The Impact of Information and Communications Technology on Supply chain management in South Indian Small-scale grocery sector

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Abstract

The study revealed that the small-scale grocery sector has various challenges such as implementation and maintenance cost concerns, lack of technical literacy and skills, security issues, changing role of employees, etc. in relation to ICT's use in managing supply chain operations. From the findings of the study it was discovered that the impact of ICT in supply chain management which has been observed in various aspects such as increased transparency of supply operations, efficiency, cost reductions, real time information access, products tracking, communication, coordination, relationship among internal and external supply chain participants. The results from the primary analysis revealed some positive impacts by the use of ICT in planning, logistics tracking and product delivery in the supply chain of grocery firms. Based on the findings, some recommendations are made for small scale grocery firms in southern parts of India.

The purpose of this study was to investigate the impact of ICT on supply chain management in south Indian small-scale grocery sector. There are certain reasons for choosing South India, one of the main reasons is India being a vast country with thousands of small-scale grocery shops, it will be difficult to find one participant from each place, so the study was focused to southern parts of India. The methodology for this study followed a qualitative study design. The primary data were drawn from qualitative technique, an interview method from different companies operating in the small-scale sector in grocery business. The secondary research was done through literature review to obtain secondary data to develop theoretical understanding of the study topic and objectives. The secondary data obtained have supported the findings of the primary data to a great extent.

Declaration Page

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Contents

Research Topic: To study the impact of information and communication technologies (ICT) on supply chain management (SCM) in South Indian small-scale grocery sector.

Chapter 1: Introduction

1.1 Background of the Research

The growth of internet and the advancements in information and communication technology (ICT) overtime has led to efficiency in the provision of real time information, timely access, sharing and exchange of data/information, improvements in coordination and interactions, logistics and other supply chain management (Manochehri, Esmail and Ashrafi, 2012). These advancements have influenced the design and cost of supply chain management, and consequently the relationship among supply chain participants such as suppliers, vendors, employees, customers. The supply chain management plays various roles in different industries or sectors. In grocery sector supply chain operation starts from ordering a product, which is then transported by a logistics company and then received by the customer which in other words called network of end-to-end (B2B) operations. Accordingly, many have recognised the application of ICT technologies in supply chain management. Information and Communication Technology field has also contributed in the internationalisation of production and distribution networks in various industrial units. As many organisations are participating in more than one supply chain in the dynamic business environment, ICT tools have been recognised to lead global supply chains to develop comparative advantage for market competitiveness. According to Kable (2014), a survey at global level revealed that there has been a 40 percent increase in ICT costs (on hardware, software, communication and IT services) in year 2013 according to 168 retailers. ICT tools are majorly being used in supply chain areas such as order placement, inventory management, shipment tracking, exchange of information/transactions with vendors, e-payment information exchange with suppliers, mobile connectivity and cloud - based services (De Marchi, Di Maria and Gereffi, 2017). In particular, manufacturers and retailers in many developing nations are using ICT tools in supply chain to enhance their operational promptness, efficiency and economic performance. From all the research findings there was a gap in the study in the impact of ICT in small-scale grocery sectors in India. In the South Indian retail sector, ICT investments are growing rapidly to improve efficiency in supply chain and profit margins. The grocery sector forms an important retail industry in India. Both

large scale supermarkets and small-scale grocery retail shops have evolved as one of the most convenient Indian businesses owing to their effectiveness and efficiency in managing the supply chain (Trebbin, 2014). On the other hand, there also exist inefficiencies in managing multiple supply chains as the business grow and expand and in terms of collaboration and communication with supply chain partners which affects the business performances and profit margins. The effective solution towards this has been recognised with the use of information and communication technologies.

1.2 Research Problem

The deployment of ICT tools has been more prominent in management of global supply chain in large grocery stores such as supermarkets and hypermarkets to lower operational costs and become value added retail providers. Information and Communication Technology has been an influencing factor for automation in supply chain operations in food and grocery retail industry and is progressing in large scale grocery stores. However, the practical use of ICT in small scale grocery sector is at its initial stage (Heeks, Subramanian and Jones, 2015). The small-scale grocery retailers have been slow in the adoption of ICT tools in leading and managing supply chain despite the numerous benefits present in the implementation and use of ICT. Particularly in India, supply chain management has much relevance from the arrival of globalisation that has opened up the domestic economy to the world. However, the significance and benefits of SCM in South India is not realized by the small-scale sectors which is dominant in the country (Gurumurthy, Soni, Prakash and Badhotiva, 2013). It can be said that there is an unequal use of ICT in the grocery retail sector. This also raises the question that 'Does ICT tools present opportunities and benefits for small scale grocery retailers in SCM?' And 'Does ICT influence the Supply Chain Management at the level of small scale in grocery retailing in South India'? Thus, there is a need to investigate the impact of ICT in the management of supply chain and opportunity for ICT use in small scale grocery sector to help these retailers in improving the supply chain performance, operational efficiency and to develop competitive supply chains. This can also provide insight for the grocery retailers to understand how ICT tools can benefit the supply chain operations at a small scale. The findings from this research will add some new knowledge in the area of literatures surrounding the impact of ICT for small scale as most of studies have focused on large scale retail formats. Hence, this research seeks

to investigate ICT's impact on supply chain management in grocery sector for small scale retailers from South Indian business perspective.

1.3 Research Aim and Objectives

The aim of this study is to find the impact of information and communication technologies (ICT) on supply chain management in South Indian small-scale grocery sector.

In order to accomplish the aim of this study, the following research objectives will be concentrated on by the researcher for this study:

- ° To widen the theoretical concepts related to supply chain management, ICT and small-scale sector
- ° To assess the importance of ICT tools in the small-scale grocery sector
- ° To explore factors that influence information and communication technologies (ICT) in grocery sector
- ° To find out the role and benefits of ICT in supply chain management in grocery sector
- ° To recommend approaches in managing ICT contribution to improve supply chain management in small scale grocery sector.

1.4 Research Questions

1. To what extent is ICT being implemented in small scale grocery sector in South India?
2. What are the various factors influencing ICT deployment in small scale grocery sector?
3. What role does ICT play in supply chain management of small scale grocery sector?
4. What are the various benefits and opportunities of using ICT in supply chain management in small scale grocery sector in South India?

1.5 Research Structure

The structure of this research includes six main chapters to carry out the research process in an orderly manner. The first chapter would be the Introduction which represents the opening chapter of study which set up the research topic and provides the general information about the topic. The chapter discusses the background information of the research, problem statement

and identifies the aim and objectives of the research, questions that will be addressed and layout to be followed by the researcher. It also explains about the concepts of supply chain management, Information and communication technology. The second chapter would be the Review of Literature which constitutes to analyse the work of other researchers done in area of research topic. This part put forward the theoretical arguments and findings of other researches that are applicable towards the research topic area and related objectives. The secondary data sources include books, journal, news articles, websites, online published information. The next topic would be the Research Methodology, this makes up the third chapter of the study which provides details about the methodology for the research process. It will specify the research philosophy, approach, tools and techniques to source, collect, and analyse the research data to achieve the aim and objectives of the study. It gives information about the sampling to specify participants chosen and number of participants taking part in the research process. The chapter will also specify the limitation and ethical considerations for the research. Reasons for choosing the qualitative analysis and reason for choosing southern India is explained in detail. In this part it can also be seen how each and every information of about the impact of ICT on supply chain management in south Indian small-scale grocery sector was collected by the researcher.

Data Analysis and Findings forms the fourth chapter of the research which is concerned with analysing the research data collected to present the final results in the context of small scale grocery sector in South India. It will also discuss the findings in correlation with secondary data findings obtained through literature review that is compare what the participants answers with the findings from the literature review. The fifth chapter would be Discussion and, in this chapter, both the primary and secondary data is being used to discuss the challenges faced by the grocery industry in south India to implement ICT. Also, in depth knowledge of the findings like the impact of ICT tools in the grocery sector to maintain the inventory, to order the stock and "what are all the ICT tools used and its advantages" are discussed. The last and final chapter would be the Conclusion which summarises the key points of the overall research and put together results that address the research aim and objectives. In this section, the researcher will also give recommendations of new ideas to improve businesses based on the findings from this research. We can see the result of how ICT impacts in the grocery sector and recommendation from the researcher based on findings from the secondary study and ideas from the primary study.

Chapter 2: Review of Literature

2.1 Theoretical concepts

2.1.1 Supply Chain management (SCM)

According to Blanchard (2010) defines supply chain management as streamlining the processes towards flow of goods from its conversion from raw material into final products. Oorganization's which provide products to end users represent the cumulative effort due to which these organizations are referred to as the supply chain and when the supply chain exists for a long period, most organizations only pay attention to what happens within their organizations. There are other areas such as logistics, procurement, information technology as well as logistics that are considered under the supply chain management. In the views of Wilhelm, Blome, Bhakoo and Paulraj (2016) supply chain management is a concept that is applied within the organization to manage the flow of goods and services, which includes the storage of raw materials and of work-in-progress inventory. At the same time, Wong, Wong and Boon (2015) opine that supply chain management is the essential part for every organization whether it is small or large. It is the dynamic management of the activities of the supply chain to increase the customer values and to achieve maintainable competitive advantages. Supply chain management signifies a conscious attempt through supply chain organizations for developing and running supply chain with the most effectual ways probable. In addition, Genovese, Acquaye, Figueroa and Koh (2017) mention that there are various activities of the supply chain from product development, logistics, sourcing, production as well as an information system that is required to organize these activities. Similarly, according to Bayraktar, Demirbag, Koh, Tatoglu and Zaim (2009), SCM is the management of activities directed by information system from sourcing to production to product development to distribution to maximize customer value. The authors also mention that supply chain management engages resources, information, processes, technology, and planning together to manufacture, store and distribute finished goods to the customers. In the words of Carter, Rogers and Choi (2015), supply chain management is defined as the design, execution, control, monitoring, and planning of supply chain processes with the intention of creating new values, building a competitive infrastructure, synchronizing supply along with demand and evaluating performance internationally.

