UNIVERSITY OF TASMANIA

FACTORS AFFECTING INFORMATION SHARING BETWEEN SUPPLY CHAIN PARTNERS AND THE EFFECT OF INFORMATION SHARING ON SUPPLY CHAIN PERFORMANCE - A CONTEXT OF NEPAL

REENU MASKEY

BEng (Electronics & Communications), MSC (Engineering Management, Distinction)

Submitted in fulfilment of the requirements for the degree of DOCTOR OF PHILOSOPHY

Australian Maritime College

University of Tasmania

July 2017

DECLARATION OF ORIGINALITY

This thesis contains no material which has been accepted for a degree or diploma by the University of any other institution, except by way of background information and duly acknowledged in the thesis, and to the best of candidate's knowledge and belief no material previously published or written by another person except where due acknowledgement is made in the text of the thesis, nor does the thesis contain any material that infringes copyright.

Reenu Maskey

25/07/2017

Date

STATEMENT OF ETHICAL CONDUCT

The research associated with this thesis abides by the *Australian Code for the Responsible Conduct in Research (2007)* and *the National Statement on Ethical Conduct in Human Research (2007)*.

Reenu Maskey

25/07/2017

Date

STATEMENT OF AUTHORITY OF ACCESS

This thesis may be made available for loan and limited copying and communication in accordance with the *Copyright Act 1968*.

Reenu Maskey

25/07/2017

Date

ACKNOWLEDGEMENTS

As a kid, I always refused to go to school. I used to say that I want to do PhD and stay at home like my uncle. While not knowing what PhD means, I was referring to staying home like my uncle who stayed home while writing his PhD thesis. Today, I feel like my childhood dream is going to come true and there are many people to thank for their contributions towards the completion of this research.

I still remember the initial days of my PhD journey. I was very anxious which, I think, made my supervisors a little dubious about me. I was not sure how I was going to spend the next three years of my life. The first six months were challenging as it was difficult to figure out a path for my PhD. My confidence built up after my candidature was confirmed. Now, when I look back, I think of all those twists and turns that taught me many lessons and helped me to become a wiser person that I am today. I have grown as a person and have learnt to look at things in a different way.

Firstly, I am most grateful to my primary supervisor Dr Jiangang Fei (Johnny) for his supervision throughout the research process. I am highly indebted to you Dr Johnny for being patient with me, sharing your experience with me, guiding me towards the right path and motivating me continuously throughout my journey. Your constructive comments and suggestions have played a key role towards the completion of my thesis. You have always appreciated and praised me which encouraged me to do much better. I have always been convinced with the way you explained or justified things whenever I came to you with confusions or doubts. Besides my PhD, you also helped me to enhance my academic experience by giving me opportunities to teach and perform other academic duties. I would also like to express my sincere gratitude to my secondary supervisor Dr Hong-Oanh (Owen)

Nguyen for his guidance, support and encouragement during my three years at AMC. I, specifically, would like to thank you Dr Owen for guiding me during my PhD application process. With your guidance, I was able to secure a full scholarship for completing my PhD Degree.

To AMC and UTAS, thank you for giving me this wonderful opportunity to pursue my degree. My three years in this university will have a long-lasting effect in my life as I have learnt a lot from this place.

I would also like to thank Dr Hilary Pateman for your invaluable feedback and suggestion and introducing me to a useful topic that became an important section of my thesis. Dr Jagan Jeevan, Dr Livingstone Divine Caesar and Dr Cecile L'Hermitte, I thank you all from the bottom of my heart for sharing your experience and knowledge with me. I would also like to thank all the administrative, academic and technical staff and all my friends and colleagues at the Department of Maritime and Logistics Management (MLM), Australian Maritime College, University of Tasmania.

I am indebted to all the survey respondents and interviewees for your participation and warm hospitality during my visit. Thank you for your participation even when the country and the businesses were going through a hard time.

I would like to thank my parents who, I know, must have been more anxious than me and will be more excited than me when I get my Doctorate Degree. To my sisters, thank you for your support and motivation. I would also like to thank my brother-in-law in Nepal who helped me during my data collection process. Nepal was facing a fuel crisis during that time but you helped me by driving me to the companies. To my brother-in-law in Australia, Niranjan Pradhan, thank you for helping us settle down in Australia.

To my husband's family, thank you for always being supportive and taking pride in me.

Last but not the least, to my husband Saras Shrestha, I cannot thank you enough for sacrificing your career and spending an entire year just to support and encourage me till my candidature was confirmed. I will never forget your motivational talks when I needed them the most. Your support has made me a stronger person for which I will forever be grateful.

Thank you everyone for your immense love and support.

ABSTRACT

In today's competitive business environment, no company can survive without coordinating, cooperating and collaborating with their supply chain partners. Information sharing is an integral aspect of supply chain management. To accomplish the three important **C**s of supply chain management, **c**ooperation, **c**oordination and **c**ollaboration, information sharing plays a key role. However, supply chain partners are hesitant to share information with each other due to various reasons. It is important to identify the factors that influence information sharing in supply chains.

A systematic review of the literature reveals that the research in this field has extended from the study of information characteristics, organisational characteristics and relationship characteristics to environmental characteristics and economic characteristics as the factors affecting information sharing in supply chains. However, previous studies are limited in terms of the number of factors being examined and the categories of the factors. Although in a segmented manner, a large number of factors appeared in the literature, many of them were repeated using different terminologies or overlapped with other factors and others were completely missing. Furthermore, many factors have not been adequately studied because some factors have only been proposed through theoretical discussions and others have only been studied in a particular context. Moreover, most of the studies have been done in countries where supply chains have been well developed. Finally, there is a dearth of work that identifies the antecedents of information sharing and further explores the role of information sharing on supply chain performance.

With the above gaps in the literature, this study identified a comprehensive list of factors affecting information sharing in supply chains and investigated the effect of information sharing on supply chain performance. In addition, this study also grouped the identified factors into four categories based on how they arise. Furthermore, to fill the gap of limited studies conducted in developing countries this study was carried out in Nepal which is different from developed countries in a number of aspects. Hence, the first primary research question for this study is: *How is information sharing affected in supply chains in the context of Nepal?* To answer the first research question, this study investigated i) the critical factors affecting information sharing in supply chains in Nepal; and ii) how these factors affected

information sharing at operational and strategic levels. The second primary research question is: *How does information sharing affect the supply chain performance of individual firms in the context of Nepal?* To answer the second research question, this study examined i) the effect of operational information sharing on supply chain performance of individual firms in Nepal; and ii) the effect of strategic information sharing on supply chain performance of individual firms in Nepal.

To answer the two primary research questions, this study used a convergent parallel mixed method research design comprising of a questionnaire survey and semi-structured interviews with supply chain participants in Nepal. The invitation to participate in the survey was dropped-off to the associate/general members of the Federation of Nepalese Chamber of Commerce & Industries (FNCCI) and Nepal Freight Forwarders Association (NEFFA). Random sampling technique was used to generate a list of 215 companies from the population of 558. Emails were also sent to potential participants including the link to the online version of the questionnaire as well as its electronic copy to provide them with different options to complete the survey. In total, 135 responses were received out of which four were invalid due to incomplete information, representing an effective response rate of 60.9 percent. For the semi-structured face-to-face interviews, nine from a sample size of 15 supply chain members participated, representing a response rate of 60 percent.

