The correlation between resilience (suppliers' characteristics) and supply chain disruption: Evidence from dairy SMEs in Pakistan

Nadeem Hussain[1] Zuhaib Asghar[2]

Received: 13/07/2019 Accepted: 16/09/2019
Online Published: 28/10/2019

Abstract

This quantitative study examines the correlation between suppliers' characteristics (resilience) and supply chain disruption process. The dimensions of resilience include; persistence, agility and adaptability while supply chain disruption contains frequency and cost. Through deductive reasoning in this cross-sectional research design the total of 31 employees working in the diary SMEs in Pakistan were approached using purposive, convenience, referral and networking approach. The self-administered survey questionnaire developed on 5-points Likert scale was emailed to respondents. Results confirmed that adaptability's magnitude of the coefficient of correlation with frequency as well as cost is strong and positive while persistence has positive moderate correlation with both components of disruption; cost and frequency. The correlation of adaptability and persistence with supply chain disruption is statistically significant. Furthermore, regression analysis confirmed that both; persistence and adaptability have significant impact of the supply chain disruption. Agility has positive weak moderate magnitude while the correlation is insignificant. Furthermore, agility have no significant impact on the supply chain disruption process.

Keywords: Adaptability, Agility, Persistence, Dairy SMEs, Supply Chain Disruption

JEL Classification: L25, L29, M11, M19

1. Introduction

This quantitative research investigates the correlation between supplier's characteristics (resilience) and supply chain disruption process in the dairy SMEs operating in different regions of Lahore, Pakistan.

1.1 Overview and Background:

Christopher (2005) explained that produced goods and services results from the various activities forming organisational network, which is also regarded supply chain. These set of activities improve the product and service's value (Davarzani, Zegordi & Norrman, 2011). Nevertheless, the resilience incurs throughout the year creating challenges due to the complexities in the process of supply chain and inclined scale of operation. There are number of researchers that have established the relationship between suppliers' characteristics and disruption process of supply chain (Davarzani et al., 2011; Hussain et al., 2015; Rana et al.,

[1] University of Wales Trinity Saint David – London, Winchester House, 11 Cranmer road, Oval, SW9 6EJ, London, United Kingdom, hussain.nadeem4545@gmail.com
[2] Ilma University, Korangi Creek Rd, Korangi Creek, Karachi, Karachi City, Sindh, Pakistan, zuhaib_asghar@yahoo.com

2015). However, these studies were commenced on the large enterprises while there is no conclusive evidence from the SMEs perspective. Additionally, the diary businesses in Pakistan is experiencing fluctuation (SMEDA, 2017).

The official report of Small and Medium Enterprise Development Authority (SMEDA) revealed that there are no traces of gradual increase or decrease in number of suppliers but at certain timeframe there are fluctuations (SMEDA, 2017). For instance, same report revealed that in the third quarter of 2015 (July to September) significant rise in suppliers evident while in the fourth quarter (October to December 2015) large decline in the number of suppliers. Following year third-quarter remained steady but last quarter of 2016 had escalated number of suppliers in cities. These suppliers' characteristics are also regarded as resilience and it differs in nature. Hence, there are variations and currently there is no conclusive evidence regarding the reason behind discrepancies in suppliers' number, which is causing supply chain disturbance.

1.2 Research Problem:

Small and Medium Sized Enterprises (SMEs) involved in the dairy products has experienced drastic changes in terms of adoption of strategies, potential challenges as well as number of suppliers have altered in recent times (Hussain et al., 2015; SMEDA, 2017). The strategic supply chain management is significant positively affected by the factors supporting SCM, practices of SCM, and determinants of SCM (Kot, Haque, & Kozlovski, 2019). Nevertheless, in the context of dairy SMEs operating in the metropolitan cities have experienced changes in multi-dimensions. Moreover, there is no trace from the literature regarding which characteristic of supplier (persistence, adaptability and agility) causes higher disruption in supply chain and vice versa.

1.3 Research Question:

After identifying the research problem, following is the main research question has been developed:

"Does the suppliers' characteristics significantly affect the cost and frequency of supply chain disruption?"

Sub-questions are as following:

Q1: Is Agility – resilience significantly affecting the cost and frequency of supply chain process?

Q2: Is persistence – resilience significantly affecting the cost and frequency of supply chain process?

Q1: Is Adaptability – resilience significantly affecting the cost and frequency of supply chain process?

1.4 Research Aim:

The aim is *"to investigate the impact of characteristics (resilience) of suppliers on the dairy SMEs' supply chain disruption"*.

1.5 Research Objectives:

The objectives of this research are as following:

- To identify the correlation between suppliers' characteristics (resilience) and supply chain disruption's cost and frequency.
- To establish the nature of relationship between suppliers' (resilience) characteristics including; persistence, adaptability and agility affecting the cost and frequency of supply chain process in dairy SMEs of Pakistan.
- To critically evaluate and conclude the nature and impact of the resilience on the cost and frequency of supply chain process in dairy SMEs of Pakistan.

1.6 Rationale:

The limited evidence at hand regarding the relationship between suppliers' characteristics and the disruption process (Davarzani et al., 2011), resilience (Hamel et al., 2003), adaptability (Higgins et al., 2013), and persistence (Walker & Salt, 2012) lead to formation of theory to test different variables within one construct. Thus, this study delimits earlier limitations. Moreover, this study explores the relationship in SMEs, which is less explored, hence, this study enhances the body of knowledge in new dimension.

1.7 Scope and Significance:

This quantitative study expands the scope by investigating the different sub variables within one construct. The managers and SMEs benefits from this research as this study opts for statistical tool for analysing the relationship. It serves a foundation for improving the procedures and policies of the organisation. Moreover, the professionals would benefit from this study as the implications could be used to overcome the resilience causing disruption in supply chain. The present study enhances the knowledge by providing the statistical evidence for various sub-variables within one construct.

2. Literature Review

2.1 Supply chain Process:

Vast literature has explained supply chain process as the strategies and procedures undertaken by the organisations in order to ensure that cost effectively and efficiently the supply chain operations are carried (Croxton et al., 2001; Hammer, 2001; Monczka & Morgan, 1997). On the other hand, Harrison (2001) defined it as the all set of activities of supply chain, which organisations intake for transforming the raw material into finished items. However, the process is complex in nature and therefore faces different challenges and obstacles. This leads to explore the disruption in the supply chain.

2.2 Supply chain disruption:

Dutta & Vandermeer (2011) argued that in the modern era, additional vulnerability is evident in the supply chain due to complexities and lean approach's contribution towards development of networking. Various strategies such as reduction in inventory, noncore activities' outsourcing, and design formation having sourcing globally while restricting suppliers are undertaken by the managers in order to have optimal supply chain design (Kearney, 2003). However, due to such steps the process has resulted in making supply chain process more vulnerable (Dutta & Vandermeer, 2011).

Nowadays, organisations are more dependent on the association, collaboration and networking with partners all over the globe while ensuring that accurate and precise quantity of items and inventories are delivered by the suppliers on right location in cost-effective way during the volatile market exerting cost pressure, which affects the entire supply chain activities (Dutta & Vandermeer, 2011). The unexpected disruptions on a large scale due to extensive complexities, especially when organisations make an attempt to have worldwide supply chain network, reduction in the inventory at hands, and the lack of terminations essential to reduce operational cost so that business can operate (Harrison, 2001). Number of researchers have shown deep interest in the topic by investigating that disruptions within the supply chain is likely due to organisation's inability to find a right match between required demands and supply at hand (Billington et al., 2002; Fisher 1997; Kilgore 2003; Lee et al., 1997; Radjou 2002).

