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Significance of Knowledge Management Practices Effecting Supply Chain Performance

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Abstract

The purpose of this research is to examine how knowledge management practices (KMP) influence supply chain performance (SCP) with mediating role of supply chain coordination (SCC). This research is conducted in Central Punjab Pakistan, which had not been investigated before. This research comprises three stages of statistical analysis where phase one is descriptive statistics and reliability, phase two is factor analysis (KMO and Bartlett's test, Eigen values and total variance) and third phase is path analysis that was used to analyze the data. Based on literature, a theoretical framework was developed consisting of four KMP; knowledge storage, knowledge sharing, knowledge creation and knowledge application and SCP is evaluated by efficiency, flexibility, responsiveness and quality, and SCC is measured by information sharing, quality of information and bullwhip effects. Structural equation modeling was employed using a sample of 19 milk processing companies of central Punjab. The tremendous results of this study have shown that the implementation of KMP interact with SCC to influence supply chain performance (SCP). The empirical results also show that KMP have significant impact on SCP which is positively mediated by SCC. The relationship between knowledge application and supply chain performance is not significant. Since the sample of this research is small and taken only from milk processing companies, it would be important to consider other companies with large sample from wider range of companies. In addition, other variables can be considering in proposed model to strengthen and improve our analyses and generalizable results. Through this study, a good understanding of relationship of KMP and SCP and mediating role of SCC can be gained. Further, that is important gap in supply chain and knowledge management literature that there is no empirical study specifically examine mediating effect of supply chain coordination affecting the relationship of SCP and KMP.

Keywords: supply chain performance (SCP), knowledge creation (KC), knowledge management practices (KMP), knowledge sharing (KSH), knowledge storage (KST), knowledge application (KA), supply chain coordination (SCC), and dairy industry.

1. Introduction

Supply chain management is an emerging field that is forcing firms to cater this phenomenon in order to thrive at marketplace in terms of competition and long-term sustainability. As pointed out by various researchers, current rivalry is no more between associations, however between supply chains. Knowledge is known as a key intangible resource and significant authoritative resource that is the base of steady advancement and maintainable competitive advantage (Allameh et al., 2011). It adds esteem through its commitment to items, procedures, and individuals, while knowledge management (KM) changes information, data, and scholarly resources into persevering worth by distinguishing helpful knowledge for management activities and expansions the accessibility and availability of profitable knowledge at the perfect time to the opportune individual (Tseng, 2010). As per Wu (2008), knowledge is turning into the main asset equipped for offering competitive advantage and in addition proceeded with development and thriving for supply chain accomplices. An unmistakable hypothetical rationale is that a firm execution relies on upon the correct management of both immaterial and substantial assets. KM manages the intangibles while SCM addresses the tangible assets (e.g. crude materials, segments, items, completed products, and so forth.) all through the entire quality stream (Peng Wong and Yew Wong, 2011). By accentuating knowledge management and supply chain management, companies can enhance their potentials for mounting competitive advantage. Given study seeks empirically based theoretical and practical insights into the liaison linking knowledge management resources and supply chain performance. Forrester (1958) presented the idea of the supply chain, this idea has a potential source of using knowledge management (KM) in supply chain (SC), there is not enough work has been done in the past (Schubert and Legner, 2011). Pakistan is the fourth greatest milk producing country in the world having yearly 33 billion liters of milk production, 97% of milk is utilized as "free milk" which is otherwise called "open milk" or "crisp milk" by unplanned routes in rural and urban regions of Pakistan and just 3% of total milk production is collected by milk industry and is sold as packed milk (Kamran and Rizvi, 2013) and during 2014-15 livestock contribution to the national GDP is 11.8% (Pakistan Economic Survey, 2015). The milk industry of Pakistan has potentials to contribute more in national GDP, if top management of milk industries consider KMP in SCM that may be will have a great impact on firm performance. In this paper, an attempt has been made to determine the impact of KMP on SCP with mediating role of supply chain coordination (SCC). The data was analyzed using structural equation modeling, confirmatory factor analysis, path analysis, and latent growth modeling. An example is given to illustrate the method and to discuss its potential use in milk industry.

2. Theoretical Background and Conceptual Framework

We will now provide theoretical backgrounds and conceptual framework on the bases of sound literature support. First of all, it is intent to give an answer of research question:

2.1 Research Main Question

How does Knowledge Management Practices (KMP) impact on Supply Chain Performance (SCP) with the intervening role of Supply Chain Coordination (SCC)?

It is a clear logical understanding that firm’s performance depends upon efficient management of tangible and intangible assets. SCM deals with tangible assets i.e. raw

material, labor etc. and KM deals with intangible assets i.e. knowledge. A good supply chain coordination lift the knowledge management among supply chain members for better performance. Supply chain members pass through knowledge which causes improvement of organization performance. Knowledge is as ancient as the recorded history of the human beings, regardless of the fact that the knowledge is originated in the period of Plato and Aristotle (Awad & Hassan, 2011). The knowledge is available as explicit knowledge or implicit knowledge. While explicit knowledge is effectively articulated and implicit knowledge is somewhat ungainly generated with experience, and extended through critical thinking exercises (Polanyi, 1967). The treatment of these two sorts of knowledge i.e. explicit and implicit might be related to both information and knowledge (Rowley, 2007). Data-Information-Knowledge Hierarchy is illustrated by Peng et al., (2013) shown in Figure (1).

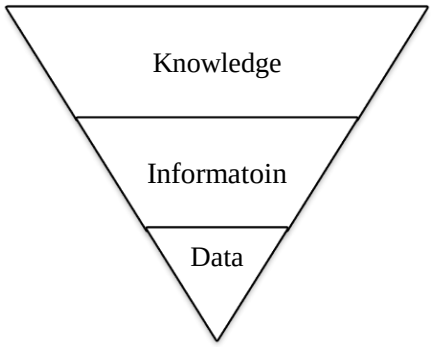

Figure 1: Data-Information-Knowledge Hierarchy

Source: Peng et al., (2013)

The knowledge about the company and the knowledge of employees have significant impact on supply chain performance (Mahmood et al., 2014). The organizational culture makes differences on local chain management. The efficient management of marginal knowledge having links with universities, suppliers, sub-contractors and competitors that can help to enhance the operational performance of the company (Marra et al., 2016) but not much relevant work on supply chain performance and knowledge management practices has been found in literature. We need to explore this field of research in dairy sector as this industry has not been exposed to KM and SCM.