According to Crandall, Crandall and Chen. (2014), the management of supply chain focuses on the integration of information system with supply chain participants' network such as organizational members, suppliers, retailers, vendors, and distribution centers. This integration is to help achieve efficiency by lowering cost and increasing profits. It is important to note that SCM integrates operations, production, logistics, transportation, and shipments with coordination and communication management.

2.1.2 Information and communication technologies (ICT)

According to Majchrzak, Markus and Wareham (2016), information and communication technology is a crucial part of the organization required for its development. Information and communication technology have become more pertinent for every organization to actualize its plan. Bloom, Garicano, Sadun and Van Reenen, (2014) define ICT as technologies that focus on communication and technologies that offer access to information. ICT is used in the organization to perform several tasks related to planning, the process of transactions and decision making. In respect to the works of Dwivedi, Shareef, Simintiras and Weerakkody (2016), it can also be explained that Information and communication technology is defined as the components and infrastructure which is essential to allow modern computing. Information and communication technology also permit's the people as well as organizations to interact with the digital world. According to Donnellan, Sheridan and Curry (2011), ICT is defined as an extension in the field of information technology which make use of telecommunications. In recent years, information technology has become an interchangeable name with ICT (Bloom et al., 2014). Kushwaha (2011) describes ICT as an information system tool necessary for the coordination and collaboration between organizations and markets to form a buyer-seller relationship. Furthermore, ICT is based on the use of internet, computer networks, mobile phones, as well as wireless network for information exchange, sharing and accessing timely information to enhance performance. The authors also mention that ICT involves hardware, software, IT services, networking and communication to form a junction for diverse technologies to provide information access in real time. From the above views, it can be said that ICT focuses on communication technologies and applications to offer informational access and exchange in digital form for internal and external contact. In ICT, the internet-enabled sphere and the mobile powered by wireless networks are also included. The antiquated

technologies such as landlines telephones, televisions broadcast, and radio are also included in it. In the other words of Hilty and Aebischer (2015), it is explained that the above-mentioned technologies are still broadly used beside cutting-edge ICT pieces, for example, robotic and artificial intelligence. In addition, ICT also refers to the extremely famous and speedily developing area of information and communication technology and it can also be determined that ICT is relatively comprehensive and includes a broad range of products and services in it. The key tasks of ICT are discussed and mentioned by the authors Ilomäki, Paavola, Lakkala and Kantosalo (2016) that it provides its products and services to its users with the functionalities which require these products and services for the help of their corporate procedures. So, it can be examined that information systems are usually the shipper of functionalities. Thus, from the above perspective, the users of functionality are not only the corporate entities, clients, partner, company employees and other parties, but they are also some other system. The progress in the ICT field has also contributed to efficiency and profits in service sectors in logistics, transport and retailing sectors. The increasing market competition in order to achieve competitive edge over rivals has stressed the need as well as use of ICT solutions in SCM to deal with time issue, communication breakdown, real time information needs and fast customer delivery (Kushwaha, 2011).

2.1.3 Small scale sectors

In the opinion of Weeratunge, Bene, Siriwardane and Charles (2014) it is stated that generally, the small-scale sectors occupy the significant place in every country's economy due to their service potentials and their input to all over industrial productivity as well as exports. In this regard, the government of every country take adequate measures to ensure they are successful. Even then, the internal, as well as external competitions are faced by the small scale and cottage industries. In the views of Sannino and Engeström (2017), no clear difference is found between small-scale and cottage industries. Although it was discovered that the cottage industry operates completely through the members of the family and in against to this, small-scale industry hires workers as well as labourer's. According to Singh, Garg and Deshmukh (2010), the small-scale sectors are distinguished based on their sizes. The small-scale sectors represent small business format of industrial units. The study of Harris, Riley and Hand (2017) mention small scale format in retail grocery unit as convenience store/shop, delicatessen store,

greengrocer shop, health food store and local general store. The study of Singh et al., (2010) also mention small scale sectors characterized by the requirement of less capital in their set up in comparison to large scale industrial units. The authors also state that small scale sectors are easily established by the young entrepreneurs. From the above views, it can be said that small scale sectors represent small sized business with less capital requirement for their establishment and imply ease of initiating small scale unit by new generation individual entrepreneurs. In relation to the significance of the small-scale sector, Rao (2015) points that the small-scale sectors contribute to the exports of a country. However, Sahu (2017) state that the small-scale sector in the developing countries contribute to economic development at the local and regional level. Rao (2015) discusses that many developing economies do have capital infrastructure and other resources to set up large scale industries for a strong industrial base. This indicates that dependence on small scale sector is high for social and economic progress in the developing countries. Singh et al., (2010) viewed that manpower is better utilized for the economy development in small scale sector. On the other side, Sahu (2017) argues that development of small scale sector in developing countries has been advantageous in dealing with poverty, local development and inequality issue at the regional level. It is also stated by Harris, Riley and Hand (2017) that small scale sector sustains better employer- employee relationship thus, have healthier industrial relations. Differently, Alam and Noor (2009) point to the problems in the small-scale sector for the progressive state which stress on the need for development of strong physical and technical infrastructure for transportation and new technologies respectively to fulfill the requirements of the small-scale sector.

2.2 Use of ICT tools in the small-scale sector

ICT tools provide promising opportunities in small scale business sector to explore its benefits. According to Ahuja, Yang and Shankar (2009), the use of ICT in developing nations like India is surrounded by several issues which has affected its progress rate of new technologies in small scale sector. In order to survive in the current highly competitive marketplace each and every business company has to be more innovative and find new ways to streamline their supply chain and optimize productivity. With the use of modern technology all the firms can have a better control over their supply chain, which will help them stay ahead of the competition in the business. Technology can also help to simplify supply chain management,

which will enable businesses to operate more efficiently, give business more visibility and control over their inventory, and help to reduce their operational costs. Additionally, through a more stable and efficient supply chain, firms can greatly enhance customer satisfaction and retention.

Oyebiyi, Misra, Maskeliunas and Damasevicius (2017) categorized challenges in terms of internal and external. The internal barriers are related to implementation and maintenance cost, return on investment, limited capital and other resources, lack of ICT literacy whereas the external barrier to ICT use are political, economic, socio-cultural, technological and regulatory issues. In the retail industry, Behera, Panda, Behera, Nayak and Jena (2015) discuss that the use of ICT helps to achieve effectiveness and efficiency in the logistics and distribution area of supply chain management. The application of radio frequency identification (RFID) technology is used in retail sector in both organised and unorganised retail sector which comprises of large and small businesses. Radio Frequency Identification (RFID) is a vital piece of technology that can provide innumerable benefits to the business owner. According to Ahuja et al., (2009) RFID chips or tags are placed on every product and provide a way for business owners to easily track their inventory. Due to the increased visibility RFID chips or tags provide, they substantially improve supply chain efficiency by detecting any order anomalies as they occur, enabling employees to immediately correct mistakes. In addition, it allows for easier and more consistent tracking, enabling business owners to have maximum control and visibility over their products at all times. Since RFID chips provide computerized product management, they can eliminate the potential for errors, simplify the supply chain, and reduce operating costs. The study of Irefin, Abdul and Tijani (2012) mention the various types of ICT tools used by small and medium business such as e-mail, web portals, video conferencing and social media.

With all the new modern technologies and Internet-based software, businesses can simplify the supply chain process and eventually reduce shipping mistakes. Software's like FlashView enables some intelligent business owners to consolidate all aspects of their supply chain in one place. The software allows firms to digitally organize inventory data, monitor and manage shipping and tracking information, and create electronic invoices with ease. Through the use of supply chain management technologies, businesses can greatly reduce the time spent shipping, receiving, tracking, and compiling order data, which will save the company both time

and money (Nuamah-Gyambrah, Agyeiwaa and Offie, 2016). Not only will FlashView improve the operational efficiency of supply chain, it will also greatly enhance the customer experience by providing consumers with the ability to continuously track the status of their orders. Through digitalized tracking, businesses can significantly reduce shipping errors and more rapidly respond to the errors that do occur. Currently, having technologies like FlashView are essential to running a thriving corporation that is both business and consumer-friendly (Eze, Ayigbe, Eberechi and Jordan, 2015).

According to Rufai (2014), social media sites are also another popular technology that has swept the world. With over 288 million Twitter users and 1.23 billion Facebook users, it's no wonder many businesses are turning to social media to gain visibility for their company. In fact, over 70 percent of all Fortune 500 companies rely on social media as part of their marketing strategy and supply chain management. Through the use of social media, firms can create more open communication with customers, increase the visibility of your company, improve the demand on their products, utilize cost-effective and time-efficient marketing strategies, lower their operational costs, and enhance the company's overall productivity (Rufai, 2014). Social media can be used to interact with customers, respond to questions, report accidents or weather conditions that may impede delivery schedules, and create automated updates about the inventory.

