

Integrating ICT with SCM: A Pakistan Retail Superstore Industry Perspective

Fahad Mateen*
Faisal Younus
Dr. Roshan Shaikh

Abstract

The concept of information communication technology (ICT) in supply chain management (SCM) is a new development that is being successfully implemented by many large companies in developed countries. Gradually companies in Pakistan are recognizing that without comprehensive implementation of ICT, SCM cannot provide bottomline benefits but only very few realize its strategic importance in their business. A survey and interviews were conducted with SCM managers of a thriving but very scarcely populated sub-sector of the retail industry of Pakistan—the emerging superstores. The managers of the supply chain departments are not only responsible for the supply chain strategy but also act as controllers of the technology being used for supply chain operations. The study examines the challenges faced by the expanding Pakistani superstore industry in the management of supply chain operations and proposes solutions to overcome these challenges by establishing the role of ICT in SCM. The solution presented provides parameters and practical approaches to integrate ICT with SCM in an optimum manner so that super stores can achieve valuable end results by implementing desired supply chain objectives and sustaining competitive advantage.

Keywords: *Information communication technologies, supply chain management, superstores.*

1. Introduction

This study examines the concept of integrating information and communication technology (ICT) in supply chain management (SCM). Taking into account various complexities and challenges in maintaining efficient and effective supply chain operations, the study discusses the importance of integrating ICT in supply chain.

*Fahad Matin and Faisal Younus are Ph.D. students at Iqra University, Karachi, fahadmateen81@yahoo.com, mfaisal4u@hotmail.com

Dr. Roshan Shaikh is a Professor at Iqra University, Karachi.

ICT in SCM is a concept which has enabled many organizations to achieve their supply chain objectives (Lee, et al., 1997). Integrating ICT in supply chain heavily depends upon the strategic partnership, which emphasizes the significance of information sharing between the stakeholders of the chain (IBMCS, 2004). Research has proven the importance of information sharing between the stakeholders as the most important strategy to achieve supply chain goals and integrating ICT in SCM has emerged as the most appropriate strategy to achieve these goals (Lee, et al., 1997). As the companies start focusing towards implementing the strategy, integration of ICT in SCM can make difference in the way supply chain operations are handled.

This paper discusses the retail superstore industry of Pakistan where the industry in the recent years has experienced volume growth. The statistics suggest a potential for growth in the industry, due to a shift in the consumer buying behavior. With the current rate of growth of the retail superstore, and due to the under developed structure of the retail industry of Pakistan (Pakistan Retailer Superstores Manufactures Association, 2005), there lies a challenge in managing supply chain operation efficiently and sustaining competitive advantage. If measures are not taken to address the future challenges, there is a danger of losing customer confidence, which ultimately may lead to the erosion of the competitive advantage resulting in decrease in marketing and financial performance of the sector.

This study assesses how well known is the concept of a synthesis of ICT in SCM in the organizations, particularly retail superstores of Pakistan. It further aims at understanding the perception of the organizations regarding the necessity of implementing it in their systems. Finally, the study aims at finding out whether it makes economic business sense for the Pakistani superstores to implement ICT to manage their supply chain, and the perceived vs. actual level of impact that it has on the productivity and cost of operation in the superstores.

An analytical approach for the research was used based on three large superstores of Pakistan where the aim was to figure out the point of significance where integrating ICT in SCM becomes desirable to implement in the superstores. Since no work has been done in the area, the study discusses a proposition which suggests the impact of ICT on the price, quality and delivery time of the superstore in its supply chain operations. To develop a working framework, top senior managers of the supply chain stores were interviewed and surveyed, and their responses were used to develop an empirical equation where point of decision for the supply chain managers was identified in order to make a case for superstores to implement ICT in their supply chain operations.

The outcome of the study suggests an outsourcing model, which would be able to address the current requirements and future challenges of the retail superstore industry of Pakistan. A proper guideline and benefits of the model are also presented to address the issues raised during the research by the respondents. The report provides a point for the future research to realize the importance and focus of ICT in SCM.

2. The Concept of ICT in SCM

ICT in SCM is a concept of sharing the information between stakeholders of the retail industry chain i.e. retailer, manufacturer and distributor in order to achieve supply chain efficiencies and reduce cost of the goods sold by reducing lead times and inventory cost, as well as improving the quality of goods to be delivered.

Over the years, there has been rapid development in the use of ICT in logistics and SCM. ICT today is being applied in many organizations over a wide range of operational areas. It has provided new ways to store, process, distribute and exchange information both within companies and with customers and suppliers in the supply chain. There are examples in literature, which establishes that ICT used to exchange information in the supply chain is often referred to as inter-organizational ICT or inter-organizational information systems (Lee, et al., 1997).