2.2 KM Practices

One can define data and information but it is not easy to define knowledge as it is in one's mind. If one is aware of the concepts of industry, market, shareholders, and stakeholders and can make well thought decisions, then one is supposed to have knowledge or common knowledge. There exists knowledge if one can keenly initiate numerous openings where people can interact and exchange new ideas with each other (Matzler et al., 2008 & Monczka et al., 2014). KM is a procedure that makes, amass, sort out and use knowledge that accomplishes endpoints and upgrade supply chain performance. Knowledge management (KM) has created impressive enthusiasm for administration experts because of its ability to convey to associations, key results and

limitations for improvement of products (Oluikpe, 2012). Numerous KM analysts and experts have now realized an accord that a basic source of knowledge economy is the total knowledge of an association (Teece, 1982). The business associations are worried about building the knowledge resources for their competitiveness and guarantee that the knowledge is utilized adequately and productively to enhance supply chain performance (Rašul et al., 2012).

2.3 Knowledge Creation (KC)

Knowledge creation (KC) is considered as distinctive level of learning (Lyles, 2013). The generation of new knowledge or knowledge creation happens using four methods of the Socialization, Externalization, Combination and Internalization (SECI) procedure to enhance better performance. Associations ought to endeavor cognizant endeavors to seek and characterize applicable knowledge and its sources from both inside and outside the association (Lawson, 2003). Knowledge creation infers the capacity to make knowledge and circle it in the items, administrations, and frameworks, and the entire association for better performance (Nonaka & Takeuchi, 1995). In this way, we propose:

- **H_1:** There is positive and statistically significant relationship exists between Knowledge Creation (KC) and supply chain performance (SCP).

2.4 Knowledge Sharing (KSH)

KSH constitutes a major challenge in the knowledge management and knowledge sharing occurs when explicit knowledge is made available to be shared between individuals of supply chains. In knowledge management, an essential thought is that knowledge can be shared (Nonaka and Takeuchi, 1995). When knowledge both tacit and explicit is available in an organization and exchanged among its members through knowledge management systems, then it becomes a valuable intangible asset for the organization (Jasimuddin, 2012). Knowledge offers the supply chain as a noteworthy variable in today's worldwide economy (Cantor & Macdonald, 2009). Execution in different parts of the association can be improved when individuals convey data, practices, and knowledge. For developing and building knowledge, knowledge sharing may modify people convictions and activities through their likely connections (Krogh, 2002).On the bases of above discussion, we hypothesize:

- **H_2:** There is positive and statistically significant relationship exists between Knowledge sharing (KSH) and Supply Chain Performance (SCP).

2.5 Knowledge Storage (KST)

Knowledge is a vital key asset and a critical corporate asset, which is genuinely regulated for its utilization of generation (Zack et al., 2009). Knowledge storage integrates the maintenance, insurance (Kraaijenbrink, 2012). Knowledge storage may likewise be a device utilized as a part of knowledge transfer (Jasimuddin, 2012). Research has demonstrated that associations create new knowledge for gainful purposes (Argote and Epple, 1990). Consequently, viable approaches to store knowledge must be discovered (Grant, 2005). Knowledge which is put away inside the association is frequently referred to as "hierarchical memory" (Stein & Zwass, 1995) and combines physical assets as well as non-physical sources (Alvi and Leidner, 2001). In view of the idea of knowledge, it is clear that tacit knowledge can't be arranged and put away in physical assets, it must be changed into explicit knowledge (Cuel et al., 2006). Explicit knowledge which is stored

in physical assets or in the brains of people will probably be unchanging (Helleloid & Simonin, (1994). Every moment of life organizations are unconsciously creating new knowledge in the shape of physical and non-physical source. The physical source of knowledge is its employee working inside and outside the organization, knowledge stored in document form or stored in computers. Non-physical source of knowledge is human mind. These two sources of stored knowledge play tremendous role to enhance firm performance (Quink U., 2008). Considering the importance of knowledge storage, it is hypothesized that:

- **H_3:** There is positive and statistically significant relationship exists between knowledge storage (KST) and Supply Chain Performance (SCP).

2.6 Knowledge Application (KA)

Knowledge application is a procedure whereby knowledge is available and is used for decision making purposes and conveying instructions to individuals who do not possess the knowledge or in other words that an individual who possesses knowledge guides another. Knowledge application is the utilization of knowledge rooted in procedures, rules and processes that direct future performance. KA is a static mode of assimilating and organizing knowledge into an organization's products or services (Li, 2007). Knowledge application assumes the blend of knowledge from obvious sources to make progressive capacity building through instruments in perspective of standards or choice making circumstances (Grant, 1996). Knowledge applications used in an advantageous way towards improve organizational performance (Olsen & Tobiassen, 2011). Thus, it is proposed that:

- **H_4:** There is positive and statistically significant relationship exists between knowledge applications (KA) and SCP.

2.7 Supply Chain Performance (SCP)

Recently researchers have considered the success of supply chain management system. The success of corporations depends on the effective performance measurement of supply chain management. For managers, an effective supply chain performance measurement process generates viable profitability and financial asset. Supply chain management is a powerful business foundation that has been studied by scholars, guides, specialists and business administrators. Wong and Wong, 2007 used technique of data envelopment analysis (DEA) in measuring internal supply chain performance and developed two DEA models namely - the technical efficiency model and the cost efficiency model. These models provided the numerical value of supply chain efficiency. Supply chain management framework is imperative for power in light of the fact that it gives information about the qualities and certain inadequacies of the supply chain performance (Bai and Sarkis 2012).

2.7.1Efficiency

Lai et al., (2002) described effectiveness as it quantifies usage of assets in an approach to supply chain overflow. Besides, it effectively incorporates various measures, for example, stock benefit and degree of profitability (Lusine et al., 2007). According to Lee (2004) supply chain which are cost effective and efficiency-based, has been susceptible to unexpected shifts in customer demand in a way of responsive supply chains.

2.7.2 Flexibility

The flexibility is defined as to how the demand pattern and repression in supply chain responds to random fluctuations in the market and to react and to compensate for the changes in supply chain (Blome et al., 2014). The viewpoint of supply chains to flexibility acclimatization and frequently changing essential circumstances, is discriminating (Blome et al., 2013). Flexibility is constantly used to reveal an affiliation's wellness to adjust or react to change. Flexibility further shows the extent to which the SC can make a move to a changing arena and to customer organization supplies (Beamon, 1998).

2.7.3 Responsiveness

Responsiveness furnishes the product demand with a base lead-time (Persson and Olhager, 2002). It might link lead-time, client reaction time, items delays, conveyance oversights with the customer difficulties and grievances. Gunasekaranet al., (2008) argues that businesses have to meet the demand of customers for high quality products and low price and to be responsive to customer's specific demands quickly. Nowadays, the responsive supply chain must be a key to the customer's accomplishment and survival (Christopher, 2000).

