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Modeling cold supply chain environment of organized farm products retailing in India

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A B S T R A C T

Organized retailing (OZR) is one of the most promising industries in India. The OZR sector of India is now among the top five fastest growing markets of the world. High population, globalization, and the increasing income of middle class etc. are a number of factors that make Indian market more challenging and competitive. In today's globalized world, effective supply chain performance (SCP) is highly important to ensure the productivity in the whole supply chain (SC). In this paper, we investigated the factors that affect cold supply chain performance (CSCP) of organized farm products retailing (OFPR), developed and validated a model. This research will be helpful to formulate better strategies for this sector to a greater extent; this model will also be useful and applicable for other developing Asian countries because of enormous similarities in their market tendencies.

1. Introduction

The aim of a supply chain management (SCM) is to hold a cost-effective competitive advantage in the market by improving firms' overall SCP. It involves the combination of SC strategies, logistics, assets management, product life cycle management, procurement and SC planning. India stands at second spot in the globe in the production of farm products. However, at the same time, the consumption of farm products within the India is also very high (Viswanadham, 2005). Today, the business firms consider the world as a single marketplace and run their operations in overseas markets. This thinking leads to global competition and encourages firms to put their footprints in overseas markets. Hence, facing the high pressure of the global competition is a multifaceted challenge for firms. Therefore, firms are constantly doing research for finding new methods for improving their SCP. The SC management is a broader concept and the overall success or failure of the firm fully depends on SCP. Within the country, the post-harvest wastage percentage of produced farm products are very high due to poor SCP. Because of poor SCP, there is a badly need of proper and high quality of SCP to minimize these wastages and this will lead to cut down the overall cost, make final products more attractive, increase sales and high return. Here, the plan is to control the factors that affect farm products SCP (See Fig 1).

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During the past few years, there has been an increase trend on the income of middle class customers' demands for fresh and hygienic products for consumption. The term cold supply chain (CSC) is defined as a temperature-controlled SC. CSC enhances the shelf life of farm products by using temperature controlled facilities during warehousing and at the time of movement of farm products from one region to another (Zhang, 2007). The farm products are always sensitive in nature and a large share of farm products get wasted because of poor SCP (Montanari, 2008). Temperature monitoring (TM) is the main activity at the time of movement and storage of food products. The variety of farm products need temperature according to their sensitivity. The fruits and vegetables always get spoiled in high and low temperature, beside chilled products always need low temperature to maintain shelf life. Therefore, the continuous temperature monitoring is essential to reduce SC losses (Kuo & Chen, 2010). Viswanadham (2005) also stress that temperature monitoring is necessary to enhance the shelf life of farm products. This chain is a key to fulfill the customer's expectations and to reduce post-harvest losses (Jackson et al., 2007) by pre-cooling facilities, cold storage, hygienic packaging, and proper warehousing. It also provides an edge to business house to provide off-season availability of farm products with preserved quality to build long term relationship with customers. The coordination between the SC partners is a very necessary to maintain an efficient firm. According to Hayat et al. (2012), SC coordination works as a vehicle between SC partners and enhances the firm CSCP. SC coordination aims at improving SCP by aligning the strategies and the goals of the business. In addition, it has an effect on firm's whole SCP (Cooper et al., 1997; Toni & Tonachai, 2005; Giannakis & Louis, 2011).

In this global market, a number of different market forces affect firm's SCP (Revilla & Saenz, 2014). According to Singh et al. (2013) the OZR in India is in its growth stage. In spite of high growth rate of OZR in the country, many corporates are failed in tackling the pressure of high competitive global market and their business objectives due to their poor SCP. We have found that presently there is no specific standard model available for CSCP. So, we have recognized a strong need of a CSCP model for the upward mobility of this sector. Measuring SCP is the key complex managerial task with a variety of activities. For this study, we obtain variables by studying literature review that affects CSCP. The structural equation modeling (SEM) technique is used to develop and validate a confirmatory model for CSCP.