2.3 Factors influencing ICT use in small scale sector in relation to grocery retail industry

The study of authors Tan et al., (2012) points out the use of ICT in mobile technologies in the area of logistics and transportation by the retailers owing to the need for real time shipment tracking and for the monitoring of delivery systems. However, according to Behera et al., (2015), many retailers incorporate new ICT technologies to maintain market competitiveness. The author also states that in incorporation, the cost of new technology implementation and risk in transition from old to new technology are the factors influencing the use of ICT in small scale businesses. Hashim (2007) put forward that the fast rate of technological development in ICT solutions influences the use of ICT tools as it creates an unbalance between the cost of implementation and benefits from new technology for small scale business. Alternatively, Apulu, Latham and Moreton (2011) point that ICT solutions are also influenced by the concern for security, privacy and low confidence in ICT solutions for small scale businesses owing to

low ICT literacy. The Retailer's are beginning to notice that technology's role is one of an be enablers in a fast-developing supply chain sector. Essentially, information technology can speed up processes and deliver cost saving benefits to the company. The retail industry faces many specific challenges related to IT management. Many retailers struggle with information overload because they're required to collect and sift through mass amounts of customer data, and then convert it into useful information in a customer-centric industry. On the other hand, Olatunji (2015) depicts that retailers must increase transparency between systems, as well as obtain better tracking to integrate systems from manufacturer through to the consumer while obtaining customer and sales information. Ongori (2009) depicts that due to radio frequency identification/electronic product coding; the entire supply chain has become more intelligent. Retailers must enable the use of real-time data to watch inventory levels. In addition, radio frequency identification tagging positions the company to be able to safeguard its shipments by allowing products to be tracked from manufacturer through the entire supply chain. At the same time, PCI Security Compliance addresses the retailer's internal security setup and practices, in order to mitigate payment security risks. Every business engaged in credit card payment processing is required to comply with PCI Security Standards. If a retailer collects or stores credit card information that becomes compromised, the retailer may lose the ability to accept credit card payments. Other possible consequences include lawsuits, insurance claims, cancelled accounts, and government fines. The retailers who take advantage of outsourcing IT will obtain optimal advice and benefit from outsourcing (Ongori, 2009). Many retailers have turned towards IT outsourcing as a way to control costs and improve their service in delivery.

2.4 Role of ICT solutions in supply chain management in the grocery sector

The study of Christopher (2016), highlight the role of communication technologies in the supply chain to enhance the relationship between supplies, retailers and the firm. It can be stated that ICT role has transformed the traditional supply chain in its ability to share data, exchange information, process information at real time to improve communication among external supply chain participants and organizational members. Similarly, Wang, Rodrigues and Evans (2015) are of the view that ICT plays a major role in enhancing retail organization capabilities in terms of obtaining, processing and exchanging transactional information which has led to improved cooperation, coordination and communication in leading the supply chain

business operations from supplier to manufacturing units to distribution centers to wholesalers/retailers to customers.

Mangiaracina, Melacini and Perego, (2012) investigated the role of ICT in small medium enterprises in grocery retail store. The authors discovered that ICT has been a driving force in the integration of supply chain to create new opportunities to improve the relationships with suppliers and customers. As stated by Christopher (2016), ICT tools help to improve the efficiency and effectiveness of supply chain by means of customization and its adaptation in the business environment. It can be said that customization helps in integration of planning activities across the operations of the supply chain management. On the other hand, the findings of Wang et al., (2015) highlight that ICT solutions provide an opportunity in road freight transport by reducing carbon emissions in the grocery retail industry in the United Kingdom.

According to Tan et al., (2012) ICT on Supply chain management is a concept involves sharing of information between stakeholders of the retail industry chain i.e. retailer, manufacturer and distributor in order to achieve high efficiencies and also reducing the cost of the products sold by reducing lead times and inventory cost, as well as improving the quality of products to be delivered. Over the years, there has been rapid development in the use of Information and communication technology 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. Researchers have also suggested that the adoption of ICT is spreading rapidly in Supply chain management (Tan et al., 2012). As competition is increasing, all the companies are implementing new strategies to improve their 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. Research work that deals with recognizing Information and Communications Technology as an enabler in supply chain management, which emphasizes information sharing and reducing inconsistencies and uncertainties as exemplified in the Bullwhip effect. 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 (Singh et al., 2010).

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. 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. The major uncertainties in Supply Chain Management can be overcome by specifically tailored systems of information sharing and implementation of ICT infrastructure (Llach and Alonso-Almeida, 2015). 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 (Rao, 2015). In other words, information sharing and the way it is managed has now become the most important factor in sustaining competitive advantage. 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 (Oyebiyi et al., 2017). 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. 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 (Majchrzak et al., 2016). Thus, various studies recognize that the implementation of ICT in SCM has an impact on the price, quality and lead-time. 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. While SCM is as old as trade itself, new information and communication technologies have made today's supply chains better, faster and cheaper. Information engineering that combines new information technologies with improved

production, inventory, distribution and procurement methods has revolutionized supply chain operations (Mangiaracina et al., 2012).

2.5 Benefits of ICT in supply chain management in grocery sector

There are several benefits of ICT tools use in the SCM in retailing. De Marchi et al., (2017) state that ICT solutions help to improve the efficiency level in the supply chain process. The authors also state that ICT transforms into modern the traditional supply chain management which is flexible and offer reliable information exchange and sharing at real time. It can be said that the use of cloud computing technologies, mobile and wireless technologies in retail sector has brought improvements in precision, efficiency and transparency in business operations in supply chain management. In grocery retail stores, Mangiaracina et al., (2012) identified the benefit of ICT solution in terms of improvement in supply chain control, reduced logistics costs, reduced lead time (LT) and increased customer loyalty owing to long-term relationship and trust development. In the findings of Lu and Swatman (2009), ICT solutions have benefitted the grocery retail sector in Australia in terms of better data collection functionalities, integration of supply chain planning with producers, and improved information access through use of mobile technologies.

The use of ICT in grocery stores, shops, supermarkets has become integral in recent years owing to the benefits provided by ICT is different areas like handling store operations, inventory and stock management, marketing, etc. The study of Nurmi, Salovaara, Forsblom, Bohnert and Floreen (2014) found that ICT benefits in gaining promotional edge over traditional and non-computerized form of promotion. The benefit of ICT in small scale grocery sector as pointed in study of Donner and Escobari (2010) state that use of emails has benefited the retailers in fast communication to suppliers in cost effective manner. Sin Tan, Choy Chong, Lin and Cyril Eze (2010) state that online promotion provides a cost-effective benefit to retailers in reaching their target customer and interact more effectively use of mobile phones apps. On the other hand, the study of Nurmi et al., (2014) revealed that the benefit of using ICT in grocery business facilitates better decision making. ICT tools capture, process and share real time information which help the retailer to make quick and effective decisions to manage day to day business operations according to Novotny, David and Csafor (2015). At the same time, Sin Tan et al., (2010) remind that ICT tools helps in identification of potential

opportunities as well as threats for business so that retailer could respond early to take decisions or actions. The study of Kurnia, Choudrie, Mahbubur, Alzougool (2015) found that ICT has benefited the business by automation of different business process which has reduced errors and enhanced the productivity. The author also states that the use of email, video conferencing and mobile communication has provided advantage of greater collaboration among the employees, suppliers and business partners. Increased collaboration has led to create stronger teamwork, reduce lead time and faster pace of new products to market. This can be useful to develop competitive edge in the marketplace. The opportunity of using ICT can be to increase the competitiveness of small scale sector. Apart from this, Nurmi et al., (2014) discuss that ICT has benefit the grocery sector in improving their customer service quality as use of ICT solution allow the retailer to provide fast responses to customer inquiries, feedback and complaints to ensure their satisfaction. ICT also allow to obtain customer information, purchase history and preferences which helps to provide high customer service. It can be said that increased knowledge about customer helps the retailer to use that information to leverage the opportunities to sell additional products. Another opportunity of using ICT is to meet the informational needs of the organization to increase the efficiency and effectiveness of organizational learning as stated by Lopez-Nicolas, and Soto-Acosta (2010). On the other side, the benefit of ICT as recognized by the study of Kurnia et al., (2015) point that ICT tools and solutions help in reducing the cost and increasing revenue by improving efficiency of work process, improving productivity and reducing errors. It can be said that benefit of ICT is to improve the financial performance of the firms in the grocery sector.

2.6 Ways to manage the ICT contribution to improve supply chain management in small scale sector

It can be said that the use of cloud computing technologies, mobile and wireless technologies in retail sector has brought improvements in precision, efficiency and transparency in business operations in supply chain management. The literature draws attention to few studies that stress on the management of ICT tools and related resource to improve performance of supply chain management. The study of Gonzálvez-Gallego, Molina-Castillo, Varajao and Trigo. (2015) mentioned that development of process-oriented perspective towards ICT can be useful in managing supply chain operations and improving supply chain performance. On the other side,

the study of Brandon-Jones, Squire, Autry and Petersen (2014) argue towards the development of a resource base perspective for promoting the use of ICT tools in supply chain business operations. The study of Llach and Alonso-Almeida (2015) suggest that organizations need to focus on enhancing the development of workforce skills especially IT skills to integrate ICT in supply chain process efficiency in supply chain management. Differently, from the finding of Hudnurkar, Jakhar and Rathod (2014) it can be stated that selection or choice of ICT tool should be done in accordance with the position of small business in the supply chain for efficiency and cost effectiveness in supply operations. Apart from this, the study of Arora et al. (2018), mention the collaboration among the technological firms and retail firms to develop ICT solution for supply chain management as per the business requirement to promote use of ICT in tremendous market potential like Southern India. Similarly, Deman and Tuyishime (2009) state that poor physical infrastructure affects the use of ICT tools in supply chain management practices which need to be developed to promote ICT use in small scale retail sector in emerging market of India. The authors also point out to the knowledge and skill development for effective use of ICT in Indian retail industry.

Chapter 3: Research Methodology

3.1 Introduction

This chapter helps to explain the research parameters needed to understand and justify the suitable research process and instruments to source, collect, analyse and interpret the research data. Thus, this chapter helped the researcher to understand and define different research methods and tools to select the appropriate one to address the research aim and objectives. This chapter includes philosophy, approach, design, techniques, methodology methods for data sampling, collection and analysis, limitation of the research and ethics considered by the researcher.

