GSJ: Volume 11, Issue 2, February 2023, Online: ISSN 2320-9186
www.globalscientificjournal.com

THE IMPACT OF PRODUCT VARIETY ON LSQ IN E-MARKETPLACES WITH MODERATING EFFECT OF VIRTUAL INTEGRATION.

Hassan Raza

Karachi University Business School,

University of Karachi, Pakistan

Hassanraza56.hr62@gmail.com

Tel: +92-316-8474760,

Dr. Sarah Anjum

Assistant Professor

Karachi University Business School,

University of Karachi, Pakistan

anjum.sar@uok.edu.pk

Tel: +923332327144

Abstract

This research aim is to define the role of virtual integration and its influence on relation of product variety (IV) and logistic service quality (DV) in B2C and B2B online stores whereas this study also focuses on the mediating effect of logistic integration on LSQ that will enhance efficiency at organization's logistic performance by sharing information electronically and strategically planning with all supply chain partners. for this research author has preferred collecting data through electronic questionnaire survey (google form) and distributed it through several online platforms (e.g. LinkedIn, Gmail, Facebook) to the supply chain professionals. Moreover, the inferential data analysis was done through the smart PLS 3 and result and findings of this research were ultimately showing us significance of virtual integration on product variety decisions and how could we resolve the declining rate of logistical service quality which is influenced by product variety with the help of virtual integration.

Keywords- *Logistics service quality, Product variety, E-marketplaces, E-tailers, Virtual integration, Logistic integration*

Introduction

Nowadays organization are experiencing difficult times at global trading due to higher supply chain risk and unrealistic lead time and to remove these hurdles and attaining growth the businesses are required to get support of virtual integration. Such integration can be established only through enabling Information technologies in the organization that will allow organization in real-time data transference, inter & intra organizational ERP systems, web- based EDI, online portals and EPOS, electronic OPS (order processing system). These modern ways of IT facilities organization to build strong relations and form association among customers, suppliers and 3pl companies for forecasting, planning, collaboratively(Smart, 2008). E-marketplaces are rapidly becoming the dominating Hubs of B2C by e-commerce throughout the globe Every multinational & national organization have its own e-store (online store) to get more business & some of them only provides just platforms to other business to sell their product and services e.g. Amazon, Alibaba, Taoboa. (The Truth about Online Consumers, n.d.). These online platforms provide external network (i.e. the larger buyer demand occurs, as more sellers are available), and technical services (security, payment system e.g.) (Wei et al., 2019), this will allow SMEs to reach a deep pool of customers (Ryan et al., 2012). E-marketplaces come with their own set of issues, and that makes logistics service quality (LSQ) a crucial competitive factor to focus (Wan et al., 2014). other than that due to poor LSQ number of problems occurs like late deliveries, increased lead time, packaging and many more other (Cao et al., 2018; Jain et al., 2017). In this study, we observe the significance of virtual integration (VI) and its impact over product variety decision (PV) and managing the decreasing LSQ to do so organization must be well integrated and have smooth information flow inside the internal and external network where for these online operation there are logistical strategies such as free and rapid home delivery, easy return policy, accurate inventory information, and many pickup alternatives to encourage customers to shop online (Wollenburg, Hübner, et al., 2018),(Herhausen et al., 2012). E-tailers can easily make available huge quantity of products for sale at suitable cost on the hosted e-marketplace platform (Ailawadi & Farris, 2017). due to the limitless virtual shelf space

availability, sellers are motivated to provide a wide range of products in order to improve sales volume by responding to the different wants of consumers (Felipe Scavarda et al., 2010). While on the other hand high product variety increases operational complexity(Wan et al., 2014; Wan & Dresner, 2015) it also enhances the probability of unfavorable events like incorrect packing, late delivery, insufficient product descriptions, unable to provide logistic service to all customer at once and a lack of relational assistance, lack of resources to fulfill delivery requirements more likely. Therefore, a larger variety offers with the objective of advancing sales may reduce the LSQ level, as a result, long-term competitiveness is harmed. (Wan et al., 2014). Many previous research scholars have shown the importance product variety decisions as well as its impact on logistic service quality and how it reduces LSQ if an organization increases its PV (Wan et al., 2012, 2014; Zhou & Wan, 2017) in the practical business environment. While this study explores not only the influence of PV on LSQ & their relationship with respect of online market, but also provide a solution for such problem whereas, resolving this issue can only be achieved with help of virtual integration that helps an organization to integrate its operations with their strategic partner and plan, replenish, deliver by the support of supply chain participants. Furthermore, the rise of information technology (IT) and contemporary supply chain management systems (SCMs), has caused the MNEs (Multinational enterprises) and suppliers to form a virtual connectivity and coordination with each other by using different types of tool and technologies (Jean et al., 2010). For example, the operating models of well-known multinational corporations such as Dell, GM and Walmart are less risky, with the administration of foreign production ceded to contracting partners who produce their company's items with strong collaboration. Along with e-commerce the online transactions take places that enhance performance, satisfaction, and brings agility and to keep up with customers need participants of SC network by establishing CPFR & quick response logistics (Christopher & Jüttner, 2000). Additionally, this can be very helpful for reducing lead time, minimizing inventory levels, increasing responsiveness and flexibility to cater fluctuation in demand of products (Steermann, 2003). Therefore, the objective of this study is to fill some of the gaps in the existing literature (Sorkun, 2019) by looking at how virtual integration handles the uncertainties caused by product variety on logistical service quality at international and domestic supply chain member’s interactions and integrating the logistic operation in the supply chain network virtually. The current study focuses on the online business and their logistics operation (In-house or/ outsourced) in Pakistan. despite of lots of new ways and innovation there is a limited work that investigates significance of virtual integration for supporting Intra & inter-organizational information flow. virtual integration can help an organization and it network participant to do collaborative planning and forecasting for replenishment (CPFR),