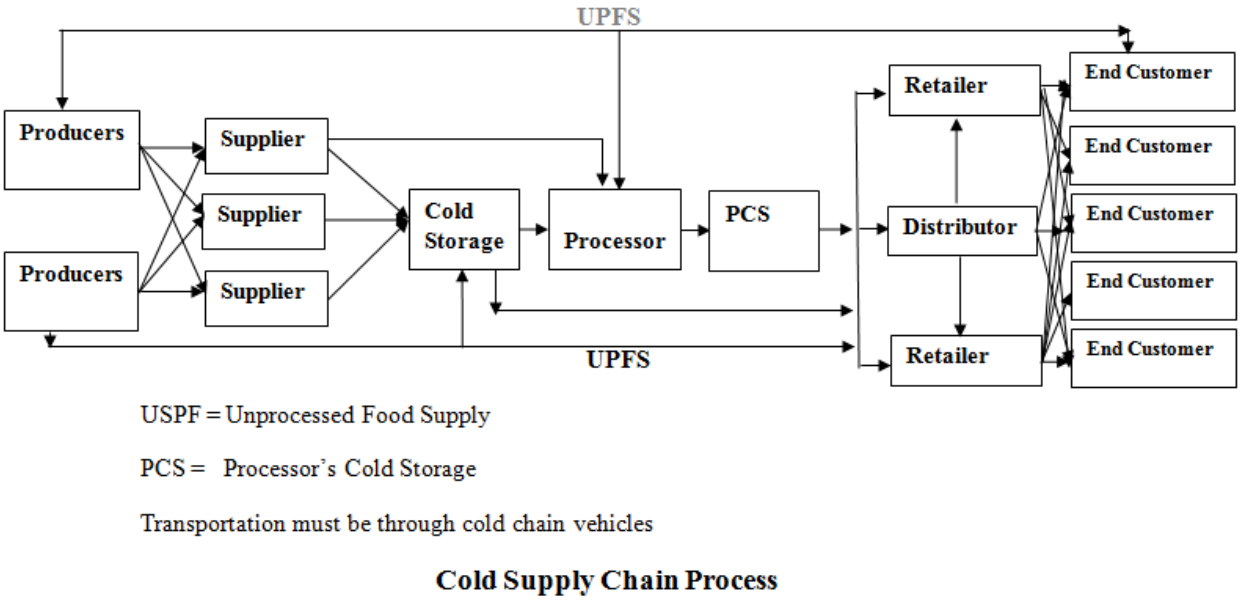

Fig. 2. The process of cold supply chain process

2. Factor affecting supply chain performance

The SCP can be managed by effective planning, forecasting and control. Table 1 presents the list of variables used in this study for achieving the objectives of controlling the factors that affect CSCP in OFPR in India.

2.1 Discussion

Innovation is a prime factor to explore new commercial opportunities (Toni & Tonachai., 2001; Srinivasan, et al., 2009; Rao & Waghmare, 2014) in the market and is an emblem of future return. The principal aim of the innovation is to achieve a high level of cost efficiency. It is an application of fresh or modified knowledge for performance improvement (Weerawardena & O'Cass, 2004).

Table 1
Factor affecting supply chain performance

Performance affecting factors/Researchers
Innovation: Kaplan and Nortan (1996), SSC (2000), Tan (2002), Chen and Qi (2003), Taylor (2004), Morgan (2004), Zeng and Lai (2008)**,** Hansend et al. (2009), Srinivassan et al. (2009), Technopak (2010), BIS (2011), Gunday et al. (2011), Quesada (2012)
Shipping Errors: Harrison and New (2002), Morgan (2004), Viswanadham (2005), Zheng and Li (2008), Gruber and Panasiak (2011), Quesada (2012), Walsh (2014)
Process Quality: Luning et al. (2002), Saadany & Jaber (2008), Bala (2013)
Strategic Purchasing: Pearson et al. (1996), Amelia at al. (1999), Chen & Pulzar (2004); Garrett (2014), McMullen & Adobar (2014)
Strategic Decision Making: Abele et al. (2004), Allen and Coates (2009), Teseng and Hung (2014)
Integration: Cooper (1993), HoulihanandHoulihan (1999), Danese et al. (2013)
Collaboration: Donlon (1996), Auramo et al. (2005), Agarwal and Shanker (2005), Kitchen and Hult (2007), KohandDemirbag (2007), Chuang et al. (2014)
Bullwhip Effect: Chen et al. (2000), Sun and Run (2005), Buchmeister (2008), Wang and He (2011) Francesco et al. (2013)
Temperate Monitoring: Gras (2006), Raab et al. (2011), Zeng et al. (2010), UkukuandSapers (2006), Anish and Aranb (2011) Raab et al. (2011)
Availability of Cold Chain Facilities: Viswanadham (2005), Jackson and Jevshink (2006), Montanari (2008), Kuoand Chen (2010), AnishandAran (2011), Fatehpuria (2013)
Product Life Cycle: Kotler(2005), Srinivasan et al. (2009), Chopra and Mendil (2010), Francesco et al. (2013)
Demand and Supply Management: Kotzab (2011), Mansuri et al. (2013),Wel et al. (2013), Ehrental et al. (2014), Patil and Divekar (2014)
Factory Location: Owen & Daskin (1998), Bhatnager & Sohal, (2005), Melo et al. (2009), Bogataj et al. (2011)
Inventory Handling Cost: Christopher (1998), TSO (2009)
Distribution Cost: Ellaram (1991), Saunders (1997), Tan et al. (2002), Talor (2004), Auramo et al. (2005), Singh et al. (2013)
Transportation: Sainathuni et al. (2010), Hasan and Alim (2010),Technopak (2010), Aung et al. (2012), Hazen and Byrd (2012), Quesada (2012), Fatehpuria (2013)
SC Relationships: Chen and Paulraj (2004), Tan et al. (2002), Miocevic et al. (2012), Quesada (2012)
Availability of Funds: Min & Galle, (1997) Min & Galle, (2001), Walker et al. (2008), Ageron et al. (2012)
Information Sharing: Donlon (1996), Alvarado and Kotzab (2001), Tan et al. (2002), Agarwal and Shanker (2005), Sakka and Genoulaz (2009), Kaya and Azaltun (2010), Technopak (2010), Pandey et al. (2010), Hazen and Byrd (2012), Anatan (2013)
Infrastructure: Abele et al. (2004), Copra (2010), Jacoby and Hodge (2008), Auramoet et al. (2005)
Performances Measurement: Berry et al. (1994), Lambert and Pohlen (2001), Lambert and Pohlen (2001), Sakka and Genoulaz (2009), Shen et al. (2013)
Information Technology: Ramdas and Speakman (2000), Sahin et al. (2000), Lambert and Terrance (2001), Mathis and Jackson (2007) Technopak (2010), Hasan and Alim (2010), Hall et al. (2012)
Risk Management: Blome and Schoenherr (2011), Sentia et al. (2013)
Lead time: Agarwal and Shanker (2005), Hasan and Alim (2010), Singh et al. (2013)
E-Supply: Lee et al. (2004), Liu et al. (2010)