3.2 Research Philosophy

The research philosophy underlines the fundamental assumptions that helped the researcher to source and collect the data, and guide its data analysis to arrive at conclusion in a systematic

manner. Research philosophy forms the research grounds to comprehend nature of research problem by building the contextual knowledge. The research philosophies are positivism, interpretivism, pragmatism, and realism. These philosophies guide research in shaping the premises of the research and identify significant thoughts to understand the research nature. Each philosophy is attached with specific theoretical values that provide guidance to the researcher to settle on research tools, techniques and approaches (Creswell, 2013).

In this study, the researcher has considered the interpretivism philosophy over the other research philosophies. This philosophy has guided the researcher for data collection and analysis techniques to gain detailed knowledge of the research problem nature for subjective judgment in reality. The philosophy also guided the researcher to shape the assumptions in order to develop an appropriate research structure to investigate the impact of Information and Communications technology in Supply Chain Management in the small-scale south Indian grocery sector. The researcher took the into fact that it will be difficult to get in contact with many participants from all over India with experience in grocery sector, so the research was focused to a particular area which is the southern parts of India.

3.3 Research Approach

Research approach justifies selection of data sourcing, collection, analysis and interpretation methods to address research objectives and questions with an actual analysis. The research approach has helped the researcher in selecting a specific research technique and also to arrange the research plan in a systematic manner by choosing specific research instruments and techniques as per the research nature. The research approaches are deductive, inductive and abduction (i.e. combination of inductive and deductive) (Hair Jr, Wolfinbarger, Money, Samouel and Page, 2015). In this research, the researcher study has employed the inductive approach which also aligns with interpretivism philosophy (Creswell, 2013). The inductive approach reasoning is based on working from specific to a more general way (Jebreen, 2012) therefore; this approach was useful for the researcher to be involved   in specific observations to move towards broad generalisation as the research progressed. It also permitted the use of secondary data to develop theoretical awareness to develop new observation from explanation of primary data.

3.4 Research Purpose

The research purpose facilitated the researcher to outline research goal by understanding the research nature. The research purpose can be exploratory, explanatory and descriptive. The researcher states the purpose of the existing study as descriptive in nature. The descriptive research purpose was considered in this study as it provides the researcher with required understanding of the research objectives. The descriptive purpose serves to explore to obtain more detailed explanation of the research topic to answer in the form of 'what is' the impact of information and communication technologies in SCM. The purpose of this research is to find how Information and communication technology has its impact in south Indian grocery sector and what are the uses of ICT? and how does it improve a supply chain of a business?

3.5 Research Design and Methodology

The research design provides shape to the research process. The design of a research helps in conceptualising the problem of research with the use of suitable research tools and methods. The research design helped the researcher to link the thought of research problem with an appropriate research tools to make the research achievable (Bell, 2014). The methodology is therefore, used to recognize the research design to fulfil the data requirement. The three popular research methods are qualitative, quantitative, and mixed research method (i.e. combination of qualitative and quantitative designs). In this study, the researcher has followed research design method of qualitative considering the nature of research. The qualitative design was useful for the researcher to obtain and collect inclusive information and quality data to realise research objectives with an in-depth perspective using qualitative data collection technique (Bryman and Bell, 2015). This design also supported the researcher in developing specific observations to wider overview (Bahari, 2010) to arrive at conclusive results to realise the association of ICT with supply chain management. As India has many small-scale grocery shops and it would be a huge task in getting in contact with as many people from the grocery sector with long term experience and it will also take more time in getting an appointment for interview as well as asking the participant to fill the online survey in the middle of their busy schedule. So, then the researcher chose to focus only on South India where with the contacts of the researcher it was

somewhat easier to get in contact with the participants in that area and get the information needed for this research. These are all the main reasons for this study in this focused area.

3.6 Methods of data collection

This step is essential to fulfil the data requirement of a research process. The research data needs can be fulfilled by obtained data from different sources depending on the research nature (Bell, 2014) and need for specific information to realise the study aim and objectives. The main methods of data collection are primary methods and secondary methods. The primary data collection method helps in the collection of new data using methods such as interview, direct observation, experimentation, survey, focus group, questionnaire, opinion poll. The secondary data collection method helps to collect existing data from the sources such as books, articles, journals, published market researches, business magazines, news articles, websites, etc. The selection of different method under primary or secondary is influenced by cost and time factor (Bell, 2014).

In this study, the researcher has followed both primary and secondary data collection methods to obtain new qualitative research data and exiting data/information from secondary sources. The primary data collection method of online survey was employed by the researcher from a focused set of people in that particular field, whereas the secondary data was collected with the review of existing literature from books, published market research, journals and articles. By taking online survey of interview and sending direct email was quick and time saving in collecting responses as the researcher collected responses from 10 specific people. Moreover, the online survey provided researcher with flexibility in distributing survey through direct email and direct links through social media to the from the target audience to fill the online survey form. The secondary data was collected by the researcher to secondary data collection enhance the reliability of the existing research. In this study the researcher chose qualitative over quantitative because, quantitative method requires a sample size of around 150 people from the grocery industry with experience, which would be difficult to find and approach the participants and get the information as few won't be flexible enough to share information.

3.6.1 Interview questions

A total of nine questions were designed for the online survey. The interview questions were open ended question to get detailed response. The question theme is about ICT use, Factors influencing ICT in grocery sector, role and benefits of ICT in supply chain management, challenges in ICT use and strategies to overcome challenges, future scope of ICT in Supply Chain Management and way to enhance ICT contribution in grocery supply chain management.

- ° How is ICT supported in your company business?
- ° What factors affect the adoption and use of ICT in grocery sector?
- ° What role does ICT tools play in supply chain operations management?
- ° How is your company benefitted by ICT solutions?
- ° What sort of challenges was faced by your company in using ICT for your grocery business?
- ° What strategies helped to overcome challenges?
- ° What other improvements can your business gain from ICT in grocery supply chain?
- ° What do you think can be the scope of ICT contribution supply chain management in future?
- ° In what ways for ICT use can be enhanced in supply chain management of small scale grocery sector in Southern India?

3.7 Sampling method and sample size
3.7.1 Sampling method

The sampling is important to recognise and choose an appropriate subgroup from the target population. The subgroup/sample represents the entire population. For this study, the researcher has preferred to use the probability sampling method over the non-probability method. Under the probability sampling, the researcher has employed simple random sampling. This sampling method is used because it allows the researcher to provide each participant an equal chance of getting chosen in the research process from the target population (Weiss and

Weiss, 2012). The simple random sampling also permitted the researcher to choose samples randomly with ease and flexibility to avoid researcher and selection related bias.

3.7.2 Population and Sample size

There are well established food and grocery small sector units in most of industrial developed areas in various locations in India. Different parts of India have their own development in different fields and the researcher has considered to choose one small-scale grocery sector from different locations of India. But the target population for this study is small scale grocery sector in the southern part of India. There are well established food and grocery small sector units in most of industrial developed areas in South India. The southern part of India was also considered as the growth of small scale industries in Tamil Andhra Pradesh, Karnataka and Kerala has been considerable as compared to other parts of India.

The sample size includes the number of participants the researcher has chosen for the research process to provide wide generalisation for the target population. As the research is qualitative in nature, the researcher has chosen small sample size which is sufficient to address the research aim and objective. Therefore, the sample size for this qualitative research was 10 participants (existing employees) from small scale grocery sector operating their business in India. These participants were selected by the researcher using known contacts in that area. The researcher chooses the participants as per the as criteria of location, employment in grocery retail industry and experience of working in supply chain management. The position of the participants are regional grocery sales manager, Owner of a Chain of grocery shops, logistics operation manager, Assistant Manager of grocery stores, director of supply chain, manager retail strategy, manager supply chain solutions, supply chain and logistic manager. The participants belong to the age group 30 to 52 years and the experience of the participants was more than 7 years to 29 years. The participants criterion was from the southern parts of the India which is an emerging market for retail industry as the southern region has witnessed high growth of small scale retail sector. The position of the participants is also best suited as per the requirement of data and nature of research as the participants are existing employees that are working in managing supply chain operations of the retail companies in southern India so are adequate and experienced in this field to provide relevant insights on the impact of ICT use in supply chain management of their respective retail firms.

3.8 Data Analysis Method

The analysis of data forms a critical step in the research process. The data is analysed from information obtained from data collection methods in a systematic way to obtain meaningful data for research inferences. The methods of data analysis can be statistical analysis, content analysis, factor analysis, etc (Albright, Winston and Zappe, 2010). In this research, the researcher has used the method content analysis to analyse the text data to identify observations relevant to form conclusive inferences to fulfil and to realize the aim and objectives of the research. The content data analysis method has helped the researcher to develop clear and in-depth understanding of survey responses to realise observations that can be applied for broad generalisations.

3.9 Research Ethics

The researcher has considered the ethics of the research as ethics is regarded as a core aspect in the research process. The ethical consideration has helped the researcher to conduct the research efficiently with low risk of misinterpretation or errors to preserve the positive impact of the research. The researcher has employed ethical practices during the overall conduct of the research process and specific attention to ethics during the use of primary and secondary data collection techniques. The researcher has considered plagiarism, copyright, and privacy related issues. The researcher has made use of in-text citation to respect the work of other researchers and provided list of references from where the secondary information was collected by the researcher. The researcher has also maintained the confidentiality of survey participants (Ponterotto, 2013) involved in the research. The researcher has also ensured adherence to university guidelines in following the ethical practices in the research process. The online survey and direct email methods was adopted over the direct interview because it would be difficult go to different locations and get appointments and ask the questions and also due to privacy reasons people don't want to be recorded.

3.10 Pilot Study

Basically, this study is about the impact of ICT on supply chain management in south Indian small-scale grocery sector. For this research a qualitative approach was taken, first in order to frame the correct questions to be asked a serious of interviews were conducted by the researcher. By getting a lot of inputs and suggestions from the participants, the questionnaire was framed. Later, selected participants were approached and the interview questions were asked through online survey and direct emails.