as well as sharing data with the help integrative mechanism (ERP, EDI, EPOS, etc.) other than that this research also focuses on forming logistic integration with help of virtual integration in the supply chain network. Specifically, the moderating effects of virtual integration on the relation of product variety and LSQ and its OP. As a result, this study we will provide us better understanding of virtual inter-firm integration role at resolving the issues raised from product variety decision and collaboration among the members of supply chain, which is not well-understood in recent studies.

Literature review

Electronic marketplaces

E-Business has huge significance in modern world's business. Whereas it simplifies and assist better satisfactory service to e-commerce partners, but on other hands the quality factor needs to be more focused while delivering (Rotondaro, 2002). every e-marketplace basically there are two types of modes in terms of their functions that are performed by them, such as merchant mode and two-sided platform mode (Hagiu, 2007). In merchant mode e-marketplaces are simply purchasing the product as merchant or retailer and then selling it to the customers. While in two-sided platform, the e-marketplace are used to connect the buyer and seller for better understanding we can say they provides sellers a web based portal where the can do business and interact with customers (Amazon, Alibaba, e.g.). In this type of mode e-marketplaces earns fixed cost or charges a commission on the transaction of good and services performed by buyer and sellers (Hagiu & Wright, 2015). Two-sided e-marketplace are used to interlink B2B, C2C, B2C, parties where mostly sellers are SMEs (S. Wang et al., 2016) and buyers are end-users.

Logistics service quality

Order fulfilment process in organization plays an important role at satisfying and retaining customers (Koufteros et al., 2014; Murfield et al., 2017). As a matter logistic operation also plays crucial role at order fulfilment process, many other researchers like (Mentzer et al., 1999),(Sohn et al., 2017) tried to find out the significance of logistic services. The logistic service factor linked with product availability, condition, delivery and return shows operational logistic performance, on other hand factors like communication and ability to respond represent the relational logistic performance. But ensuring a better LSQ is very difficult job to do in web-based retailing due to last-mile order delivery & small order quantities (Agatz et al., 2008),(Ishfaq et al., 2016). E-tailers usually use in-store sales, that increases the chance of errors at forecasting and inventory record (Wollenburg, Holzapfel, et al., 2018). Now these types of problems show us the importance of logistic integration thru channel at the time fulfilling

online orders from customer (Hübner et al., 2016). In short, to get competitive edge in online marketplaces, it is very important for an e-tailer to deliver better LSQ (Lim et al., 2018; Marino et al., 2018) because customers these days are very much conscious about delivery time and package quality and they can switch to competitor without even considering cost sometimes (Cho et al., 2008; Jain et al., 2017), Spatial & temporal differences in online buying also raises customers concerns and requests (Daugherty et al., 2019). Consumer in online market desire to get their package as soon as possible without being damaged and same product that is offered for buying in online marketplace (Han & Xie, 2019). As regards to these facts, the timeliness, accuracy and condition of order are emphasized as three essential dimensions of LSQ (Murfield et al., 2017),(Collier & Bienstock, 2006).

The 3PL firm have number of services that are used by other organizations and e-business, such as physical distribution, packaging, information management and inventory management (Sengupta et al., 2018). Small quantities orders (Parcel delivery) and door to door deliveries to area-wise Scatter locations (Ishfaq et al., 2016) to force online retailers (SMEs) entertain customers by 3PL companies. Therefore, transmission that occurs in online marketplace creates a logistic service triad that covers the e-tailers, consumers, and logistic providers (Sohn et al., 2017). This shows the example of consumer facing service triad relation (Sengupta et al., 2018). The 3PL companies only came in contact with customer when product is about to be deliver, and during tracking the shipment or at the point of return. Therefore this research is highlighting importance of collaboration among the e-tailers and third party logistics providers to delight their customers with best LSQ experience (Lin et al., 2016; Sohn et al., 2017).