Innovation is thus regarded as a crucial success factor in the Knowledge-Based Economy and it is linked with fostering the level of quality, productivity and designing etc. (Singh & Rao, 2011; Tulsian

& Saini, 2014). Hansen et al. (2009) also highlighted that innovation is one of the most important variables that has an effect on SCP. According to Viswanadham (2005) the firms cannot run their operation without having the awareness of the legal and regulatory issues that has an impact on entire firm's SCP. The Government has pre-fixed the frontiers for doing business and firms have to do their business within these frontiers. The regulations like Ecological Act, Food Standards, Uniform commercial coding and Corporate Social Responsibility, Manufacturing and Labor Regulations, Safe and Efficient Transportation Act, Manufacturing and Transport Regulations affect SCP (Gong., 2008; Hales et al. 2009; Gruber & Panasiak.,2010; Rao & Patel, 2013).

In any type of SC, the factory location can be a crucial success or failure factor. The distance between the factory location and resource locations are two prime subject of concerns. As the distance between the resource location, factory location and market location increases the overall cost of business also increases. Similarly, many researchers believe that there was a close association between factory location and inadequate infrastructure. According Shankar (2014), new or well developed infrastructure helps the firms improve their SCP and well managed distribution activities. It minimizes lead time with prompt delivery between two channels. By this, the life of farm products is automatically increases. Abele et al. (2004) also indicates that the infrastructure is an important factor that affects SCP.

Most inventory systems do not consider time value effects. Firms need strategic purchasing (SP) to tackle business challenges. It is a proactive long-term business process that is related to purchasing activities of a company (Pearson et al., 1996; Melo et al., 2009). To purchase the required quality and quantity tools, machinery and raw material are the prime responsibility of the suppliers and they are entities as SC intermediaries. The demand and supply of the product or services always varies according to stage of product life cycle (PLC). In addition, different amount of investments and strategies are required according to the stage of the PLC. Srinivasan et al. (2009) reveal that the PLC is a key factor that affects CSCP. Hence, SP is a weapon to get a purchase required quality material at low price (Chen, 2004; McMullen & Adobar, 2014). Furthermore, funds are very much essential from the initial stage of CSCP to run business operation. The firm cannot do anything in the absence of sufficient funds. For achieving this purpose, firm needs collaborative efforts. Fawcett et al. (2012) reveal that supply chain collaboration (SCC) is a dynamic competency in performing various tasks and (Kitchen & Hult., 2007; Rexhausen et al., 2012; Wagner et al., 2012; He et al., 2013) creates effective paths to explore largely untouched potential opportunities within the market for increasing the commerce share of firms profitably. Singh et al. (2013) stressed that SCC plays a significant role in the business growth.

The management of demand & supply is the biggest challenge. The uncertainty in demand and supply always invokes high risk. Fundamentally, it is a pre methodology for estimating that how much demand of product and services will occur in the future and how many resources will be sufficient for meeting these demands (Chen et al., 2004; Gong., 2008; Rao & Patel, 2011; Makalef et al., 2013; Ehrental et al., 2014). Customer demand is the subject of variation, which is influenced by seasonal changes, price, product age, and availability, etc. During the flow, product personality is vital variables of superior SCP. This is based on color, volume, outer look and design of the material. These variable will help firm retain the customers for long time. In today's marketplace, a firm can reduce the risks of low sales, lost customers and low customer satisfaction (CS) by the balanced demand and supply management (DSM) and it creates wealth for the firm as well as worth for customers (Raturi & Singhal., 1990; Shepherd & Gunter., 2006; Singh et al., 2013; Patil & Divekar, 2014).