3.11 Research Limitation

There were few limitations in this research which the researcher recognised in the research methodology. The use of qualitative design can be considered as a limitation as it does not provide factual knowledge about the research topic. The use of qualitative research method limits itself to subjective judgement (Bahari, 2010) and does not provide an understanding of research topic in a logical way through quantifiable data to gain valid inferences (Bryman and Bell, 2015). Another limitation of this study was identified from the consideration of small scale grocery sector from South India. This limits the study finding for small-scale grocery retailers in operating in in Southern parts of Indian region only.

Chapter 4: Data analysis and Findings

4.1 Introduction

This chapter of the dissertation highlights the results obtained from primary and secondary studies and analyses the collected data to provide meaningful findings. In this chapter, responses of research participants from the interview questions are analysed to determine to what extent, researcher has been successful to obtain answer to research questions to successfully achieve research objectives.

4.2 Data analysis process

The subsequent section analyses the data which were obtained as primary research data from the interview of ten participants from India. The contents of interview responses are analysed and interpreted to find and establish information pattern that will be assistive to answer the research objectives. The data source is interview questions based on ICT and supply chain management in reference to small scale grocery sector in India. The analysis process takes place under four broad objective areas: use of ICT in grocery sector, factors influencing ICT, role and benefit of ICT and approach to increase ICT use in this sector. The analysis is focused on the responses of the interview participants to know their views regarding the impact of ICT tools in supply chain management in grocery sector.

4.3 Analysis of responses of interview questions

For this study, interview was conducted by the researcher with 10 participants from different companies which deal in the small-scale grocery sector in India. The following is the analysis of the responses of interview questions with the perspective of different research objectives:

4.3.1 Use of ICT tools in the small-scale grocery sector

In relation to this research objective, it was enquired from the participants how ICT contributes to the operations of their company. From the interview responses, it can be interpreted that most of the participants believe that different ICT tools like social media, email, RFID, Internet-based software, etc. are used by the grocery firms in the small sector enable them to innovate new ways to expand their businesses. One Supply chain manager stated that "we use radio frequency identification (RFID) technology to easily track our inventory. It is valuable for us to detect supply chain efficiency by detecting any order anomalies." Consistent to this finding, Ahuja et al., (2009), also stated that the use of RFID is significant for the firms to control inventory properly which is also useful to reduce the inventory costs. These chips are useful in eliminating errors thereby making the supply chain efficient and simplified. Interestingly, the regional grocery sales manager held the opinion that

"Social media is a very effective technology that enables our company to access large number of customers and promote our products easily in a cost-effective way."

Furthermore, the manager supply chain solutions provided his response by stating that "they use Facebook and Twitter to promote their products and new offers and develop brand awareness among the customers. The use of these social networking sites enables them to determine the views and opinions of the customers and improve the demand of their products accordingly." The use of these social networking sites enables them to determine the views and opinions of the customers and improve the demand of their products accordingly."

At the same time, supply chain and logistic manager also highlighted the use of social media in their organization to improve supply chain. They explained that "social media is used to communicate with customers openly and also that it's a cost-efficient way of communication and helps to update their inventory level based on demand of their products and services."

These primary findings are also consistent with the literature review as Oyebiyi et al., (2017) also stated that it is important for the firms to have their presence on social media to interact with the customers and know their feedback on the products and services for improvements in the supply chain through inventory management.

On the other hand, manager retail strategy responded in relation to this question that "internet-based software's like FlashView is used to make the supply process simplify and minimize the shipping faults." In support of this, Rufai, (2014) also stated that the use of online based software's is effective for the firms to organize inventory data and monitor it to manage shipping and tracking information, it helps the firm to develop electronic invoices and make the tasks in supply chain simplified. At the same time, according to Behera, panda, Nayak, Behera and Jena (2015) also highlighted that the use of such technology is useful to reduce time spent in shipping and tracking leading to saving of time and money.

4.3.2 Factors influencing information and communication technologies (ICT) in grocery sector

This section is related to factors that may impact the adoption and use of ICT in grocery sector. In this, a direct question was asked to the participants about the factors that encourage or restrict the firm to adopt ICT in grocery business. From the interview findings, it can be analysed that several factors such as benefits of ICT in terms of communication, cost savings, quicken the

processes and security aspects motivate the small-scale grocery firms to adopt ICT tools and techniques in their operations. However, it was also discovered that some issues and challenges such as cost of the ICT tools, risk in transition from old to new technology, security, privacy and low confidence in ICT solutions also affect the small-scale grocery firms in adopting these tools and techniques in supply chain operations. Regarding this, the regional grocery sales manager replied that "benefits obtained from ICT technologies like social media, email, software, etc. encourage them to use these tools for improving their supply chain efficiency. For instance, they use information technology to make their processes faster and reduce the costs in operations that contribute to their financial performance significantly."

At the same time, director supply chain also responded negatively that "it is difficult for them to transit the old technology to new technology that restricts them to adopt ICT in small scale sector. It is because employees are not familiar with new technology that increases their resistance level."

Meanwhile, it was discovered from all the respondents that cost is the most significant factor that affects the ability of the small-scale grocery firms to adopt ICT tools. In relation to this, manager retail strategy and manager supply chain solutions stated that "the investment in ICT is highly costly for their business as they prefer to adopt cost effective ICT techniques such as Social Media to improve their supply chain."

4.3.3 Role and benefits of ICT in supply chain management in grocery sector

The participants were asked about the role played by ICT tools in management of the supply chain operations. From the interview responses, it can be interpreted that the role of ICT tools in the small grocery seems to have greater impact on supply chain activities in planning, sourcing, production, delivery of products and also in return of defective products. The ICT role has been recognised to improve the performance of supply chain in small grocery sector as per majority of respondents. According to the director supply chain, ICT tools have been useful in managing the sourcing and distribution aspects and waste reduction in value chain activities which has increased the performance and efficiency of supply chain. As stated by supply chain manager, "ICT tools play an integral role in planning and managing control over supply chain activities as it has increased transparency across all levels and improved

accessibility to real time information". This point agrees with De Marchi et al., (2017) that states ICT solutions offer reliable information exchange/ sharing at real time and transparency in supply chain operations. The supply chain manager added that "ICT also played a significant role in improving the supply chain integration decisions at the company". Logistics operation manager replied that ICT plays an immense role in reducing the cost of logistics in delivery and returns and lead time. This finding is supported by Mangiaracina et al., (2012) study that identified the fact that ICT solutions lead to reduced logistics costs and reduced lead time (LT) in grocery retail stores. On the other hand, manager supply chain solutions replied that "ICT played a role in narrowing the communication gap in between the company and its suppliers and customer". This is in consensus with Christopher (2016) and Wang et al., (2015) stated that underlines the role of communication technologies in improving communication among the internal and external supply chain participants. Thus, from the above responses it can be said that ICT tools play multiple role in the supply chain operations management.

The participants were also asked about the how ICT solutions have been beneficial for their company. To this, manager supply chain solutions responded that ICT solutions have benefit in identifying products and keeping the track of inventory (mentions barcodes and RFID) and logistics operations and to achieve high level of cost and time efficiency in logistics. The supply chain and logistic manager replied that "ICT solution has been advantageous in terms business transparency to stakeholders, adoption of internet-based practices to meet the market and customer demands". In the views of regional grocery sales manager, the benefits from ICT solution is in improved coordination and communication with supply chain members including customers. It is also stated by respondents that ICT solution has increased the company capabilities in accessing real time information for exchange and sharing by various mobile and wireless technologies. The findings agree with the study of Lu and Swatman (2009) that found that ICT solutions have benefits for improved information access with mobile technologies use. The answer also adds that ICT solution have been beneficial for the company in maintaining continuous flow of information from raw material sourcing to customer delivery to customer feedbacks. The supply chain manager answers that "ICT solutions benefits the company by better management of company supplier, vendor and customers and also by simply removing the inefficiencies in managing the supply chain operations thus, better control on supply chain activities". This in agreement with Mangiaracina et al., (2012) that identify improvement in

supply chain control as one of the several benefits of ICT solutions. The responses from different participants are analysed which points that the major benefits of ICT solutions are in streamlining the supply chain activities, transparency in supply operations, real time information exchange and sharing to maintain control over supply operations and take effective decisions.

4.3.4 Approaches in managing ICT contribution to improve supply chain management in small scale grocery sector

In response to the question about the kinds of challenges faced by the company in the use of ICT in grocery business, manager retail strategy replied that lack of proper knowledge about ICT benefits and use was a challenge in supporting the use and implementation of ICT tool, ERP in the company. Another challenge was "the change in role and responsibility of employee in use of ICT solutions which has changed the organisation structure and norms" to a certain extent as per the response of supply chain manager. On the other hand, director supply chain responded to this by pointing to "the high cost of internet services, cost of maintenance and security costs and concern over security among the challenges in the use of ICT". Similarly, manager supply chain solutions also replied that a good amount of investment and training cost is required in adoption and use of new ICT technologies which pose challenges for the companies in use of ICT. Thus, the majority of the responses analyzed for this question points that insufficient knowledge/awareness, changing roles, security concerns and cost factors are problematic issues faced by small scale grocery sector in the use of ICT.

In response to the question about the strategies to overcome the challenges in use of ICT, majority of the respondents consider that careful planning of resources and building the knowledge and technical skills of employees to use and integrate ICT in planning and supply chain management have been useful in overcoming ICT deployment challenges. The director supply chain also answered that "achieving a shared commitment from organisational members was also effective in overcoming ICT related challenge". Further, supply chain and logistic manager answered that "collaborating with communication technology firm helped in understanding the benefits and scope of ICT" for grocery business which has brought technical and ICT management expertise has helped the company to overcome the changed in adoption

and use of ICT solution in the grocery business. It can be analysed that skills development, level of commitment from all organisational level and collaboration with other firms are highlighted as strategies to overcome challenge in using ICT tools.

