parast, M. M. (2020). The impact of R&D investment on mitigating supply chain disruptions: Empirical evidence from U.S. firms. *International Journal of Production Economics, 227*. https://doi.org/10.1016/j.ijpe.2020.107671

Paraušić, V., Cvijanović, D., Mihailović, B., & Veljković, K. (2014). Correlation between the state of cluster development and national competitiveness in the global competitiveness report of the World Economic Forum 2012–2013. *Economic Research-Ekonomska Istrazivanja, 27*(1). https://doi.org/10.1080/1331677X.2014.974917

Patrucco, A., Luzzini, D., Moretto, A., & … (2017). Attraction in business relationships: The strategic relevance of customer attractiveness to improve supply performance. *Institute Annual Meeting*.

Power, R. C., Salazar-García, D. C., Wittig, R. M., Freiberg, M., Henry, A. G., Willekes, C., 霍巍, Dalgleish, T., Williams, J. M. G., T. M., Golden, A.-M. J., Perkins, N., Barrett, L. F., Barnard, P. J., Au Yeung, C., Murphy, V., Elward, R., Tchanturia, K., Watkins, E., Yang, X. X. X., … Fraser, S. (2015). *西藏草场资源与放牧制度*. *Journal of Archaeological Science, 39*(1).

Rezaei, S., Harandi, A., Brepols, T., & Reese, S. (2022). An anisotropic cohesive fracture model: Advantages and limitations of length-scale insensitive phase-field damage models. *Engineering Fracture Mechanics, 261*. https://doi.org/10.1016/j.engfracmech.2021.108177

Rojo, A., Llorens-Montes, J., & Perez-Arostegui, M. N. (2016). The impact of

ambidexterity on supply chain flexibility fit. *Supply Chain Management, 21*(4). https://doi.org/10.1108/SCM-08-2015-0328

Rafaqat, M. ., Azad, F. ., Ahmad, S. ., Aijaz, K. ., Ikram, S. H. ., Bashir, U. ., Bhatti, M. A. A. ., & Saeed, S. . (2024). Impact of Governance and Strategy Performance on Employer Branding. *Research Journal for Societal Issues, 6*(2), 852–867.

Scheibe, K. P., & Blackhurst, J. (2018). Supply chain disruption propagation: A systemic risk and normal accident theory perspective. *International Journal of Production Research, 56*(1–2). https://doi.org/10.1080/00207543.2017.1355123

SEC Releases. (2001). Report of investigation pursuant to section 21(a) of the Securities Exchange Act of 1934 and commission statement on the relationship of cooperation to agency enforcement decisions. *SEC Releases*, 1470.

Sekar, S., & Hooker, R. (2020). Supply chain resilience on business continuity programs: The role of anticipated, inherent, and adaptive resilience: An abstract. In *Developments in Marketing Science: Proceedings of the Academy of Marketing Science*. https://doi.org/10.1007/978-3-030-39165-2_241

Tuan, L. T. (2016). Organisational ambidexterity and supply chain agility: The mediating role of external knowledge sharing and moderating role of competitive intelligence. *International Journal of Logistics Research and Applications, 19*(6). https://doi.org/10.1080/13675567.2015.1137278

Whitten, G. D., Green, K. W., & Zelbst, P. J. (2012). Triple-A supply chain performance. *International Journal of Operations & Production Management, 32*(12).

Wieland, A., & Wallenburg, C. M. (2013). The influence of relational competencies on supply chain resilience: A relational view. *International Journal of Physical Distribution and Logistics Management, 43*(4). https://doi.org/10.1108/IJPDLM-08-2012-0243

Yang, Y. C., & Chang, W. M. (2013). Impacts of electric rubber-tired gantries on green port performance. *Research in Transportation Business and Management, 8*. https://doi.org/10.1016/j.rtbm.2013.04.002

Yoon, J., Talluri, S., Yildiz, H., & Ho, W. (2018). Models for supplier selection and risk mitigation: A holistic approach. *International Journal of Production Research, 56*(10). https://doi.org/10.1080/00207543.2017.1403056