2.8 Supply Chain Coordination (SCC)

There seems to be no standard definition of SCC. Supply chain coordination is defined as pinpointing interdependence of supply chain activities between producer and the retailer. Supply chain coordination is among the central issues in supply chain management. The purpose of supply chain coordination is to improve supply chain performance by bringing into line with the plans and the objectives of individual companies. There is a need to address the improbabilities in supply chain and supply chain coordination. Supply chain coordination is accomplished when the operations of the producer and the retailer are improved on the whole, rather than separately (Glock, 2012). Knowledge might be an essential source of coordination and is integral part to chain working (Hansen, 2002) who gives proof in Toyota case, that suppliers adapted automaker's system and showed that collaboration was encouraged inside the system.

2.8.1 Bullwhip Effects (BWE)

The bullwhip effect, first discussed by Jay Forrester's Industrial Dynamics (1961), is a delivery network on the basis of statistical forecasts at customer demands whereby other partners of supply chain system increase their production on ad hoc basis. Since customer demand is not constant, every partner of the supply chain must also forecast for their inventory point to carry an inventory safeguard. Each supply chain partner has to have a larger number of products in demand and as such has a greater need for inventory safeguard. Lack of contacts between each supply chain link regarding the customer's demands may lead to bullwhip effect. Ordering policies have been recognized as a major cause of the bullwhip effects. The bullwhip effect is a problem for supply chain management (Costantino et al., 2015a and 2015b).

2.8.2 Information Sharing (IS)

Since last decade, IS has become important element in SC which is considered important in organizations. As indicated by Wong et al., (2015), information sharing is an essential

for joining and encouraging IT for empowering basic leadership. Cai et al., (2010) stated that process coordination complements information sharing and completes the integration process.

2.8.3 Information Quality (IQ)

Information Quality (IQ) is a multidimensional idea, which has been investigated by numerous specialists to distinguish and characterize its measurements (Marinagi et al., 2015). Some of these measurements incorporate authenticity, interpretability, notoriety, fulfillment, objectivity, unwavering quality, security, opportuneness, value, obviousness, precision, accessibility, idleness and reaction time (Naumann & Rolker, 2000).Information quality (IQ) describes the quality of the content of information systems and assures that specific information meets its quality requirements. Higher the quality the greater will be the confidence in meeting more general requirements (Ivanov, 1972).

Hence it is discussed that KM practices are involved to improve supply chain performance. So main and sub hypotheses are as follows:

Main Hypothesis

- **H_5:** Supply chain coordination (SCC) positively and statistically significantly mediates the relationship between knowledge management practices (KMP) and Supply chain performance (SCP).

Other Hypotheses

- **H_6:** There is positive and statistically significant relationship exists between KC and SCC.
- **H_7:** There is positive and statistically significant relationship exists between KSH and SCC.
- **H_8:** There is positive and statistically significant relationship exists between KST and SCC.
- **H_9:** There is positive and statistically significant relationship exists between KA and SCC.

3. Theoretical Framework

The performance of any firm determines by its management of intangible assets (knowledge) and tangible assets (e.g. finished goods, materials, products, components etc). Knowledge management deals with firm's intangible resources and supply chain management deals with firm's tangible resources (Peng Wong & Yew Wong, 2011) and the coordination of these two fields e.g. supply chain management and knowledge management can be tie up with better coordination. The theoretical framework for the supply chain coordination and its various factors seem to follow as:

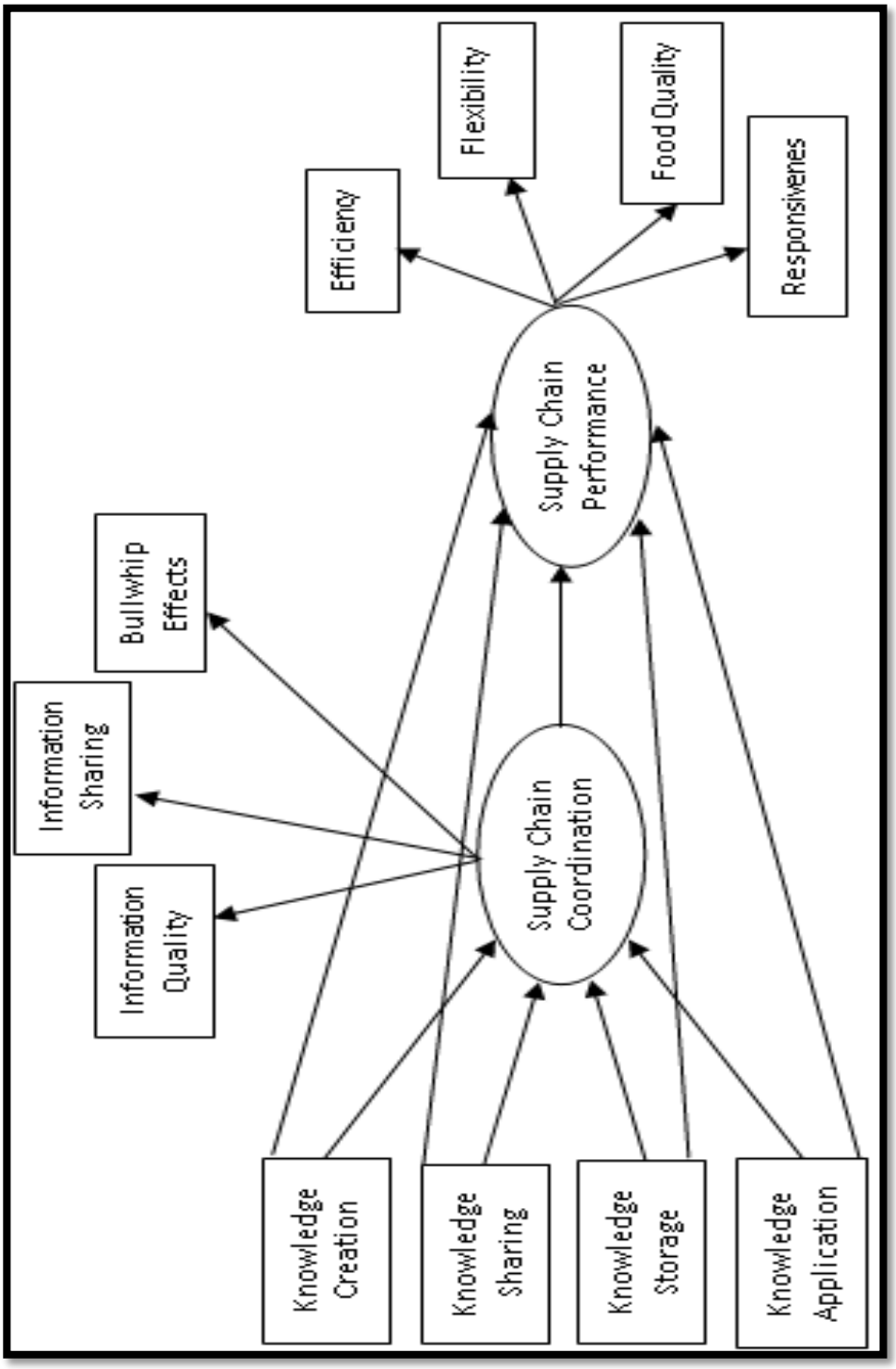

Figure 1: Theoretical Frame Work

3.1 Aim/Purpose

The fundamental point of this study is to investigate the relationship between KMP and SCP with the mediating part of SCC in milk industry of central Punjab, further:

- To determine the role of knowledge management practices in supply chain performance.
- To fortify the supply chain performance of dairy industry of central Punjab.
- To distinguish the role of supply chain coordination (SCC) and
- To upgrade the SCP.