The participants were asked about question related to other improvements that can be gained for businesses from ICT use in supply chain management. To this, supply chain and logistic manager replied that "ICT use in supply operations can help in value creation for the company". The response from regional grocery sales manager points towards the development of long term relationship with suppliers, vendors and customers and improvement in customer relations to develop customer loyalty. On the other side, the reply of manager retail strategy points that "ICT systems can bring improvement in the company competitiveness in the marketplace". However, major responses highlight towards improvement in supply chain network and business profits by reducing inventory management cost, reducing delay in process, logistics cost and tracking costs.

The participants were asked about the scope of ICT contribution in future in the management of supply chain operations. In the opinion of manager supply chain solutions, "ICT will contribute in restructuring the supply chain activities to improve the performance and efficiency of supply chain". On the other hand, director supply chain replied that "scope of ICT in future will assist in establishing sustainable supply chain". Also, the logistics operation manager was of the opinion that "future scope of ICT in supply chain will contribute in integration of logistics function more adequately by creation of knowledge and real time information sharing for effective decision making". The answer adds that ICT scope will be greater in improving logistics performance in supply chain particularly, avoid delay process, better integration of supply processes, on time delivery to customers, and shorter lead time. It can be analysed that future scope of ICT by all the participants looks promising in managing supply chain functions.

The question about the way in which ICT use can be increased for the supply chain management in the small-scale grocery sector received various responses from the participants. The supply chain and logistic manager believes that "improving the partnership among the organisation and technical solution firms can encourage the use of ICT solutions in supply

change management" whereas logistics operation manager was of the opinion that "there should be more emphasis on the proper allocation of resources and funds to integrate ICT solutions in supply chain functions". On the other hand, in the views of regional grocery sales manager and manager supply chain solutions, "improving the awareness level and technical skills of the workforce" can be an important measure to increase use of ICT in managing supply chain. This finding is supported by the study of Llach and Alonso-Almeida (2015) which also points to skills development of employees to incorporate ICT in improving the efficiency of supply chain. It can be analyzed that the development of employee skills is emphasized as it will help prepare the employees to cope with new and emerging ICT technologies and also support in transition from the use of old to new technology. Thus, from the above responses it can be interpreted that ICT use can be increased in managing supply chain of grocery businesses by focusing on the improving technical skills, collaboration with other technology firms, proper planning for budget and resources for ICT deployment in the supply chain domain.

4.4 Limitation

The limitation of this study as observed by the researcher was related to the interview methodology and the choice of sampling methodology. The nature of the interviews was investigative as the purpose was to find on the impact of ICT in supply chain management of specific group and was also explored for the comparison of primary results from the literature review findings. Thus, the standard questions were not use instead, the question were formulated and adapted to suit grocery sector and objectives of literature review. Also, the non-probability sampling highlights non-representative sample of study participants. Another limitation is that study has focus on only the impact of ICT in supply chain of small scale grocery sector and did not reflect on the ICT impact on innovation for competitive advantage for firms supply chain as there is a growing competitive pressure on these firms.

Chapter 5: Discussion

This section discusses the results based on the secondary and primary research findings. From, the secondary data to the review of existing literature it can be discussed that India currently faces challenges in the use of ICT such as cost factors in its implementation, maintenance, and training and lack of technical know-how and skills. However, the use of ICT tools has given opportunity to the small-scale grocery retailer to streamline their supply chain operations by adopting new technologies that are faster, visible and efficient in managing the different functions and activities of supply chain. The use of ICT in grocery supply chain management focus on optimizing the overall productivity and performance of supply chain. According to Mangiaracina et al., (2012) supply chain benefits a lot from using the ICT tools in the grocery sector. It can be discussed that ICT plays an immense role in supply chain management in various aspects like controlling, tracking, access to real time information, enhancing relationship with participants of supply chain, reducing operational costs, reducing delay and shorter lead time.

Based on the primary finding, it was realized that most of the respondents are using ICT tools such as emails, social media, RFID, barcodes, etc. to operate supply chain activities. It can be discussed that the use of RFID tools is used by the small-scale grocery in order to achieve efficient tracking of products by automatic identification and to help identify any issue related to inventory and logistic functions. As said by Ahuja et al., (2009), RFID will play a vital role in maintaining the inventory. This technology is also helping the grocery firms to capture data for real time processing. Apart from this, it can be considered that social media networks such as Facebook and Twitter have also gained relevance in the small-scale sector to increase customer reach for their promoted products and respond to customers' enquiry, order, complaints, feedback, suggestions, etc. The use of internet-based software's such as FlashView is also discussed which is being employed in small scale grocery sector for detecting shipping faults.

It would appear that ICT adoption and use in small scale grocery sector is affected by different factors and challenges. The factors such as cost reduction, improved communication, collaboration, information exchange, efficiency in performance, fast and improved processes, tracking and identification etc. have influenced the use of ICT in supply operations. It can be said that the pressure to reduce and save cost in supply chain has encouraged ICT adoption and

use. Moreover, the need for fast and real time information and transparency in supply operations also forms a great part in identifying inefficiency in supply chain which can drive up costs. This has influenced the supply chain managers to turn to mobile technology, wireless and cloud computing technologies for performance and efficiency improvements in supply chain. On the other hand, the cost of implementation, lack of proper ICT knowledge and skills, security concerns and changing role of workers in adoption of new technology are factors that are challenging for ICT in small scale grocery sector. It can be discussed that for small scale sector the investment in ICT tools is a major consideration which require the firm to weigh the benefit in accessing real time information, supply chain efficiency and performance improvements against the cost of implementation and maintenance. It can be discussed that the finding related to role and benefit of ICT in SCM of small scale grocery sector underlines the huge impact of ICT on activities of supply chain starting from planning to final delivery. There has been less waste reduction as the transparency of each activity of supply chain has helped to identify inefficient processes and reasons for delay which are controlled to improve overall efficiency. The capture of data by ICT tools also allows to process real time information and sharing of information on real time for better supply chain decisions. Apart from this, it can also be discussed based on the findings that ICT advantage has also helped in enhancing communication among the firm, its supplier and customers. ICT tools like mobile technologies, social media, etc. enables faster and uninterrupted communication which makes the supply chain operations much easier. This relates with Lu and Swatman (2009), stated that use of mobile technologies will help keep the flow of information within the company. The improved communication results in better relationship with suppliers and customers which also positively affect productivity of supply chain members. A greater collaboration is achieved by improving communication among the supply chain participants.

Towards the approach to increase the use of ICT in management of supply chain of small scale grocery retailers it can be discussed that high consideration is given to the cost aspects of ICT tools acquisition and implementation costs as well as increasing ICT literacy and skills. It can be said that ICT is a cost center, at the same time; it is an enabler of business value and performance. The small grocery sector is realizing the benefits of ICT by use of cost effective tools like email, social media, web portals, etc. The allocation of adequate funds and resources are required for acquiring hardware such a computer system, ICT software and maintaining it as the small-scale grocery sector deal with limited budgets. It can be discussed that to improve

the effectiveness and gain desired benefits from ICT tools, ICT's literacy and skills training is essential for the workforce. This will result in better adaptability to new system and also encourage innovation practices from the application of ICT in supply chain operations. It can be conferred that the use of ICT in grocery supply chain in South India poses impact in various ways in the supply chain operations.

5.1 Addressing the research objectives

The findings of the primary research have been supportive to address the different research objective identified for the study to investigate answer for the impact of ICT in SCM of small scale grocery sector in South India. The study has revealed the use of different ICT tools by the grocery firms in India such as RFID technology, social media sites (Facebook and Twitter) and FlashView, an internet-based software. By this research we know the importance of ICT in supply chain management in a grocery sector and how ICT can develop a small-scale grocery sector with its tools were discussed. The study has also revealed the factors that influence ICT in grocery sector for fast process, on time delivery, real time information access, reduce supply chain costs, etc. that work towards increasing the efficiency and performance of supply chain. The findings highlighted an improving ICT role in the small-scale sector and establishing an integral role in improving the overall supply chain management. The responses also mention benefits of supply chain from planning to delivery, cost reduction, improving communication and coordination among the different supply chain participants and many more. The participants have suggested increased collaboration with technological firms and improving the knowledge and skills of workforce to get familiarity to encourage increased ICT use in managing the supply chain operation of grocery in small scale sector. The results from the primary analysis revealed that there are impacts of use of ICT from planning to product delivery such as cost reduction and increase overall performance of supply operations in working with supplier and customers. Llach and Alonso-Almeida (2015) said that skilled employees have to be employed to handle the ICT tools, which will increase the performance, efficiency as well as the cost for the company, but give a better result. In order to manage and operate ICT tools different approaches were taken by various small-scale sector managers and they realized how ICT will be contributing to the company's development in the future.

Chapter 6: Conclusion and Recommendations

This research investigated the impact of information and communication technologies in managing the supply chain in the small-scale grocery sector operating in the different parts of South India. The research provides insights to understanding the small-scale sector, the use of different ICT tools in grocery retail stores, factors that affect ICT and the role and importance of ICT in SCM in grocery sector through the review of existing literature and primary data analysis. The research also points out the ways to increase the use of ICT in grocery supply chain management.

The research findings conclude that the impact of ICT for small scale grocery sector in South India is growing in its application in supply chain area as the focus of grocery firms is to increase the capabilities of supply chain and lower the inefficiency in supply operations to gain numerous benefits associated with use of ICT tools. The impact of ICT has been revealed on various grounds for supply chain management in terms of increased transparency and an improved efficiency of supply chains operations which are also further impacted by lowering the supply chain cost thus, resulting in cost saving for the business. The impact is also revealed in terms of access to real time information and sharing, improved communication and nurturing relationship with suppliers and customers. The improved communications due to ICT use has made the tracking of products and delivery efficient and reduce delays and lead time. However, the study response reveals only a little information about the impact of ICT in SCM in an innovation aspect.

