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THE EFFECT OF SUPPLY CHAIN INTEGRATION AND IT USE ON FIRM PERFORMANCE: AN EMPIRICAL STUDY ON SERVICE INDUSTRIES

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ABSTRACT

Supply chain integration (SCI) has been widely discussed area in supply chain literature. Based on extended resource based view (RBV), and resource orchestration theory (ROT), our study was conducted to analyze the effects of SCI (i.e. information integration, process integration and measurement integration) on firm's performance (i.e. operational, business) in service industries in Pakistan. In addition, we investigate the contingency effect of IT use (i.e. Transaction management, order delivery and customer services, planning & control) on the relationship of integrative Supply chain practices and firm's performance. We follow step wise hierarchical regression approach by pair wise comparison of performance effect of IT use and each dimension of SCI. Survey data were collected from a sample of firms in food, hospitality, fashion, telecom, IT and retail industries in Pakistan. The empirical results indicate that IT use strengthen the effects of SCI on firm's performance by significantly moderating the aforementioned relationship. The results demonstrate best model fitted with pair wise interaction between IT use and SCI mechanisms. The study contributes to supply chain literature by analyzing pivotal role of IT use in integrating various supply chain activities in B2 B and B2 C markets. The research has implications for retail managers, service supply chain planners and distribution companies to use IT in integrating supply chain and materializing performance.

Keywords: Supply chain integration, Firm performance, IT use
JEL Codes: L25, O30

I. INTRODUCTION

Supply chain integration (SCI) has been extensively researched topic in SCM research. The objective of the SCI is to make effectiveness and accuracy in overall operations of a company and streamline product, process and cash flows from suppliers to end consumer (Sammuel and Kashif, 2013). Previously, SCI has been extensively researched in manufacturing sector in relation to information technology (IT) and performance (Gunasekaran and Ngai, 2004; Liu et al., 2013; Liu et al., 2016; Huo et al., 2014; Flynn et al.,2010; Wiengarten et al.,2014; Wong et.al.,2011), yet there is still need to shed light on operational benefits of SCI with IT use in service sector. Retail sector has potential to use IT in various operational activities. Retail and distribution involves multiple stakeholders and firm's retail line should be capable enough to deliver optimum performance while facing market dynamism.

Globalization has transformed retailing from traditional to data driven retailing. Furthermore, IT has transfigured service business function significantly from upstream to downstream. Traditional web channels are being converted into mobile channels with emergence of various social apps. Mobile internet particularly provide organizations new opportunities to maximize value, by creating demands, increasing efficiency, supporting knowledge flow and improving competitiveness in the form of reduced e wastage, lower operational cost and innovation in product and process (Sheng et al., 2005; Unhelkar and Murugesan, 2010).

Firms are connecting themselves in values chains to bundle their resources to reap the benefits of integration. Retail firms are different in their resources, capabilities and demographic factors like their size, age and IT experience.

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According to resoucre orchestraion theory, organizations can materalize the full benefits of their resources only when resources are managed effectively (Sirmon et al; 2011). Based on extended RBV and ROT(Peteraf, 1993; Sirmon et al; 2011), the current study intends to analyze the moderating effect of IT use on the relationship between SCI and firm's operational and business performance.

First, based on literature review and experts feedback SCI and IT use were operationalized keeping in view the emerging needs and dynamic nature of retail function. Second, this study theorizes and empirically tests, how selected integrative mechansims affect focal firm's operational and business performance. Third, how IT use in retail operations interact with those integrative mechanisims to give combined performance effect. Hence, the study would answer the following questions empirically;

- How do the SCI (i.e. information integration, process integration, measurement integration) affect firm's operational and business performance?
- How do the IT use (i.e. transaction management, order delivery and customer services, planning and control) moderate the relationship betweeen SCI and firm's operational and business performance?

The selected dimensions of SCI were followed from existing literature (Cai et al.,2010; Cao and Zhang,2011; Flynn, Huo and Zhao, 2010) and need more empirical research in context of IT use in service supply chain (Saeed et al.,2011;liu, Wei, Ke, Wei, & Hua, 2016).

The study make two contributions to the literature on service supply chain integration. First, this study empirically tests how IT use and SCI interact with each other to affect focal firm's performance. Second, we tested the hypothesis beyond the bivariate interaction effects and identified specific pairwsie interacting patterns of IT use and SCI dimesnios that are suitable to firm performance.

II. THEORETICAL FOUNDATIONS AND LITERATURE REVIEW

II.I. THEORETICAL FOUNDATIONS

This study takes the theory lens of Resource-based view (RBV), Relational View (RV) and Resource Orchestration Theory (ROT). RBV states that internal resources of firm are rare, inimitable, non-substitutableand are competitive advantages for firms (Peteraf, 1993). According to relational view, relational capabilities become a fundamental source of competitive advantages for the whole value chain. According to Resource orchestration theory, afirm can materialize the value of resources only with proper resource management (Chadwick et al., 2015; Sirmon et al, 2011). ROT indicates how resources and capabilities can be aligned together to make excellence in performance.