Both the process quality and product quality are very essential to satisfy the customers. The exercise of proficient processing technologies shall facilitate to diminish the quantity of scrap and finally the product quality shall be superior. The use of statistical process control, root cause analysis of poor quality, improvement in process capability, staff training and development of facilities shall help to

improve process quality. According to Saadany and Jaber (2008) and Bala (2013) process quality is an important factor for better SCP. The customer always expects prompt delivery of products and services. Lead time is the time between an order and delivery of goods or services and considers as a final decision making variable. Prompt delivery consequences helps in reducing handling cost, saving time, long-lasting purchasing and in building strong relationships with entire SC. Singh et al. (2013) identified lead time as a key indicator for measuring SCP.

Business integration permits producers to look into business processes across multiple suppliers. In this process, a number of SC members combine their operations, business functions and work together in achieving the prefixed goals. It delivers optimal situations for doing business on a large scale by assimilating the resources (Rao & Padmanabhan, 2006; Zailani & Rajagopal, 2005; Dodd & Bouwer, 2014). Therefore in SC processes, misleading or variance in information from one end to another end is a major subject. Irregular or unbalanced coordination and communication is the main reason behind rising the Bullwhip effect (BE). The misleading or variance in information results excessive inventory investment, poor customer service and wastage of all firms' available resources (Lee et al., 1997; Patil et al., 2010; Hu et al., 2010; Feisel et al. 2011; Giannakis & Louis., 2011). These errors are most common problem that is associated with delivery of products/services to the SC nodes. Many times short lead time, manual processing of outbound products and dispatch bottlenecks shall add to costly shipping errors, delivery related disputes, claims, and charge back. These shipping errors should be eliminated immediately, otherwise customer dissatisfaction shall not only lose the sale, but also discolor the company image. Many researchers (Farley, 1997; Patil et al., 2010; Wanger et al., 2012) identified it as an important key factor.

SC relationship is a widespread approach for handling a firm's interactions with the other parties which supply the products and services for users. In an ideal SC relationship, consumers and traders get connected in a way that permits them to interchange information, data and the visibility of status. Chen and Paulraj (2004) highlighted that the firm SC relationship is an indicator that affects SCP. Customer service (CS), service quality and customer loyalty have a considerable relationship with each other (Alonso et al., 2011; Shi et al., 2014). Customer feedback is an important tool to measure the CS (Chen et al., 2004; Richardson, 2005; Li et al., 2006; Rajaguru & Matanda., 2013). It creates a loyal customer base for the business economy.

Typical information sharing (IS) environment comprises portfolio levels, manufacturing plans, demand forecasts and supply capability, and its paybacks are obtained by downstream and upstream suppliers. Advancement in information technology (IT) enables firms to rethink their SC strategies and explore new opportunities. In addition, it enables firms to drag their economy profit to the peak. But, at the same time, an incomplete or less IS and sick flow coordination hinders all these efforts (Beamon., 1999; Sahin & Robinson, 2002; Singh, 2013; Rajaguru & Matanda., 2013; Ing-Long et al., 2014). Both IS and information quality is influenced positively by trust in SC partners and shared vision between SC partners (Li & Lin, 2006). According to Moberg et al. (2002) information sharing is the success factor in the system of each and every corporate SCM.

The performance of firms indicates its goodwill and effectiveness between competitors. The performance measurement (PM) is a key concern for future investments. It is a process of gathering, analyzing and designing a report to measure the accountability of the performance, profitability of individual customers, suppliers, distributor's logistics and organization (Chen, 2009; Cai et al., 2010; Singh et al., 2013,). Firms must move for measuring individual supplier's performance to manage their entire SCP.

Business processes includes variety of risks such as financial risk, sale losing risk, operational risk, technology risk, strategic risk and environmental risk etc. Risk management (RM) has become a prime concern for the firm, which is still further stressed by the current economic and political crisis (Thun & Hoening, 2011; Bala, 2013). Hence, it is very much needed to evaluating the possibility of future

losses and then to take most suitable steps to minimize these expected losses through effective RM planning (Feisel et al., 2011).

According to Piera et al. (2014), E-supply chain combination enables organizations in exchanging real time information, improve productivity, increase efficiency, and improve the ability of the SC to deliver faster and better products/services. It makes the balance between supply and demand, reduces costs by proper coordination and IS, and also reduces the threats of bullwhip effects by fast and direct communication. Averbakh and Baysan (2013) also found that E-supply had been one of the key variables that affect the internal business process. According to Wagner et al. (2012) strategic decision making (SDM) involves both the art of leadership and the science of management. SDM is the process of taking routine decision, regarding how to manage resources efficiently and to prepare the qualitative strategic plan for the future. Uru et al. (2011) also highlighted that the SDM has impact on business growth.

3. Framework and gap analysis

Knowledge of the business environment has always been a central issue for enterprises during SCP. This has been investigated through nodal measure such as requirement, expectation, capacity and path. SCM is not only making and delivering, but also is an intangible strategy to tackle the dense competitive arena. According to Farley (1997), SCM focuses on how firms use their supplier's processes, technology, capability to enhance competitive advantage, the coordination of the manufacturing, logistics and materials management functions within an organization. Here, the nodal points are (1) how to improve SC performance (2) How to gain competitive advantage? (3) How to reduce SC losses for better SCP (Chen *et al.,* 2004 and Singh et al., 2013). Interruption and information gaps are the points that hinder agility of SCP. Hence, it's important to measure the factors and inter- dependency of constructs that affects CSCP.