3.2 Significance of Study

The study has devised certain hypothetical considerations for the dairy industry in Pakistan. ***Theoretical Significance:*** Despite the fact that an unlimited amount of literature exists on KM for SCM, just a few papers have properly examined the theoretical aspect of knowledge management practices in setting the worldwide supply chain system (Schubert & Legner, 2011).

3.2.1 Practical Significance

Based on the findings of present literature, there exists certain factors which are needed to explore and cater the overall supply chain performance with the help of KM practices.

3.2.2 Policy Significance

Objectives of this study hold massive policy implications which need to be looked into and to be devised by the management personnel and policymakers for the upgrading of the dairy sector.

4. Methodology

4.1 Population/Sample

In this study, stratified random sampling was used. Stratification procedure is used when the sampling units are heterogeneous and strata are devised. Moreover, these strata are non-overlapping. Further, care has to be taken on the information from supply chain members having a place in various organizations dealing with delivering dairy items. For this reason, respondents were chosen for their employment and gender status. As per the Pakistan Dairy Association (PDA) measurements, there are following organizations in Pakistan:

1. Adam's Milk Foods (Pvt.) Ltd
2. Americana Dairy
3. At-Tahur (Pvt) Ltd
4. Dairyland (Pvt) Ltd
5. Engro Foods Limited
6. Gourmet Foods Ltd
7. Haleeb Foods Ltd

8. Jk Dairies (Pvt) Ltd (A&A Farm Fresh Milk & Products)
9. Millac Foods (Pvt) Ltd
10. Nestle Milkpak Ltd
11. Noon Pakistan Ltd
12. Pakola Products Ltd
13. Premier DairiesLtd
14. Prime Dairies Ltd.
15. Shakarganj Food Products Ltd
16. Sharif Dairies
17. Yummy Milk Products (Pvt) Ltd
18. Dalda Foods Ltd
19. Solve Agri Pak

The researchers have made 2 strata from milk processing companies with a careful selection on the basis of following guide lines;

1. Market share of the company
2. Number of employees
3. Quality controlled measures taken by company
4. International standards adaptation.
5. Supply chain infrastructure of the company.
6. Net worth of the company

Selections of companies were made at random on the basis of previously laid down criteria which do not have correlation and association on supply chain performance. Keeping in view the above criteria the following companies were divided in to two population strata:

4.1.1 Stratum 1

1. Adam's Milk Foods (Pvt.) Ltd
2. Americana Dairy
3. At-Tahur (Pvt) Ltd
4. Dairyland (Pvt) Ltd
5. Engro Foods Limited
6. Haleeb Foods Ltd
7. Millac Foods (Pvt) Ltd
8. Nestle Milkpak Ltd
9. Noon Pakistan Ltd

The companies classified in stratum 1 are on the bases of guidelines mentioned above; where stratum 1 companies are enjoying good supply chain infrastructure and

international standard with large market share. The net worth of the companies is also high.

4.1.2 Stratum 2

1. Jk Dairies (Pvt) Ltd (A&A Farm Fresh Milk & Products)
2. Gourmet Foods Ltd
3. Pakola Products Limited
4. Prime Dairies Ltd.
5. Shakargan Food Products Limited
6. Sharif Dairies
7. Yummy Milk Products (Pvt) Ltd
8. Dalda Foods Ltd
9. Solve Agri Pak
10. Premier Dairies

The companies included in stratum 2 are those who's market share is low and the number of the employees are less and international standard adaption criteria and quality control measures are relatively week as compared to the stratum 1 companies.

4.2 Selection of Sample

On random bases, 3 companies from stratum 1 and 4 companies from stratum 2 are selected:

4.2.1 Stratum 1

1. Nestle Milkpak Ltd
2. Haleeb Foods Ltd
3. Engro Foods Ltd

4.2.2 Stratum 2

1. Shakarganj Foods Ltd
2. Premier Dairy Ltd
3. Dalda Foods Ltd
4. Solve Agri Pak

4.3 Measurement of Questions

Supply chain performance scale was adapted from Mahmood et al., (2014), supply chain performance's constructs i.e. efficiency, flexibility, and product quality were adapted from the study of Aramyan et al., (2007), and one construct of supply chain performance i.e. responsiveness was modified from Gilaninia et al., (2011) and Aramyan et al., (2007). Knowledge management practices have four variables which are adapted from different studies i.e. knowledge creation questionnaire was adapted from Turyasingura, W., (2011), knowledge sharing, knowledge storage, and knowledge application questionnaires were adapted from the study of Donate and de Pablo, (2015). Supply chain coordination scale was adapted from Hill and Scudder, (2002) and its construct i.e. information sharing items were adapted from Gilaninia et al., (2011), information quality

items was adapted from the study of Li et al., (2005) and bullwhip items were adapted from the qualitative study of Mahmood et al., (2014).

4.4 Methods

Principal Component Analysis (PCA) was used in this study for factor analysis with varimax pivot technique. The reason for KMO and Barlett's test of Sphericity is to inspect that whether the information is appropriate for element investigation.

5. Analysis and Results

5.1 Descriptive Statistics

Table 1: Demographic Profile

Respondent Demographics (N = 355)	Frequency	%
Gender		
▪ Male	269	76
▪ Female	86	24
Age		
▪ From 25 to 30	85	24
▪ From 31 to 35	95	28
▪ From 36 to 40	80	23
▪ From 41 to 45	70	19
▪ From 46 to 50	20	5
▪ 51 and above	5	1
Qualification		
▪ Under Graduation	12	3
▪ Graduation	159	45
▪ Masters	149	42
▪ M. Phil	35	10
▪ PhD	0	0
Income in PKR		
▪ From15,000 to40,000	39	11
▪ From 41,000 to 60,000	211	59
▪ From 61,000 to 100,000	70	20
▪ 101,000 and Above	35	10
Company Type		
▪ Local	110	31
▪ International	155	44
▪ Multinational	40	11
▪ Global	50	14
Department		
▪ Production	80	23
▪ Sales and distribution	205	58
▪ Procurement	70	19