DCV positthat better firm presentation comes from two kinds of hierarchical capacities, specifically, dynamic ability and functional capacity (Cepeda and Vera, 2007; Fawcett et al., 2011).). Dynamic capacities direct firms in securing new information essential to exploit market patterns and leads towards ordinal ability like hierarchical nimbleness (Wu et al., 2010; Teece et al., 1997).

In the present contemporary business world, firms are essential for larger supply chain networks while IT is a powerful tool to connect the holes between inventory network accomplices when applied suitably (Nair, Frazier and Markowski, 2016). DCV places that organizations can perform better assuming their profit by assets and best acts of their accomplices (Liu et al.2013; Barreto, 2010). In our review setting, IT is a lower order capability which helps to foster higher order dynamic capabilities, for example, data assimilation, and operational coordination leading to effective execution (Liu et al., 2016; Rai et al., 2006). Essentially, IT framework alone isn't ensured to convey prevalent execution until IT is utilized across different supply chain network (Yu et al., 2018; Davenport, 2006). Understanding these thought processes, IT when use with integrative practices in production network produce ideal reaction and wanted results (Ramasubbu and Sambamurthy 2008).

In today's contemporary business world, firms are part of larger supply chain networks while IT is an effective tool to bridge the gaps between supply chain partners when applied appropriately (Nair, Frazier and Markowski, 2016). DCV posits that firms can perform better if they capitalize on resources and best practices of their partners (Liu et al.2013; Barreto, 2010).. In our study context, IT is a lower order resource capability which assists to develop higher order capabilities such as, information integration, and process integration leading to increased performance (Liu et al., 2016; Rai et al., 2006). In effect, IT infrastructure alone is not guaranteed to deliver superior performance until IT is used across various supply chain activities (Yu et al., 2018; Davenport, 2006). Following these lines of thinking, IT when use with integrative practices in supply chain produce optimum response and desired results (Ramasubbu and Sambamurthy 2008).

II.II. SUPPLY CHAIN INTEGRATION

Supply chain integration refers to the extent to which firm make collaboration with channel partners to build up their capabilities by deploying strategic resources in such a way that optimize their collective performance in the creation, distribution, and support of end value to product (Flynn, Huo and Zhao, 2010). The focus of study is on external integration with three key components of information integration, process integration and strategic supply chain relationships with strategic relationships as central outcome of other two dimensions.

Information integration refers the extent to which a firm shares information about various supply chain activities with channel members (Lee and Whang, 2004; Liu et. al, 2016). Food supply chain is agile and need collaborative forecasting techniques to be applied for better integration and optimized performance. Eksoz, Mansouri, & Bourlakis (2014) described that key to success in food supply chain is collaborative forecasting based on modern knowledge management systems Samaranayake & Laosirihongthong (2016) worked on developing a conceptual model of integrated supply chain that can be used to measure, estimate and control complete operations under uncertain circumstances. Complete process is based on fuzzy-based decision support system which monitor and control demand variation, capacity utilization, inventory planning and quality on real time basis. Supply chain agility requires information sharing across network inside and outside the organization for better collaboration (Gligor, 2014). Information sharing helps in better responding to market fluctuations which in turn makes positive impacts on the firm's sales, market share, profitability and service quality (DeGroote, 2013). Bullwhip effect is a common problem in modern supply chain management which make difficult to handle uncertain situations of demand forecast updating, order batching, price fluctuations, and rationing. It was analyzed that bullwhip effect is the outcome of poor level of information integration among supply chain partners. According to Prajogo (2012), information integration not only enhances the technical capability of organization but also increase mutual trust between supply chain partners. Leuschner (2013) finds that there is positive relationship between information sharing, operational integration and firm performance.

In nut shell, information sharing plays a pivotal role in building strategic partnerships which leads to optimized operational and financial performance of supply chain.

Hypothesis 1a/b: Information integration is positively related to firm's operational and business performance

Process integration refers the degree to which a firm plans, smooth out and execute its supply chain processes with channel accomplices (Lee and Whang, 2004). Process integration need high level of operational coordination and supply chain planning at all levels of business process like demand forecasting, inventory planning, process automation and customer relationship management (Jonsson & Holmstrom, 2016). Supply chain planning is a system of coordinating the different units and processes at inter & intra firm level to meet the challenges of demand and supply relationship (Oliva and Watson, 2011). Chan (2012) found that consistent improvement in interior and outside business processes is compulsory for accomplishing business targets and arriving at the ideal phase of consumer loyalty. Many companies are automating their service operations with digital cloud technologies in order management, handling customer complaints and relationship management. Efficient process integration reduces service lead time by improving production planning and inventory management using accurate and timely market information (Huo, Qi, Wang & Zhao,2014)**.**Stevens and Johson (2016) states that firms are now reviving their image from product based differentiation to process based differntiation because the process through which product satisfies customer needs make differentaition for firms.