This study is in the farm product context. OFPR industry is a high contributor to Indian GDP. India can also increase the total farm product export with controlling the percentage of post-harvest losses and maintaining proper balance in SC activities. Therefore, to find the appropriate solutions of poor SCP for upgrading the farm product SCP is a demand of time by developing and validating a proper CSCP model.

On the basis of literature review, it is clear that the trend of OZR in India is increasing day by day. In addition, it attracts many foreign OZR players for doing business in the Indian market because of enormous market opportunities. There has been extensive research related SCM. However, none of the previous studies focus on the CSCP. There have been some studies on Information Technology, Logistic aptitude and Integrated Logistics Support. But, these studies missed the structural relationships among the factors. Most of prior research discussed limited variables and there is absence of testing the construct correlation in these studies, also, till date there is no proper model for CSCP. In this study, an attempt has made to incorporate the relationships among various factors related to CSCP and we propose a confirmatory factor analysis model for better CSCP.

Within each system, the SCM includes all parts required for meeting and fulfilling the customer requirements. The SCM begins with the demand for product and services by the customers. The process firm buys the raw material from a variety of vendors, these vendors may buy the material from down layer suppliers. Packaging material for finished goods possibly will come from packaging companies, while packaging companies receive raw materials from other vendors to satisfy the needs of company customers. The major trouble in the farm supply is product's shelf life. The life of farm products gets started decreasing after harvesting and the probability of spoilage increases as, the length of the channel and delivery time get increased. The use of temperature machineries at the time of warehousing and transportation play a crucial role to minimize the amount of spoilage. The product should be delivered

within minimum possible time from one end to another end. The next level of this SC is the merchandise store, where the end buyer visits or from where they get the products. A typical SCM may include a series of levels. These SC stages include: equipment and material vendors, manufacturers, wholesalers/distributors, retailers and buyers.

4. Research design and methodology

4.1 Methodology

The structured questionnaire has been used for achieving the research objectives. The 27 CSCP affecting variables and 7 points Likert scale have been used in this study. After the pre-pilot survey, Organizational Environment and HRM were excluded due to low Eigen and communality values. We removed the error of questionnaire on the basis of pre-pilot survey results and by consulting with SC experts. And, the most promising set of variables are selected for this research (Table 1).

Table 2

Scale statistics

SN	Items	Mean	Corrected Item total	Communality	
				Initial	Final
1	Transportation	5.24	.981	1.00	.973
2	Demand & Supply Management	5.41	.980	1.00	.970
3	SC Relationships	5.39	.961	1.00	.956
4	Inventory Handling Cost	5.40	.976	1.00	.963
5	E-Supply	5.25	.935	1.00	.904
6	Information Sharing	5.43	.919	1.00	.869
7	Infrastructure	5.28	.937	1.00	.905
8	Lead Time	5.23	.904	1.00	.862
9	Strategic Decision Making	5.41	.971	1.00	.956
10	Factory location	5.37	.980	1.00	.979
11	Bullwhip Effect	5.41	.967	1.00	.950
12	Performance Measurement	5.41	.937	1.00	.905
13	Availability of funds	5.28	.902	1.00	.854
14	Shipping Errors	5.42	.954	1.00	.959
15	Information Technology	5.40	.955	1.00	.931
16	Collaboration	5.37	.957	1.00	.953
17	Innovation	5.43	.965	1.00	.969
18	Risk Management	5.40	.947	1.00	.921
19	Process Qulaity	5.43	.961	1.00	.966
20	Distribution Cost	5.26	.948	1.00	.924
21	PLC	5.40	.837	1.00	.752
22	Availability of CC Facilities	5.25	.960	1.00	.942
23	Integration	5.37	.965	1.00	.961
24	Temperature Monitoring	5.26	.925	1.00	.890
25	Strategical Purchasing	5.41	.974	1.00	.961

Statistic for Scale: (Mean=133.93; Variance=67.250, Std Dev.=8.201, N of Variables=25; N of cases=457; alpha=.885)

Finally, 25-item Likert scale survey has been used for collecting the data. In the final survey, the data were collected from 471 respondents, engaged in CSCP (Suppliers, processors, SC managers, agent, and distributors) within the region of Chandigarh, Punjab and Himachal Pradesh. Each respondent was asked to rate the each measurement variable in a 7 point Likert scale (1-Strongly disagree, 2-disagree, 3-somewhat disagree, 4- neutral, 5-strongly agree, 6- agree and 7-somewhat agree). But, we find 14 unengaged responses. Therefore we deleted 14 unengaged responses from our data set and finally, 457 responses were taken for this study. Further, the collected responses were analyzed by using SPSS principal component factor analysis method and scale reliability was done.