The results of the data analysis (quantitative and qualitative) reveal that a number of critical factors across all four categories had a significant effect on information sharing in supply chains in Nepal. The quantitative results show that operational information sharing is significantly affected by interaction routines, organisational compatibility, incentives, project payoffs, commitment, personal connection and top management commitment while strategic information sharing is significantly affected by interaction routines, government support, personal connection and monitoring. The research model explained 38 and 31 percent of the variations in operational and strategic information sharing respectively. The results from the qualitative analysis were largely congruent with the quantitative results. The results also confirmed that information sharing affected supply chain performance. While the effect of information sharing on cost and quality performance was not statistically significant, delivery and flexibility performance was significantly affected by operational as well as strategic information sharing.

This thesis contributes to the literature by simultaneous empirical analysis of the cause and effect on information sharing in supply chains. This study identified a wide-ranging list of factors affecting information sharing in supply chains and empirically examined their effects on information sharing and the effect of information sharing on supply chain performance. The results of this study exhibits how supply chain members in Nepal perceive information sharing and what factors affect them to share information with their partners. The results also show that not all factors postulated to affect information sharing in developed countries were applicable in the context of Nepal. It provides support to the fact that not all supply chains are same and hence, context-specific research is imperative. Hence, it fulfils the need to conduct such studies in less-developed countries that are different in many aspects such as economic, political, legal, social and cultural settings.

On the performance side, significant variations exist in the studies conducted previously. Some authors considered information sharing and supply chain performance as one-dimensional constructs while some considered information sharing as one-dimensional and supply chain performance as multi-dimensional. Few studies have considered both as multi-dimensional constructs. While all the authors who considered information sharing as multi-dimensional construct separated it into operational and strategic levels, the components of supply chain performance varied. By considering information sharing at operational and strategic levels and supply chain performance as cost, quality, delivery and flexibility performance, this study confirmed the need to consider information sharing and supply chain performance as multi-dimensional constructs.

From an industry perspective, it illustrates that information sharing between supply chain partners can be enhanced by improving the identified factors, which in turn will enhance supply chain performance. While many authors have identified information technology as an important precursor of information sharing, this study provides empirical evidence to show that information technology might not be as important in developing countries because of its high cost and compatibility issues. The results suggest that for a country like Nepal with limited IT advancements, factors such as interaction routines and personal connection can have more value than IT. The findings of this study can help practitioners in Nepal to improve those factors that had a significant effect on information sharing rather than focussing on all the factors that theories have suggested. This study contributes to the development and improvement of supply chain management in Nepal by providing them a

better understanding of the importance and benefits of information sharing in supply chains. This study also highlights the need to enhance information sharing between supply chain partners for firms to achieve their individual as well as supply chain goals.

The main limitation of this research is the moderate sample size compared to the large number of items in the data set. In addition, small companies were excluded as potential respondents in this study. Larger sample size should be aimed in future studies to improve the EFA results. To incorporate small companies, future research may frame their survey/interview instrument in a way that can be understood and answered by small firms. As this is the first study conducted in a country like Nepal, future research can be conducted in similar countries, land-locked and low-income, to improve the generalisability of the findings. Future research can also consider conducting empirical analysis to confirm the four categories of factors as proposed in this study. Finally, since information sharing can enhance trust, commitment and integration between supply chain partners, future research may consider a feedback loop analysis from information sharing to such factors to enrich the findings.

PUBLICATIONS

2017 (Revision Submitted)

- Maskey, R., Fei, J. and Nguyen, H. O. 2017. Critical factors affecting information sharing in supply chains. *International Journal of Operations & Production Management.*

- Maskey, R., Fei, J. and Nguyen, H. O. 2017. Use of exploratory factor analysis in maritime research. *The Asian Journal of Shipping and Logistics*.

2017

- Maskey, R., Fei, J. and Nguyen, H. O. 2017. Exploratory factor analysis – Antecedents of information sharing in supply chains. *Maritime Transport Quality in the Evolving World Trade: IAME 2017 Conference, 27-30 June, Kyoto, Japan, pp. 1-25 (2017).*

2015

- Maskey, R., Fei, J. and Nguyen, H. O. 2015. Identifying the factors affecting information sharing in supply chain - A systematic review of the literature. *The Role of Maritime Clusters and Innovation in Shaping Future Global Trade: IAME 2015 Conference, 23-26 August, Kuala Lumpur, Malaysia, pp. 1-21 (2015).*

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

AMC	Australian Maritime College
AMOS	Analysis of a Moment Structures
ANOVA	Analysis of Variance
BSC	Balanced Scorecard
CCTV	Closed Circuit Television
CEO	Chief Executive Officer
CHA	Custom House Agent
CME	Census of Manufacturing Establishments
CPFR	Collaborative Planning, Forecasting and Replenishment
CRP	Continuous Replenishment Program
DC	Degree of Confidence
DF	Degrees of Freedom
DP	Desired Precision
DV	Dependent Variable
ECR	Efficient Consumer Response
EDI	Electronic Data Interchange
EFA	Exploratory Factor Analysis
EM	Expectation Maximisation
ERP	Enterprise Resource Planning
ESCAP	Economic and Social Commission for Asia and the Pacific
EU	Environmental Uncertainties
FA	Factor Analysis
FMCG	Fast-Moving Consumer Goods
FNCCI	Federation of Nepalese Chambers of Commerce and Industry

HR	Human Resource
HREC	Human Research Ethics Committee
IBM	International Business Machines
IS	Information Sharing
ISCC	International Supply Chain Connectivity
ICT	Information and Communication Technologies
IT	Information Technology
IV	Independent Variable
KMO	Kaiser-Meyer-Olkin
LPI	Logistics Performance Index
LSP	Logistics Service Provider
MAR	Missing at Random
MCAR	Missing Completely at Random
MNAR	Missing Not At Random
MD	Managing Director
NCME	National Census of Manufacturing Establishments
NCPS	National Centre for Ports and Shipping
NEFFA	Nepal Freight Forwarders Association
PCA	Principal Component Analysis
POS	Point-of-sale
P-P	Probability Plot
PRQ	Primary Research Question
QR	Quick Response
RBV	Resource-based View
RFID	Radio Frequency Identification
SC	Supply Chain

SCM	Supply Chain Management
SCOR	Supply Chain Operations Reference
SEM	Structural Equation Modelling
SLR	Systematic Literature Review
SMS	Short Message Service
SPSS	Statistical Package for Social Science
SRQ	Subsidiary Research Question
SS	Sample Size
TCT	Transaction Cost Theory
TMC	Top Management Commitment
US	United States
USD	United States Dollar
USP	Unique Selling Point
UK	United Kingdom
UTAS	University of Tasmania
V	Variability
VMI	Vendor Managed Inventory

Chapter 1 INTRODUCTION

1.1 Background to the Study

Supply chains (SC), whether managed or not, have existed since the first day of trading among partners (Mentzer et al., 2001, Shaw, 2001) and the management of supply chains is very important to achieve a sustainable competitive advantage for all parties involved (Cheng et al., 2008). However, supply chain management (SCM) recently reached to its prominence, fuelled by the need to improve customer services through providing them the right product, in the right quantity, at the right time, and at the right cost. With the increasing level of integration among supply chain partners, the competition has shifted from amongst organisations to between supply chains (Cooper et al., 1997b, Lambert et al., 1998, Li et al., 2006b).