Product variety

The excessive product variety increases company's sales and share at market (Wan et al., 2012). By increasing varieties, a company can also entertain those customers that seek for different taste, quality, features of a product (Cachon et al., 2019). Good PV decision can reduce the effect of price competition in competitive market and it will allow a company to earn more from customers for availing huge variety (Ushchev & Zenou, 2018). Also, PV supports organization to achieve larger market share, with fewer product range the competitors can set higher entry barriers for newcomers (Wan et al., 2012). Additionally, high PV also reduces lost sale by offering alternative product for demanded product due to likelihood of shortage in market (Ton & Raman, 2010). Because of these benefits, e-tailers puts a good use from Omni-channels by offering a larger assortment, that permits them to expand their limited shelf space capacity for their in-store shops (Ishfaq et al., 2016; Wollenburg, Holzapfel, et al., 2018). However, excessive

product variety possibly can decreases the benefits, due to product cannibalization and can create puzzle situation for customers to choose (Cachon et al., 2019). So for that, to keep positive effect product variety or upswing the efficiency of product variety firms should plan a better assortment strategy to minimize the negative effective (Melacini et al., 2018). Some of studies (Patel & Jayaram, 2014; Zhou & Wan, 2017) indicates and represents the negative effect of product variety on operational performance, that it might also reduce competitiveness (Wan et al., 2012). Huge product variety increases high setup and holding cost it also raises the rate of defects in production (Ton & Raman, 2010). Likewise, high variety intensifies operational disturbance in retailing activities and processes, for examples scheduling (Zhou & Wan, 2017), data synchronization (Wan et al., 2014) and forecasting (Wan & Sanders, 2017). This as well as impacts negative on logistics service quality, such as higher lead time, overstock, improper handling of material (Wan et al., 2014), which plays crucial role in on-time order fulfilment process.

Virtual integration

The expansion of the internet and the development of real-time information sharing technologies, such as integrated ERP systems, web-based EDI, electronic portals, and e-order processing systems, that will help businesses create stronger ties with their consumers, suppliers, and other 3rd party vendors, such as logistics service providers(Smart, 2008). The evolution of modern technologies (IT) and integrated supply chain suites have transformed the old-era's integration concept into virtual integration and collaborative alliances that allows organization to work effectively and efficiently, whereas a lot of enterprises are jointly working together to resolve the conflicts inside their network(Jean et al., 2010; Subramani, 2004). Virtual integration is type of quasi-integration which forms information network that provides real-time data and information deployment among partners(E. T. G. Wang et al., 2006). Besides that different researcher have argued that IT-enabled integration supports effective governance mechanism without owning supply chain parties (van Hoek, 1998; Zaheer & Venkatraman, 1994). So for that, virtual integration launches a feasible governance mechanism which requires involvement of both exchange parties to put and fulfil their side efforts and resources by mutual agreements (Kim & Mahoney, 2006). In order to achieve success in business by supply chain activities organization must own and share knowledge regarding different aspects of supply chain operations (Hult et al., 2004)**.** The information collection activities can reduce cycle time with the means of performance outcome, at the supply chain domain and the processes to develop knowledge are most essential antecedent for obtaining efficiency.

Logistic integration

Logistic is considered to be a transportation process of material & people from one point to another point perhaps there is one more thing to be focused more often which is information flow, for example of a water bottle keeping in mind that water is life, the entire flow of water that is extracted from its source till it reaches the customer is crucial. There are various things to be focused as instance as delivered to the right place, right time, right condition, right quantity e.g. (Naway & Rahmat, 2019). The logistical integration includes different parameters that are considered by the operational management to achieve a sustainable environment in the supply chain activities (Cole et al., 2019). Probably most of the companies needs its logistic to improve their performance; hence, effectivity of integration of logistic along with technology measures could affect the result in supply chain activities (Dolgui et al., 2020).

Hypothesis

The decisions taken by an e-tailers for product variety can directly impact logistic service quality that is provided by 3PL firm to e-tailer. A seller have to be more responsive when it comes to answering customer queries, while order fulfilment process seller should respond rapidly and accurately to the consumer (Bouzaabia et al., 2013; Han & Xie, 2019). LSQ is likely to be drop down if the quantities of different product categories and brands available by an e-tailer are increased, an e-tailer only can survive in such situation by having detail information and different type of abilities, which is very hard to collect, disseminate and apply to each areas of organization (Blome et al., 2014). This kind of wide information is very significant apart from responding to customer question correctly, but as well as for handling material properly and while logistics processes. Each brand or product needed special care & maintenance but once product variety rises it would be hard and troubling for a company to handle inventories maintain them for longer time. All products require different packaging, transportation and storage if an organization is unable to meet such requirements then ultimately increases rate of defects in product and lowers the standard LSQ.

The great product varieties indicate higher level of price dispersion for products offered in the market. Because of charge extra than other competitors e-tailers are forced to meet the demand of customer, who has a lot of expectation from product. For example, significance of packaging of products is raised according to price of product, whereas other customers are only concern to safety of product, some of them pays extra amount for the features and quality of the product. Similarly, this also works for customer's expectation of relational support. The flow,

consistency, kind and detail of information that is needed while fulfilling an order varies on the basis of product price (Cho, 2014). Failing to detect these numerous factors that are likely to occur with higher assortments of items, can lead towards customer complains about logistic services;

H1. Product variety negatively affects the LSQ level.