International Exposure		
▪ Yes	144	41
▪ No	211	59
Employees in department:		
▪ 0 to 10	123	38
▪ 11 to 20	192	54
▪ 21 – 30	25	7
▪ 30 and above	15	1
Number of subordinates:		
▪ 0 to 5	223	62
▪ 6 to 10	54	16
▪ 11 to 20	50	14
▪ 20 and above	28	8
Company Name		
▪ Nestle Pakistan Ltd	59	17
▪ Engro Foods Ltd	60	17
▪ Haleeb Foods Ltd	103	29
▪ Shakarganj Foods Ltd	70	19
▪ Solve Agri Pak	18	5
▪ Premier Dairy Ltd	20	6
▪ Dalda Foods Ltd	25	7

According to table 1, out of 355 populations, 286 (76%) were male and 86 (24%) were female, and age of 24% of respondents lies 25-30 years, 28% were between 31 to 35 years, 23% were between 36-40, 19% were age of 41 to 45, 5% respondents were age of 46 to 50 and only 1% were age of 51 and above years range. According to table 1, 03% respondents were having degree of undergraduate, 45% holding graduate degree, 43% were holding master degree, and 10% respondents were with M.Phil. So, according to table 1, majority of the respondents have Graduate degrees. According to table 1, 11% of respondents are enjoying income of 15,000 to 40,000, 59% from 100% of respondents are with income level of 41,000 to 60,000, 20% are with 61,000 to 100,000 income level, and 10% respondents are having income level 101,000 and above.

According to table 1, 110 (31%) respondents are working in local company, 155 (44%) working in international company, 40 (11%) are working in Multinational company and 50 (14%) are working in global company whose offices are running business at large level in the world. Table 1 also shows that 23% respondents are working in production department, 58% and 19% are working in sales and procurement department respectively. And, 41% respondents are having international exposure and 59% are working in the companies without international exposure.

Meanwhile, out of 355, 327 (92%) are having subordinates who are directly reporting them are less than 5, 20 (6%) said they have subordinates 5 – 10 and 8 (2%) said 10 – 20 subordinates are reporting them but nobody said they have above than 20 subordinates.

Table 2: Descriptive Statistics of Survey Items

	N	Minimum	Maximum	Mean	Std. Deviation
KC1	355	2.00	4.00	3.8479	.46269
KC2	355	2.00	4.00	3.7718	.45881
KC3	355	2.00	4.00	3.4648	.54801
KC4	355	2.00	5.00	3.6507	.61682
KC5	355	2.00	5.00	3.6563	.57262
KS1	355	2.00	5.00	2.8169	1.00718
KS2	355	3.00	5.00	3.8930	.46314
KS3	355	2.00	5.00	2.9070	.93569
KS4	355	2.00	5.00	3.0563	.87474
KS5	355	2.00	5.00	3.1634	.77846
KST1	355	2.00	5.00	2.7521	.96578
KST2	355	2.00	5.00	3.6620	.68774
KST3	355	2.00	5.00	3.0197	.93709
KST4	355	2.00	5.00	3.0676	.93636
KST5	355	2.00	5.00	3.4366	.73131
KA1	355	1.00	5.00	2.8451	.98072
KA2	355	2.00	5.00	2.7408	.87682
KA3	355	2.00	5.00	2.9155	.84950
KA4	355	2.00	5.00	3.0704	.78697
KA5	355	2.00	5.00	3.4620	.60655
EF1	355	2.00	5.00	2.7690	.87827
EF2	355	2.00	4.00	2.7211	.87235
EF3	355	2.00	4.00	3.1859	.53607
EF4	355	3.00	5.00	3.6986	.54397
EF5	355	2.00	5.00	3.7070	.69203
EF6	355	2.00	5.00	3.2085	.81403
EF7	355	2.00	5.00	3.6197	.78773
FL1	355	2.00	5.00	2.9437	1.00966
FL2	355	2.00	4.00	2.7268	.89015
FL3	355	2.00	5.00	3.7634	.52648
FL4	355	2.00	5.00	3.1437	.85647
FL5	355	2.00	5.00	3.0113	1.01117

RSP1	355	2.00	5.00	3.9239	.53400
RSP2	355	2.00	5.00	3.4113	.64211
RSP3	355	2.00	5.00	3.7944	.59182
RSP4	355	2.00	5.00	3.7352	.57024
RSP5	355	2.00	4.00	3.2958	.58209
RSP6	355	2.00	5.00	3.2563	.67580
RSP7	355	2.00	4.00	2.9155	.87892
RSP8	355	2.00	5.00	3.0930	.97124
PQ1	355	2.00	5.00	3.7577	.71538
PQ2	355	3.00	5.00	3.5944	.66296
PQ3	355	2.00	5.00	3.8873	.62322
PQ4	355	2.00	5.00	3.2761	.94622
PQ5	355	2.00	5.00	3.5352	.84758
PQ6	355	2.00	5.00	3.5183	.85805
IS1	355	2.00	5.00	2.9268	.94793
IS2	355	2.00	5.00	3.2366	.80976
IS3	355	2.00	4.00	3.3803	.51984
IS4	355	2.00	5.00	3.4225	.61667
IQ1	355	2.00	5.00	3.6845	.61677
IQ2	355	2.00	5.00	3.8394	.55196
IQ3	355	3.00	5.00	3.7324	.48005
IQ4	355	2.00	5.00	3.7268	.54848
IQ5	355	2.00	5.00	3.6225	.59523
BWF1	355	2.00	4.00	3.3127	.53227
BWF2	355	2.00	4.00	2.8958	.80805
BWF3	355	2.00	5.00	3.0845	.87892
BWF4	355	2.00	5.00	3.4394	.79803
BWF5	355	2.00	5.00	3.5493	.64634
BWF6	355	2.00	4.00	2.9268	.81320
BWF7	355	2.00	5.00	2.8451	.88055
BWF8	355	2.00	5.00	3.3972	.89094
BWF9	355	2.00	5.00	3.4901	.57910
BWF10	355	2.00	5.00	3.4648	.72156
SCC1	355	2.00	5.00	3.2028	.63200

SCC2	355	2.00	4.00	3.1324	.64829
SCC3	355	2.00	5.00	3.5437	.70525
SCC4	355	2.00	5.00	3.7352	.57517
SCC5	355	2.00	5.00	3.7408	.55784
SCP1	355	2.00	5.00	3.8563	.43723
SCP2	355	2.00	5.00	3.7127	.56920
SCP3	355	2.00	5.00	3.5972	.64088
SCP4	355	2.00	5.00	3.4817	.67362
SCP5	355	2.00	5.00	3.4394	.60471
SCP6	355	2.00	5.00	3.5915	.65046
SCP7	355	2.00	5.00	3.4479	.68434
Valid N (listwise)	355				

This study was bases on 82 items. Response of all items varies from one to five on five-point Likert Scale. Mean scores of different items range from 2.6085to 3.9239and the value of standard deviations range from 0.43723 to 1.01117.