Researchers have also suggested that the adoption of ICT is spreading rapidly in SCM (Kollberg and Dreyer, 2005). As competition is increasing, companies are seeking strategies to improve supply chain efficiency through increased integration where ICT can be considered as a key enabler for supply chain management by supporting information sharing and overcoming operational inefficiencies raised due to various reasons (Kollberg and Dreyer, 2005). Research work that deals with recognizing ICT as an enabler in SCM emphasizes information sharing and reducing inconsistencies and uncertainties as exemplified in the Bullwhip effect (Lee, et al., 1997). This implies further focus on information sharing on the basis of which supply chain automation can be achieved. For example the research, which describes the vendor-managed inventory (VMI) and the collaborative planning, forecasting and replenishment (CPFR) as initiatives that require automation in both the transportation of physical materials and the exchange of information between companies, is used to improve the efficiency in the supply chain operations of the company (Kollberg and Dreyer, 2005).

The bullwhip effect phenomenon has been observed in different industries and occurs whenever demand uncertainties and variability become magnified when viewed by managers at each link in the supply chain. It is one of the most important causes of inefficiency in a supply chain. While this study considers the bullwhip effect and its implication in the research work, a direct focus on this phenomenon has been avoided. Instead, the thesis takes note of a study which suggests that the impact of the technology in SCM reduces the bullwhip effect which removes supply chain inefficiencies and ultimately reduces cost, lead-time and maintains quality (Basu and Siems, 2004). The major uncertainties in SCM can be overcome by specifically tailored systems of information sharing and implementation of ICT infrastructure (Basu and Siems, 2004).

Information sharing in the supply chain management among the stakeholders has become the desired aspect of managing a supply chain of a superstore while electronic means of sharing information is the key component to sustain the competitive advantage in the industry (IBMCS, 2004). In other words, information sharing and the way it is managed has now

become the most important factor in sustaining competitive advantage (IBMCS, 2004). The focus is towards planning and strategically implementing the process with the help of technology to achieve the desired results in a strategic relationship. The partners in the supply chain of the superstores i.e. retailers, manufacturers and distributors have entered a promising and challenging period in their relationships as they realize the importance of working closely together to achieve improved operational efficiencies and service standards. Some studies, while establishing the importance of IT, have laid emphasis upon the requirement of integration of IT into an organization's culture and the reorganization of work for an effective competitive advantage strategy (Siems and Yucel, 2005).

Current literature describes the effects of ICT as improvements in areas of supply chain with reduced production instability, optimum inventory levels, less expensive logistics and streamlined procurement systems (Siems and Yucel, 2005a; Siems, 2005b). Thus, various studies recognize that the implementation of ICT in SCM has an impact on the price, quality and lead-time (Siems and Yucel, 2005). Most successful businesses have now reorganized themselves to take advantage of information technology and are re-establishing the way work is done in their organizations resulting in consumer benefits and enabling them to select from a wide range of high quality products at lower prices (Lee, et al., 1997). While SCM is as old as trade itself, new information and communication technologies have made today's supply chains better, faster and cheaper (Basu and Siems, 2005b). Information engineering that combines new information technologies with improved production, inventory, distribution and procurement methods has revolutionized supply chain operations (Siems, 2005).

In summary current literature highlights the increasing strategic importance of ICT in SCM in the business of the organizations in maintaining competitive advantage with direct impact on price, quality and lead-time. The literature also stresses the need for strategic partnership and information sharing among the stakeholders of supply chains as a key component for success. Having explained the importance of ICT in SCM, the paper now looks at retail industry in Pakistan.