Supply chain management is a set of approaches utilised to successfully coordinate and integrate all the activities and the interdependent chain members associated with the flow of goods and services from the point of production to the point of consumption (Cooper et al., 1997b, Levi et al., 2008). SCM assists in establishing inter-organisational relationships between firms to achieve common business goals because individual firms cannot generate all the critical resources internally (Patnayakuni et al., 2006). It has emerged as an important management approach to reduce costs, improve quality and enhance the long-term performance of the individual firms and the supply chain as a whole by integrating both information and material flows across the supply chain (Li et al., 2006b, Crook and Combs, 2007).

Increased globalisation, ever changing customer demand and constant pressure to reduce costs have created a need to restructure supply chains to form partnerships among chain members rather than arm's-length relationships (Mena et al., 2009). According to Wilson (1995), the ultimate goal of organisations is to reduce costs and maximise profits. This can be achieved through a cooperative relationship model where the partner firms work together towards common goals. An increasing number of firms have realised that cooperation, coordination and collaboration would lead firms towards achieving competitive advantage, individual objectives as well as the goals of the whole supply chain (Fiala, 2005). Information

sharing (IS) has been identified as one of the key relationship connectors that improves the level of trust among chain members and strengthen their relationships (Moberg, 2000, Baihaqi and Sohal, 2013). It is one of the most frequently cited factors in the supply chain management literature as it facilitates both internal and external linkages that enhance coordination between supply chain partners. According to Ramdas and Spekman (2000), supply chain performance of a firm can be distinguished as either outstanding or mediocre depending on their ability to use information. An adequate flow of information in terms of scope, frequency and intensity is a crucial requirement of supply chain management because it helps firms to make wise decisions during rapidly changing and unexpected situations (Stank et al., 1996, Fawcett et al., 2007b, Youn et al., 2008, Ramayah and Omar, 2010).

Information sharing is one of the most important drivers of supply chain management which facilitates supply chain coordination (Li and Lin, 2006) and expedites the decision making process to better meet customer demands, improves the quality of products and services and reduces supply chain costs (Ramayah and Omar, 2010). Information about events (such as order receipt and production), stocks (such as work-in-process and finished goods inventory), flows (such as shipment and delivery) and outcomes (such as operational performance, profit margins, revenues, and sales) can be shared between supply chain partners to make better decisions (Patnayakuni et al., 2006). Information sharing helps different functions within the supply chain to plan, react and take preventive measures to fulfil customers' demands (Mitchell and Kovach, 2016).

Traditionally characterised by arm's-length relationships, supply chain partners conduct their businesses independently without sharing much information with their partners (Mason-Jones and Towill, 1999, Patnayakuni et al., 2006). The main reason for this is their lack of knowledge about the advantages that can be achieved through sharing information. Greater operational inefficiencies (such as mismatch between demand and supply, unreliable delivery), transaction risks, and coordination costs are the consequences of the lack of information sharing and information asymmetries (Patnayakuni et al., 2006). Advancement in information technology (IT) and the increased need for long term cooperation, coordination and collaboration between supply chain partners have made such sharing of information possible. This has given rise to a new management culture in the supply chain and logistics industry. Managers have now realised that the various entities in supply chain are inter-connected because any actions taken by one member can influence the performance of the

entire chain (Cooper et al., 1997a). It is suggested that supply chain members should focus on strengthening relationships with their trading partners, increasing information exchange and investing in advanced communication technologies (Moberg, 2000). This will help firms to overcome the obstacles for the successful implementation of supply chain management strategies.

While the advancement in information technology has augmented information sharing amongst supply chain partners, there exists a substantial gap between available technology and supply chain collaboration (Fawcett et al., 2007b). Technology alone cannot improve the level of information sharing in supply chains. Willingness to share information is crucial to fill the gap and make the most out of IT. However, firms are reluctant to share information with others due to various reasons such as perceived complexities, risks and costs (Huong Tran et al., 2016). Consequently, the performance of supply chain members is compromised. To improve the overall efficiency and performance of supply chains, it is important to identify the factors that affect information sharing among chain partners. Literature has examined different factors in different contexts using different methods (Moberg et al., 2002, Li and Lin, 2006, Madlberger, 2009, Müller and Gaudig, 2011, Nguyen and Nguyen, 2014). However, there has been a dearth of empirical research examining all factors affecting information sharing and the relationship between information sharing and firm performance in the supply chain context.

1.2 Research Context

Abundant in natural resources, Nepal is an economically poor and landlocked country in South Asia. With the absence of direct access to seaports, Nepal falls into a separate category having special problems in trade (Rajkarnikar, 2010). It faces several logistics issues because of its geographical position. Supply chain management can play a key role in coping with such issues. However, supply chain management is at its infancy in Nepal due to delayed modernisation and weak industrial sectors. The manufacturing industry, for example, is still at rudimentary stage due to lack of transportation and communication infrastructure. The report on the National Census of Manufacturing Establishments (NCME) 2011/2012 presented by the Government of Nepal (2014) shows 18.3 percent increase in total number of operating manufacturing establishments as compared to the previous census (2006/2007). As

a result of this increase in the manufacturing establishments, the number of people employed in this sector has increased by 14.8 percent (Government of Nepal, 2014).

While the increase in the manufacturing establishments has improved product supplies in the country, it still has not been able to fulfil the market demands due to various reasons such as lack of raw materials, logistical challenges and frequent strikes (Government of Nepal, 2014). This has increased the inability of Nepalese firms to compete in the international market. To develop its economy, Nepal relies very much on the exports of manufactured products. The improvement in the competitiveness of Nepalese products requires the establishment of supply chains where firms work with each other to achieve their common goals. Supply chain management and information sharing enhances collaboration among chain members and improves the level of coordination among the various supply chain processes. This will help supply chain firms to reduce problems such as mismatch between supply and demand, stock-outs and overstocks, effects of uncertainties, and unreliable delivery schedules which will eventually improve the overall efficiency and effectiveness of their business operations nationally and internationally.

Information sharing can help to minimise the impact of logistics problems faced by Nepalese industries. Being a landlocked country, it faces several logistical challenges. Considering the logistical challenges that are difficult to solve, timely information sharing between partners might help them to plan in advance or make alternate arrangements. Thus, information sharing can act as a cross-functional or soft infrastructure of connectivity. Unlike physical infrastructure, the main requirement for information sharing is the willingness of supply chain participants. Identifying the influential factors of information sharing will help Nepalese firms to improve information sharing and hence connectivity with their supply chain partners.

In addition, Nepal will provide a completely different context to carry out supply chain management research because: 1) it is a landlocked country; 2) it is characterised by inadequate infrastructure including information technology which has been considered as one of the most important requirements for supply chain information sharing; 3) the firm size is small; and 3) it has a culture that is different from the western countries where most of the research has been carried out. Owing to these variations, the results generated from the research can be used for comparison with previous studies.

1.3 Research Questions and Research Objectives

Prior research on supply chain management has considered information sharing among trading partners as a key factor for successful supply chain management implementation (Moberg et al., 2002). Despite the increased benefits of information sharing as discussed in the literature, very few companies have understood the real ability of information sharing in improving supply chain performance (Fawcett et al., 2007b). Arzu Akyuz and Erman Erkan (2010) suggest that information sharing or productivity is one of future research area that can contribute to a better understanding of supply chain performance metrics.