The research survey of MIT (2003) revealed that unexpected disruption leads to create the situation of resilience, by which the potential response emerges so that supply chain network and operational standards are restored (cited from Saenz & Revilla, 2014). In simple words, the problems in the supply chain arise due to organisation's approach for attaining optimal efficiency in the transformation of raw material into finished items. Additionally, Christopher & Peck (2004) explained that resilience is the ability of the organisation to recover from the challenges and difficult situations. After the disruption, organisation having strong resilience would bounce back by having the most innovative approach so that progress is greater than the caused problem (Christopher & Peck, 2004). Now that the resilience and disruption is briefly explained. The next step is exploring the cost and frequency of supply chain process.

2.3 Cost and frequency of supply chain process

Caniato et al., (2009) stated that cost and frequency of supply chain is mainly evident in the disruption of process and it includes five types; namely, cost and frequency associated with facilities, transportation, demand, communication, and supply. Zhang & Figliozzi (2010) argued that the cost of disruptions is attempted to be minimized with the widespread information and the new strategic developments, however, these implementations and information have remained less effective in preventing disruption cost to large extent. Similarly, the frequency of supply chain is affected with the change in the external environment because with the flux and variation in the demand, lead to unbalance the flow of operation (Christopher & Peck, 2004). A survey of Klie (2006) revealed that over 80 percent organisations are highly concerned about the disruptions and resilience in the supply chain process, especially the cost and frequency aspects but only 11 percent organisations have successfully implemented practical solutions to minimize the disruptions in terms of cost and frequency (cited from Urciuoli, 2015). Interestingly, Figliozzi & Zhang (2010) argued that the cost and frequency vary for the type of the organisations, but they mainly consist of the inability of the organisation in tackling the agendas of vulnerability, labour dispute, excessive stock, unable to meet demands, stock-outs and failing to deliver items of time. The vast literature has confirmed that the cost and frequency are attributes of the disruptions and they significantly affect the economy of the country by delayed operations (Brooks & Button, 2006; Figliozzi & Zhang, 2010; Wilson, 2009). Thus, cost and frequency as attributes of disruptions are examined through the resilience.

In this study, resilience is considered as the tendency or potential of the organisation to sustain

control on the performances despite the variations caused by the disruptions in the supply chain process. Hence, it reflects that the adaptability is one key attribute of resilience in this study to cope up with the uncertainties arising from the shifts in the environment, especially the uncertain demands. Additionally, the consistency to stick with the appropriate approach reflects the persistence (another attribute of resilience) whereas quickness to act is regarded as agility of the organisation to deal with supply chain disruptions.

2.4 Resilience

Resilience is viewed differently such as, "the capability to maintain required functions and outcomes within the strain" (Bunderson & Sutcliffe, 2002), "firm's adaptability via its energetic capability to increase with the passage of time is resilience" (Wildavsky, 1988) "the competence to return back from the inconvenient proceedings" (Sutcliffe & Vogus, 2003), and "constructive variation within the demanding circumstances" (Worline et al., 2002). Hence, it can be concluded that resilience perhaps might not be static feature which organisation acquire. In comparison, the process' result which enables organisations in preserving resources through storable, flexible, adaptable and agile to ensure the disruptions are catered (Worline et al, 2004; Sutcliffe & Vogus, 2003). The firms having resilience are ready for disruption through proactive approach so that there is nominal setback and enhance the efficiency to deal with the issues effectively (Mitroff & Alpasan, 2003). Nevertheless, Anderson (2003) explained that there is difference between resilience and recovery by stating that, remarks that, there is distinction between recovery and resilience, one is being restoring to normal situation while other being adaptable to changes (cited from Tang, 2006). Coutu (2002) defined it as, *"resilience is a response, a method of confronting and understanding the world. It is a capacity to be flexible and return from the difficulty"* (p. 55). After explaining resilience, the next section explores the resilience characteristics of suppliers within supply chain.

2.5 Suppliers' characteristics (resilience) in supply chain:

In this study, the focus is on the resilience is considered as the suppliers' characteristic in supply chain in order to investigate the impact of these attributes on the frequency and cost (attributes of disruption). There are different features identified as suppliers' resilience such as, persistence (Alcantra, 2014; Allen, Dutta & Christopher, 2006), agility (Allen et al., 2006), and adaptability (Higgins, 2013; Lee, 2004). Therefore, all these three attributes are examined in this study.

2.5.1 Persistence

Persistence reflects the ability to remain consistent with the same procedures and patterns in the supply chain management (Christopher & Lee, 2002). On the other hand, Alcantara (2014) argued that it is the most frequently type of resilience among the suppliers' characteristic within the supply chain reflecting the quality of continuing with the same methods. Nevertheless, Allen et al., (2006), it is prolonged state within the supply chain while in the face of disturbance. Predictably, persistence is a term which is closely associated with the risk management and naturally emerging uncertainties of supply chain (Lee, 2002; Christopher & Lee, 2005). Conversely, Walker and Salt (2012) explained the persistence as, the ability to follow parallel systematic procedure in order to regain from interruption within the supply chain process, however, at all stages, remain in accordance with the difficult nature of managing supply chain

activities. Alcantara (2014) considered it as the most important feature interlinked with disruption whereas Harrison (2001) found it insignificantly linked with supply chain disruption. Therefore, there are mixed findings, reflecting no conclusive evidence from the dairy SMEs' perspective.

2.5.2 Agility

The second commonly found resilience type within the suppliers' characteristics is regarded as agility. Allen et al., (2006) argued that it is the quickness of the organisation via creating strong network, which enables it in quickly responding to the flux and changes in the environment. On the other hand, Harrison (2001) explained it as the promptness to react to constantly changing situations. Visibility and velocity are two commonly used techniques for measuring and determining agility (CLSCM, 2003). Visibility indicates to end-to-end observing ability of associates engaged in the process of supply chain while velocity is considered as rapidity and quickness through which substance move from department to department in supply chain process (CLSCM, 2003). Hence, both are equally important for measuring firm's agility. Additionally, Dong et al., (2009) confirmed that physical and virtual are the natures of both networks engaged in the supply chain process. Gilgor et al., (2013) found that agility has a vital impact on the cost and frequency of supply chain disruption. On the other hand, Rai et al., (2006) found no role of agility in relation to the supply chain disruption. Interestingly, agility is measured through dimensions such as, alertness, decisiveness, flexibility, accessibility, and flexibility (Gilgor et al., 2013). However, in the context of diary SMEs, there is no conclusive evidence regarding the role of agility in relation to supply chain disruption.