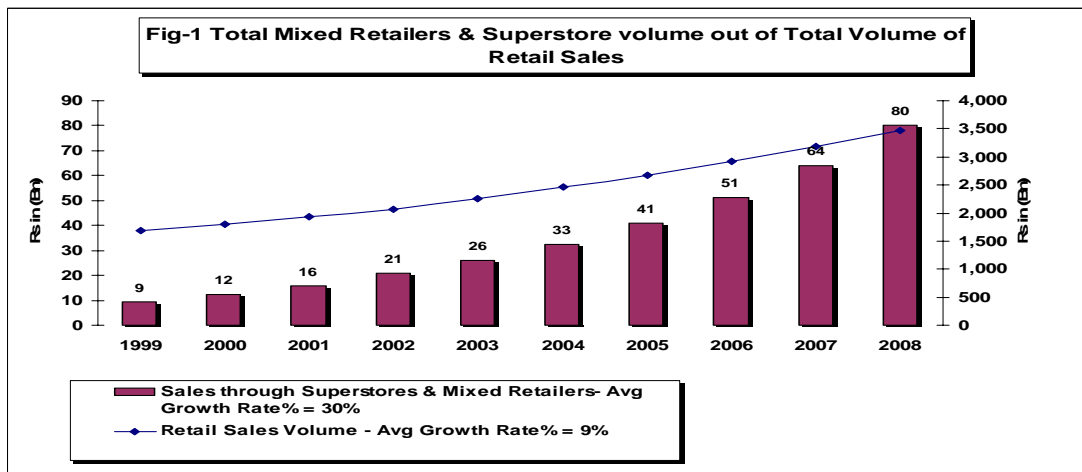
3. Retailing Business and the Retail Industry in Pakistan

Retailing is a specialized marketing activity. It comprises of all business activities directly involved in the sale of goods and services to the ultimate consumer for personal, family, household or non-business use. Retailing is the last stage in a channel of distribution. Literature emphasizes that the aim of marketing activities is to reach the final consumer with the right product at the time needed, at the right price (Hardwick, 2004).

Current literature also explains that the retailer has to be very familiar with the environmental factors where the retailer has to be conscious about the constant changes taking place in the environment. The impact of these factors has always been very important particularly, the impact on sustainability, growth, profit-making and ultimate success of the business (Durrani, 2002).

Pakistan's superstore industry has experienced changing trends in the last five years due to the introduction of proper superstores by experienced entrepreneurs of the retail industry.

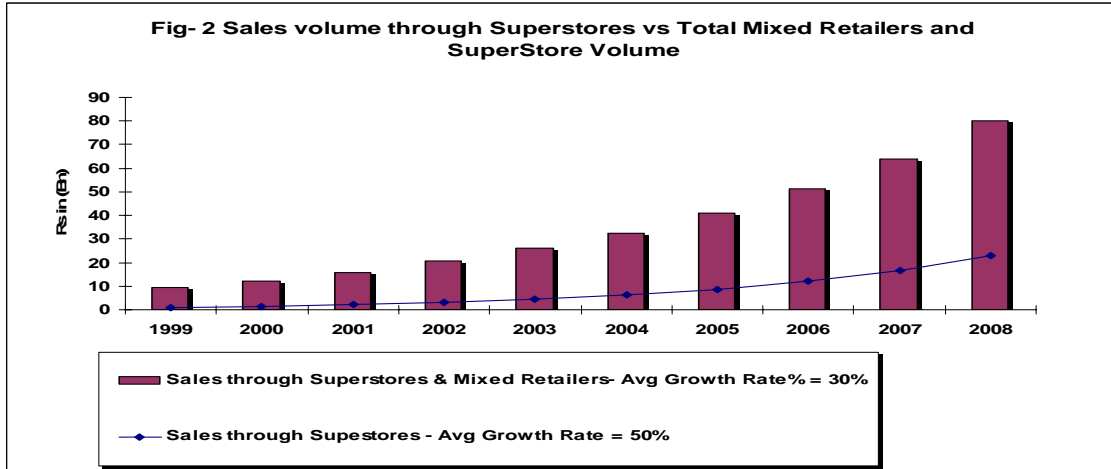
This fact has been corroborated by the Ministry of Commerce, Pakistan which has stated that consumer preferences will continue favoring superstores over other types of outlets and the volume forecasted is expected to almost double in number by 2008, with sales nearly tripling (Ministry of Economic Affairs and Statistics, Pakistan, 2004). However, supermarkets, a new concept in Pakistan, are gaining popularity in the urban areas, and these types of outlets are the fastest growing, starting from a very small base (Pakistan Retailer Superstores Manufactures Association, 2005).