Larger product variety decision might be attractive in first glance because an online seller can get the profit from different type of customers segments that demand various kind of product for example size, color, quantities, features (Duch-Brown et al., 2017). Besides that, e-tailers are only paying off tiny amount of money to e-marketplaces that provides platform to sell their product in exchange of that money, not only that e-tailers also exploits the limitless shelf space of e-marketplaces by displaying huge varieties and all these activities are performed without any need of physical store (Koufteros et al., 2014). Furthermore, the growing sales also enhances "transaction intensity" i.e. number of transaction required in completion of an order in specific time duration. Hence, for high transaction intensity e-tailers needs less time for communicating with vendor and 3PL firm to get ready for delivery and shipment of consignments (Zhou & Wan, 2017). This will lead to the unrealistic deadline to meet and heavy work pressures on workers (Bruccoleri et al., 2014). They will incline more picking, checkout, and data errors (Moussaoui et al., 2016; Wan et al., 2014), this cause late and unfinished orders. Additionally, in this perplexing situation the operational conditions are allowing e-tailers to handle the queries of customers on time. Therefore, the following two hypotheses are investigating indirect (mediation) effect of product variety on LSQ through transaction intensity.

H2. Product variety positively affects transaction intensity.

H3. Transaction intensity negatively affects the LSQ level.

Moderating effects of virtual integration

Collaborative planning with members of supply chain initiates set of activities that would make ease in decision making, results obtaining competitive advantage through implementation of virtual integration and collaboration with their supply chain members (Petersen et al., 2005; Subramani, 2004). The joint collaboration of supply chain partner thru, virtual integration can lead towards a better and accurate forecasts that could also support a firm to improve its logistics and SCM operations (Nagashima et al., 2015; Yao et al., 2013). For instance, collaboration by Information technology among the supply chain members will help in both demand and replenishment planning with regards of providing availability of right product on right time so a consumer can purchase it when it is demanded.

As a result, inventories could be stored at a place that has proximity of market with accurate volumes of product, this would help us for improving logistics performance of firm to satisfy their customers (Seifert, 2003), collaboration among supply chain players can improve the responsiveness and establish an reliable supply chain network that leads to lesser lead times, availability, fewer stock-outs (Alftan et al., 2015), all these activities are assisting an organization to retain customer and satisfy them in order to generate more sales. In addition to the direct impact of product variety decision on logistic service quality and its negative relation which also influences the operational performance of e-marketplaces. We suggest that virtual integration have a positive moderating effect on the relationship between product variety and LSQ. The virtual integration enhances the day to day information transactions including inventory, rates, and particular stock information (Jean et al., 2020). These regular day to day information sharing can supports logistical performance and removes deficiencies from LSQ. Furthermore, virtual integration plays a crucial role in facilitating information exchange across the inter-firm and intra-firm network with the help of information technology. This also discussed that virtual integration helps as a quasi-integration mechanism that allows protection against taking advantage in exchange relationships (Kim et al., 2018) The role of virtual integration in business is not only for information exchange and sharing but also integrating the logistic inside the network which will provide better resilience, transparency and robustness in the operation hence we have following hypothesis.

H4. Virtual integration weakens the negative impact of product variety on.

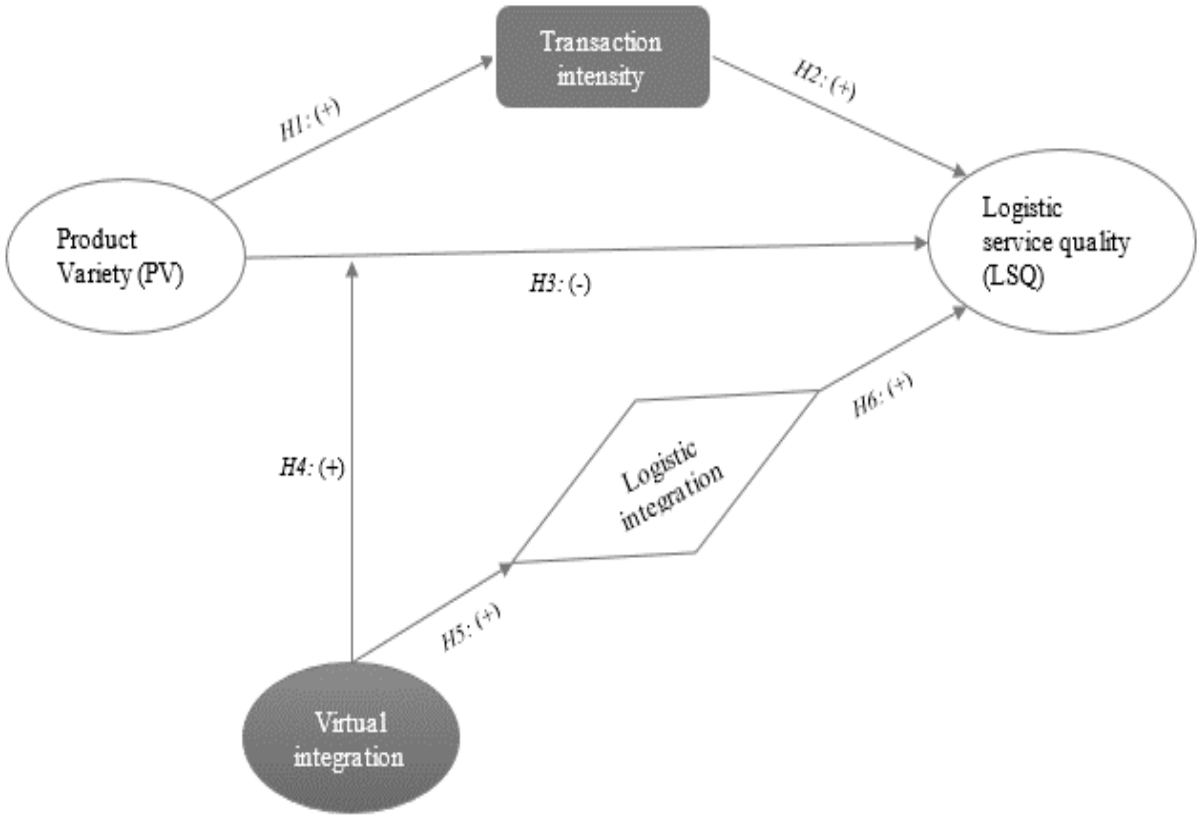
H5. Virtual integration positively effects Logistic integration.