According to Childerhouse et al. (2003), in real-world supply chains, information is withheld, masked, distorted or just plainly missing. Hence, the amount of information that needs to flow through supply chains is below the ideal amount of information that needs to be shared. Firms are hesitant to share information with their partners as they believe that information is a source of competitive advantage and sharing it will affect their competitive position in the market. It is important that managers understand the various conditions under which information sharing occurs besides understanding the importance of information sharing (Patnayakuni et al., 2006). Even though there have been a vast number of studies carried out in the field of supply chain management, information sharing, and the antecedents of information sharing are less explored areas (Kembro and Näslund, 2014).

As information sharing is an important attribute of supply chain collaboration, it is essential to identify a comprehensive list of factors (Madlberger, 2009) and understand how different factors affect information sharing in supply chains. It is necessary to conduct a study including a range of factors to facilitate understanding of why supply chain partners share information with each other. A systematic approach is lacking that investigates the full range of factors related to information sharing.

Moreover, Moberg et al. (2002) identify the need for more empirical research that identifies the antecedents of information exchange and further explores the role of information exchange in performance enhancement in supply chain settings. Patnayakuni et al. (2006) suggest that further research needs to be undertaken to investigate the impact of information sharing on firm performance along with its antecedents. The need to investigate the cause and effect of information sharing in supply chain has been recognised recently by Baihaqi and Sohal (2013) and Huo et al. (2014). While there are separate studies conducted to examine

the cause and effect of information sharing, limited studies have included both aspects in one study. This proves that the supply chain management literature is scant with studies carried out to identify the antecedents and consequences of supply chain information sharing. Hence, it is important to undertake studies that will concurrently investigate the cause and effect of information sharing in supply chains.

With different metrics and measures used to capture supply chain performance (Neely et al., 1995, Kaplan and Norton, 1996, Beamon, 1999), there has been no unanimity regarding the best measures for supply chain performance measurement (Gunasekaran and Kobu, 2007). The main objective of supply chain is to improve customer satisfaction and achieve maximum profits. Bearing this in mind, this study has considered cost, quality, delivery and flexibility as the components of performance measurement to examine how these measures can be improved through sharing information with trading partners.

According to Hausman (2004), "One shoe size does not fit all," which means that companies and supply chains are different from each other and require different strategies to run their businesses. It is necessary to design context-specific SCM practices. In addition, very limited research has been done in the context of small under-developed countries like Nepal. Most studies have been carried out in developed countries with advanced economies.

Another reason that motivates researchers to carry out supply chain related research in developing countries is the business potential that these countries possess due to the availability of cheap labour and raw materials. However, these countries are overwhelmed with high degree of uncertainty and lack of information, which significantly affects the development and maintenance of efficient supply chains (Babbar et al., 2008). Given the global and interconnected nature of today's supply chains, it is important to take measures to properly implement SCM at every stage of the product or service flows, in particular where the stages fall within the jurisdiction of developing countries.

The main aim of this research is to contribute to the literature by identifying comprehensive list of factors that influence supply chain partners' information sharing decision and examining the effect of information sharing on supply chain performance. It has acknowledged the need to study the antecedents and consequences of information sharing in supply chains in economically poor countries like Nepal where such studies are most needed and may provide interesting comparisons across different contexts. It aims to provide

practical recommendations to the Nepalese businesses in their effort to implement SCM and to facilitate information sharing among chain members. Based on detailed review of the literature, two primary research questions (PRQ) and four subsidiary research questions (SRQ) were formulated as follows:

PRQ1: How is information sharing affected in supply chains in the context of Nepal?

> **SRQ1.1:** What are the critical factors affecting information sharing in the supply chains in Nepal?
>
> **SRQ1.2:** How do these factors affect information sharing at strategic and operational levels?

PRQ2: How does information sharing affect the supply chain performance of individual firms in the context of Nepal?

> **SRQ2.1:** How does operational information sharing affect the supply chain performance of individual firms in Nepal?
>
> **SRQ2.2:** How does strategic information sharing affect the supply chain performance of individual firms in Nepal?

The research objectives of this research are to:

1. Investigate what, when, how and with whom do the supply chain members in Nepal share information;
2. Evaluate the critical factors that facilitate or impede information sharing in supply chains in Nepal;
3. Evaluate the effect of information sharing in enhancing the supply chain performance of individual firms in terms of cost, quality, delivery and flexibility; and
4. Provide recommendations to Nepalese businesses to improve information sharing in their supply chains.

1.4 Methodologies

To answer the research questions and to achieve the research objectives, the data will be collected from Nepal. Different supply chains in agriculture and manufacturing will be considered as the target population and the sample will be selected from a list of supply chain members of these supply chains in Nepal. The rationale behind choosing the above two supply chains are: 1) agriculture dominates the economy of Nepal with more than 70% of the total population engaged in this sector; and 2) manufacturing is one of the major driving forces of economic development which needs further development in Nepal.

This research will use a combination of qualitative and quantitative methods for data collection. The membership roster for the Federation of Nepalese Chambers of Commerce and Industry (FNCCI) and Nepal Freight Forwarders Association (NEFFA) will be used as the sampling frame for this study. For the first part of the data collection, a survey questionnaire will be distributed to the identified list of supply chain participants in Nepal. Considering the context of Nepal, this study will conduct the survey by direct visitation to supply chain participants from the selected sample list. The survey response will be analysed using the statistical package for social science (SPSS), a software package used for statistical analysis in social science.

As part of the qualitative method, face-to-face interviews with managers and other senior executives of supply chain participants will be conducted. The interviews will be conducted simultaneously with the questionnaire survey. It is expected that the number of participants for the interviews will be much less than that of questionnaire survey as the main objective of conducting the interviews is to provide better understanding of, and support to, the quantitative data. Fifteen medium/large size firms from the sampling frame will be chosen as the respondents for the interview. The size of the firms will be determined based on their total number of employees. Content analysis will be used to analyse the qualitative data collected from interviews.

Medium/large firms are chosen as the potential respondents for survey and interviews because: 1) they are most likely to comprise of supply chains with a number of national and international members; 2) they are expected to have knowledge about supply chain management and inter-organisational relationships; and 3) with the availability of sufficient funding, they are likely to use new technologies for business operations (Yigitbasioglu, 2010,

Singh, 2011). The data collected from small firms which, in the context of Nepal are most likely to have little knowledge about the importance of SCM, organisational relationships and information technology, might not provide useful insights towards the field of study.

The rationale behind using mixed methods is to obtain more information about the field of study by collecting qualitative data in addition to quantitative data which is the preliminary source of data. While survey is an economical way of collecting large amount of data which can be generalised from a sample to the population of interest, it has its own limitations including the length of the survey. With the restriction to ask a limited number of questions through surveys, interviews can provide better understandings about supply chain participants attitudes and behaviours towards information sharing and inter-organisational relationships.

1.5 Research Contributions

The contributions of this research can be explained from two aspects. The first one is its contribution to the literature. This research, unlike others, identifies a comprehensive list of factors that enhance or impede information sharing in supply chains through a systematic review of the literature. It answers the question of how supply chain partners can facilitate information sharing to achieve desired performance outcomes. It contributes to the literature by providing a full range of factors related to information sharing, and the applicability of the identified factors in one of the least developed countries through an empirical test. Furthermore, this research will provide empirical evidence on how information sharing will affect the supply chain performance of individual firms in terms of their cost, quality, delivery and flexibility.

The second contribution of this research is to provide practical recommendations to the development of supply chain management practices in Nepal, one of the least-developed countries in the world. For an agriculture dominated economy, a very important contribution of this research is to provide a better understanding of the importance and benefits of information sharing in supply chains of various industries in Nepal. Firms in Nepal can benefit from reduced costs and improved overall efficiency and effectiveness of their supply chains through effective information sharing.