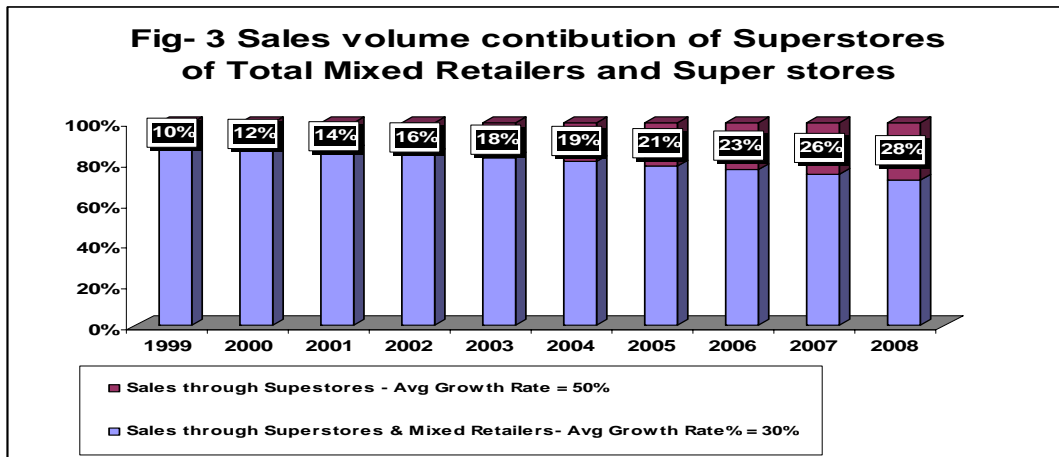
Retailing employs around 4.43 million people, and makes up around 11% of the total registered employment. Most retail businesses are family owned, who mostly run general stores or small specialist shops (Ministry of Statistics, Pakistan, 2004).

One of the highlights of this industry is the fact that retail sales, which amounted to about Rs. 2,069 billion in 2002, expanded at an average annual rate of 7.2% between 1999 and 2002. Retail sales are expected to expand at a higher pace of 9% ¹ (see Fig-1). The Ministry of Commerce has also predicted that the expected volumes in the supermarkets will grow at a very high rate, and has also indicated that the sales through supermarkets and mixed retailers are still insignificant as compared to the overall retail trade, accounting for only 1% of total retail sales. (Ministry of Economic Affairs and Statistics, Pakistan, 2004)

¹ The Ministry of Economic Affairs and Statistics conducts analyses of these figures after every four years. These figures are projected on the prediction stated by the Ministry in its last analysis of years 1999-2002 in 2004.



However, these sales grew by about 30% on average per year over the 1999-2002 periods, with sales through supermarkets alone growing by about 50% (Ministry of Commerce, Pakistan, 2005) (see Fig-2). As a result, sales almost tripled over the period. This high rate of growth in sales through modern retail formats is expected to continue during the coming years. (See Fig-3) The sales contribution clearly shows the increase in sales of the super stores. This emphasizes that as the management of these super stores face such high rate of growth, supply chain inefficiencies are likely to occur if not properly taken care of.



Source: Ministry of Economic Affairs and Statistics, Pakistan, 2004.

When compared to its South Asian counterparts, Pakistan is behind in terms of development, structure and organization due to which there are only a handful of large retailers and even these tend to operate at a regional level (Pakistan Retailer Superstores Manufactures Association, 2005).

One of the drawbacks of the Pakistani approach towards retailing is its short-term focus, as well as low and inconsistent product quality. Pakistan's superstore industry is also suffering from other negative trends and practices such as counterfeiting. According to Pakistan Retailers Association, a significant opportunity, therefore, lies in any segment where quality plays an important role in the decision making of consumers. (Pakistan Retailer Superstores Manufactures Association, 2005)

4. Cost and Productivity Relationship in Implementing ICT

Earlier the relationship of cost and productivity in implementing ICT in superstore was presented. We now present the mathematical formula that incorporates all the studies variables with their defined relationship:

$$I_{ICT} = \frac{C(a)}{X=1} \cdot \frac{P(a)}{y=1} \quad (1)$$

Where

C (a) = Cost as function of a = 13%, the choice made by respondents as provided and explained in data analysis question 7

P (b) = Productivity as function of b = 11%, the choice made by respondents as provided and explained in data analysis question 8

n = max number of instances

x = instant of cost

y = instant of productivity

Where as $C(a) \propto P(a)$ _____ (2)

And $C(a) = \lambda \times P(a)$ _____ (3)

i.e. $\lambda = C(a) / P(a)$ _____ (4)

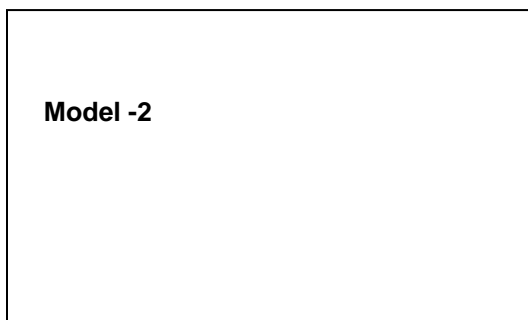
However, the survey conducted in the work identifies

$$\lambda = 13\% / 11\%$$

$$\lambda = 1.18$$

Where λ is the proportionality factor of the required decrease in cost over increase in productivity.