According to Hair et al. (2009) the following level is required for conducting a research in business management:

- Cronbach alpha value = > 0.6
- Item-to-total correlation = > 0.5
- Inter- item- correlation = >0.3

The obtained values in this study are given below (Table 2):

- Cronbach Alpha value = 0.885
- Item-to-total correlation = >0.5
- Inter- item- correlation = >0.3

Hence, the obtained results are sufficient for conducting a research. Here, the confirmatory modelling technique is used for developing a model for CSCP and we used AMOS 4.0 version to validate the model.

Table 3
Factor analysis results (A)

Variables	**Factors**			
	Managerial metrics (f1)	**Logistic Metrics (f2)**	**Relationship metrics (f3)**	**Innovation metrics (f4)**
Demand & Supply Management	.985			
Inventory Handling Cost	.981			
Strategical Purchasing	.980			
Strategic Decision Making	.977			
Bullwhip Effect	.974			
Information Technology	.965			
Risk Management	.959			
Performance Measurement	.951			
Information Sharing	.931			
PLC	.862			
Transportation		.986		
Availability of CC facilities		.970		
Distribution Cost		.961		
Infrastructure		.951		
E-supply		.952		
Temperature Monitoring		.943		
Lead Time		.926		
Availability of Funds		.942		
Factory Location			.988	
Integration			.980	
SC relationship			.977	
Collaboration			.974	
Innovation				.984
Process Quality				.982
Shipping Errors				.979
% variance	36.7	29.0	15.3	11.5
Cumulative % variance	36.7	65.7	81.1	92.696
Scale reliability alpha	.989	.985	.987	.982

KMO= .888, Bartlett's Test of Sphericity (Chi-Square= 8994.985, Df.=300, Sig.=0.00

4.2 Factor analysis results

The scale mean for twenty five key variables is 133.93 (Table 2).
If all the variables are rated at 7 = 25*7= 175

Total percentage of explained construct = scale mean/rated variables*100

Percentage = 133.93/175*100

Percentage = 76. 53

Here, 76.53% of constructs is explained. This is sufficient to explain construct validity. The factor analysis taxonomy and results are shown in the Table 3 (A) & Table 4 (B). The correlation is shown in Table 5. Here, all the requirements of performing factor analysis are fulfilled. The principal component method is used for this analysis.

Table 4(B)

The results of factor analysis

Factor	Total covered variables	Factor loading range	Inter-item-correlation range	Item-to-total correlation range	Explained variance %	Eigen value
Managerial Metrics	10	0.985 to 0.862	0.989 to 0.754	0.980 to 0.837	36.780	9.195
Logistic Metrics	8	0.986 to 0.924	0.966 to 0.809	0.981 to 0.902	29.016	7.254
Relationship Metrics	4	0.972 to 0.931	1.000 to 0.546	0.980 to 0.965	15.307	3.827
Innovation Metrics	3	0.984 to 0.977	0.955 to 0.940	0.965 to 0.654	11.593	2.898

- Scale reliability = 0.885
- Bartlett's test of Sphericity has chi. Square = 8994.985
- Kaiser-Meyer-Olkin Measure of the sampling adequacy = 0.888
- Degree of freedom = 300
- Level of significance = 0.00
- The communality large range from 0.979 to 0.752

4.3 Findings

The 25 variables has been used to measure the CSCP of OFPR and they have been classified into four groups. The first most important group of the key variables is a managerial metric with ten most important variables. The second important key indicator group is logistic metrics that consist of eight key variables. The third group of the key variables is relationship metrics that consists of four key performance variables. And, fourth and last group is innovation metrics, which consists of three key performance variables. The results of these groups are shown in Table 3 (A) & Table 4 (B). These groups shall be helpful for developing better strategies and to make changes in existing strategies in this industry.

Table 5

Correlation

	Demand &SCM	Transportation	Factory Location	Innovation	Summated 1	Summated 2	Summated 3	Summated 4
Demand &SCM	1	-.005	.057	-.004	.977**	-.018	.057	-.002
Transportation	-.005	1	-.021	-.017	.009	.985**	-.020	-.023
Factory Location	.057	-.021	1	-.016	.059	-.037	.989**	-.026
Innovation	-.004	-.017	-.016	1	-.005	-.014	.002	.985**
Summated 1	.977**	.009	.059	-.005	1	-.009	.057	-.005
Summated 2	-.018	.985**	-.037	-.014	-.009	1	-.035	-.022
Summated 3	.057	-.020	.989**	.002	.057	-.035	1	-.009
Summated 4	-.002	-.023	-.026	.985**	-.005	-.022	-.009	1

**. Correlation is significant at the 0.01 level (2-tailed).

4.4 Structural model results

The proposed SEM is shown in Fig. 2. It has Chi-square = 256.763, Degrees of freedom = 269, and Probability level = 0.000. The fit measure are; RMR = 0.009, NFI = 0.897, IFI = 0.918, TLI = 0.908 and CFI = 0.918. Here, the correlation of factor analysis is not significant. So, all the factors are

independent factors, because of their correlation value less than 0.05. In this model error loading is positive. Hence, this is a valid model.