Logistic integration

The technological & logistical aspects are important in every business entity because of their dominating nature influences over supply chain whereas sharing of information in overall supply chain thrust positive role between them. the relationship of operation performance (Hajdari, 2018). Besides integration of logistic operational processes are supported by a developed infrastructure that also help various operational specifications required to create supply chain solutions for particular consumer. (Bowersox et al., 1999). Similarly, this type of Integrated infrastructure facilitates the transmission of information and creates a monitoring system for specially managing coordinated SC logistical operations. Such integrated information sharing system gives user quick access of coordinated data and tools to process it. Moreover, this intra & inter organization monitoring system can expand the boundaries of external SC members and organization's internal functional areas in order to be more responsive and took corrective action for optimum outcome and improve our logistical performance. (Rodrigues et al., 2004) In the uncertain and unanticipated

business environment one can gain competitive advantage over other if organization's logistics is more flexible or adaptive to changes but it should possess necessary systems and procedures to correspond with customer. (Solistica, n.d.) This requires centralization and real-time data transferring from many departments and external player e.g. manufacturing, administration, & logistic, distribution, supplier. Whereas, internal & external integration aligns company's strength with SC-partners to jointly accomplishing better quality of service capabilities on lesser total supply chain cost (Bowersox et al., 1999; Daugherty et al., 2019; Forza, 1996; Vargas et al., 2000) Primary objective of external integration is to do outsourcing and subcontract for particular activities that are used to carry out internally to attain optimal cost. Afterward it assures the removal of redundancy & duplication of activities that wastes time and effort of SC-participants by linking all operational interfaces inside the network. (e.g. number days' inventory sits idle in supply chain to number days being used productively). Internal and external integration emphases on logistic capabilities for offering products/ or services at effective cost, value for money and can't be matched by competitor at the time. This type of synchronization increases whole organization's performance (Rodrigues et al., 2004). Logistic is considered as ability to transmit specific demand level of value to a required point at time. Therefore, we offer following hypothesis.

H6. Logistic integration positively effects LSQ.



Methodology

The core objective for this thesis was to find out the Moderating effect of virtual integration, and mediating effect logistic integration on product variety decisions and also resolve problems caused by wide range of products and large quantities that disturbs order fulfilment process at online marketplaces. The aim of research includes the examination of information sharing network created through virtual integrating mechanism among supply chain partner, other than that this research focuses on operational performance of logistics sector and online marketplaces in Karachi Pakistan. The data was collected through online surveys from the employees of several "logistical organizations and e-marketplaces" which are associated with the supply chain or related department.

Research approach

The research method which is utilized for this study is quantitative method this method will help us to categories, ranks our data through statistical analysis. Furthermore, quantitative research applies a systematic approach that is based on empirical finding from observable event / or phenomena. Quantitative method uses computational techniques and statistical models. For developing and employing hypothesis or theories regarding specific aspect of research. So in order to obtained valid results from this research the quantitative method is very much appropriate and acceptable to the nature of this research.

Research Design

In this study, product variety is independent variable whereas, logistic service quality is dependent variable, moderating variable is virtual integration, also transaction intensity and logistic integration are mediating variables in this research.

Settings and Participants

For this purpose of the research scholar has selected the geographical area of Karachi, Sindh, cause this city is one of the main transportation hub Pakistan and there are larger are number companies that are operating their business online in this metropolitan city, besides that many logistic service providers are operating here for longtime period now. Although the targeted respondent for this research will strategic and functional mangers of different firm that are related with supply chain roles this will bring concreteness and accuracy in our data obtained from responses of this research so for that this city is most dedicated city for our research.