2.5.3 Adaptability

Third considered dimension of resilience (supplier' characteristic) undertaken in this study is adaptability. Higgins et al., (2013) explained it as the capability of the organisation to evolve and shape up according to the rapidly dynamic environment so that the demands of the situation are met in appropriate manner. Conversely, Lee (2004) described it as the grasping tendency of the organisation to consider all aspects from modernized/advanced technology and on-going social trends in order to compete in the intense competitive environment. Nevertheless, the adaptableness is effective to fulfil the requirements of social, technological, and environmental changes and opting for the most appropriate method to ensure that the customer's needs and demands are met at all stages of the product/services development (Melnyk et al., 2013). In the time of complexities and disruptions, experts of the resilience believe that adaptability is the most essential feature to survive in the dynamics (Alcantara, 2014). The study of Alcantara (2014) found the positive association between adaptability to survive in supply chain disruption. On the other hand, Harrison (2001) found no significant role of adaptability to overcome the supply chain disruption. Interestingly, Faizan & Haque (2015) found that bullwhip effect causes problem in supply chain activities, but there is no evidence that adaptability helps the SCM in overcoming those problems. However, this indicates that there is no conclusive evidence about their relationship.

2.6 Gap in Literature

From the above critical discussion, it is evident that there is no conclusive evidence regarding

the nature and strength of the relationship between the suppliers' characteristics and supply chain disruptions. Moreover, the discussion showed both sides as some literature confirmed the relationship while other opposed it. Additionally, there is no conclusive evidence from the dairy SMEs. Thus, although, the previous empirical studies do provide the foundation for developing theoretical framework but there is still no concrete evidence to affirm or oppose the role of most dominant or least visible attribute of the resilience interlinked with the supply chain disruption. Therefore, based on the identified gap in the literature, following hypotheses are proposed:

2.7 Research Hypotheses

The research hypotheses are as following:

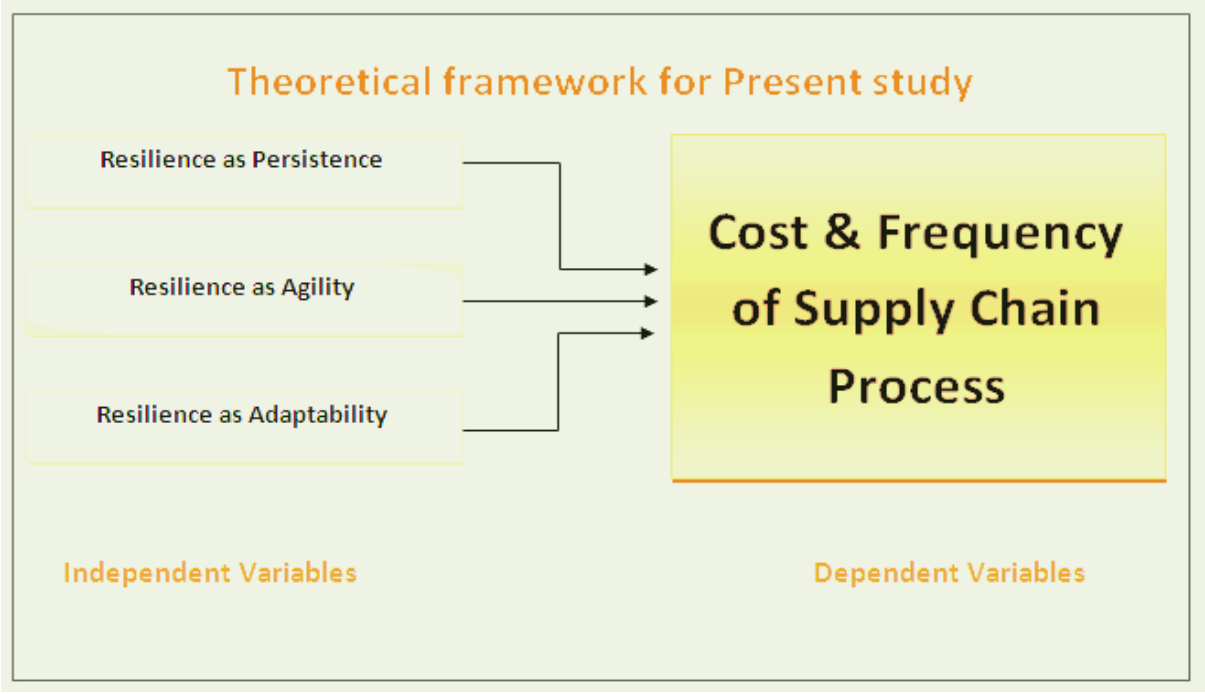
H1: There exist no statistically significant correlation between the suppliers' characteristics (resilience) and cost and frequency of supply chain disruption.

H2: Agility does not significantly affect the cost and frequency of supply chain process.

H3: Persistence does not significantly affect the cost and frequency of supply chain process.

H4: Adaptability does not significantly affect the cost and frequency of supply chain process.

2.8 Theoretical framework



Source: *Self-constructed theoretical framework*

3. Research Methodology

3.1 Research Paradigm

Research paradigm is a set of patterns containing concepts and prepositions of raw collection flowing in logical way reflecting researcher's stance in commencing research (MacKenzie & Knipe, 2001). Ontology, epistemology and methodology are key components of research

paradigm (Mack, 2010). Positivist and socio-anthropological are two types of paradigm where one largely related to quantitative while later deals with qualitative studies (Mack, 2010). Since, the present study follows quantitative analysis for measuring the relationship between research variable through numeric expression, thus, this study falls into 'positivist paradigm'. The starting point is ontology in for exploring the reality (Patton, 2002). This research has critical realism stance as the study is within the business philosophy for explaining the reality of the relationship between variables. Castellan (2010) argued that the nature and relationship of perceived reality is regarded as epistemology. This research considered objectivist epistemological stance because the information (perceived reality) is attained in objective manner from the participants. Furthermore, quantitative method is used to expand the body of knowledge by ensuring empirical confirmation drives and test research hypothesis.

3.2 Research Philosophy

Research philosophy Saunders, Lewis, and Thornhill (2012) proposed a 'research onion' that is used by researchers to systematically commence research. The first layer of research contains research philosophy. It serves a foundation for researchers to follow a pattern (Sekaran & Bougie, 2012). For inductive approach, most ideal philosophy is interpretivism and positivism philosophy is suitable for deductive approach whereas post-positivism philosophy follows both depending on the nature of research; inductive as well deductive approach (Denzin & Lincoin, 2003; Hatch & Cuncliffe, 2006; Sekaran & Bougie, 2012). Eriksson & Kovalainen (2008) argued that post positivism philosophy considers objective knowledge from the experiences of subjects. In this study, researcher aim to explore the connection between the attributes of female representation at corporate hierarchy and firm's competitiveness and deductive approach is followed therefore it is appropriate for present study.

3.3 Research Approach

Deductive, inductive and abductive are three different approaches commonly used in social science researches (Bryman & Bell, 2015; Saunders et al., 2013). Deductive reasoning follows the pattern of deducing information to reach specific conclusion (Bryman & Bell, 2015). This approach is frequently used in quantitative studies. On the other hand, inductive reasoning involves inducing information to explore phenomenon (Sekaran & Bougie, 2012). Qualitative studies follow inductive reasoning whereas abductive reason is based on the occurrence of surprising facts and combines the attributes of both; inductive and deductive reasoning (Bryman & Bell, 2015). Deductive approach is taken to reach specified conclusion while abductive and inductive reasoning is more on the exploration of occurrence. In this study, deductive approach is taken because the research is commenced to reach specific conclusion and additionally, the quantitative methods are used to express the relation in numeric. Hence, deductive reasoning approach is most suitable for present research.