4.5 Effect for Metric

In this study, managerial metric spans over variety of nodal managerial activities. The followings are the total effects for this metric (Fig.2): demand and supply management (1.00), inventory handling cost (0.98), PLC (0.92), strategic purchasing (.96), bullwhip effect (.94), information technology (0.91), bullwhip effect (0.94), performance measurement (0.93), risk management (0.95), information sharing (0.96) and strategic decision making (0.99). From these, it is revealed that strategic decision making, bullwhip effect and DSM play significant role in the CSCP. At the same time, the SC of farm products always wears high probability of loss. So, the strategic decision and purchasing should be according to the requirement and the timely exchange of data and information among the SC intermediates for the measurement of uncertainty. Here, the main focus should be that the firms will have to enhance the professionalism in the SC for accomplishing the objective of compatible SCP.

Fig. 2 presents the total effects for logistic metric: transportation (.93), availability of CC facilities (0.99), distribution cost (0.98), infrastructure (0.97), E-supply (0.96), temperature monitoring (1.00), lead time (0.95) and availability of funds (0.94). In today's globalized world, efficient logistics management is even more important to ensure efficiency in production and distribution. In this factor, transportation, availability of funds and temperature monitoring plays a vital role. This metric has serious repercussion on distribution and coverage of business operations. Appropriate distribution and adequate infrastructure help in increasing the total share of profit. The customer satisfaction can be fulfilled by providing fresh products through reducing lead time and E-supply. Here, the key point is that the growth rate of market share leverages and invokes by the initial screening of necessities and strategic logistic contribution. Hence, absolute or proper implications of this metric will help the corporate to enhance the SC capabilities in the area of SCP.

The following are the total effects of relationship metric (Fig.2): factory location (1.00), integration (0.99), SC relationship (0.95) and collaboration (0.96). In this metric, factory location plays a major role and it is followed by integration and collaboration. In the business, the healthy relationships are considered as a critical success factors for the long-lasting survival of the firm in this competitive world with high commitments. But, here the question arises that how much healthy relationships the firms has established with their SC player and customers? The healthy and cooperative relations among the SC players provide supremacy to firm to cope the competition more effectively. The work finds that the relationship metric is canalizing subject in nature and its variables are complementary to each other. Thus, it mitigates the probability of uncertain jeopardy.

The following are the total effects for innovation metric (Fig.2): The total effect for are: innovation (1.00), process quality (0.98) and shipping errors (0.97). In this factor, the innovation is a leading variables and plays very crucial role followed by quality and shipping errors. Innovation is an emblem of commercial growth and hence, traders need to maintain the continuous focus on innovation for accomplishing the purpose of enhancement of business scope and business areas. Here, it is important to mention that the less shipping error leads to foster the level of internal inputs and processes and firms have to adhere to the govt. rules and regulations. All the variables here is matched with study allocated in Table 1.