Prajogo, Oke & Olhager (2016) firms are now investing in lean production and distribution. Process integration mediates relationship of logistics integration with firm operational & financial performance. Various studies support the fundamental argument that high performance returns and competitiveness can only be gained through channel integration at all levels (Forslund,2015; Cao and Zhang, 2011; Prajogo and Olhager, 2012; Moori, 2012). Process integration is the best way to acquire upper hand as far as development, dexterity, adaptability and diminished cost which is conceivable simply by close coordination inside the firm and among firm and its suppliers (Wu et al., 2016; Richey 2009; Spole, 2012). Junqueria (2010) recommended that supply chain activities essentially affect supply chain relationships and it fabricates elevated degree of shared trust and cooperation between the firms and supply chain partners. Subbaiah (2009), store network is a coordinated arrangement of business partners like providers, producer, operations middle people and wholesalers where they cooperate to smooth out the course of material, money and data stream.

Hypothesis 2a/b: Process integration is posiively related to firm's operational and business performance

Measurement integration refers to the degree to which a firm develops strong linkages within its network to reach out strategic goals (Lee and Whang, 2004). Such kind of strategic partnership need synchronized planning with channel partners in designing plans and high level of trust in information sharing at all levels inside and outside the organization (Lee and Whang,2000). Supply chain relationships are subject to change according to behavioural pattern of stake holders. External uncertainities and buyer's use of power are two fundamental reasons for opting oportunistic behaviour by supplier**.** It was suggested that better the integration in supply chain lower will be opportunisim in supply chain relationships and more will be the level of trust among supply chain partners(Wang, Huo, Tian, & Hua, 2015). In context of our research, milk supply chain face power problems in shape of bargaining power of buyer and suppliers and coercive/ non coercive power. Where firms face opportunisim from a big buyer or supplier in a high uncertain external environment. So the rich organizational culture supporting better integration inside and outside the organization curbs the opportunisitic behaviour of suppliers while incultating trust between buyer and supplier.

Flyn, Huo and Zhao (2010) internal integration is about functioning of different units within organizations in close coordination while external integration leads towards close strategic relationships with customers and suppliers. Cadden (2012) strategic partnerships are now considered as a strategic weapon and competitive advantage for the organizations. Knowledge management is a challenging topic in global supply chain management. MNCs need to inculcate rich institutional culture of knowledge transfer with supply chain partners. So subsides of organization need to be integrated both internally and externally in order to reap maximum benefits of operational coordination (Demeter, Szasz, & Racz, 2016). Ross(2011) fast communication channels between channel members help in framing business policies, goal alignment and in time achievement of tasks. Strategic partnerships are the outcome of interorganizational communication, internal and external knowledge sharing and operational coordination.
Hypothesis 3a/b: Measurement integration is posiively related to firm's operational and business performance

II.III. IT USE

The usage of IT assumes a focal part in empowering supply network coordination. It permits production network accomplices to build the volume and intricacy of data exchange. It additionally empowers ongoing data sharing, which increments visibility in the drawn out production or supply network (Prajogo and Olhager, 2012). Li et al. (2009) contend that IT utilize just in a roundabout way influences execution using supply chain network coordination strategies, despite the fact that most scholars (for example Leuschner et al., 2013) incorporate IT use as a component of the supply chain network combination measure. The last option makes it challenging to comprehend its particular use, either as an empowering tool for information sharing or as an enabler for functional coordination, in supply chain network. Thusly, the second point of this exploration is to explain the way that IT use cooperates with these unique and interrelated reconciliation strategies in the supply network. As a feature of this, this concentrate likewise assesses whether IT utilize upstream and downstream in the supply chain network brings about comparative functional benefits for the central firm. IT use estimates the degree to which organizations utilize IT to help supply network associations with key serivcey providers and clients.

It is evident from literature that IT has profound effect on integration with significant role in realizing value chain performance. Liu, Wei, Ke, Wei, & Hua(2016) studied the joint effect of SCI and IT use as a fit on firm operational and financial performance. Their results supported claim that IT has contingency effect on the link between SCI and firm performance. Moreover, there must be match in level of IT competency of firm with its particular SCI group. Supply chain integration through community cloud is a new concept in modern supply chain management for sharing of virtual resources inside and outside the organization. With community cloud technology, partner firms can use supplier's IT resouces in smooth and cost efficient manner(Cámara, Fuentes, & Marín, 2016).

III. CONTINGENCY APPROACH

In contingency approach, the relationship between supply chain integration and firm performance is contingent on IT use. For example, high level of IT use make easy for firms to derive optimized performance and customer service from SCI (Flynn et al.,2010). Soderoa, Rabinovich and Sinha (2013) suggests that internet based technologies make organization capable to improve business process because of timely and accurate flow of needed information for shared decision making among business partners. Similarly, IT use is effective in making significant impact not only on information and physical resources integration but also in optimized operational performance. (Cámara, Fuentes, & Marín, 2016). Yang (2014) technical capabilities like IT infrastructure and competencies along with Information sharing, work collaboration and mutual trust are antecedents of supply chain agility which leads to cost efficiency that capitalize increased performance. Rajaguru (2013) emphasized lowering inventory cost and high quality customer service by information integration through assimilation of IT based compatible information system in supply chain.