3.4 Research Design

Sekaran & Bougie (2012) categorized research design into cross-sectional and longitudinal design. Cross-sectional is used for shorter length while participants only once participate whereas longitudinal studies commence for more than year with participants' participation more than once (Laurie & Lynn, 2009; Sekaran & Bougie, 2012). This study was completed in less

than six months while the survey was commenced only once with the participants therefore, cross-sectional research design is more appropriate for this study.

3.5 Research Instruments

Different research instruments are used for investigating research problem (Walliman, 2001). The type of instrument depends on the nature of research as it is significant in gathering data regarding identified research problem (Sekaran & Bougie, 2012). It is very important to select the right type of instrument for exploring the research variables in adequate desired pattern (Bryman & Bell, 2015; Saunders et al., 2013; Sekaran & Bougie, 2012). Survey questionnaire, observation, case study, and interviews are most commonly used research instruments (Sekaran & Bougie, 2012). The quantitative studies use widely the survey questionnaire while interviews are frequently used in qualitative studies (Saunders et al., 2013). Since this study is quantitative in nature by focusing on statistical tools to establish the relationship between variables so that it can be expressed in numeric. Therefore, survey questionnaire is considered as research instrument. The questionnaire is divided into two parts; (A) demographic information and (B) questions related to research variables. The self-developed semi-structured survey questionnaire is driven from the literature at hand. For part B, 5-point Likert Scale was used where 1=Strongly disagree while 5=Strongly agree. The questionnaire was personally sent to the respondents through e-mails.

3.6 Pilot Study

Thabane et al., (2010) explained that before commencing quantitative research on a large scale, the pilot study is often carried out so that the feasibility of research instrument is checked. It is also a pre-testing to avoid the misuse of money and time because it can cost the process (Eldridge et al., 2016). Additionally, it helps the researcher in ensuring research reliability protocol and assessing the issues in adapting considered methodology (Teijlingen van & Hundley, 2001). In this research, the pilot study was commenced by circulating total six questionnaire in the supply chain department of Medina Dairy, London. This organisation was selected on the basis of convenience and networking. The pilot study was to ensure that the research instrument is adequate such as the language and flow of questions were checked. This helped in the fine tuning of the research instrument.

3.7 Target Population

In this study, small and medium sized enterprises (SMEs) involved in dairy businesses are targeted population for investigating the research problem. By narrowing it further, main research area is the local dairy businesses in Lahore (Pakistan). The research is to examine the impact of characteristics (resilience) of suppliers on the supply chain disruption within the diary businesses therefore, the target population includes all the employees working in the supply chain department of the targeted local dairy SMEs in Lahore. As the researcher has previously worked in the dairy SMEs and has close links to reach target audience, therefore, using the strategy of earlier studies such as Faizan et al. (2019), Haque & Aston (2016), Haque, Aston & Kozvlovski (2018), Haque, Kot & Imran (2019), Imran, Haque & Rębilas (2018), and Haque & Oino (2019) networking approach and convenience sampling technique, this target population is reached in this study. Only supply chain department's personnel are included

because the study mainly deals with the supply chain disruption process and such personnel have more knowledge and experience about it in comparison to other departments.

3.8 Sample Size

According to Sekaran & Bougie (2012), "sample size is the sub-set of population". It is a true representative of the population as the study of entire population is difficult therefore, only some events are studied to generalize results to all (Hair et al., 2007). There are different studies arguing about the right size of the sample, however, Roscoe (1979) argued that, "as a rule of thumb, sample size should be between 30 to 500 for drawing conclusion" (cited from Sekaran & Bougie, 2012). In this cross-sectional research, it was ensured that the Roscoe's criterion is met, thus, the survey was circulated among 80 respondents. Total 31 were received filled and completed, which is above 30 therefore, sufficient to draw conclusion. Moreover, the response rate is 38.75%, which is acceptable in social science studies.

3.9 Sampling Techniques

"Probability and non-probability are two main types of sampling technique" (Sekaran and Bougie, 2010). In probability, the chances of selection for all events are equal while unequal chances of selection for event are in the non-probability (Gingery, 2009). Both sampling techniques have its advantages and disadvantages (Brown, 2006; Hair et al, 2007). In this research, both are combined as the stratified (probability) sampling technique is used to make strata in terms of regions in the Lahore such as; east, west, north and south. Thus, equally 20 each survey was distributed to have overall 100% from entire Lahore. This helped in the attainment of higher generalization of findings. Moreover, the convenience and referral (non-probability sampling techniques) were used to select the organisations. This proved to be cost-effective technique because it saved time, money and other resources.

3.10 Statistical Test

In this study, for statistical analysis, the SPSS 25.0 was used. The Shapiro-Wilk test for the normality assumption was run to select from parametric and non-parametric test (Faizan, Nair & Haque, 2018; Haque, Faizan & Cockrill, 2017). The obtained value scored 0.861, which is greater than alpha, confirming data is normally distributed therefore, parametric test was preferred over non-parametric test. Hence, Pearson's correlation for association of research variables and regression for predicting the variation caused by independent variables on dependent variable.

3.11 Reliability and validity

According to Healy & Perry (2000), reliability in statistics reflect the consistency of results. Inter-rater is a reliability test used in the quantitative studies to measure the internal consistency of items on scale (Tavakol & Dennick, 2011). In this research, Cronbach's alpha (inter-rater) reliability test for checking the items are aligned on the scale (Urbański et al. 2019). The incurred value of 0.78 reflects that the internal consistency is acceptable. On the other hand, Patton (2001) defined valid as accuracy in the methods, tools and procedures. In this study, the content and construct validity were attained by reviewing the literature and using most updated

one. Moreover, the use of pilot-study was part of validity to ensure that instrument is valid. Additionally, using Pallant (2014) dimension reduction approach, the exploratory factor analysis was carried out for checking validity. The KMO & Bartlett test value 0.784, reflect validity while extraction of variance confirmed that 2 out of 5 items on the scale explained over 61% of the variance. Thus, the instrument and procedures are valid.

3.12 Ethical considerations

Ethical consideration is important part of research, which reflects that the adopted practices are acceptable (Resnik, 2015). As part of ethical consideration, the participants were informed about the academic purpose of research. They were also informed that their participation will be voluntary, and no reward will be given against participation. The total time of survey was stated, and they were given the option to leave anytime if they feel to quit it. Moreover, they were ensured that shared information will remain confidential and their anonymity will be maintained.

4. Results and Discussion

4.1 Reliability

Table 4.1 Case Processing Summary

		N	%
Cases	Valid	31	100.0
	Excluded[a]	0	.0
	Total	31	100.0

a. Listwise deletion based on all variables in the procedure.

Table 4.2 Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.782	.789	5

Cronbach’s alpha = 0.782, which is higher than threshold value 0.70, reflecting that there is acceptable internal consistency. In other words, the items of the scale are aligned and therefore, the instrument has acceptable reliability.

4.2 Validity

In order to ensure the validity of instrument, the dimension reduction option is used to explore the factor analysis option. Hence, KMO and Bartlett’s test and total variance explained are statistical tests to measure the validity aspect.

Table 4.3 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.784
Bartlett's Test of Sphericity	Approx. Chi-Square	22.654
	Df	10
	Sig.	.012

The KMO and Bartlett's test scored 0.784, which is greater than threshold value = 0.70, reflecting that the model is a good fit for the analysis. In other words, the goodness of model is acceptable and valid (Field, 2017).