6.1 Recommendations

Based on the findings, it can be suggested that the small-scale grocery business should focus on their training policy in increasing the awareness of ICT tools and benefits in managing supply chain activities and functions. It is also advised to collaborate with technological firms to gain awareness of new ICT technologies cost, benefits and training requirements. It can be concluded that ICT's impact on SCM is affected by the limited technical knowledge and skills of workforce in the use of ICT tools, therefore, it is advised to improve knowledge and upgraded the skills of the employees in the grocery sector to adapt to new communication technologies which can increase use of ICT in supply chain operations management. Thus, the

upper management or senior managers must encourage the organizational learning on the benefits and use of new and emerging information communication technologies that are relevant to the grocery business. It is also suggested to provide provisions for budgeting related to ICT investments and development of technical infrastructure in the organization. A proper allocation of funds and resources will help the small-scale firms with constrained budgets to ease the implementation and maintenance of ICT system in the grocery business. Also, proper planning is advised for small scale grocery firms in planning to adopt new ICT technologies for their supply chain practices as per the business requirements to ensure ICT investment will get benefits that outweigh the acquiring and implementation costs of ICT system.

6.2 Areas for Future work

The focus of the study was narrowed only on ICT impact on supply chain management related to efficiency, productivity, cost reduction, collaboration, communication real time information access, etc. However, given the significance of innovation and competitive advantage from a firm's supply chain this area should be examined as well with the use of standard questions and selecting samples are representative of population to address the study limitations. There is need and pressure for the companies in grocery sector to improve the supply chain capabilities and efficiency to sustain and achieve competitive advantage. There is a further need for researchers to investigate on the challenges and barriers in adoption and use of ICT and how these challenges can impact the innovation in SCM to achieve competitive advantage. This will also help in identifying the relationship among the innovation factor and SCM aspect and ICT tools.

7. References

Ahuja, V. Yang, J. and Shankar, R. (2009) 'Study of ICT adoption for building project management in the Indian construction industry'. *Automation in construction*, *18*(4), pp.415-423.

Alam, S.S. and Noor, M.K.M. (2009) 'ICT adoption in small and medium enterprises: An empirical evidence of service sectors in Malaysia'. *International Journal of Business and management*, *4*(2), pp.112-125.

Albright, S.C., Winston, W. and Zappe, C. (2010) *Data analysis and decision making.* US: Cengage Learning. 4th ed.

Apulu, I., Latham, A. and Moreton, R. (2011) 'Factors affecting the effective utilisation and adoption of sophisticated ICT solutions: Case studies of SMEs in Lagos, Nigeria'. *Journal of Systems and Information Technology*, *13*(2), pp.125-143.

Bahari, S. F. (2010) 'Qualitative versus quantitative research strategies: contrasting epistemological and ontological assumptions'. *Journal Teknologi*, *52*(1), pp.17-28.

Bayraktar, E., Demirbag, M., Koh, S.L., Tatoglu, E. and Zaim, H. (2009) 'A causal analysis of the impact of information systems and supply chain management practices on operational performance: evidence from manufacturing SMEs in Turkey'. *International Journal of Production Economics*, *122*(1), pp.133-149.

Behera, B.S., Panda, B., Behera, R.A., Nayak, N., Behera, A.C. and Jena, S. (2015) 'Information communication technology promoting retail marketing in agriculture sector in India as a study'. *Procedia Computer Science*, *48(1)*, pp.652-659.

Bell, J. (2014). *Doing Your Research Project: A guide for first-time researchers*. UK: McGraw-Hill Education.

Blanchard, D. (2010) *Supply chain management best practices.* US: John Wiley & Sons, pp.3-273.

Bloom, N., Garicano, L., Sadun, R. and Van Reenen, J. (2014) 'The distinct effects of information technology and communication technology on firm organization'. *Management Science*, *60*(12), pp.2859-2885.

Brandon-Jones, E., Squire, B., Autry, C. W. and Petersen, K. J. (2014) 'A contingent resource-based perspective of supply chain resilience and robustness'. *Journal of Supply Chain Management*, *50*(3), pp.55-73.

Bryman, A. and Bell, E. (2015). *Business research methods*. USA: Oxford University Press.

Carter, C.R., Rogers, D.S. and Choi, T.Y. (2015) 'Toward the theory of the supply chain. *Journal of Supply Chain Management*, *51*(2), pp.89-97.

Christopher, M., (2016) *Logistics & supply chain management*. UK: Pearson.

Crandall, R.E., Crandall, W.R. and Chen, C.C. (2014) *Principles of supply chain management*. US: CRC Press.

Creswell, J. W. (2013). *Research design: Qualitative, quantitative, and mixed methods approaches*. London: Sage publications.

De Marchi, V., Di Maria, E. and Gereffi, G. eds. (2017) *Local clusters in global value chains: linking actors and territories through manufacturing and innovation*. UK: Routledge.

Donnellan, B., Sheridan, C. and Curry, E. (2011) 'A capability maturity framework for sustainable information and communication technology'. *IT professional*, *13*(1), pp.33-40.

Donner, J. and Escobari, M.X. (2010) 'A review of evidence on mobile use by micro and small enterprises in developing countries'. *Journal of International Development*, *22*(5), pp.641-658.

Dwivedi, Y.K., Shareef, M.A., Simintiras, A.C., Lal, B. and Weerakkody, V. (2016) 'A generalised adoption model for services: A cross-country comparison of mobile health (m-health)'. *Government Information Quarterly*, *33*(1), pp.174-187.

Eze, N.M., Ayigbe, S.F., Eberechi, O.O. and Jordan, N. (2015) 'Information and Communication Technology Applications in small and Medium scale enterprises (SMEs) funding in Nigeria: An Impact assessment'. *International Journal of Finance and Accounting*, *4*(5), pp.293-303.

Genovese, A., Acquaye, A.A., Figueroa, A. and Koh, S.L. (2017) 'Sustainable supply chain management and the transition towards a circular economy: Evidence and some applications'. *Omega*, *66*, pp.344-357.

Gonzálvez-Gallego, N., Molina-Castillo, F. J., Soto-Acosta, P., Varajao, J. and Trigo, A. (2015) 'Using integrated information systems in supply chain management". *Enterprise Information Systems*, *9*(2), pp.210-232.

Gurumurthy, A., Soni, G., Prakash, S. and Badhotiya, G.K. (2013) 'Review on Supply Chain Management Research—An Indian Perspective'. *IIM Kozhikode Society & Management Review*, *2*(1), pp.1-19.

Hair Jr, J. F., Wolfinbarger, M., Money, A. H., Samouel, P. and Page, M. J. (2015) *Essentials of business research methods*. UK: Routledge.

Harris, P., Dall'Olmo Riley, F., Riley, D. and Hand, C. (2017) 'Online and store patronage: a typology of grocery shoppers'. *International Journal of Retail & Distribution Management*, *45*(4), pp.419-445.

Hashim, J. (2007) 'Information communication technology (ICT) adoption among SME owners in Malaysia'. *International Journal of Business and Information*, *2*(2), pp.13-69.

Heeks, R., Subramanian, L. and Jones, C. (2015) 'Understanding e-waste management in developing countries: Strategies, determinants, and policy implications in the Indian ICT sector'. *Information Technology for Development*, *21*(4), pp.653-667.

Hilty, L.M. and Aebischer, B. (2015) 'ICT for sustainability: An emerging research field'. In *ICT Innovations for Sustainability*, Germany: Springer, Cham, pp.3-36.

Hudnurkar, M., Jakhar, S. and Rathod, U. (2014) Factors affecting collaboration in supply chain: a literature review. *Procedia-Social and Behavioural Sciences*, *133(2)*, pp.189-202.

Ilomäki, L., Paavola, S., Lakkala, M. and Kantosalo, A. (2016) 'Digital competence–an emergent boundary concept for policy and educational research'. *Education and Information Technologies*, *21*(3), pp.655-679.

Irefin, I.A., Abdul-Azeez, I.A. and Tijani, A.A. (2012) 'An investigative study of the factors affecting the adoption of information and communication technology in small and medium scale enterprises in Nigeria'. *Australian Journal of Business and Management Research*, *2*(2), pp.1-9.

Jebreen, I. (2012) 'Using inductive approach as research strategy in requirements engineering'. *International Journal of Computer and Information Technology*, *1*(2), pp.162-173.

Kable. (2014) 'ICT investment trends in the retail industry'. [Online] Available at: https://www.kable.co.uk/media-centre/ict-investment-trends-in-the-retail-industry.html (Accessed 15 July 2018).

Kurnia, S., Choudrie, J., Mahbubur, R.M. and Alzougool, B. (2015) 'E-commerce technology adoption: A Malaysian grocery SME retail sector study'. *Journal of Business Research*, *68*(9), pp.1906-1918.

Kushwaha, G.S. (2011) 'Competitive advantage through information and communication technology (ICT) enabled supply chain management practices'. *International Journal of Enterprise Computing and Business Systems*, *1*(2), pp.3-15.

Llach, J. and Alonso-Almeida, M.D.M. (2015) 'Integrating ICTs and Supply Chain Management: The Case of Micro-Sized Firms'. *Human Factors and Ergonomics in Manufacturing & Service Industries*, *25*(4), pp.385-397.

Lopez-Nicolas, C. and Soto-Acosta, P. (2010) 'Analyzing ICT adoption and use effects on knowledge creation: An empirical investigation in SMEs'. *International Journal of Information Management*, *30*(6), pp.521-528.

Lu, N. and Swatman, P.M. (2009) 'The MobiCert project: Integrating Australian organic primary producers into the grocery supply chain'. *Journal of Manufacturing Technology Management*, *20*(6), pp.887-905.