Table 3: Reliability of Measurement

Constructs	**No. of Items N=355**	**Cronbach's Alpha**
Knowledge Storage (KST)	5	0.787
Knowledge Creation (KC)	5	0.880
Knowledge Application (KA)	5	0.910
Knowledge Sharing (KSH)	5	0.820
Information Quality (IQ)	5	0.813
Bullwhip Effects (BWE)	4	0.911
Information Sharing (IS)	10	0.771
Flexibility (FL)	5	0.890
Product Quality (PQ)	7	0.821
Efficiency (EF)	6	0.911
Responsiveness (RP)	8	0.744
Over all	70	0.862

The reliability of each item of data instrument is shown in the above table 2. The values of table 2 vary from 0.774 – 0.911. KC with 88%, KSH with 82%, KST with 78.7%, KA with 91%, IQ with 81%, IS with 77%, BWE with 91%, FL with 89%, EF with 91%, PQ with 82%, RP with 74% which reveal that items are having good reliability. The high value shows that there is consistency between constructs items (Cronbach, L.J. ,1951). The whole reliability of the questionnaire is 86%.

5.2 Factor Analysis

To confirm that whether the given information collected from respondents is enough for element examination, KMO is utilized with Bartlett's test and Eigen values.

Table 4: KMO and Bartlett's Test

Constructs	No of items	KMO Measure of Sample adequacy	Bartlett's Test of Sphericity Chi-Square	Bartlett's Test of Sphericity Significance
Knowledge Storage (KST)	5	0.761	3341	0.000
Knowledge Creation (KC)	5	0.769	1711	0.000
Knowledge Application (KA)	5	0.668	1360	0.000
Knowledge Sharing (KSH)	5	0.897	5474	0.000
Information Quality (IQ)	5	0.778	1434	0.000
Bullwhip Effects (BWE)	4	0.755	701	0.000
Information Sharing (IS)	10	0.696	4785	0.000
Flexibility (FL)	5	0.799	5777	0.000
Product Quality (PQ)	7	0.842	3231	0.000
Efficiency (EF)	6	0.860	1921	0.000
Responsiveness (RP)	8	0.792	1320	0.000

Hutcheson and Sofroniou (1999) declared that the value of KMO considered attractive if it is equal or greater than 0.7. And Hinton et al., (2004) concluded that KMO for each factor is being considered acceptable if value of KMO is equal or greater than 0.06. In this study, above table 4 shows that all the constructs are having values greater than 0.06 which are acceptable. And values of the construct show that components are having enough information to present data.

Table 5: Eigen Values and Total Variance

Constructs	Components	Eigen values		
		Total	% of variance explained	Cumulative % of variance explained
Knowledge Storage (KST)	Comp 1	4.416	68.432	68.432
Knowledge Creation (KC)	Comp 1	3.641	66.754	66.754
Knowledge Application (KA)	Comp 1	2.640	71.304	71.304
Knowledge Sharing (KSH)	Comp 1	5.631	74.532	74.532
Information Quality (IQ)	Comp 1	3.605	46.841	46.841
Bullwhip Effects (BWE)	Comp 1	4.141	73.059	73.059
Information Sharing (IS)	Comp 1	3.703	87.103	87.103
Flexibility (FL)	Comp 1	4.812	65.231	65.231
Product Quality (PQ)	Comp 1	4.216	64.421	64.421
Efficiency (EF)	Comp 1	2.501	61.780	61.780
Responsiveness (RP)	Comp 1	3.213	81.131	81.131

Those construct's component which are having greater than 1 Eigen value can be considered for further analysis. The above table shows all the Eigen values and variance explained for the above constructs. The above table shows only one component extracted from the each construct using PCA. KC clarifying 66.7% variance, KSH clarifying 74.53% variance, KST clarifying 68.43%variance, KA clarifying 71.3% variance, IQ clarifying 46.8% variance, IS clarifying 87% variance, BWE clarifying 73% variance, FL clarifying 65% variance, EF clarifying 61.78% variance, PQ clarifying 64.4% variance, and RP clarifying 81% fluctuation.