Furthermore, respondents had shown their concerns over the investment that is required for the implementation of ICT in their superstores; however, all of them expressed raising apprehensions of inefficient delivery times of the vendors and loss due to irregular activities such as fraud and breakage/wastages and commented that in future these factors will reach at point where they will effect the superstore business, where integrating ICT in the supply chain of the superstore will become important. This is also mathematically represented as:



$$V_x = \sum_{X=1}^{X=n} C_x$$

Where:

$$C_x = C_{xa} + C_{xb} + C_{xc}$$

C_{xa} = Sales opportunity cost due to inefficient delivery times

C_{xb} = Fraud and theft

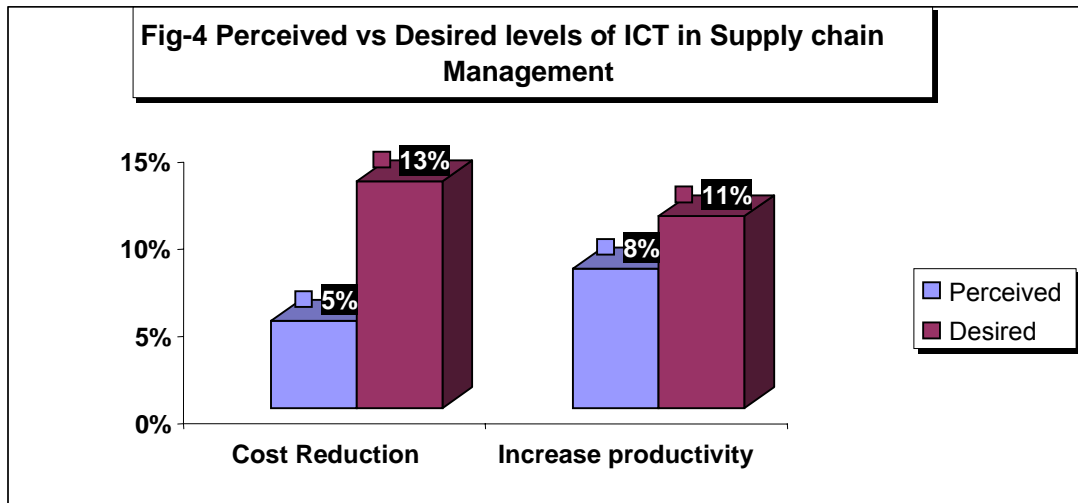
C_{xc} = Breakage and wastage

n = Number of instances

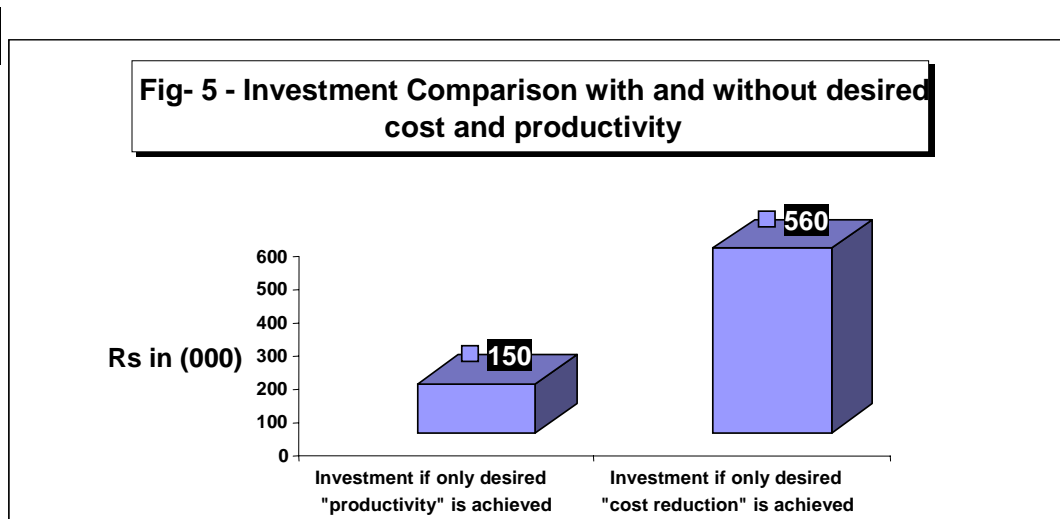
V_x = Point of impact for ICT in SCM

5. Summary of Results

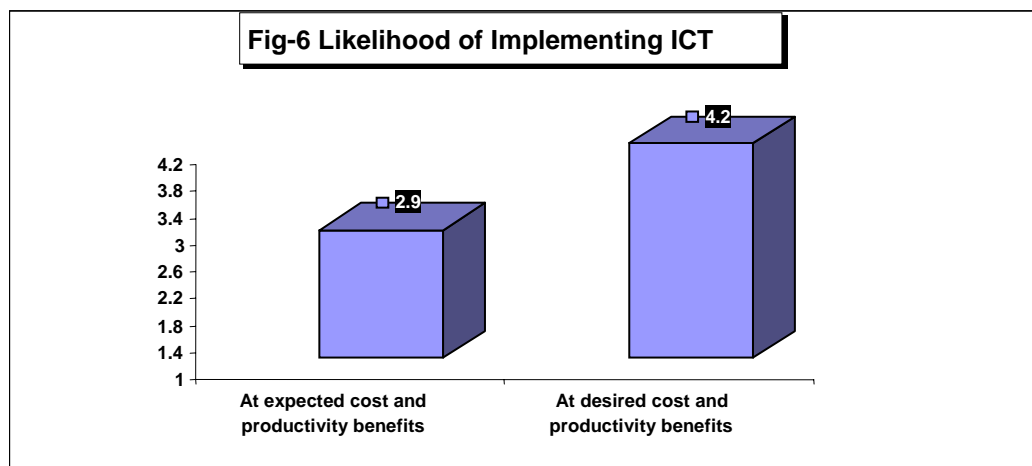
The results of the study conclude that the retail superstore industry of Pakistan recognizes the importance of ICT in the supply chain management of a superstore and the future demand would give it a competitive advantage over others who are not using it.



The concept of ICT though is very appealing to the respondents, surprisingly however, this is considered as an extra expense rather than an investment by the management. The perceived reduction in the cost that it can bring was quoted as 4%-6% against the desired value of 13% or more. The perceived