1.6 Structure of the Thesis

This thesis is organised into seven chapters as shown in Figure 1.1. Chapter 1 introduces the background of the research and explains the need to carry out this research giving rise to the research questions and objectives. Chapters 2 and 3 review the relevant literature from a wide range of disciplinary areas such as supply chain management, transport and logistics management, operations management, production and distribution, information and management, industrial marketing and social and behavioural science. Based on the literature review, a conceptual research framework is developed in Chapter 4. The conceptual framework consists of a series of hypotheses to test the effect of the identified 21 factors affecting information sharing between supply chain participants and the effect of information sharing on supply chain performance.

Chapter 4 further explains the methodology used in this research. It discusses both the quantitative as well as the qualitative method along with the data collection techniques used to collect quantitative and qualitative data. Chapter 5 describes the statistical techniques used for quantitative and qualitative data analysis process using the SPSS software and content analysis. The results of the analysis are also presented in this chapter. Chapter 6 provides detailed discussions of the findings as presented in Chapter 5. Finally, Chapter 7 concludes and summarises the thesis. The research contributions, implications, limitations, and future research needs will also be discussed in this final chapter.

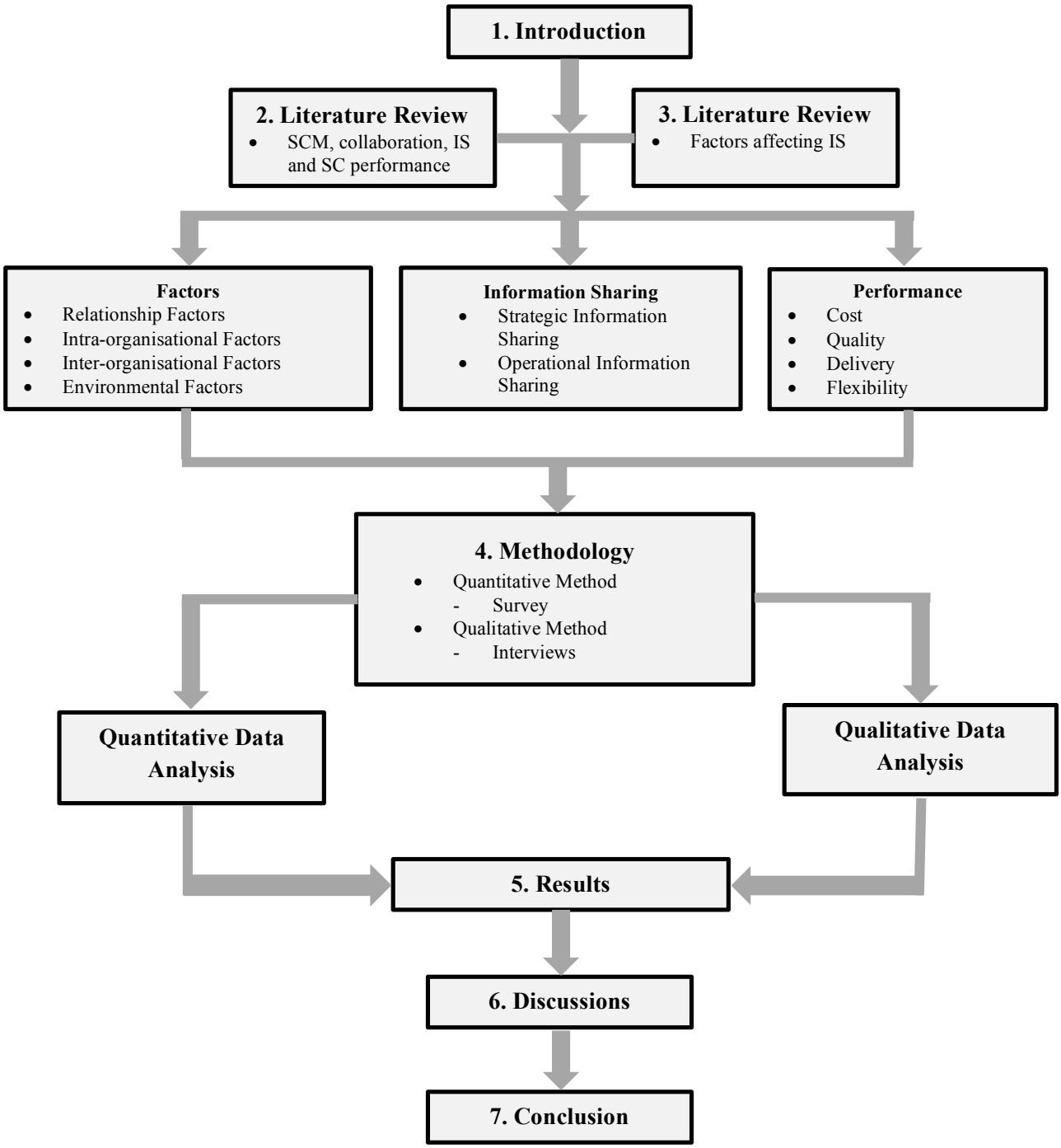

Figure 1.1: Thesis Framework

Chapter 2 SUPPLY CHAIN MANAGEMENT, INFORMATION SHARING AND SUPPLY CHAIN PERFORMANCE

2.1 Introduction

The main objective of this chapter is to review the literature concerning information sharing in supply chains and supply chain performance. Before discussing the factors that affect information sharing in supply chains and the effect of information sharing on supply chain performance, it is imperative to understand some important concepts in supply chain management. The chapter begins with brief definitions and discussion of supply chain, supply chain management and the role of collaboration in supply chains. The second objective of this chapter is to outline the theoretical foundations that explain the need of information sharing in supply chains. Transaction cost theory (TCT) and resource-based view (RBV) explain how information sharing will help supply chain partners to acquire skills that will help them to reduce costs and improve performance. The theoretical foundations justify the necessity to identify the factors that will affect information sharing in supply chains so that supply chain participants can enhance their performance.

The next section of the chapter includes thorough discussion about information sharing in supply chains incorporating critical facets such as why information should be shared, what information should be shared and with whom information should be shared. This section distinguishes between operational and strategic information sharing which provides the rationale to consider information sharing as a multidimensional variable. Finally, this section discusses the role of information sharing as cross-functional driver of connectivity in Nepal. The final section of this chapter provides an overview of supply chain performance and its metrics. It explains why cost, quality, delivery and flexibility under resource, output and flexibility measures, are in-line with the concept of supply chain management. It also provides an overview of the literature that illustrates how information sharing will help improve supply chain performance in terms of cost, quality, delivery and flexibility.

2.2 Supply Chain, Supply Chain Management and Collaboration

Whether a company sells directly to end customers, provides a service or manufactures a product, it will always be a part of one or more supply chains as no single organisation is self-sufficient to satisfy all the required resources, skills and expertise (Handfield and Nichols, 1999). An organisation can leverage its core competencies and outsource the skills and resources that they lack. This motivates firms to look beyond their company walls to acquire what they lack and concentrate on what they can do best (Fawcett et al., 2007a). This gives rise to a network of suppliers and buyers that satisfies the needs and requirements of each other creating value throughout.