Sample Size

In this research the scholar has calculated the sample size of 92 respondents by using G*power software through selecting option of linear regression: Fixed model R^2 deviation from zero F test were conducted, also the number of 5 predictors were used with the power 0.8 for probability error (Faul et al., 2009).

Table 1**:** Shows the data of F tests - Linear multiple regression: Fixed model, R^2 deviation from zero

Analysis: A priori: Compute required sample size	
Input: Effect size f^2	=0.15
Power (1-β err prob)	=0.8
Number of predictors	=5
Output: Non centrality parameter λ	=13.8000000
Critical F	=2.3205293
Numerator df	=5
Denominator df	=86
Total sample size	=92
Actual power	=0.8041921

Statistical tool

For the process of data running we have used SmartPLS 3 (Ringle et al., 2022) this statistical tools had helped us to run and test data through many systematic and statistical ways where researcher has checked convergent and discriminant validity and reliability test and hypothesis were tested through outer loadings and path coefficient matrix, and done the bootstrapping for set hypothesis so that researcher could establish acceptable relationship by getting desired p value.

Targeted population.

The targeted population for this research are the employees that working in different organization such as logistics service providers, online marketplaces, or any business organization that are operating their businesses both online and at physical stores /or places these employees are particular playing supply chain role inside these companies, whereas this research also requires responses from such kind of employees that plays SCM role at their firm.

Sampling technique

For the purpose of sampling we have selected stratified random sampling technique for this research, the strata for this research is selected from different industries such as transportation, online marketplaces, FMCG industry, following appropriate supply chain management procedures.

Research instrument

Table 2: shows the Instruments of this research

#	Construct	Items used	Author(s)
1.	Logistics service quality (LSQ)	5	Metehan Feridun Sorkun
2.	Product variety (PV)	4	Metehan Feridun Sorkun
3.	Transaction intensity	2	Metehan Feridun Sorkun
4.	virtual integration	5	Ruey-Jer Bryan Jean
5.	Logistic integration	4	John E. Spillan

Ethical Consideration

Ethical consideration is one of the most important factor in every research because if anything wrong happens while doing such type of thing it could affect overall research & could also cause failure. So for that, I have assured that this research study will maintain the confidentiality of respondents and the data shouldn't be used for any other purpose rather than research purpose of this study, the researcher has make sure that no respondents is offended or bothered by any type of questions and totally avoid hurting the sentiments of participants. as well as the responses that are collect by this research are concrete and true by eluding fake and false responses at same time. The wording & language used in this questionnaire is quite understanding by focusing ethical consideration of participant in mind in this study.

Results and findings

Overview

In this study scholar has run its data by using Smart PLS 3 and for better understanding of its construct validity the researcher has developed variance based structural equation model that will supports during measure and covers different statistical aspects and it will also assist author for observation of its variables and their indicators.

Measurement Model

The structural equation model is divided into two categories, first measurement model which examines the latent variable and their relationship with indicators. Other than that measurement model has techniques to measure the model of latent variable and its indicators which are convergent validity and discriminant validity. The statistical tool used for this research is Smart PLS 3.

Convergent Validity

A construct's validity is necessary to be assessed and measured because of there are some variables that can't be measured and observed straight, then we can only measure them with the help of many observable or measurable indicators that help us to assess them by using them. Thus convergent validity is a type of finding construct validity it will support researcher and help to find out that how much construct are related with each other theoretically. the result has shown us that convergent validity of this research are valid and there is a good relationship among the items due to value Cronbach's alpha and value of composite reliability are greater than 0.70. where the values of AVE (average variance extracted) of item are also greater than 0.50 mentioned in the

table no. 4.1. where in the case of our research it is proved by these result that these constructs are related with each other.

Table 3: Shows reliability and validity of construct form convergent validity.

Construct Reliability and Validity

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
LI	0.750	0.850	0.700	0.500
LSQ	0.727	0.820	0.727	0.827
PV	0.710	0.790	0.710	0.750
TI	0.717	0.767	0.737	0.893
VI	0.700	0.750	0.720	0.780

These are some previous scholars criterion that have been used for supporting the result of this research, such as if AVE (average variance extracted) should be higher than 0.5 (Fornell & Larcker, 1981) where C.R values should be above or equal to 0.7 (Gefen et al., 2000) & for the Cornbach's alpha it should be acceptable on 0.7 (Nunnaly 2009). the convergent validity table validates by pairing or multiple other methods for individual matrix in order to find out the reliability stage of data between variables (Carmines & Zeller, 1979). It also includes examination various variables that each item's must be weighted more than 0.5 or equal to it (Hair, Hult, Ringle & Sarsted 2014).

Discriminant Validity

Discriminant validity is also a subtype of construct validity and it is used for the reason that a construct shouldn't be highly related to other construct and if they are, a researcher cannot justify that one construct is not measuring same construct. In comparison of convergent validity, the discriminant validity assess indicates construct level of difference among construct and it is also known as divergent validity.