productivity and efficiency it can bring was quoted as 7%-9% against the desired of 10%-12% (see Fig-4). The perceived investment that it requires was quoted as Rs. 560K to make it a business sense for it to be implemented. The result in the study provides the measurable variables of expected and desired levels of cost and productivity related to integrating ICT in SCM in their current structure.



In this research, an attempt was made to discover the perceived impact that ICT in the supply chain can make in the overall operational effectiveness of the retail superstores in Pakistan. The results were quite positive favoring the usefulness of ICT in supply chain of the superstores. The results from question 2 shows the mean of 3.6 (5 being very different) indicate that ICT will make a difference in relation to current technologies being used in superstores. The rest of the results are summarized in Fig-5 and Fig-6. Comparison of desired cost where productivity or cost alone is relevant is given in Fig-5, while Fig-6 consolidates the desired and expected cost of both "cost reduction" and productivity.



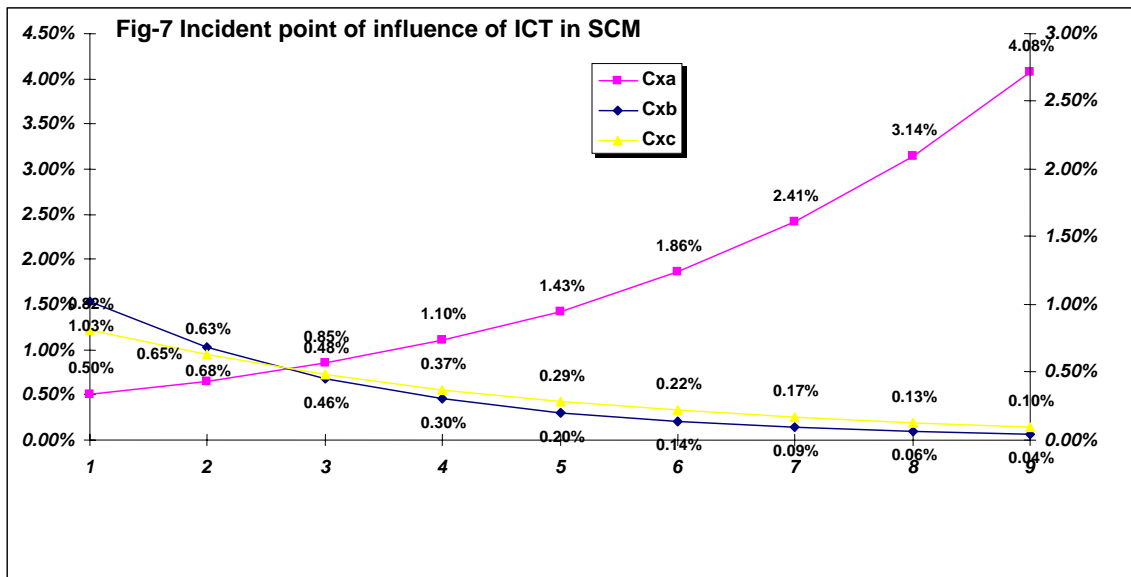
The major result of the study shows the desired level of productivity and cost relationship as emphasized by superstore management. The results have defined the importance of cost reduction (human resource and administration) as more important than the increase in productivity (quality, lead-time). The significance of cost reduction in the research may have