In nut shell, managerial commitment towards adoption of digital technologies, flexible IT infrastructure and required skill set enables the firm to benefit from strategic partnerships and supply chain integration practices

Hypothesis 4-5 a/b/c. IT use moderates the relationship between information integration, process integration, measurement integration and firm's operational and business performance.

III.I. THEORETICAL MODEL AND MATHEMATICAL DESCRIPTION:

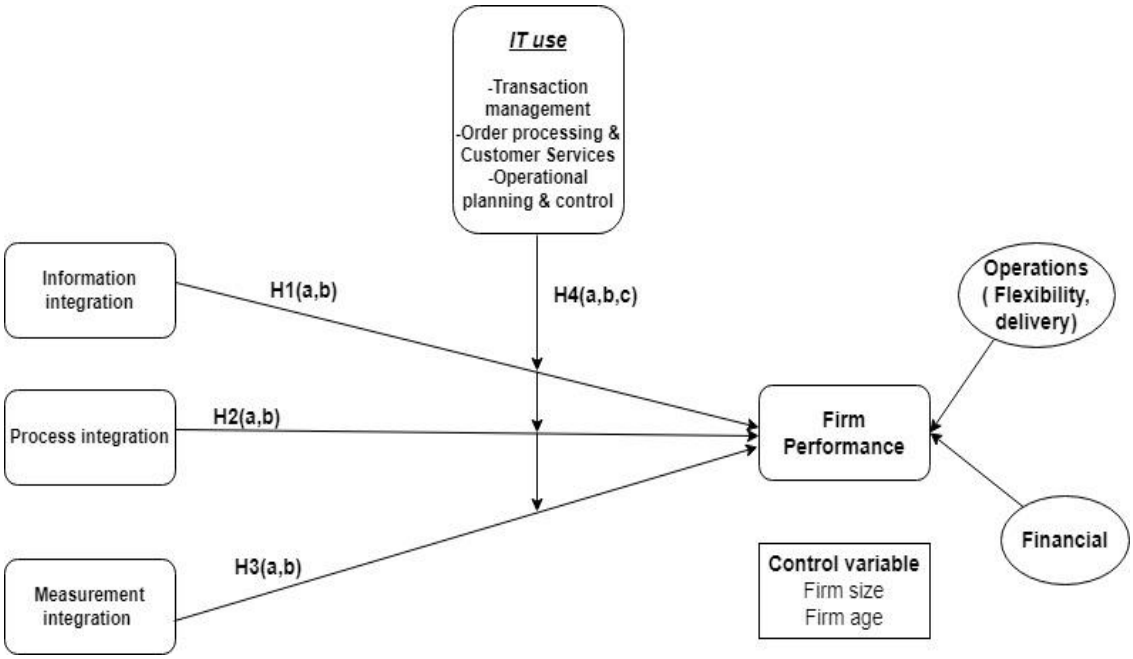

Fig 1: **Structural Model**

Let we assume; firm performance is y and SCI (information integration, process integration and MI) are$x1, x2$ and $x3$. The IT use is z and control variables; Firm size, ownership type and firm experience are s, t and e respectively.

Hence regression equation can be written as follows,

$$y = \propto + \beta 1x1 + \beta 2x2 + \beta 3x3 + \beta 4z + \beta 5zx1 + \beta 6zx2 + \beta 7zx3 + \varepsilon \text{---------- (1)}$$

Final econometric model with control variables can be written as;

$$y = \propto + \beta 1x1 + \beta 2x2 + \beta 3x3 + \beta 4z + \beta 5zx1 + \beta 6zx2 + \beta 7zx3 + \beta 8s + \beta 9t + \beta 10e + \varepsilon \text{ ----- (2)}$$

IV. RESEARCH METHODS

IV.I. SAMPLING AND DATA COLLECTION

Our research approach was deductive. Deductive research tests a theory by testing the hypotheses (Gulati2009; Bryman, 2007). Our study was focused on SCI in service sector. The target populationwere retail firms engaged in both upstream and downstream supply chain operations.. We first gathered internal company information from department managers, regional sales managers of distribution centers and other "key informant" in three companies (Flynn et al.,2010; Zhao et al.,2011; Zhou et al.,2014). The Sales & distribution executives were interviewed because of their vast experience and knowledge in the area of customer care and process integration . Our sample consist of distributors, wholesalers, retailers and key account outlets of modern trade like super market chains; Metro cash & carry, Macro, Hyper stars, health care, tourism and hospitality chains. To obtain representative sample, multi stage cluster sampling within probability sampling was used. In the first step geographically closed clusters of cities were selected as sample frame and in next stage sample was chosen randomly from selected clusters. Multi stage cluster sampling is cost effective technique among all the sampling techniques (Malhotra,2005).. We personally visited all sales offices, warehouses and distribution centers of firms in selected sample frame of 3 urban cities of lahore, faisalabad and Sahiwal to get deep understanding of structure of supply chain. In order to make parsimony in data collection; within chosen sample frame; we applied the stratified random sampling technique to make initial sample of 450 firms. Our sample was mix of main distributor, handling distributions, wholesalers, large retailers and key account outlets of modern trade. Stratified random sampling is time and cost effective technique when population is