6. SEM Model

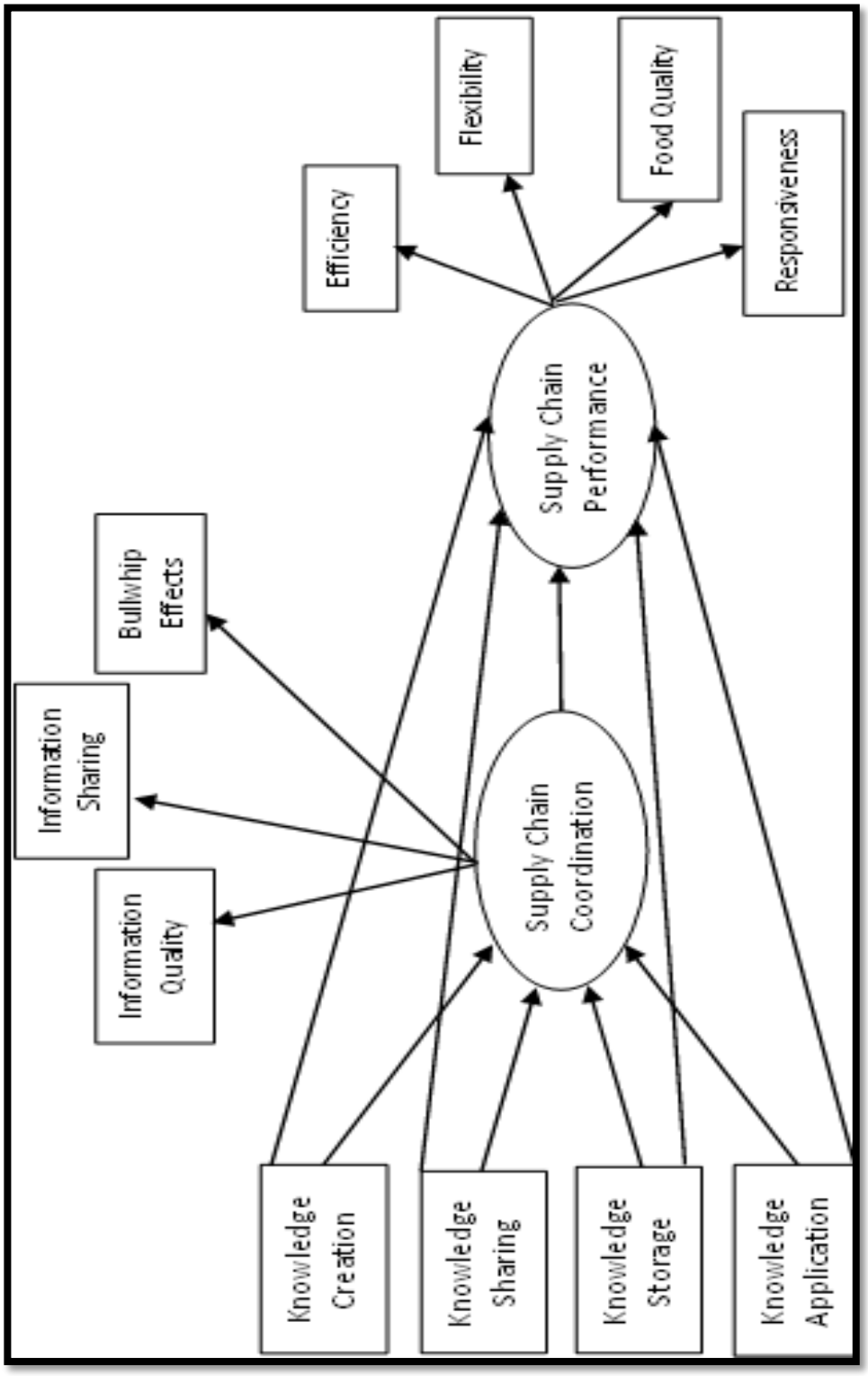

Figure 2: Path Diagram

In order to apply structure equitation modeling (SEM), developing the path analysis is the first step by using Amos software. As per requirement of software, variables are in squares and circles. Above diagram (fig. 2) shows the association among measured and latent variables. For testifying research main model, Recursive Simultaneous model is also applied.

6.1 Recursive Simultaneous Model

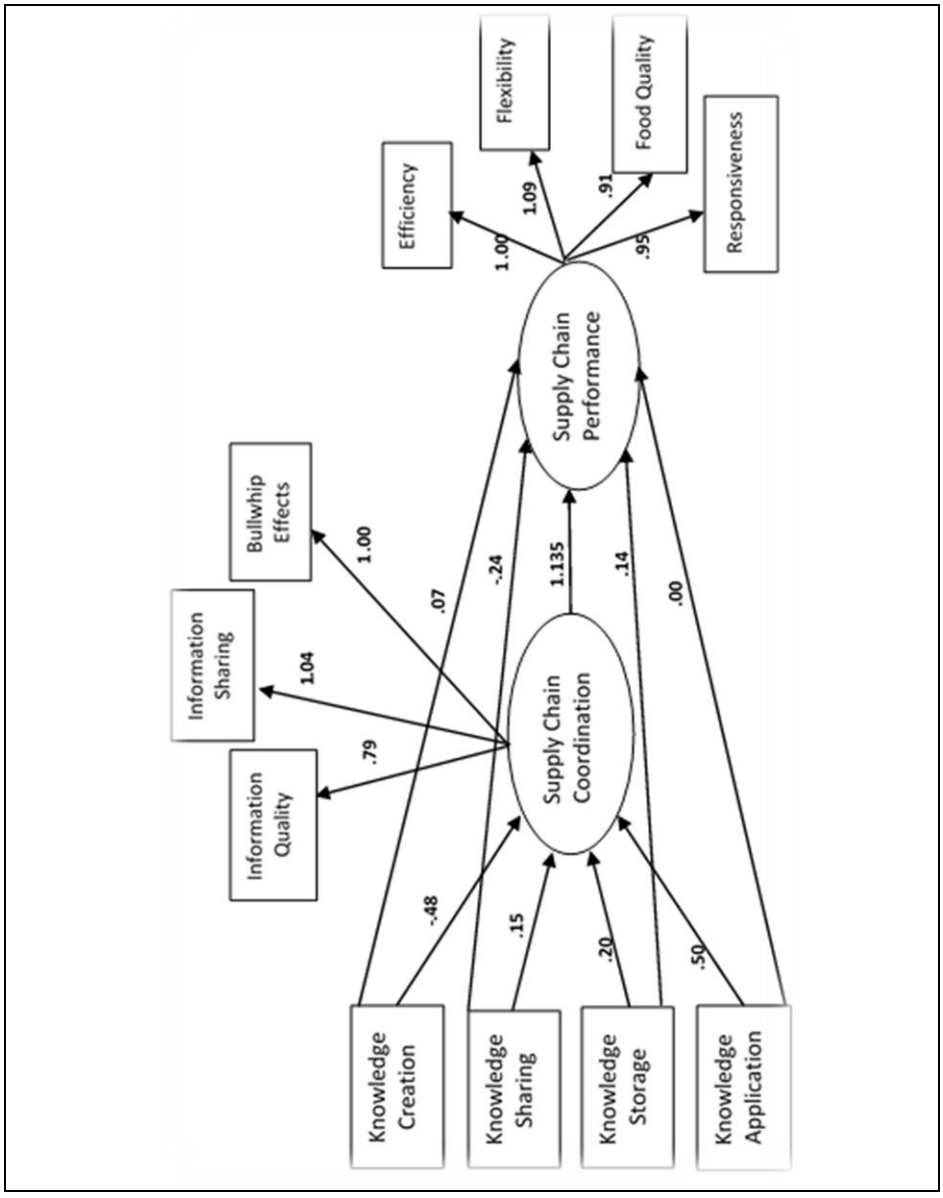

Figure 3: SEM Model

The regressions coefficients are shown in the above figure 3 with arrows which demonstrate the change in SCP because of one-unit change in SCC in the presence of KMP.

Table 6: Regression Weights

			Estimate	S.E.	C.R.	P
SCC	←	KC	-.048	.023	-2.109	.035
SCC	←	KSH	.153	.023	7.531	.000
SCC	←	KST	.224	.023	8.761	.000
SCC	←	KA	.511	.027	18.276	.000
SCP	←	SCC (in the presence of KMP)	1.135	.110	9.281	.000
SCP	←	KST	.136	.028	5.010	.000
SCP	←	KA	.012	.054	.001	.999
SCP	←	KC	.077	.020	3.399	.000
SCP	←	KSH	-.235	.027	-7.713	.000