Table 4.4 Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.752	35.047	35.047	1.752	35.047	35.047
2	1.323	26.467	61.514	1.323	26.467	**61.514**
3	1.007	20.141	81.655	1.007	20.141	81.655
4	.608	12.169	93.824			
5	.309	6.176	100.000			

Extraction Method: Principal Component Analysis.

The total variance explained by the model is another criterion for measuring the model's validity (Field, 2017). The half of total variables explaining more than 60% of the variance in cumulative factor loading indicate that the model is valid (Field, 2017). In the present study, it is evident that two out of five variables (which is less than half) are able to explain more than 60% of the variance. Thus, the model is a good fit (valid).

4.3 Descriptive Statistics

The descriptive statistic contains the analysis of demographic variables. The majority of the respondents are male (51.6 percent) lying in the age bracket of 26-35 years (38.7 percent) having bachelor's degree (48.4 percent) and 3-5 years' experience (35.5 percent) *(See Appendix A)*.

4.4 Normality Test

Table 4.5 Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Gender	.346	31	.798	.638	31	.858

a. Lilliefors Significance Correction

The next step is the determination of data in terms of normal distribution. In this study, Shapiro-Wilk test is used to assess the normality assumption as it is the most widely statistical test in the social sciences (Harmon, 2011; Ruppert, 2004; Thode, 2002). The result confirmed that sig-value is greater than alpha (0.858 > 0.05). Hence, there is strong evidence against null hypothesis. In other words, the data is normally distributed. Moreover, the Skewness over standard error and Kurtosis over standard error also confirmed that data is normally distributed as the value lies between (+1.96 to -1.96) (See Appendix A).

Since data is normally distributed, therefore, the parametric test is preferred over non-parametric test. As a result, for correlation Pearson's (parametric) test is used instead of Spearman's (non-parametric) test.

4.5 Correlation

Table 4.6 Correlations

		Persistence	Agility	Adaptability	Frequency (Disruption)	Cost (Disruption)
Persistence	Pearson Correlation	1	.284	.389*	.694	.547
	Sig. (2-tailed)		.121	.031	.000	.003
	N	31	31	31	31	31
Agility	Pearson Correlation	.284	1	.339	.342	.124
	Sig. (2-tailed)	.121		.062	.060	.508
	N	31	31	31	31	31
Adaptability	Pearson Correlation	.389*	.339	1	.818	.762
	Sig. (2-tailed)	.031	.062		.002	.001
	N	31	31	31	31	31
Frequency (Disruption)	Pearson Correlation	.694	.342	.818	1	.290
	Sig. (2-tailed)	.000	.060	.002		.114
	N	31	31	31	31	31
Cost (Disruption)	Pearson Correlation	.547	.124	.762	.290	1
	Sig. (2-tailed)	.003	.508	.001	.114	
	N	31	31	31	31	31

*. Correlation is significant at the 0.05 level (2-tailed).

The above table revealed that there is positive moderate coefficient correlation of persistence with frequency (disruption) and cost (disruption) (r=0.694, r=0.547; Table 4.6). In other words, 69.4% is the magnitude of variation in frequency and 54.7% magnitude of variation in cost is caused by persistence. Moreover, there is statistically significant evidence against null hypotheses because the p-values are different than zero (=0.000 < 0.05; $p < \alpha$; =0.003 < 0.05; $p < \alpha$; Table 4.6). To large extent the previous empirical studies are confirmed including; Alcantara (2014), Allen et al., (2006), Christopher & Lee, (2002), and Walker & Salt (2012). On the other hand, the coefficient correlation between agility and frequency as well as agility and cost are positive weak (r =0.342, r =0.124; Table 4.6). In addition to that, there are no statistical evidence against null hypotheses being different than zero (=0.060 > 0.05; $p > \alpha$; =0.508 > 0.05; $p > \alpha$; Table 4.6). Hence, null hypotheses are rejected. In other words, agility has no significant correlation with disruptions in terms of frequency and cost. Thus, this study supports the work of Rai et al., (2006) while opposes the work of Allen & Dutta (2006), Dong et al., (2009) and Gilgor et al., (2013). Adaptability has strong positive correlation with frequency (disruption) (r=0.818) and cost (disruption) (r=0.762). Adaptability causes 81.8% magnitude of variation in disruption - frequency and 76.2% in cost disruption. Additionally, there is significant statistical evidence against null hypotheses being different from zero (=0.002 < 0.05; $p < \alpha$; =0.001 < 0.05; $p < \alpha$; Table 4.6), reflecting the correlation is significant between considered research variables. Hence, the findings are aligned with the work of Alcantara (2014), Higgins et al., (2013) and Lee (2004) while contradict the work of Harrison (2001).

4.6 Regression

Table 4.7 Model Summary

					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.707[a]	.657	.575	.597	.257	3.116	3	27	.043

a. Predictors: (Constant), Adaptability, Agility, Persistence.

In regression section, the predictors namely; adaptability, agility and persistence are assessed with the frequency (disruption), which is a dependent variable. The adjusted R^2 is preferred over simple R^2 because, "adjusted R^2 compares regression model having different set of predictors' explanatory power whereas the problem with R^2 is that higher order polynomials result with large number of predictors involved" (Fields, 2017). The model summary showed that adjusted R^2=0.575, which means that 57.5% variation in frequency (disruption) is due to adaptability, agility and persistence (Table 4.7).

Table 4.8 ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	3.335	3	1.112	31.16	.043[b]
	Residual	9.633	27	.357		

Total	12.968	30			

a. Dependent Variable: Frequency (Disruption).

b. Predictors: (Constant), Adaptability, Agility, Persistence.

The F=31.16 in the ANOVA table reflects that 31.16% is the explanatory power of the model, which is acceptable in social sciences (Table 4.8). The model has acceptable explanatory power.

Table 4.9 Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.396	.930		3.653	.001
	Persistence	-.387	.179	-.396	-2.164	.039
	Agility	.261	.174	.271	1.507	.068
	Adaptability	.287	.142	.294	2.021	.002

a. Dependent Variable: Frequency (Disruption).

The regression analysis revealed that with 1-standard deviation increase, persistence negatively affects the frequency (disruption) by 0.396. Moreover, the p-value is less than alpha, therefore there is strong evidence against null hypothesis (=0.039 < 0.05; $p < \alpha$; β = -0.396; Table 4.9). In other words, persistence affects the supply chain's frequency (disruption). The present findings are aligned with the work of Alcantara (2014) while differs with the findings of Harrison (2001). Agility is evident to cause 0.271 positive variation in frequency (disruption) but there is no strong evidence against null hypothesis because p-value is greater than alpha, therefore, it is not rejected (=0.068 > 0.05; $p > \alpha$; β = 0.271; Table 4.9). The agility does not significantly affect the supply chain's frequency (disruption). Therefore, the present findings support the work of Rai et al., (2006) while contradicts the previous work of Gilgor et al., (2013). Lastly, it is found that 1-standard deviation increase, adaptability positively affect the frequency (disruption) by 0.294 (β = 0.294; Table 4.9). Also, there is strong statistical evidence against null hypotheses because p-value is less than alpha (=0.002 < 0.05; $p < \alpha$; Table 4.9). Thus, null hypothesis is rejected, which means that adaptability significantly affect the supply chain's frequency (disruption). The work of Alcantara (2014) is confirmed by present findings while work of Harrison (2001) is opposed.