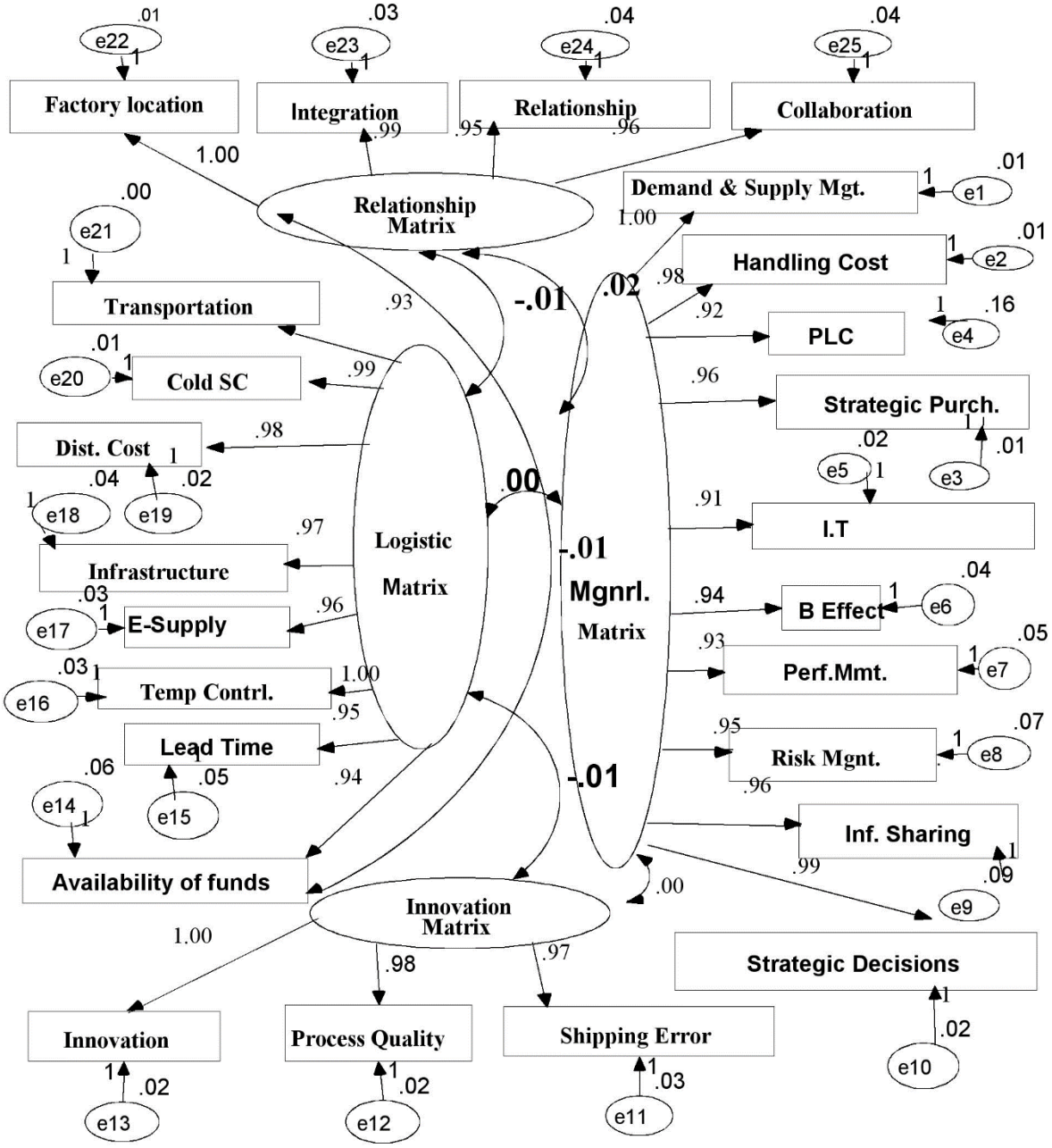

Fig. 2. Confirmatory model

4.6. Model validity results and discussion

According to McDonald and Ho, (2002) define as an absolute fit model as a degree of model fitness that how well a model fits the collected sample data. In this study, the AMOS 4.0 version is used to test the model (Fig. 2). In, the pilot survey data are collected from the 200 respondents and confirmatory model was developed. And this final survey is conducted and data is collected from the rest of 257 respondent and then the model was developed. Both the models have almost the same results. Hair *et al*. (2010) suggested the criteria of goodness-of-fit model. They suggested that Probability level should be less than 0.05, RMR range should be between 0 to 1, NFI range between 0 to 1, TLI value should fall below 0 or above 1 and CFI value should be between 0 and 1. In this model, the obtained results are given below:

- Chi-square = 256.763

- Degrees of freedom = 269
- Probability level = 0.00
- RMR value = 0.009
- NFI range = 0.908
- TLI = 0.908
- CFI value = 0.918.

Hence, the model is overall fit.

5. Conclusion

The developed model for CSCP has been summarized in the Fig. 2 and the results of this model have been empirically tested and validated. All the 25 variables are well arranged to meet the SCP measurement requirements. SCP measurement is a complex and span activity that has an effect on SC practices. Firms need a structured method to examine existing performance measurement system (Medori et al., 2009) to come out of fuzzy commerce situations. In this highly competitive arena, the high and deep level, managerial inputs is required in order to calibrate and strengthen SC performance. A firm should realize that its individual efficiency and competitiveness depends heavily on strengthening its SC relationship with its business partners. In order to uphold the maximum probable SCP readiness, it is necessary to get better logistic capacities for CSCP effectively. Logistics must work out a guiding role in representative resourceful visualization and programs to apex management. SCP cannot be enhanced by controlling a single factor. The proper management of variance in SC structure is essential for implementing this metric as a strategic tool in SC and immediate elimination of shipping errors. Information sharing is a weapon that's as power of leading the business even in complexities; hence, firms have to work in a unified manner in order to take the benefits of business opportunities.

Innovation and infrastructure are the area, where more investment is required to uplift the standard of SCP. The investigation also explores, a number of small uneducated village farmers wind up or decreased their capacity of production because of post-harvest losses and hard government policies. Well managing inventories requires appropriate route, manpower and technology. Therefore, the horticultural authorities and agricultural authorities should take more initiatives to accumulate these farmers' subsidies, group solar cold storage and regular motivational & awareness programs. Authorities should help producers, in setting up their production targets and supply of farm products in the market. By this, the contribution of the farm products in GDP can be maximized.

The outcomes of this investigation are anticipated to be used as guidance for the betterment of CSCP. In addition, the proposed model can be extended to provide the management index for farm companies which cover various products and materials.

6. Research limitation/future research

Despite the absolute model fit, this research has one main limitation: the interaction with top management was limited during final survey. The contacts with top management are always necessary for deep exploration of any sector. Also, there is a robust need to work on all the categories of agro-products for the boosting the all over return and for preparing better plans for of agriculture industry.

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