large, diversified and scattered in vat geographical area (Sekaran, 2003). Next, we removed those firms which were mix buyers of more than one company because of duplication. Finally, 400 firms were selected for sample. For data collection, we visited personally each firm to collect data with the help of each company sales force and distribution field staff in selected areas. Few firms refused to give data due to their privacy issues and few not filled surveys properly. Finally 300 useful questionnaires were obtained with high response rate of 75% due to personally administering the data collection procedure. In order to analyze the potential for non response bias we compared the responding and non responding firms by conducting an independent sample t-test. We found that there was no significant difference between the two groups regarding key firm demographics like; firm experience (t =0.268, p =0.789), ownership type (t=-1.034, p=0.302) and firm size (t =-1.266, p= 0.206) suggesting that non-response bias was not a concern (Flynn *et al., 2010; Zhao et al.,2011).*Since, all the questions were responded by one key informant in downstream firm, so common method biasness was checked by Harman one factor (single factor) method and test of common method biasness (Zhao et al.,2011;Flynn et al.,2010). The maximum variance explained by single factor was 26.075% which is smaller than 50% indicating that common method bias is not the issue (Sanchez and Brock,19996).

Table 1: Sample demographics (N=300)

	N	Percentage (%)
Respondent titles		
Warehouse Manager	12	4%
Distribution Managers	23	8%
Floor manager	53	17%
Retailers	137	46%
Key account outlet managers	75	25%
Area		
Lahore		
Sahiwal	121	40%
Faisalabad	81	27%
Ownership	98	33%
Private owned		
Foreign owned /MNCs		
Firm Age	282	94%
≤5 years	18	6%
>5≤10 years		
>10≤15 years		
>15years	63	21%
Firm Size (Turnover p.a, converted into $)	105	35%
5000-10,000	93	31%
10,000-15000	39	13%
15000-20,000		
>20,000		
	57	19%
	108	36%
	90	30%
	45	15%

IV.II. MEASURES

We collected data on a structured questionnaire which was developed by adopting/ adapting previously validated measures from the existing literature. It was translated first into national language, then retranslated into English and was pilot tested by language and industry experts. The questionnaire adopted a five-point Liker scale with options ranging from 1 ("strongly disagree") to 5 ("strongly agree") to measure the items. We first submitted the questionnaire to eleven operations mangers and regional sales managers of selected units in chosen sample frame. The feedback of key informants was taken about questionnaire with an interview after they completed it. Later, we pretested the questionnaire with direct firms to refine the measures adopted from multiple sources in literature. The necessary modifications were made in wording and format of items according to specific industry needs. We also included some control variables that might affect firm performance, namely, firm ownership status, firm size (annual turnover)and

firm age or experience (Huo et al.,2014; Rajaguru & Matanda, 2011). Dummy variables were used for control variables. For the ownership dummy variables; ownership 1 refers to private owned firms and ownership 2 refers to MNCs or foreign owned firms. Firm size was assessed by annual turnover and firm age was measured by years of business experience. Table ii presents the measurement items and their source of adaption from literature. Table iii presents the measurement items, their descriptive statistics, construct reliability and validity of measures.

Table 2: Literature on Measures

Items	Literature
Supply chain integration	
Measurement integration	Lee and Whang,2000;Krause et al., 2007; paulraj et al.,2008; Flynna *et al*.,2010; Flynn, Huo and zhao, 2010
Our performance indicators are aligned with company and our channel partners	
We share risks, costs and rewards with our channel members.	
We promote an attitude and plans of action to support an integrated business performance with our channel partners	
We involve with our channel partners for the joint establishment of objectives for the end customer satisfaction.	
We make corrective measures and targets based on online customer reviews about our channel performance	
Information integration	
We exchange information frequently with our channel partners.	Cai et al.,201;0; Raja guru & Matanda,2013; Kim et al., 2006; Wu et al.,2006; Lee and Wang,2000; Liu et al.,2016
We keep each other informed about events, promotions or changes that may affect our business	
We share real time information with channel members to make a common demand forecast	
We share our available inventory with our channel partners	
Partners (suppliers/customers) are provided with any information that might help them for quick order processing	
Partners (suppliers/customers) are provided with any information that might help them for quick complaint handling.	
Process integration	
We practice shared decision making using shared resources within supply chain to improve the routine operation activities.	Lee and Whang,2000 Saeed et al.,2011;Wu et al.,2003;Flynna*et al*.,2010; Moori, Lima &Menezes, 2012; Liu et al.,2016; Flynn, Huo and zhao, 2010
We coordinate our supplier in Procurement (e.g., online order placement: place and track orders with suppliers; allow suppliers to submit bids online)	
Order execution (e.g., online ordering: accepting orders electronically from customers; allowing customers to track and inquire about their orders)	
We jointly involve in agreements with our channel members on delivery frequency, packaging customization in the procurement and distribution of products.	
We coordinate Financial exchange (e.g., online payment) of our supplier / customers with banks and relevant institutions	
We help our major supplier to improve their process to better meet our needs	
IT use	
a) Transaction Management	Ray et al.,2005; Saraf et al.,2007; Liang et al.,2007Ranganathan et al.,2004;Kim et al.,2006; power et al.,2005;Ellram et al. (2007); MellandGrance 2014; Liu et
We use Electronic tools with suppliers in procurement.	
Our IOS(system) saves purchase history of online and offline customers	
We use IT in integration of dynamic QR code for mobile payments through phone pay or other applications at our store.	
We use Electronic tools with customers in POS and online purchases	
We use IT in restoring transaction data across multiple channels through QR codes	
b) Order delivery and customer services	