Table 4.10 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.635[a]	.524	.484	.858	.024	.521	3	27	.021

a. Predictors: (Constant), Adaptability, Agility, Persistence

The adjusted R^2=0.484 in the model summary reflects that 48.4% variation in frequency (disruption) is due to adaptability, agility and persistence (Table 4.10).

Table 4.11 ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	.490	3	.163	22.1	.021[b]
	Residual	19.897	27	.737		
	Total	20.387	30			

a. Dependent Variable: Cost (Disruption).

b. Predictors: (Constant) Adaptability, Agility, Persistence

The ANOVA table above revealed that F=22.1, which confirms that the model has 21.1% explanatory power (Table 4.11). This is acceptable explanatory power.

Table 4.12 Coefficients[a]

		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B	
Model		B	Std. Error	Beta	T	Sig.	Lower Bound	Upper Bound
1	(Constant)	4.559	1.336		3.412	.002	1.817	7.301
	Persistence	1.392	.257	.998	5.416	.001	.435	.620
	Agility	-.195	.251	-.160	-.777	.444	-.709	.319
	Adaptability	.541	.204	.537	2.652	.031	.377	.459

a. Dependent Variable: Cost (Disruption).

Considering the regression analysis for the predictor variables; adaptability, agility and persistence and cost – disruption (dependent variable), the coefficient table showed that with the increase of 1-standard deviation, the cost (frequency) is positively affected 0.998 by persistence (β = 0.998; Table 4.12). Furthermore, there is statistically strong evidence against null hypothesis because sig-value is less than alpha (=0.001 < 0.05; $p < \alpha$; Table 4.12). Hence, it is confirmed that persistence has a significant impact on the supply chain's disruption in terms of cost. The findings support the previous work of Alcantara (2014) while contradict the work of Harrison (2001). On the other hand, agility is found to have no impact on the cost (disruption) because the sig-value is greater than alpha value (=0.444 > 0.05; $p > \alpha$; β = -0.160; Table 4.12). Thus, null hypothesis is not rejected. Hence, in the light of statistical evidence, work of Rai et al., (2006) is confirmed whereas recent study of Gilgor et al., (2013) is opposed. Considering the last predictor, adaptability, results showed that with increase of 1-standard deviation, it positively affects the cost (disruption) by 0.537 (β = 0.537; Table 4.12). Moreover, the sig-value is less than alpha, reflecting that there is strong statistical evidence against null hypothesis (=0.031 < 0.05; $p < \alpha$; Table 4.12). As a result, null hypothesis is rejected. In other words, the cost (disruption) is statistically significantly affected by adaptability. Thus, the study supports the work of Alcantara (2014) while contradict the work of Harrison (2001).

5. Conclusion and Recommendations

The statistical test results revealed that the magnitude of the coefficient correlation between adaptability and disruption (cost and frequency) is strong positive (r=0.762; r=0.818) and

statistically significant (=0.001 < 0.05; $p < \alpha$; =0.002 < 0.05; $p < \alpha$) while persistence has positive moderate coefficient correlation with disruption (cost and frequency) (r=0.547; r=0.694). Additionally, the correlations are statistically significant (=0.003 < 0.05; $p < \alpha$; =0.000 < 0.05; $p < \alpha$). On the other hand, agility has a positive weak correlation with disruptions (cost and frequency) (r =0.124; r =0.342). There is no statistically significant relationship between these variables (=0.060 > 0.05; $p > \alpha$; =0.508 > 0.05; $p > \alpha$).

The regression analysis confirmed that persistence and adaptability have statistically significant impact on the frequency (disruption) and cost (disruption (adaptability - frequency =0.002 < 0.05; $p < \alpha$; adaptability- cost=0.031 < 0.05; $p < \alpha$; persistence – frequency=0.039 < 0.05; $p < \alpha$; persistence- cost=0.001 < 0.05; $p < \alpha$). Interestingly, the magnitude of variation is higher caused by adaptability in contrast to persistence. On the other hand, agility has no statistically significant impact on the frequency and cost (agility – frequency=0.068 > 0.05; $p > \alpha$; agility - cost=0.444 > 0.05; $p > \alpha$). Nevertheless, among the supplier's characteristics, adaptability (resilience) is the most essential dominant predictor while agility is the least effective predictor. Thus, to large extent the present findings support work of Alcantara (2014) and Rai et al., (2006) while opposes the work of Gilgior et al., (2013) and Harrison (2001).

It is concluded that in the dairy SMEs of Pakistan, adaptability and persistence that are suppliers' characteristics (resilience) have significant impact on the supply chain disruption process.

5.1. Managerial Implications:

In the light of present findings, it is suggested that the managers of the dairy SMEs in Pakistan that there should be higher focus on the use of adaptability and persistence in the supply chain operations because more flexibility in inventory management and responsiveness in the approaches during the volatile external environment. Moreover, they should persist with the techniques that improves the quality, accuracy and planning process so that the cost and frequency could be managed in adequate and effective manner. Lastly, the managers should ensure that the promptness in the decision-making process should be carried out by using enterprise resource planning so that all the supply chain activities are interconnected with the different departments. This will improve the channels of communication and lead to reduce the wastage of resources. As a result, the cost and frequency would be managed effectively and efficiently by them.

5.2. Research Limitations:

However, although, different strategies were considered to ensure research is carried out in adequate and comprehensive manner but there is always room to improve further. One of the limitations of the present study is that the research highly focused on the numeric expression of the correlation while qualitative perspective was ignored. Some of the variations require in-depth understanding, for which qualitative approach should have been used. The study considered deductive reasoning to reach specific conclusion while inductive reasoning was not considered that could have explored more detailed variations. Moreover, the sample size is relatively small therefore, the generalization of result cannot be made. Furthermore, the study has cross-sectional research design, where respondents were only studied once, thus, the variation in different time interval was not explored. The results could not be confirmed by

same respondents in different time intervals. Hence, the variation and conformity of results in different timeframe are not attained, which is the limitation. Lastly, the study was self-funded therefore, the resources were limited. This led to the use of alternative approach. The participants were not observed because of the distance between researcher and case studies.

5.3. Recommendations for Future Researchers:

The future researchers shall consider the limitations of this study and use it to improve their research framework. The qualitative study should also be included in the future studies to have in-depth understanding about the research phenomenon. The use of interviews with the managers should be included so that both employees and management's perspective is attained. Moreover, the sample size should be increased to have higher generalizations. Additionally, the longitudinal research design should be considered so that same respondent is studied in different time intervals. This will enable researchers to learn about variations in more depth. Furthermore, the researchers should use observational technique to learn about the respondent's behaviour and gesture so that more accurate information about the research problem is obtained. It would be beneficial if future researchers could have a source to fund the project. This will enhance the chances of the researcher exploring more in detailed manner because of the funding they could personally visit the case studies, consider Delphi technique for interviews with the experts from the industry and so on, which was not carried out in this study.

References

Alcantara P. (2014). *A new horizon: BCI Executive Forum 2014*. Business Continuity Institute. Retrieved from: https://www.thebci.org/uploads/assets/uploaded/a3158900-52d9-4df6-ae7412ef10f85567.pdf, [accessed on: 10-12-2018].