The management of these networks comprising of a number of supply chain participants along with the flow of materials, finance and information is known as supply chain management (SCM) (Lee and Whang, 2000). Supply chain management improves the performance of the entire chain through improved competitiveness of the individual players of the chain (Cooper et al., 1997a) along with the improved relationships among the chain members. Efficiency and cost effectiveness are the two main objectives of SCM, hence, reducing system-wide costs which includes transportation, distribution, inventories of raw materials, work-in-process, and finished goods should be the approach of SCM (Levi et al., 2008).

Supply chains are difficult to manage because it involves a large number of supply chain players with different, sometimes conflicting goals and objectives (Levi et al., 2008). They are likely to try and make effort to achieve their goals which sometimes could be against the goals of the entire chain. Such behaviour of individual participants tend to have an adverse effect on the overall performance of the chain as the decisions made by each player directly or indirectly affect other partners along the chain (Cooper et al., 1997a). However, in this networked world no individual firm can be self-sufficient which is why firms tend to work together with other firms sharing each other's resources, skills and expertise (Lehoux et al., 2013). Hence, this makes supply chain collaboration an essential requirement.

Fawcett et al. (2007a) compare a well-managed supply chain with a well-choreographed ballet focussing mainly on the role of collaboration, coordination and information sharing for better performance. In the context of supply chains, it is essential that firms coordinate their

supply chain activities such as purchasing, manufacturing, logistics and distribution through collaboration to improve the performance of the entire chain (Barratt, 2004). Collaborative firms generally cooperate, share information and work together to plan and achieve their mutual goals (Ralston et al., 2017). Collaborative approaches such as vendor managed inventory (VMI), quick response (QR) and collaborative planning, forecasting and replenishment (CPFR) have been proposed and widely used by firms to facilitate information sharing (Simatupang and Sridharan, 2005, Lehoux et al., 2013). Collaboration initiates information exchange based relationships not only at operational levels but also at tactical and strategic levels that leads firms towards a long-term relationship (Barratt, 2004).

As an important coordination mechanism, information sharing is considered as one of the main foundations of collaboration between supply chain firms along with the mutuality of benefits, rewards and risks (Barratt, 2004, Wiengarten et al., 2010, Ralston et al., 2017). The role of information sharing as a critical competitive resource was recognised only after 1980s when firms started focussing on SCM initiatives (Handfield and Nichols, 1999). It is the glue that holds all the supply chain participants together (Fawcett et al., 2007a) with an objective to maintain a long-term, collaborative relationship and drive the effectiveness of that relationship (Hsu et al., 2008). According to Constant et al. (1994) information sharing has the capability to improve organisational efficiency, learning, innovation, flexibility and understanding of organisational goals.

Amongst the different flows in supply chains, information is one of the primary flows which has a huge impact on the efficiency, effectiveness and the overall supply chain performance (Thomas et al., 2013). The need for information sharing in supply chains has been recognised for decades (Forrester, 1958, Cooper et al., 1997b, Lee and Whang, 2000). Information sharing has been considered as the most important driver for successful supply chain management because it will lower the degree of uncertainty (Mentzer et al., 2001, Kwon and Suh, 2004, Tan et al., 2010), improve integration (Patnayakuni et al., 2006) and coordination between supply chain processes (Patnayakuni et al., 2006, Fawcett et al., 2007b, Baihaqi and Sohal, 2013), mitigate bullwhip effect (Lee et al., 1997, Zhang and Chen, 2013), reduce total costs (Yu et al., 2001, Sahin and Robinson, 2002, Paulraj and Chen, 2007) and improve the level of trust among supply chain partners (Fawcett et al., 2007b). Supply chain strategies, such as quick response (QR), efficient consumer response (ECR), vendor managed inventory

(VMI) and continuous replenishment programs (CRP) are all based on the idea of sharing information with the members of the supply chain network (Lee and Whang, 2000).

In order to receive valuable information that helps to make wise decisions, firms need to establish and maintain a good and trustworthy relationship with its trading partners. Collaboration with supply chain members is the best available solution to motivate firms to share information most needed to coordinate supply chain activities to reduce costs and improve customer satisfaction (Barratt, 2004, Wiengarten et al., 2010).

2.3 Theoretical Foundation of Information Sharing in Supply Chain

Despite knowing the benefits of information sharing among the trading partners, firms are still reluctant to share the information that they possess due to various reasons such as fear of losing power, confidentiality, and perceived costs of information sharing (Li and Lin, 2006, Li and Zhang, 2008, Madlberger, 2009). However, information sharing has the potential to strengthen collaborative relationship between supply chain partners which helps to reduce transaction costs and acquire skills and resources needed to perform efficiently in their supply chain. Two theories, transaction cost theory (TCT) (Williamson, 1975) and resource-based view (RBV) (Wernerfelt, 1984), are considered relevant to, and form the theoretical foundation of, this research.

2.3.1 Transaction Cost Theory (TCT)

Transaction Cost Theory (TCT) (Williamson, 1975, Williamson, 1981) states that a firm will encounter high transaction costs when bounded rationality (an inability to know everything) combines with transaction specific investments and a high level of uncertainty (Heide, 1994). This is because firms act opportunistically in the presence of bounded rationality, uncertainty and information asymmetry (Kembro et al., 2014), making opportunism a fundamental feature of TCT (Hoyt and Huq, 2000). Opportunistic behaviour increases transaction costs because it involves the costs of monitoring, safeguarding assets, adaptation and making sure that the other party does not involve in opportunistic behaviour (Kwon and Suh, 2004).

Asset specific investment is another important dimension of TCT, according to which partners with greater asset specificity will put in more efforts to continue the exchange

relationship as an approach to reduce transaction costs involved in turning to an alternate partner (Williamson, 1981). At the same time, the investing party becomes prone to the risk of opportunism as the specific investment made towards the relationship will have very little value outside that relationship (Stump and Heide, 1996). However, when supply chain partners establish a trust-based relationship (Ganesan, 1994), the long-term gains from maintaining the relationship surpass the short-term payoffs from opportunism (Stump and Heide, 1996). This clarifies why supply chain partners with relationship specific investments involve in long term collaborative relationship where partners collaborate and exchange necessary information with each other to achieve their common goals.

The main rationale behind TCT is that there are potential costs associated with safeguarding, adaptation and evaluation processes and one of the options to reduce such costs is by establishing inter-organisational trading relationships (Heide, 1994). Accordingly, organisations aim to avoid uncertainty through collaboration facilitated by information sharing which may eventually lower transaction costs (Yigitbasioglu, 2010). As organisations have the capability to mitigate the effect of uncertainty, research based on TCT focuses on the role of the organisation as a mechanism to reduce exchange uncertainty (Tan et al., 2010).

With different business goals and priorities, it is crucial for supply chain organisations to develop and maintain a collaborative partner relationship to achieve supply chain information alignment which helps to reduce uncertainty, opportunistic behaviour and transaction costs (Tan et al., 2010). Social relationships offer reciprocal benefits to one another over time which has a direct impact on transaction costs. It emphasises on the fact that collaborative inter-organisational relationships allow firms to make relationship-specific investments, share important information and engage in activities that improve the performance of both partners which will eventually lower transaction costs (Hoyt and Huq, 2000, Sheu et al., 2006). Hence, TCT, from an economic standpoint, provides a basis on which supply chain relationships are developed, where firms share information, and risks and benefits for the achievement of their common goals to improve the overall supply chain performance.