The gift coupons or vouchers issued by the store can be redeemed either online or offline.	al.,2016; Oh et al; 2012; wang et al., 2013
Customers can get post-purchase services support for the products purchased at our physical stores from our Website or social APP	
Our customers can search for products, store address and contact information through our mobile Applications or web site	
The Website or App allows ordering by a catalog number	
C) planning and control	
We use IT in logistics tracking and shipment both inbound & outbound	
Our customers can receive a customized Web page or interface in APP.	
We use IT to make future purchase recommendations to customers based on past online and offline purchases	
a) Flexibility performance	Rai et al.,2006;Rai and Tang,2010; Leuschner, Rogers and Charvet;2013; Yang,2014; Flynn, Huo and zhao, 2010; Oh et al; 2012
We can respond to changes in market demand.	
We have the ability to provide new ways of performing transactions	
We can manage product mix portfolio of company	
b) **Delivery performance**	
Our lead time for fulfilling customers' orders is short	
We can solve customer complaints in due time.	
c) Business Performance	
Growth in sales.	
Return on sales.	
Return on investment	
Growth in market share	

IV.III. MEASURE VALIDATION

Before moving to factor analysis, we checked the normality of data by testing the values of skewness and kurtosis. The resulting absolute values of skewness were less than 1.10, and absolute values of kurtosis were all less than 1.00, satisfying the condition of normality (Cao and Dowlatshahi, 2005). We further used the KMO measure of sampling adequacy and Bartlett-test of sphericity to find normality and significance of study. The KMO value range from 0 to 1 with over 0.6 being considered feasible. The KMO score was 0.770, and the Bartlett-test of sphericity, approximate chi square value was 4144.0 with a significance level of $p<0.001$. These results show that our measures were normally distributed and could be used for factor analysis and structure equation modeling (Paulraj et al.,2008). Our test showed that the highest variance inflation factor value was 2.940, less than the bench mark value of 3.3 recommended by Diamantopoulos and Siguaw (2006). Therefore, there was no issue of multicollenerity in our dataset. We used partial least square(PLS) approach to structural equation modeling(SEM) using smart PLS 3.0. Unlike covariance based SEM models, this technique make assessment of measurement model and structural model together (Hair et al.2013). We conducted principal component exploratory factor analysis for factor reduction and deleted those items whose factor loading was smaller than 0.5 in our measurement model. Further, convergent validity was assessed through reliability and validity of our measurement model. The final results revealed that the standardized factor loading ranged from 0.50 to 0.90 with t-values ranging from 8.09 to 20.32 and all items coefficients were greater than twice the values of their standard errors (Flynn et al., 2010). Furthermore, the average variance extracted (AVE) values ranged from 0.51 to 0.75, suggesting that convergent validity was achieved. Although several items had relatively low factor loading, which caused relatively low AVE, but we still keep those items due to their high importance for construct (Flynn et al., 2010). Further, all constructs showed satisfactory level of reliability with value of chronbach's alpha ranging from 0.67 to 0.83 and composite reliability ranging from 0.78 to 0.89, higher than 0.70 (Lance et al.,2006).

To assess discriminant validity, we compared the relationship between shared variance among construct and the value of AVEs. As shown in table iii, the square root of AVEs for all constructs were higher than corresponding correlations between constructs, supporting discriminant validity.