Allen, P. M., Datta, P. P., & Christopher, M. (2006). Improving the Resilience and Performance of Organizations Using Multi-Agent Modelling of a Complex Production – Distribution System, *Risk Management*, 8(4), 294-309.

Billington, C., Johnson, B., & Triantis, A. (2001). "A real options perspective on supply chain management in high technology". *Journal of Applied Corporate Finance*, 15, 32-43.

Brooks, M. R., & Button, K. J. (2006). *Maritime container security: A cargo interest perspective*, International Workshop on Risk Management in Port Operations and Logistics and Supply Chain Security, London, 29.

Brown, R. B, (2006). *Doing Your Dissertation in Business and Management: The Reality of Research and Writing*, London: Sage Publications.

Bryman, A. & Bell, E. (2015). *Business Research Methods*. (4rd edition) Oxford: Oxford University Press.

Bunderson J. S., & Sutcliffe, K. M. (2002). Comparing alternative conceptualizations of functional diversity in management teams: process and performance effects. *Academy of Management Journal*, 45,875–983.

Caniato, F., Caridi, M., Castelli, C. M., & Golini, R. (2009). A contingency approach for SC strategy in the Italian luxury industry: Do consolidated models fit?, *International Journal of Production Economics*, 120(1), 176-189.

Castellan, C. M. (2010). Quantitative and qualitative research: a view for clarity. *International Journal of Education*, 2(11).

Christopher, M. (2005). Logistics and Supply Chain Management: Creating Value-adding Networks, 3rd edn. Prentice Hall: Harlow, UK.

Christopher, M., & Lee, H. (2002). *Supply Chain Confidence –The Key to Effective Supply Chains through Improved Visibility and Reliability*. Vatera Inc.

Christopher, M., & Peck, H. (2004). Building the resilient supply chain, *International Journal of Logistics Management,* 15(2), 1-13.

CLSCM (2003). *Creating Resilient Supply Chains: A practical guide*. Cranfield School of Management.

Coutu, D. L. (2002). How resilience works, *Harvard Business Review*, 80(5), 46-55.

Croxton, K. L., García-Dastugue, S. J., Lambert, D. M., & Rogers, D. S. (2001). The Supply Chain Management Processes, *The International Journal of Logistics Management*, 12(2), 13-36.

Davarzani H., Zegordi S. H., & Norrman A. (2011). Contingent management of supply chain disruption: Effects of dual or triple sourcing, *Scientica Iranica*, 18(6), 1517-1528.

Denzin, N. K., & Lincoln, Y. S. (2005). *Introduction: The discipline and practice of qualitative research*. In N. K. Denzin & Y. S. Lincoln (Eds.). The SAGE handbook of qualitative research. 3rd edition. Thousand Oaks, California: SAGE, 1–32.

Dong S., Xu, S. X., & Zhu, K. X. (2009). Information Technology in Supply Chains: The Value of IT-Enabled Resources under Competition. *Information Systems Research,* 20(1), 18-32.

Dutta, K., & Vandermeer, D. (2011). Cost-based decision-making in middleware virtualization environments, *European Journal of Operational Research*, 210, 344-377.

Eldridge, S. M., Chan, C. L., Campbell, M. J., Bond, C. M., Hopewell, S., Thabane, L., & Lancaster, G. A. (2016). CONSORT 2010 statement: extension to randomized pilot and feasibility trials, *Pilot and Feasibility Studies*, 2, 64.

Eriksson, P., & Kovalainen, A. (2008). *Qualitative Methods in Business Research*. Business & Economics. London: SAGE.

Faizan, R., Haque, A.U., Cockrill, A., & Aston, J. (2019). Females at Strategic Level affecting Logistics Firms' Competitiveness: Qualitative Comparative Analysis, *Forum Scientiae Oeconomia*, 7(1), 57-71.

Faizan, R., & Haque, A. U. (2015). Bullwhip effect phenomenon and mitigation in logistic firm's supply chain: Adaptive approach by Transborder Agency, Canada. *International Journal of Supply Chain Management*, 4(4), 43-51.

Faizan, R., Nair, S.L.S., & Haque, A.U. (2018). The Effectiveness of Feminine and Masculine Leadership Styles in Relation to Contrasting Genders' Performances, *Polish Journal of Management Studies*, 17(1), 78-91.

Field, A. (2017). *Discovering statistics using SPSS* (6th ed.). Los Angeles, Thousand Oaks: SAGE Publications, 143.

Fisher, M. (1997). "What is the right supply chain for your product?". *Harvard Business Review*, March-April, 105-116.

Gligor, D. M., Holcomb, M. C., & Stank T. P. (2013). A Multidisciplinary Approach to Supply

Chain Agility: Conceptualization and Scale Development, *Journal of Business Logistics*, 34(2), 94-108.

Hair, J. F., Babin, B., Money, A. H., & Samouel, P. (2007), Research Methods for Business, New York, USA: John Wiley and Sons.

Hamel, G. (2006). The why, what and how of management innovation. *Harvard Business Review*, 84(2), 72-84.

Hammer, M. (2001). "The Superefficient Company," *Harvard Business Review*, 79(9), 84.

Harmon, M. (2011). *Normality Testing in Excel - The Excel Statistical Master*. Retrieved from: https://books.google.co.uk/books?id=rNsAxsExasYC&pg=PA27&lpg=PA27&dq=harmon,+2011+shapiro-wilk+test&source=bl&ots=XR2QiHe9oh&sig=sOGjYbMZYPwvO-Vj55DouI8Ol34&hl=en&sa=X&ved=2ahUKEwijyJDyg6vfAhWrTBUIHWrKBzcQ6AEwFnoECAgQAQ#v=onepage&q=harmon%2C%202011%20shapiro-wilk%20test&f=false, [accessed on: 12-12-2018].

Haque, A.U., & Aston, J. (2016). A Relationship between Occupational Stress and Organizational Commitment of I.T Sector's Employees in Contrasting Economies. *Polish Journal of Management Studies*, 14(1), 95-105.

Haque, A.U., Aston, J., & Kozlovski, E. (2018). The impact of stressors on organisational commitment of managerial and non-managerial personnel in contrasting economies: Evidences from Canada and Pakistan, *International Journal of Business*, 23(2),152-168.

Haque, A.U., Faizan, R., & Cockrill, A. (2017). The relationship between female representation at strategic level and firm's competitiveness: evidences from cargo logistic firms of Pakistan and Canada, *Polish Journal of Management Studies*, 15(2), 69-81.

Haque, A.U., Kot, S., & Imran, M. (2019). The moderating role of environmental disaster in relation to microfinance's non-financial services and women's micro-enterprise sustainability, *Journal of Security and Sustainability Issues*, 8(3), 355-373.

Haque, A.U., & Oino, I. (2019). Managerial challenges for software houses related to work, worker and workplace: stress reduction and sustenance of human capital, *Polish Journal of Management Studies*, 19(1), 170-189. DOI: 10.17512/pjms.2019.19.1.13

Harrison, T. P. (2001). "Principles of Global Supply Chain Design," INFORMS, *The International Journal of Logistics Management Annual Meeting*, Miami, FL.