2.3.2 Resource Based View (RBV)

The primary emphasis of resource-based view is the management of internal resources to achieve advantages difficult to be imitated by competitors (Conner, 1991, Fawcett et al.,

2007a). According to the RBV, resources could be defined as tangible (e.g., machineries and equipment) or intangible (process knowledge) assets possessed by a firm that act as its strength (Wernerfelt, 1984). Firm resources include assets, capabilities, organisational processes, firm attributes, skills of employees, patents, information and knowledge that are strictly controlled by the firm and enable it to use them in a way that improves its efficiency and effectiveness (Grant, 1991, Varadarajan and Cunningham, 1995). Barney (1991) suggests four major characteristics for resources to hold the potential of sustained competitive advantages which are: valuable, rare, inimitable and non-substitutable.

The RBV is based on the fact that every firm is different in terms of their resources and internal capabilities (Barney, 1991, Peteraf, 1993, Barney, 2001). The RBV posits that the proper development and exploitation of these valuable, rare, inimitable and non-substitutable resources puts a given firm at an advanced level over its competitors (Tan et al., 2010). Firms lacking certain skills, resources and capabilities will make an effort to form a collaborative relationship with the partners possessing those resources (Varadarajan and Cunningham, 1995, Paulraj et al., 2008). According to Peteraf (1993), firms with unique resources are capable of competing in the market and hence, should protect and preserve their resources to help generate increased rents for sustained competitive advantage. The resource based view (Wernerfelt, 1984) clearly regards information as a valuable resource which makes the firm possessing it more powerful leading to a competitive advantage over its partner firms (Hall, 1992, Hall, 1993, Mason-Jones and Towill, 1997). Based on RBV, this study considered information as strategic resource and supply chain performance as capabilities (Grant, 1991, Huo et al., 2016). To create valuable capabilities, it is imperative that the resources the company have is used or exploited effectively (Huo et al., 2016). With the fear of losing power, firms are reluctant to give away information, and thus, it requires incentives for firms to agree to share information with their partners. Fawcett et al. (2007a) suggest that resources if shared can change companies' processes and business models that directly affect firm performance. Since some resources cannot be generated internally, an external approach is required (Samaddar et al., 2006). This explains why firms develop collaborative partnership to gain access to important information required to achieve their performance goals (Patnayakuni et al., 2006, Kembro et al., 2014). Thus, information sharing, while on the first level, seems more like resource sharing which may cause the delivering firm to lose its power, can act as a new capacity for both the delivering and receiving parties. Under the SCM

concept, the sharing process itself creates intangible resources that are inimitable, creating much value to the partners.

Although firms try to keep information to themselves as a valuable resource, the collaborative relationship built through the sharing of important information amongst the supply chain partners will be a more valuable resource which will generate relational rents and have a significant impact on supply chain performance enhancement (Patnayakuni et al., 2006). In addition to the development of collaborative relationships, knowledge development through critical thinking processes, analysis, evaluation, review and reflection of the information received is another important resource generated through the sharing of useful business information (Jarvenpaa and Staples, 2000, Hult et al., 2004, Cheng, 2011, Sanders et al., 2011, Rashed et al., 2013).

Managers tend to focus more on tangible assets such as infrastructure and technology, which can be easily copied or acquired by competitors (Fawcett et al., 2007a). The competition between firms can develop unique resources and skills that are much more difficult to imitate such as knowledge and relationships. It can be argued that, collaborative partner relationship and knowledge development are valuable resources which are unique, inimitable and non-substitutable (Patnayakuni et al., 2006, Fawcett et al., 2007a) and will play a crucial role in reducing the transaction costs. Thus, on the one hand firms give up their power by sharing information (tangible) with their partners; on the other hand, through information sharing, partners reap the benefits of intangible resources and the relationship developed from the process.

Hence, the resource based perspective supports the need of information sharing between supply chain partners in the development of sustainable competitive advantage (Hoyt and Huq, 2000, Patnayakuni et al., 2006) and provides a clear theoretical foundation, based on which investigation can be made to identify the factors that influence information sharing amongst supply chain partners (Kembro et al., 2014).

2.4 Information Sharing

According to the “Information-Capability Hierarchy” (Fawcett et al., 2007a), most companies today are competing at the information level of the hierarchy rather than the wisdom and

knowledge. While information is an important resource that every firm tries to keep it to themselves, the value generated through sharing information is much more as it is through shared information, firms develop new knowledge which is more valuable and actionable (Jarvenpaa and Staples, 2000, Rashed et al., 2013). Firms need to understand the importance of information and realise that its real benefit can be gained once it is shared throughout the supply chain (Mason-Jones and Towill, 1997).

Milliken and Company, a textile and chemical company was one of the pioneering companies to share information with its trading partners in the form of point-of-sale data (POS) which helped reducing the order lead time from 18 weeks to three weeks (Levi et al., 2008). Besides Milliken and Company, Dell and Wal-Mart can be considered as the best examples of companies that have demonstrated the benefits of information sharing to help supply chain actors to work collaboratively towards a common goal (Fawcett et al., 2007b).

Information sharing is the process of exchanging information among supply chain members or partners which is critical and proprietary in nature (Li et al., 2006b, Ramayah and Omar, 2010). Information content and information quality are the two major aspects of information sharing (Li and Lin, 2006, Zhou and Benton Jr, 2007). According to the RBV, organisations are hesitant to give away more than minimal information as they consider information as a valuable resource and a source of power and sharing information means giving up their competitive advantage (Mason-Jones and Towill, 1997, Li and Lin, 2006, Fawcett et al., 2007b). Thus, potentially useful information required for decision making remains unavailable for the managers (Fawcett et al., 2007b) as they consider the risks of sharing information higher than the benefits they can gain from information sharing (Kähkönen and Tenkanen, 2010).

Available information needs to be shared with partners to enhance processes to meet customer needs, or else it will have very little value (Stank et al., 1996, Kwon and Suh, 2004). Information sharing and the development of strong relationships among supply chain partners have been regularly studied in the literature as a way to overcome SCM implementation barriers (Moberg et al., 2002, Huo et al., 2016). It is an important predictor of successful partnership as it helps partners to complete their tasks more effectively and increase their level of satisfaction (Mohr and Spekman, 1994). The availability of undistorted and up-to-

date information is the key to achieve supply chain efficiency and effectiveness (Mason-Jones and Towill, 1997, Li and Lin, 2006, Hsu et al., 2009).

Information asymmetry has been addressed as a key problem in every supply chain (Madlberger, 2009). For example, the upstream partners who maintain stock levels in the chain always have less information regarding customer demand whereas the trading partners closer to final customers have full information about market demand (Mason-Jones and Towill, 1997, Chu and Lee, 2006, Madlberger, 2009). As a result, it is likely that upstream players with limited demand information will end up misinterpreting market demand with catastrophic effects on cost and inventory level (Mason-Jones and Towill, 1997, Madlberger, 2009).

Information sharing in a supply chain takes place in two different ways: 1) internally for the effective planning of purchases and company growth and 2) externally for sharing information with supply chain partners to enhance demand planning, physical flows, and financial work processes (Du et al., 2012, Huo et al., 2016). It is crucial for supply chain members to share important information across various functions and boundaries (Eng, 2006). In order to be able to share information with supply chain partners, information needs to be shared first internally amongst various departments or functions (Fawcett et al., 2007a). While internal information sharing is critical, it is not within the scope of the current study. The focus is on information sharing with external partners which will help supply chain members to coordinate their processes for improved supply chain performance in terms of costs and customer service (Moberg et al., 2002).