resulted from the challenges of managing cost element due to expected growth in the business, where the management of the superstore would want to control cost using the same resources in the coming future.

Table 1

Cost / x	Description	Value
Cxa	Opportunity cost due to delivery time, placed on the primary access.	-
	Base value of the cost is taken as the approximate % of sales as stated by the respondents.	0.50%
	Increase from the base point is taken on the growth as stated in statistics report from Ministry of Commerce, Pakistan.	30%
Cxb	Cost due to fraud and theft at the store and warehouse, placed on the secondary access.	-
	Base value of the cost is taken as the approximate % of sales as stated by the respondents.	0.04%
	Increase from the base point is taken on the growth as stated by the respondents as an increase in such cases with the increase in volume in comparison with Cxc.	50%
Cxc	Cost due to wastages and breakages, placed on the secondary access.	-
	Base value of the cost is taken as the approximate % of sales as stated by the respondents.	0.10%
	Increase from the base point is taken on the growth as stated in statistics report from Ministry of Commerce, Pakistan.	30%

The points of implementation value were taken from Table 1 which was developed after the analysis of the literature review and discussion.



The point of implementation that is derived based on the total cost impact of loss, fraud/theft and breakage/wastage ranges around 2% or more. At that particular point in time the super store should decide to implement ICT in their supply chain operation in order to avoid the loss caused by these troublesome factors.

6. Proposed Working Model

The above discussion and results highlight the fact that superstore management, although realizes the importance of ICT in the supply chain management for the survival of their retail super stores, is not very keen in putting an investment beyond certain threshold in procuring an IT solution. The Pakistani market is used to instant cost and productivity benefits to their investments, and has little patience to wait for long-term and strategic growth that is possible if they implement ICT for their supply chain operations.

These findings suggest the following solutions for the superstores in Pakistan, which would provide them their desired bottom line benefits. The outsourcing model that is suggested for the Pakistani retail superstores can also be supported by the earlier studies which propose that new models should be developed that will give optimal results in cost reduction, re-engineering, and reduced time to market. Thus using outsourcing partners and acquiring wholly owned ICT services is an optimum solution to align internal and operational resources (Narayanan and Varghese, 2004). For example, Accenture is a global management consulting technology services and outsourcing company, which has provided SCM and IT outsource solutions to Italian giants like Zara, and UK giant TESCO. They state that the 'experience suggests excellent retail supply chain management revolves around understanding and balancing three key dimensions of availability, inventory and cost. The real challenge is to manage these trade-offs efficiently to achieve improved business performance and drive competitive advantage' (Accenture, 2006). The research is indicating that an excellent performance can be achieved through outsourced processes to overcome