Thus, results shown in this research expresses that there are not higher similarities between variables because the values of calculated according to Fornell larcker criterion along with cross loading has shown that the link between construct is much stronger with itself than the link among other construct in this research so there are zero construct the measures for same other construct, the values can see be in table 4.2. Table 4: Shows the Fornell-larcker criterion..

Fornell-Larcker Criterion

	LI	LSQ	PV	TI	VI
LI	0.831				
LSQ	0.711	0.859			
PV	0.713	0.688	0.695		
TI	0.580	0.471	0.423	0.760	
VI	0.831	0.775	0.657	0.579	0.665

The discriminant validity can only be satisfactory once loading of AVE is greater than 0.5 for only one and each of them expresses at least half of estimation a wide range which remain to hold the frame (Chin, 1998). In discriminant validity if side to side door segment values are consistent and little or/ slightly to be better than standard values in relevant portions, then from one part to another part modules are square rooted and AVE values for can be created for each.

Heterotrait-Monotrait Ratio (HTMT)

By using Fornell larcker criterion (Fornell & Larcker, 1981) for Hetrotrait-Monotrait ratio which should be lower than 0.90 the HTMT values of variables inside the table 4.3 are considered to be valid and it also explains that there are no linkage found between the constructs

Table 5: Shows HTMT ratios from discriminant validity.

	LI	LSQ	PV	TI	VI	VI x PV
LI						
LSQ	0.792					
PV	0.791	0.765				
TI	0.798	0.776	0.731			
VI	0.782	0.773	0.726	0.718		
VI x PV	0.704	0.712	0.725	0.715	0.742	

Structural Model

In this part of SEM (Structural equation model) is used to measure the relationship between the variable and test their level of correlation among them by many methods (*Structural* n.d.).

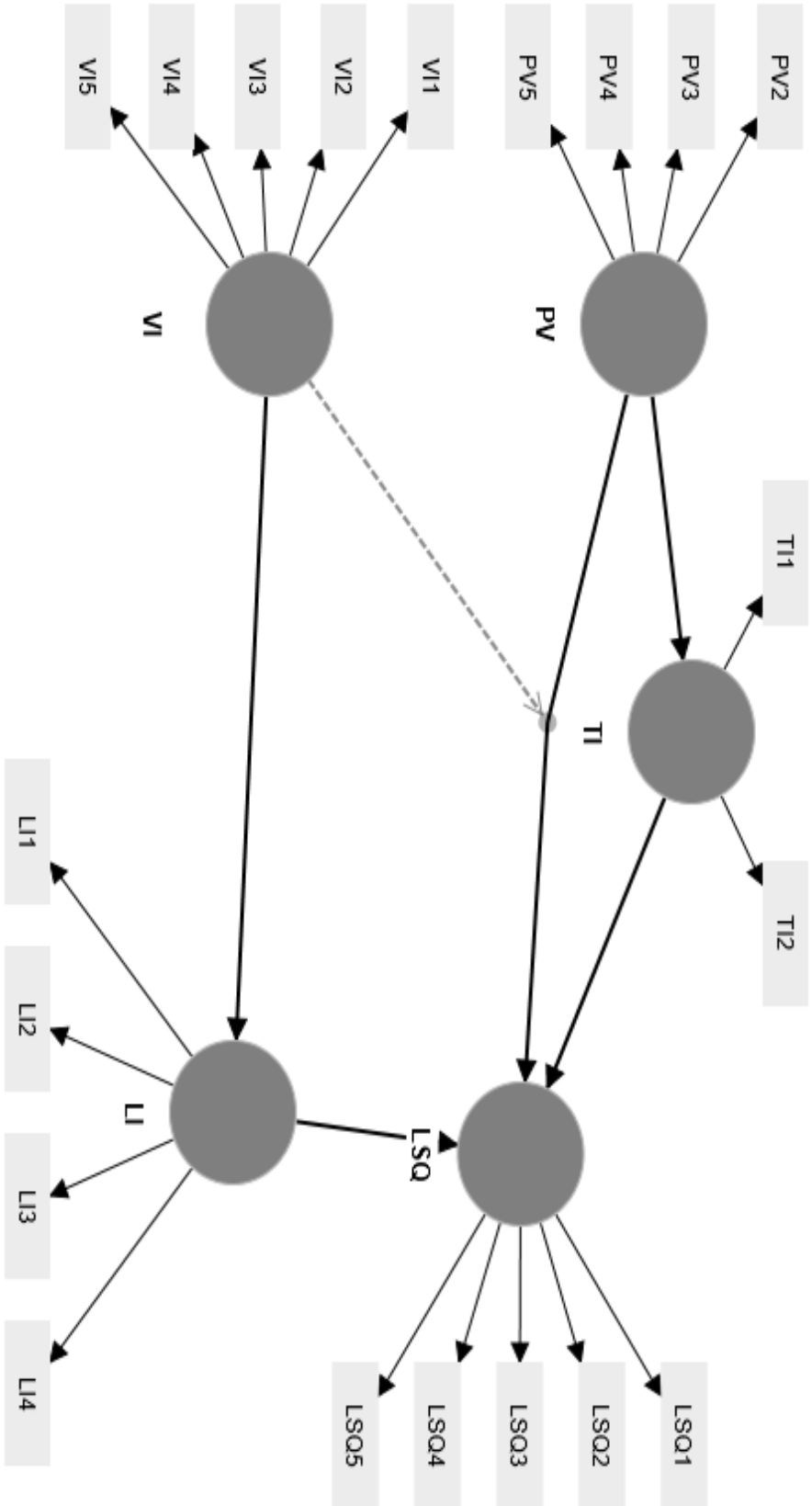


Figure 2: Structural equation model of this research).