Majchrzak, A., Markus, M.L. and Wareham, J. (2016) 'Designing for digital transformation: Lessons for information systems research from the study of ICT and societal challenges'. *MIS Quarterly*, *40*(2), pp.267-277.

Mangiaracina, R., Melacini, M. and Perego, A. (2012) 'A critical analysis of vendor managed inventory in the grocery supply chain'. *International Journal of Integrated Supply Management*, *7*(1-3), pp.138-166.

Manochehri, N.N., Al-Esmail, R.A. and Ashrafi, R. (2012) 'Examining the impact of information and communication technologies (ICT) on enterprise practices: A preliminary perspective from Qatar'. *The Electronic Journal of Information Systems in Developing Countries*, *51*(1), pp.1-16.

Novotny, Á., David, L. and Csafor, H. (2015) 'Applying RFID technology in the retail industry–benefits and concerns from the consumer's perspective'. *Amfiteatru Economic Journal*, *17*(39), pp.615-631.

Nuamah-Gyambrah, K., Agyeiwaa, F. and Offei, M.O. (2016) 'Role of ICT in the Survival of Small and Medium Scale Enterprises in Ghana Evidence from selected Small and Medium Scale Enterprises in New Juaben Municipality Koforidua'. *International journal of management,* 2(3), pp.34-79.

Nurmi, P., Salovaara, A., Forsblom, A., Bohnert, F. and Floréen, P. (2014) 'Promotion Rank: ranking and recommending grocery product promotions using personal shopping lists'. *ACM Transactions on Interactive Intelligent Systems (TiiS)*, *4*(1), pp.7-48.

Olatunji, O.S. (2009) 'Adoption of information communication technology on small and medium scale enterprises in Nigeria'. *African Journal of Business and Economic research,* 4(2), pp.73-84.

Ongori, H. (2009) 'Role of information communication technologies adoption in SMES: evidence from Botswana'. *International journal of management,* 2(1), pp. 12-43.

Oyebiyi, O., Misra, S., Maskeliūnas, R. and Damaševičius, R. (2017) 'Application of ICT by Small and Medium Enterprises in Ogun State Nigeria'. In *International Conference on Recent Developments in Science, Engineering and Technology,* 4(2), pp. 459-471.

Ponterotto, J. G. (2013) 'Qualitative research in multicultural psychology: Philosophical underpinnings, popular approaches, and ethical considerations'. *Division of psychological & Educational services,* 16(4), pp.581-648.

Rao, J.M. (2015) 'Challenges to Innovation in Small Business Enterprise Sector in India. *In International Interdisciplinary Business- Economic Advancement Conference,* 49(4), pp. 164.

Rufai, I.A. (2014) 'The Impact of Communication Technologies on the Performance of SMEs in a Developing Economy: Nigeria as a Case Study'. *The Electronic Journal of Information Systems in Developing Countries*, *65*(1), pp.1-22.

Sahu, P.A. (2017) 'A Study on Small Scale Sector in Bangalore'. *Imperial Journal of Interdisciplinary Research*, *3*(5).

Sannino, A. and Engeström, Y. (2017) 'Studies of expansive learning: Foundations, findings and future challenges'. In *Introduction to Vygotsky*. UK: Routledge, pp. 100-146.

Sin Tan, K., Choy Chong, S., Lin, B. and Cyril Eze, U. (2010) 'Internet-based ICT adoption among SMEs: Demographic versus benefits, barriers, and adoption intention'. *Journal of enterprise information management*, *23*(1), pp.27-55.

Singh, R.K., Garg, S.K. and Deshmukh, S.G. (2010) 'Strategy development by small scale industries in India'. *Industrial Management & Data Systems*, *110*(7), pp.1073-1093.

Tan, M.I.I., Razali, R.N. and Desa, M.I. (2012) 'Factors influencing ICT adoption in halal transportations: A case study of Malaysian halal logistics service providers'. *International Journal of Computer Science Issues (IJCSI)*, *9*(1), p.62.

Trebbin, A. (2014) 'Linking small farmers to modern retail through producer organizations– Experiences with producer companies in India'. *Food policy*, *45*, pp.35-44.

Wang, Y., Sanchez Rodrigues, V. and Evans, L. (2015) 'The use of ICT in road freight transport for CO2 reduction–an exploratory study of UK's grocery retail industry'. *The International Journal of Logistics Management*, *26*(1), pp.2-29.

Weeratunge, N., Béné, C., Siriwardane, R., Charles, A., Johnson, D., Allison, E.H., Nayak, P.K. and Badjeck, M.C. (2014) 'Small-scale fisheries through the wellbeing lens. *Fish and Fisheries*, 15(2), pp.255-279.

Wilhelm, M.M., Blome, C., Bhakoo, V. and Paulraj, A. (2016) 'Sustainability in multi-tier supply chains: Understanding the double agency role of the first-tier supplier'. *Journal of Operations Management*, 41(1), pp.42-60.

Wong, C.Y., Wong, C.W. and Boon-Itt, S. (2015) 'Integrating environmental management into supply chains: a systematic literature review and theoretical framework'. *International Journal of Physical Distribution & Logistics Management*, *45*(1/2), pp.43-68.

8. Appendices

8.1 Appendices- Interview with manager supply chain solutions

When the researcher spoke with the manager of a supply chain the person said that they use social media sites to promote their products and new offers in order to develop brand awareness among the customers. The use of these social networking sites enables them to determine the views and opinions of the customers and improve the demand and supply of their products accordingly. The investment in ICT related products costs higher than their business capital as they prefer to adopt cost effective ICT techniques such as Social Media sites to improve their supply chain. ICT tools are playing a vital role in narrowing down the communication gap in between the company and its suppliers and customer, which makes it easier to understand the customer needs. ICT tools have their pros in identifying products and keeping the track of inventory (mentions barcodes and RFID) and help logistics operations to achieve high level of cost and time efficiency. There is a good amount of investment and training cost is required in adoption and use of new ICT technologies which was challenge for the company as employees with skills expect higher salary. The financial resources were carefully planned for the acquisition, implementation and to fulfill the training needs of employees to deal with the challenge. Other benefit from ICT is observed in developing and improving supply chain network by coordination and communication. This has also reduced delay from supplier's end. The ICT will contribute in restructuring the supply chain activities to improve the performance and efficiency of supply chain in its future scope. The firm should make more efforts to improving the awareness level and technical literacy and skills for ICT tools in the workforce.

8.2 Appendices- Interview with supply chain and logistics managers of Grocery shop

When the survey questions were sent to logistics manager of grocery shop the participant said that the use of social media sites by the organization in order to improve supply chain was implemented. The social media is used to communicate with customers openly that is cost-efficient way of communication, which is also used to attract the customers with new deals and offers and helps to update their inventory level based on demand of their products and services. The need for consistent communication with supplier and customers in a cost-effective manner and cost savings in business operations are motivating factors impacting the use of ICT tools

in the business. The ICT has played an integral role in supply chain planning activities, from sourcing decisions to production and on time delivery of products to satisfy our customers. ICT solution has been advantageous in terms business transparency to stakeholders, adoption of internet-based practices to meet the market and customer demands. The security and privacy concerns over online networks and the cost of implementation are some of the challenges faced by the company. Budgeting for the ICT investment and seeking the advice of technological firm for the security aspects has been useful in dealing with these challenges. ICT use in supply operations can help in value creation for the company. The scope of ICT in supply chain will scope help in improving the logistics performance and better integration of supply chain activities and processes of the company. ICT use can increase its contribution in supply chain management by improving the partnership among the organisation and technical solution firms can encourage the use of ICT solutions in supply change management.

8.3 Appendices- Interview with Manager retail strategy

From the survey with a manager of retail sector has said that the use of RFID and barcodes has supported in product tracking and stock management and mobile app, email and other internet-based tools has supported the grocery business in providing opportunity to expanding its reach of customers and develop relations with suppliers. The need for cost reduction in supply chain and business operations and reaching customers in a cost-effective way are some of the factors favouring the use of ICT in grocery retailing. The ICT has played an integral role delivery of product on time as well as responding to product issues faced by customers. The mobile app has provision for easy return and replacement of products to satisfy our customers with high customer service. ICT solution has been useful in terms keeping the track of all the products in the inventory and in display. It also benefits the company in managing the stock replenishment and avoid problem of surplus stocks. The lack of clarity of several benefits of ICT for the grocery business and the implementation and maintenance cost were challenges observed by the company. Developing a separate budget for ICT activities in the company has been helpful to deal with cost challenges. ICT can be used to expand the customer reach and expand business activities. It can also be used to enhance relationship with external customers of the company. The future scope of ICT in improving the business process and use of knowledge capture for marketing campaigns, take effective supply chain integration decisions. ICT use can raise its

contribution in supply chain management by understanding the benefits and functions for the supply chain management.

8.4 Appendices- Interview with director of supply chain

We use radio frequency identification (RFID) technology to easily track their inventory. Internet based software like FlashView is used to make the supply process simplify and minimize the shipping faults. ICT has been playing a significant role in improving the supply chain management integration decisions at the company ICT tools can be an integral part in planning and managing control over supply chain management activities as it has increased transparency across all levels and improved accessibility to real time information. ICT solutions benefits the company by better management of company supplier, vendor and customers and also by simply removing the inefficiencies in managing the supply chain operations thus, better control on supply chain activities.

8.5 Appendices- Interview with regional grocery sales managers

In the conversation as well as through emails the some of the regional sales managers says that, Social media sites are a very effective technology that enables their company to access large number of customers and promote their products easily in cost effective way. Benefits of using ICT tools like social media, email, software. encourage them to use these tools for improving their supply chain efficiency. ICT play an immense role in reducing the cost of logistics in delivery and returns with more lead time. The benefits from ICT tools are improving by good coordination and communication with supply chain members including customers.