Table 3: Descriptive statistics, Reliability, Correlation and AVE

	Constructs	A	1	2	3	4	5
1	Measurement integration	0.68	**0.707**				
2	Information integration	0.71	0.673**	**0.709**			
3	Process integration	0.67	0.610**	0.459**	**0.708**		
4	IT use	0.68	0.088	0.024	0.190**	**0.742**	
5	Firm Performance	0.83	0.555**	0.587**	0.445**	0.173**	**0.714**
	Mean		3.71	3.88	3.48	2.57	3.92
	S.D.		0.57	0.58	0.64	0.96	0.68

Note**:** Square root of AVE reported along diagonal in bold ** Correlation is significant at 0.01 level (2 tailed)

V. ANALYSIS AND RESULTS

V.I. SEM AND RESULTS OF CONTINGENCY ANALYSIS

We tested our hypothesized structural model as per assumptions of mediation and moderation by analyzing both direct and indirect effects (Baron and Kenny, 1986; Iacobucci, Saldanha and Deng, 2007). The results as in (Figure 2) support our hypothesis of significant direct effect of information integration and process integration on firm performance (H1a, $p< 0.001$, H1b, $p<0.05$) and significant effect of measurement integratrion on firm performance (H1c,$p<0.001$). In order to test moderation, we first tested the direct effect of IT use on firm performance ($p<0.001$) and then their relative moderating effect on the relationship of information integration, process integration and measurement integration each on firm performance (H3a, $p<0.05$; H3b, $p<0.05$; H3c, $p<0.001$) supporting our hypothesis of moderation. Furthermore we checked the predictive power of our model by assessing value of $_R^2$ (Firm performance) with and without control variables. The results demonstrated relatively higher value of R^2, 0.508 with control variables than R^2, 0.507 without control variables.

Table 4: **Summary of hypotheses and results.**

Path in the structural model	**Path coefficient(t-value)**	**Outcome**
Information integration ⟶ Firm performance(H1a)	0.337(5.830)	Supported
Process integration ⟶ FIrm performance(H1b)	0.126(2.329)	Supported
Measurment integration ⟶ Firm performance(H1c)	0.321(5.198)	Supported
IT use*II ⟶ Firm performance(H3a)	0.149(2.051)	Supported
IT use*PI ⟶ Firm performance(H3b)	0.113(2.081)	Supported
IT use*MI ⟶ Firm performance(H3c)	0.312(4.761)	Supported
IT use ⟶ Firm performance	0.185(4.010)	Supported
Control variables		
Firm Age ⟶ Firm performance	0.003(0.062)	
Firm Size ⟶ Firm Performance	-0.021(0.513)	
Ownership type ⟶ Firm peformance	-0.022(0.573)	

Note: **II**: Information integration; **PI:** Process integration; **MI:** Measurement integration

V.II. CONTINGENCY ANALYSIS WITH HIERARCHICAL REGRESSION

We also applied hierarchical regression analysis to compare alternative models with and without interaction terms. Moreover the interaction effect of each dimension of IT use on each dimension of SCI (information integration, process integration, measurement integration) was tested to support our hypothesis of moderation. As per existing literature, both the overall SCI (Cai et al., 2010; Cao and Zhang, 2011) and IT use were taken as second order reflective variables. Then we computed the average value of three integration dimensions and average of three IT use. In order to minimize the issue of multicollinerity, all moderator variables and their interacting independent or mediator variables were mean centered. As shown in Table v, we tested different models in SPSS and compared the R^2 and F value of each regression model with control variables. The interaction between overall SCI construct and IT use were positively related to firm performance ($\beta=.203$, $p<0.001$) giving evidence for moderation. However, the results revealed that few pair wise interactions of SCI dimensions and IT use components were significantly positive related to firm performance and few were significantly but negative related to firm performance. Specifically, only the interaction between IT infrastructure (IC1) and information integration ($\beta=0.164$, $p< 0.01$) and between knowledge, skills & managerial commitment (IC2) and information integration ($\beta=0.149$, $p< 0.05$) were significantly positive

related to firm performance. Furthermore results of M8 (R^2=0.521, F= 16.991) supported our best model fitted with hierarchal regression.

Table 5: **Hierarchical regression results**

	Firm Performance							
	M1	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**
Age	0.066	0.034	0.006	0.017	0.001	-0.002	-0.003	-0.002
Ownership	-0.025	-0.049	-0.036	-0.032	-0.034	-0.034	-0.042	-0.051
Size	-0.031	-0.023	-0.027	-0.028	-0.018	-0.026	-0.043	-0.021
SCI		0.607***		0.683***				
Measurment integration			0.236**		0.296***	0.256***	0.339***	0.324***
Information integration(II)			0.326***		0.313***	0.305*	0.333***	0.278***
Process integration(PI)			0.134*		0.123*	0.121***	0.149**	0.153**
IT use		0.105*		0.148***				
Transaction mgt (ITU1)			0.212		0.148**	0.230***	0.203***	0.167**
Order mgt & CS (ITU2)			-0.078		-0.037	-0.094	-0.012	-0.025
Planning & Control (ITU3)			0.026		0.046	0.031	0.029	0.033
SCI* ITU				0.203***				
ITU1*II					0.164**			0.113
ITU1*PI					0.004			0.001
ITU*MI					-0.337***			-0.276**
ITU2*II						0.199**		0.149*
ITU2*PI						-0.005		0.058
ITU2*MI						-0.199**		-0.074
ITU3*II							0.036	-0.070
ITU3*PI							-0.110*	-0.126*
ITU3*MI							-0.165*	0.000
R^2	0.006	0.399	0.441	0.431	0.497	0.465	0.471	0.521
F value	0.586	39.087***	25.39***	37.036***	23.59***	20.81***	21.32***	16.99***