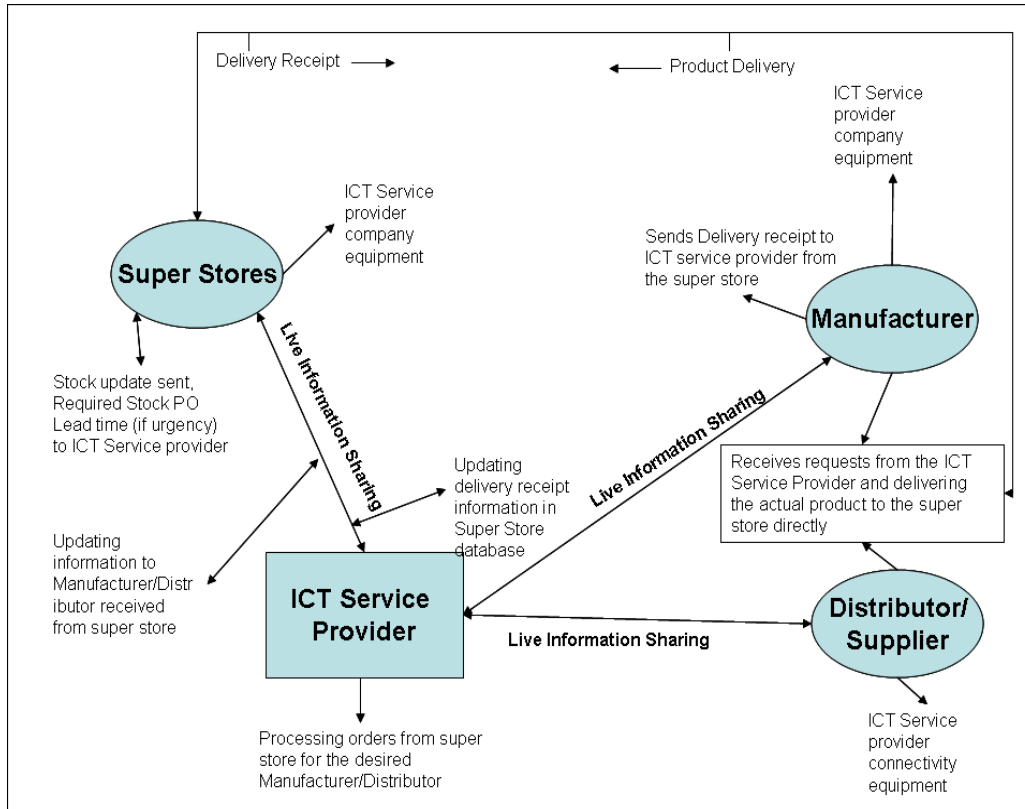
any competitive disadvantage, which may require talent and skills that the company wants to address but, may not want to invest in.

To overcome this reluctance of investment by the companies themselves, the thesis based on literature and analysis of data, proposes an ICT outsourcing model to be incorporated in SCM system of retail superstores operation. This model is proposed in the next section.

The Model

Fig-10 suggests a model for the Pakistan's superstore industry in terms of the application of ICT in managing the supply chain operations is introducing the concept of 'ICT for SCM service provider.' A third party manages outsourced solution where the investment on the technological front is done by the ICT service provider and the service is given to the superstore, while charging them a rental amount in return. The introduction of such a service would enable the Pakistani superstores to meet their bottom line benefits by not having to invest large amounts but at the same time utilize the benefits of ICT that it can provide in their supply chain operations at minimum cost.

Fig-8 Model – ICT Supply Chain Management Service Provider (ISCMSP)



6.1.1 Functionality and Benefits of the Model

ICT service provider would have to equip the superstores along with the manufacturer, distributor and supplier with necessary gadgets and infrastructure required such as RFIDs for the exchange of the information that would be taking place in order to enable electronic update of the information. As soon as there is a change in inventory/sale of the superstore it would be entered into the superstore's system which is updated accordingly. This will trigger an action at the ICT service provider's end through the RFID placed at the superstore, to start the procurement process for the superstore arising from this activity.

The information is then processed and sent to the desired manufacturer or distributor accordingly through the same RFID, which is also placed at their end. The delivery is then made to the superstore by the manufacturer or distributor. The superstore receives the good and the receipt information is then updated by the manufacturer/distributor in their system which then gets updated in the superstore system confirming the delivery of goods.

7. Impact of Effectiveness Parameters for Implementing

The study suggests in light of the literature review, discussions and their results, and the proposed working model that the advance and new technology results in better efficiency and productivity of the store. In other words, the effectiveness of the superstore depends on advance technology used for their supply chain operations. This proposal is depicted in the following mathematical model:

$$\text{Effectiveness} = \frac{P_{NT} \cdot (\alpha f(E)n + \beta f(P)n)}{n=U \quad n=U}$$

Where

P_{NT} = Probability of New Technology

E = Efficiency

P = Productivity

U = Upper Limit
 n = impact change

The proposal equation suggests that with the advent of new technology the effectiveness of the superstores would increase accordingly. This equation incorporates the effects on efficiency and productivity of the supply chain of the superstores which increases with technological advancement in the SCM structure.

8. Conclusion

In this work, the proposed model is an attempt to close the gap between the desired levels of cost reduction against the perceived cost reduction by the superstore management. At the same time, the model tries to eliminate the hurdle of investment required from the superstore management by providing them a managed and outsourced solution. The proposed model would be very relevant in Pakistan as successful retailers around the world are trying to outsource their technology and their supply chain functions. This model will not only help superstores of Pakistan meet their bottom line benefits but would also provide them competitive advantage along with the opportunities in the Pakistani retail industry to further grow their businesses. The suggested model's guidelines in the paper should enable the ICT industry to jump start the real SCM growth in Pakistan.

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