Running the model in AMOS, the un-standardized and standardized regression coefficients are shown as follows. Each un-standardized regression coefficient represents the amount of change in the dependent or mediating variable for each one-unit change in the variable predicting it. The table displays the un-standardized estimate, its standard error (abbreviated S.E.), and the estimate divided by the standard error (abbreviated C.R.for Critical Ratio). The probability value associated with the null hypothesis that the test is zero is displayed under the P-column. All of the regression coefficients in this model are significantly different from zero beyond the .01 level except in case of KC and KA which are above .01 then null hypothesis are rejected in these case at 1% LOS. The knowledge creation is statistically significant (sig.=.000) and regression estimate for knowledge creation impacts on SCP (β=0.077). There are several studies (Gholami et al., 2013) in the support of acceptance of H_1 that KC plays a vital role to improve organizational performance. The regression estimate of KSH shows significant impact on SCP which is negative relationship as estimate shows (β = -0.235). There are several studies (Sangari et. al, 2014 & Gholami et al., 2013) in the support of acceptance of H_2 that KSH influence organizational performance. This is knowledge sharing amount supply chain partners that significantly impacts on organizational performance (Done A., 2011). This study shows that KA is failed (sig. = 0.999) to play an important role because supply chain is quick decision making mechanism where supply chain members do not go with the application of new knowledge but the study of Sangari et. al., (2014) shown knowledge application is most important factor by applying new knowledge to meet the ever changing competitive environment. Regression estimate (β = 0.012) can be considered at 10% level of significance. H_6 is rejected at 1% LOS (See table 6). Nonaka and Takeuchi (1995) explained that knowledge creation is a spiral of four modes (socialization, externalization, combination and internationalization) in the production of knowledge which is time taking process and supply chain is a rapid decision making area where supply chain members do not go for new knowledge creation they just apply knowledge created already. Regression estimate (β = -0.048) shows a negative

relationship between KC and SCC. Knowledge storage in supply chains making its worth as it is shown by estimates (β = 0.136) at (sig. = 0.000). Supply chain coordination influence supply chain performance as it is stated by Costantino et al. (2015a) the lack of coordination and the search for local optimization by each partner, without considering the consequences on the other partners, reduces the performances of the whole supply chain. Knowledge management (KM) significantly impacts supply chain performance of auto mobile industry (Mahmood et al., 2014). Regression estimate (β = 1.135) strongly influences supply chain performance where other KMP shows moderate relationship at 1% LOS (See table 6). The main hypothesis of this study accepted that supply chain coordination (SCC) is statistically and significantly mediates the relationship between KMP and SCP. Other sub hypotheses (h_7, h_8, h_9) of this study are accepted at (sin. = 0.000) or 1% LOS and their regression estimates are (β = .153, .224, .511) respectively.

6.2 Model Fit Summary

Table 7: CMIN (Chi-Square Min)

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	38	1266.12	34	.000	36.13

As stated in table 7, model is having 38 boundaries, and with discrepancy of 1266.12, model is good fit at 1% LOS.

7. Discussions

The study revealed its findings in table 6 and 7 and shows graphical image in figure 3 that SCC statistically and significantly intercede the relationship between KMP and SCP. The figure 3 shows that if SCC changes its one unit whether increase or decrease the impact on SCP comes with change in SCP unit change at 1% LOS. So, the main hypothesis of the study accepted which is "SCC statistically and significantly mediates the relationship between KMP and SCP". With 1 unit change in SCC, the change ensue in SCP is 1.35 at 1% LOS. So, the results come of this study are; if SC individuals coordinate effectively and sincerely, the utmost outcome will be produced that is good SCP, but there is another factor which cannot be ignored that is "Information quality". Because information quality impacts directly on SCC and SCP. As directed by Manoj et al., (2014), many researchers contended that store network execution can be upgraded by data sharing and its quality which will help in cost lessening, less stock administration, less bullwhip impacts and high perceive ability. This study also revealed that KSH has negative relationship with SCP at 1% LOS that is (β=-.235). But, other KM practices KST, KC, and KA have statistically and significantly positive relationship with SCP at 1% LOS. Kanat and Atilgan (2014) showed that KMP have relationship with SCP, as also indicated by Mahmood et al., (2014) there is a critical effect of KM on SCP. The study, through quantitative research and methodology, relevant literature and with related work, has disclose the importance of KMP in milk production industry that how KMP are playing role to improve the SCP with better coordination among SC members. If SC members share quality information within SC, the ultimate output occurs in good SCP. There is one thing which amazed the researchers that KC is no more important in SC. As, KC has no relationship with SCP. It shows that SC members no more interested or we can say, SC members of milk industry have no time to create new knowledge, because the SC of milk industry works very fast and the output of the workers depends upon their job future and they just share information which is already created within SC from

upstream. But, researchers are keen to get attention of concerned bodies on KC, the KC is very important factor or element in SC which can enhance the whole SCP in a right direction (Gholami et al., 2013). This needs consideration of the concerned bodies that measures are expected to take for the advancement and start among the supply chain individuals such that knowledge creation additionally can be reflected as a crucial element in the supply chain knowledge management process. Other studies show different prospective of knowledge management and supply chain management or supply chain coordination and supply chain performance. In current study, together all knowledge management practices are being studies in the context of milk processing industry and supply chain coordination is taken as mediating varible in order to study relationship between knowledge management and supply chain performance. The study reveals that SCC signifcally mediates the relationship between KMP and SCP.

7.1 Managerial Implications

On the bases of the results of this study, concerned bodies are endorsed to focus on the possibility of KMP by virtue of its hugeness and foremost impact on SCP as investigated in the study (Mahmood et al., 2014) and the clear centrality by the executives and masters who have responded in survey of this study.

7.2 Theoretical Implications

This study gives a root to start working on KMP and SCP. Additionally, this study will grasp the miracles of creating markets especially by virtue of milk division while driving study for upgrading SCP by focusing on management of knowledge

7.3 Suggestions and Recommendations

Milk industry should execute right learning administration procedures radiantly with a particular deciding objective to stay alive and be engaged in organizations where wild conflict and mighty exchange charge is required. The supply chain is the most vital management occasion for supply chain managers of the milk industry. Management of the supply chain has picked up so much significance that competition happens among supply chains as opposed to between ventures.

Knowledge management would give the most proficient and right control of knowledge streams all through the supply chain. At the point when knowledge is considered as the key of each achievement, the significance of being a proprietor and proficient supervisor of knowledge turns out to be clear. If the information required is at the ideal spot at the ideal time, oversights would be minimized all through the store network. In this way, the execution of the production network would increase. The speculation proposed in the study is demonstrated by the aftereffects of the study. Components of knowledge management productively utilized apply a positive effect on the supply chain performance of milk industry. The theoretical theory is authentic at execution. The examination of the audit centers out that speculatively basic convictions are in like manner basic in the execution for administrators of milk industry (Kanat S., 2014).

8. Limitations and Directions for Further Research

There are number of confinements that this study confronted. As a matter of first importance, supply chain management is field where diverse associations cooperate to fulfill purchaser needs.

This study is simply coordinated by achieving store network people working in the association while, venders and scattering assistants are ignored. Additionally, simply milk industry of Punjab was in focus in this study but did not address the condition of whole country as the geographical condition in every territory would be particular.

This examination is an explorative examination drove with the viewpoint to study start to finish the vital forms of supply chain management. The independent variables of knowledge management practices and interceding variables i.e. supply chain coordination is concentrated to discover any relationship and essentialness. Knowledge creation has been discovered demonstrating negative association with SCC. Further studies can combine KM types (tacit knowledge and explicit knowledge), by investigating these proposed measurements of knowledge management can help to study supply chain knowledge management with an alternate point of view.

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