Hatch, M. J., and Cunliffe, A. L. (2006). *Organization Theory*. 2nd ed, Oxford: Oxford University Press.

Healy, M., & Perry, C. (2000). Comprehensive criteria to judge validity and reliability of qualitative research within the realism paradigm, *Qualitative Market Research*, 3(3), 118-126.

Higgins, A. J., Miller, C. J., Archer, A. A., Ton, T., Fletcher, C. S. and McAllister, C. C. J. (2010). Challenges of operations research practice in agricultural value chains, *The Journal of the Operational Research Society*, 61(6), 964-973.

Hussain, S., Ahmed, W., Rabnawaz, A., Jafar, R. S., Akhtar, H., Guang-Ju, W., Ullah, S., & JainZhou, Y. (2015). Integration and Effective Supply Chain Management: A Review of Agriculture in Pakistan and China, *Journal of Economics and Sustainable Development*, 6(21), 1-6.

Imran, M., Haque, A.U., & Rębilas, R. (2018). Performance Appraisal Politics and Employees'

Performance in Distinctive Economies, *Journal of Polish Management Studies*, 18(2), 135-150.

Kearney, A.T. (2003). *Supply Chains in a Vulnerable, Volatile World*.

Kilgore, M. (2003). *"Mitigating supply chain risks"*. White paper, Atlanta, Georgia: Chainalytics LLC.

Kot, S., Haque, A.U., & Kozlovski, E. (2019). Strategic SCM's Mediating Effect on the Sustainable Operations: Multinational Perspective, *Organizacija*, 52(3), 219-235. DOI: 10.2478/orga-2019-0014

Laurie, H. & Lynn, P. (2009). The use of respondent incentives on longitudinal surveys. *Methodology of Longitudinal Surveys*, 205–234.

Lee, H. L. (2004). The triple-A supply chain, *Harvard Business Review,* 82(10), 102-113.

Lee, H., Padamanabhan, P., & Whang, S. (1997). "Information distortion in supply chain: The bullwhip effect". *Management Science*, 43, 546-558.

Mack, L. (2010). The Philosophical Underpinnings of Educational Research. *Polyglossia*, 19, 1-10.

Mackenzie, N., and Knipe, S. (2006). Research dilemmas: Paradigms, methods and methodology, *Issues in Educational Research*, 16(2), 193-205.

Melnyk, S. A., Davis, E. W., Spekman, R. E., & Sandor, J. (2010). *Outcome-driven supply chains.* MIT Sloan Management Review Winter. Retrieved from http://sloanreview.mit.edu/article/outcome-driven-supply-chains/. [accessed on: 17-12-2018].

Mitroff, I. & Alpasan, M. (2003). Preparing for the evil. *Harvard Business Review*, (April), (109-115), ISSN 0017-8012.

Monczka, R. M. & Morgan, J. (1997). "What's Wrong with Supply Chain Management?" *Purchasing*, 122(1), 69-72.

Pallant, J. (2014). *SPSS Survival Manual. A Step by Step Guide to Data Analysis Using SPSS*, 22rd edn. Maidenhead: Open University Press.

Patton, M. Q. (2002). *Qualitative Research and Evaluation Methods*. 3rd ed. Thousand Oaks, California: Sage Publication Inc.

Radjou, N. (2002). "*Adapting to supply network change*". Cambridge, Massachusetts: Forrester Research Inc.

Rana, S. M. S., Osman, A., Bahari, A. B., & Solaiman, M. (2015). Determinants of supply chain performance: a strategic point of view. *International Journal of Supply Chain Management*, 4(3), 94-102.

Resnik, D. B. (2011). *What is ethics in research and why is it important?* National Institute of Environmental Health Sciences. Retrieved from: http://www.niehs.nih.gov/research/resources/bioethics/whatis, [accessed on 11-12-2018].

Roscoe, J. T. (1975). *Fundamental Research Statistics for the Behavioural Sciences*, 2nd edition. New York: Holt Rinehart & Winston.

Ruppert, D. (2004). Statistics and Finance: An Introduction, Springer Text in Statistics, New York: Springer.

Saenz, M. J., & Revilla, E. (2014), Creating More Resilient Supply Chain, *MIT Sloan Management Review*, 55(4), 22-24.

Saunders, M., Lewis, P., & Thornhill, A. (2012). *Research Methods for Business Students*. 6th ed, Harlow: Prentice Hall Financial Times.

Sekaran, U., & Bougie, R. (2012). *Research methods for business: A skill building approach*. (6th ed.). West Sussex, UK: John Wiley & Sons.

SMEDA (2017). *Small and Medium Enterprises Development Authority - SMEDA: Dairy Businesses*. Retrieved from: https://smeda.org/, [Accessed on: 13-12-2018].

Sutcliffe, K. M. & Vogus, T. J. (2003). "*Organizing for Resilience*," In K. S. Cameron & J. E. Morgan, Foundations of a New Discipline, San Francisco: Berrett-Koeller.

Tang, C. S. (2006). Robust strategies for mitigating supply chain disruptions, *International Journal of Logistics: Research and Applications*, 9(1), 33-45.

Tavakol, M. & Dennick, R. (2011). Making sense of Cronbach's Alpha, *International Journal of Medical Education*, 2, 53–55.

Teijlingen van, E., Rennie, A. M., Hundley, V., & Graham, W. (2001). The importance of conducting and reporting pilot studies: the example of the Scottish Births Survey, *Journal of Advanced Nursing*, 34, 289-295.

Thabane L., Ma, J., Chu, R., Cheng, J., Ismaila, A., Rios, L. P., Robson, R., Thabane, M., Giangregorio, L., & Goldsmith, C. H. (2010). A tutorial on pilot studies: the what, why and how. *BMC Medical Research Methodology*, 10, 1-10.

Thode, H. C. (2002). *Testing for Normality*, STATISTICS: textbooks and monographs, volume 164, Stony Brook, New York: Marcel Dekker Inc.

Urbański, M., Haque A. U., & Oino, I. (2019). The Moderating Role of Risk Management Between Project Planning and Project Success: Comparative Study, *Engineering Management in Production and Services*, 11(1), 23-35.

Urciuoli, L. (2015). "Cyber-Resilience: A Strategic Approach for Supply Chain Management", *Technology Innovation Management Review*, 5(4), 13–18.

Walker, B. and Salt, D. (2012). *Resilience Thinking: Sustaining Ecosystems and People in a Changing World*. Washington, DC: Island Press.

Walliman, N. (2001). *Your Research Project: a step-by-step guide for the first-time researcher*. London: SAGE, 194.

Wildavsky, A. (1988). *Searching for Safety*. New Brunswick, NJ: Transaction Press.

Wilson, B. (2009). Naval diplomacy and maritime security in the western Indian ocean, *Strategic Analysis*, 33(4), 488-497.

Worline, M. C., Dutton, J. E., Frost, P. J., Kanov, J., Lilius, J. M., & Maitlis, S. (2002). *Creating fertile soil: The organizing dynamics of resilience*. Paper presented at the annual meeting of the Academy of Management, Denver.

Zhang, Z., & Figliozzi, M. A. (2010) A Survey of Chinese Importers and Exporters: China's Logistics Industry Developments and the Impacts of Transportation System Performance on Supply Chain Costs and Operations, *Transport Reviews*, 30(2), p. 179-194.