Table 6: Show path coefficients of this research.

Path Coefficients

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
LI -> LSQ	0.677	0.576	0.101	0.673	0.000
PV -> LSQ	0.309	0.317	0.077	3.994	0.000
PV -> TI	0.423	0.436	0.070	6.045	0.000
TI -> LSQ	0.238	0.193	0.646	0.368	0.000
VI -> LI	0.831	0.835	0.023	36.050	0.000
VI -> LSQ	0.567	0.570	0.098	5.763	0.000
VI x PV -> LSQ	0.151	0.135	0.062	2.442	0.000

H1 This hypothesis has P value of 0.000 that show significant influence of logistic integration over logistic service quality. Accepted

H2 This hypothesis has P value of 0.000 that show significant influence of l product variety on logistic service quality. Accepted

H3 This hypothesis has P value of 0.000 that show significant influence of Product variety on transaction intensity. Accepted

H4 This hypothesis has P value of 0.000 that show significant influence of transaction intensity over logistic service quality. Accepted

H5 This hypothesis has P value of 0.000 that show significant influence of virtual integration over logistic integration. Accepted

H6 This hypothesis has P value of 0.000 that show significant influence of virtual integration over logistic service quality. Accepted

H7 This hypothesis has P value of 0.000 that show significant influence of logistic integration & product variety over logistic service quality. Accepted

According to the table no. 4.5 the p values of all hypothesis is 0.000 which should be less than 0.05 to establish acceptable hypothesis these p values are conduct through bootstrapping technique on Smart PLS software, these values also has shown that a positive relationship can be formed among variables. so for that each and every hypothesis is accepted hence null hypothesis are not taken.

Conclusion, managerial implication, & limitation

Conclusion

In the end this study has helped us to understand impact of product variety decision on overall logistical service performance and how much these sort of troubling factor can be resolve through proper incorporation of the logistics with other supply chain partners. Furthermore, this research is mainly focused on the online retailer segment, due to that the finding cannot be ideal for any other thing. However, the outcomes of this research has shown that the information sharing and collaboratively planning & replenishing inventory and raw material can lead us to avoid issues like (Delayed shipment, Stock out, overstock, damaged order placement, wrong door delivery and numerous other problems) not only that it will also assist an online retailer to work efficiently and effectively. The information exchange among supply chain partner plays key role & it also help form an alliance by just creating a virtual network that can be used by intra-organizational member and inter-organizational member so that a proper cross-function communication will carry out beside information sharing is a renowned approach for achieving better supply chain performance and results (Zhang & Han, 2020). Whereas, previous researcher (Charkaoui et al., 2012; Roaimah et al., 2010) has defined that information sharing and information quality can put an impact logistical performance can raise it up 50% at once while supply chain partner are contributing their effort in achieving target. Concluding, all facts, taking aggressive decision for product variety can damage firm ability to do business correctly for the reason companies should always seek a balanced fit where companies nor loses customer neither loses its competitive edge, because there are number of newcomers and competitor waiting for their chance to get customer without wasting time to dodge such situation retailers should focus of logistical factor. Moreover, every research hypothesis is accepted and that represent positive relation among constructs. Afterward the construct validity test was good because each of results and values were above or equal to criterion used in research methodology section. so far that the moderating effect of virtual integration on our research is valid and right on the basis of result obtained through several statistical test it shows that virtual integration has an influence or/ effect over the relationship of product variety and logistical service quality it weakens the negative effect of wide range of product variety on LSQ.

Managerial implication

The strategic manager of an organization can use such type of technology for the purpose integrating the all supply chain partners and form a long term collaboration network in order to get higher rate of accuracy of demand, dodging and resolving uncertainties caused by supply chain and logistical risk, they should implement all required state of art

technologies in their business operation Like Augmented reality, virtual integration, EPOS, EDI and many more others.

Limitations:

Current research study has only focused specific industries (e.g. transportation, online marketplaces, textile etc.) there are multiple other industry that can be studied specifically on this title of research.

Due to conveyance issue this research has geographically limit because it has only surveyed through two or three cities of Sindh, so researcher can use this opportunity to explore more regarding this study.

Whereas in this research we have discussed addition moderating variable (Virtual integration) though the researcher can also add some type of variable or may he/or she can add more the one variable to initiate some new type of research study that may help future problems or solve existing one more effortlessly.

Researcher can also expand the number of responses collected for research and drag it to the international ground with the internet.

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