Note: *p<0.05, **p<0.01, ***p<0.001**.**

VI. THEORETICAL AND MANAGERIAL IMPLICATIONS

Our study has many implications for academia and industry experts in context of service supply chain integration and performance. The results support the idea that dairy retail firms can achieve excellence of performance in supply chain activities under the efficient utilization of integration capabilities with supplier firm integration practices. It is unavoidable for agile dairy supply chains to make smooth flow of information between company and distributors. So, study support the theory of RBV and ROT that by investing into resource capability development of partner firms and leveraging their integration capabilities can overcome on challenges and results in enhanced performance. It is very important for sensitive value chain in service industries to have smooth flow of information between company and distributors for timely order processing and fast delivery of product in market. Now global supply chains have realized importance of information integration across value chain and are using ERP and modern communication systems for real time inventory management, demand forecasting and order management. Now need is to make sound knowledge management system with internal and external partners of supply chain to better handle agility and uncertainty.

Firms have different requirement for integration according to their volume of business that need different use of IT; like flexible infrastructure and IOIS applications. So SCI requires flexible level of IT usage to better reap the rewards of operational & financial performance (Liu et al.2013). Supply chains are operating now in uncertain market environment so information sharing is helpful to cope with dynamic market conditions and create trust among members to reduce chances of power war (Wang, Huo, Tian, & Hua, 2015).

Process integration is concerned with operational coordination and utilization of resource in form of common logistics operations but in developing economies distributors are not willing to have joint activities with company and other

external stake holders because of fear of losing business volume and lack of trust upon each other. Sustainability has given many implications to coordinate and take participation of front end supply chain partners for sustainable product design and operations.

Measurement integration are related to one vision, joint objectives, sharing new ideas and inculcating rich institutional culture in the organization which supports continuous process and product innovation. We found that Nestle and Engro Foods the leading dairy brands in Pakistan are working on this one vision policy with their distributors. Company has established sound ERP system based on real time process innovation. Distributors face trust and ease with help of real time order processing and payment system of bar code system.

VII. LIMITATIONS AND FUTURE RESEARCH

In future, SCI can be studied with other co related concepts like E- supply chain, logistics out sourcing, Sustainability, TQM and reverse logistics. Study open new horizon for analyzing relationship of marketing strategies, supply chain design strategies and supply chain integration along with value chain performance. Upstream partners of supply chain like suppliers and other stake holder can be engaged in model for comprehensive conceptualization of concept. Future research can also be directed to behavioral operations management to examine role of power and trust in supply chain exchange relationships.

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Appendix A: Measures and Reliability

Items
Measurement integration (AVE=0.50 CR= 0.83)
Our performance indicators are aligned with company and our channel partners
We share risks, costs and rewards with our channel members.
We promote an attitude and plans of action to support an integrated business performance with our channel partners
We involve with our channel partners for the joint establishment of objectives for the end customer satisfaction.
We make corrective measures and targets based on online customer reviews about our channel performance
Information Integration (AVE= 0.51 CR=0.84)
We exchange information frequently with our channel partners.
We keep each other informed about events, promotions or changes that may affect our business
We share real time information with channel members to make a common demand forecast
We share our available inventory with our channel partners
Partners (suppliers/customers) are provided with any information that might help them for quick order processing
Process integration (AVE= 0.50 CR= 0.80)
We practice shared decision making using shared resources within supply chain to improve the routine operation activities.
We coordinate our supplier in Procurement (e.g., online order placement: place and track orders with suppliers; allow suppliers to submit bids online)
Order execution (e.g., online ordering: accepting orders electronically from customers; allowing customers to track and inquire about their orders)
We jointly involve in agreements with our channel members on delivery frequency, packaging customization in the procurement and distribution of products.
IT use (AVE= 0.55 CR= 0.78)
a) Transaction Management
We use Electronic tools with suppliers in procurement.
We use IOS to get purchase history of online and offline customers
We use IT in integration of dynamic QR code for mobile payments through phone pay or other applications at our store.
We use Electronic tools with customers in POS and online purchases
b) Planning & control
Our customers can receive a customized Web page or interface in APP.
We use IT to make future purchase recommendations to customers based on past online and offline purchases
We use IT in restoring transaction data across multiple channels through QR codes
c) Order delivery and customer services
The gift coupons or vouchers issued by the store can be redeemed either online or offline.
We use IT in logistics tracking and shipment both inbound & outbound
Customers can get post-purchase services support for the products purchased at our physical stores from our Website or social APP
The Website or App allows ordering by a catalog number
Firm performance (Business)(AVE= 0.51 CR=0.89)
Growth in sales.
Return on sales.
Return on investment
Growth in market share
Operational performance
We can respond to changes in market demand.
We can solve customer complaints in due time.
Our lead time for fulfilling customers' orders is short
We can manage product mix portfolio of company