For a firm to reap the benefits of information sharing on supply chain performance, it should first address the issues such as what information is shared, when and how it is shared, and with whom it is shared (Holmberg, 2000). If these issues are properly addressed, it would minimise sharing costs, information deficiency or overload and improve customer responsiveness by fulfilling their demands at a faster speed (Ramayah and Omar, 2010).

2.4.1 Why Should Information Be Shared?

A number of authors have highlighted the fundamental need for information sharing for supply chains to improve their performance (Gustin et al., 1995, Cachon and Fisher, 2000, Lee and Whang, 2000, Fawcett et al., 2007b, Zhou and Benton Jr, 2007, Baihaqi and Sohal,

2013). Supply chain members may not realise the need to share information with partners if they have excess capacity (Hall and Saygin, 2012). However, maintaining excess capacity means more cost on inventory, machinery and labour. It is important for firms to maintain a balance between their capacity and their costs for which they need to share information with their trading partners. For example, if they receive timely and accurate information from their downward partners about customer demand and upward partners about the status of supply, they will know how much to acquire and how much to keep as buffer stock. In this way they will not have to maintain an excess capacity and their money will not be tied up.

Supply chain members feel the pressure to share information with their trading partners due to increased demand uncertainty, globalised supply chains, pressure to reduce costs and the need to bring products to the market faster. Conversely, firms are hesitant towards information sharing due to their fear of being exposed to opportunism, misuse of their proprietary information, fear of information overload and financial and technical barriers to IT implementation. Figure 2.1 summarises the pressures for and against information sharing in supply chains. In the figure, the upper side represents the pressures 'for' and the lower side represents pressures 'against' information sharing.

Yu et al. (2001) suggest that the negative impact of the bullwhip effect on a supply chain can be reduced or eliminated by sharing information with trading partners. Supply information shared in a timely manner can diminish the effect of disruption at an upstream stage by alerting the downstream stages to make alternate arrangements (Li et al., 2006a). Similarly, timely sharing demand and sales information by the downstream supply chain can prevent disruptions in the upstream supply chain (Li et al., 2006b) by reducing problems such as inaccurate demand forecasts, low capacity utilisation, excessive inventory, and customer service failure due to stock outs (Lee et al., 2000). The upstream members can synchronise their production and delivery schedules by accessing the customer inventory information (Kaipia and Hartiala, 2006). This provides significant cost savings to the manufacturers whereas retailers do not benefit much from sharing that information. In order to motivate retailers to share the necessary information, vendors should provide incentives to help retailers reduce costs by making arrangements such as vendor managed inventory (VMI) programs, flexible payment terms, lead time reduction, lower wholesale price, and sharing IT implementation costs (Chu and Lee, 2006, Lee et al., 2000). The negotiation of the terms of

incentives should be agreed in advance (Yigitbasioglu, 2010) so that there are no disputes later.

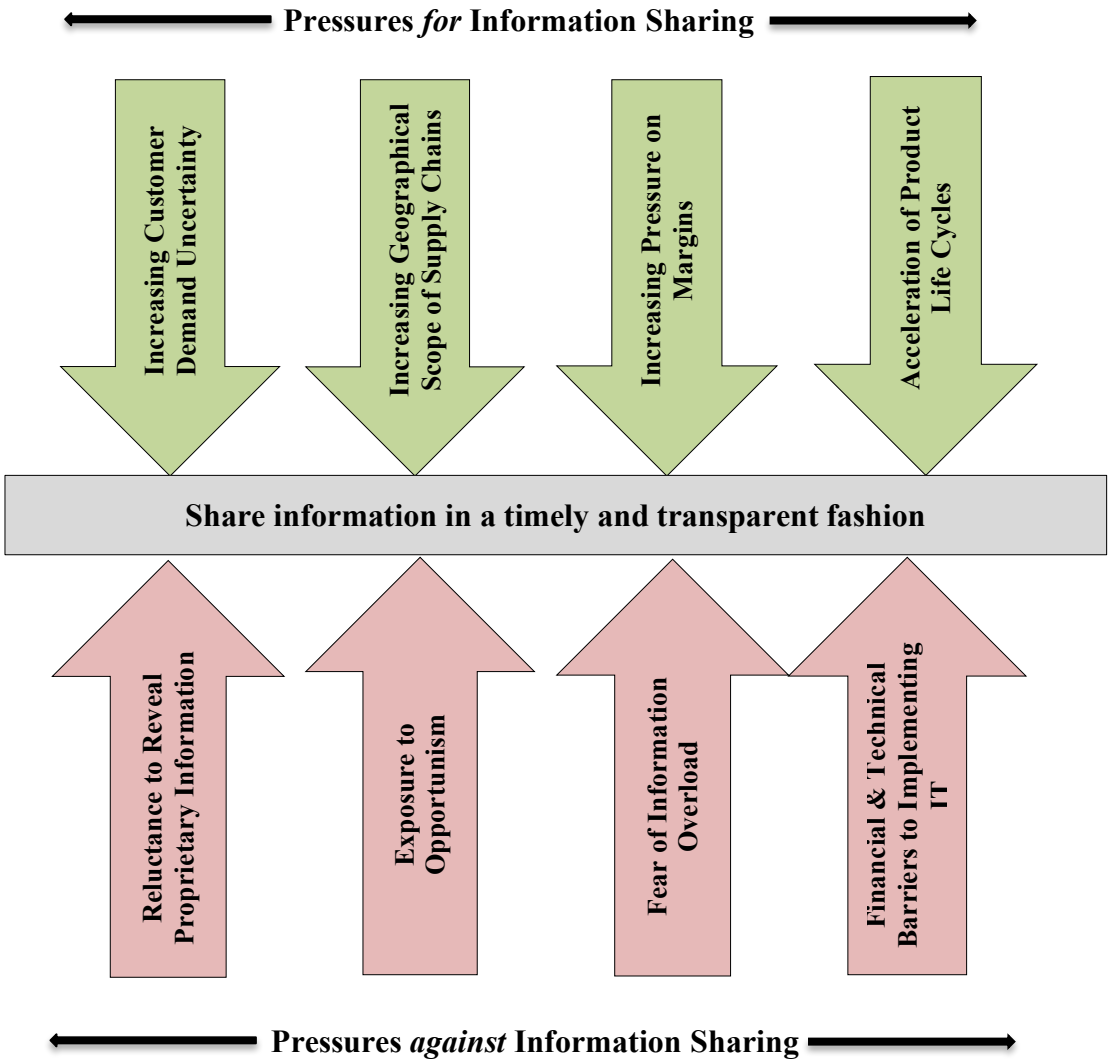

Figure 2.1: Force-field Diagram Summarising Pressures for and against Information Sharing in Supply Chains

Source: Childerhouse et al. (2003)

Sharing important information between supply chain partners to have a long-term perspective on the relationship helps to reduce opportunistic behaviour (Kwon and Suh, 2004). However, Hall and Saygin (2012) state that the nature of the relationship between supply chain partners plays a significant role on determining the performance improvement through information sharing. Thus, supply chain partners can initiate information sharing by exchanging a small amount of information at operational level (such as orders) in the initial stages and can later

share more confidential and sensitive information once the relationship grows and the partners have confidence in each other (Cooper et al., 1997a).

2.4.2 What Information Should Be Shared?

According to Du et al. (2012) firms need to be very careful when determining what and with whom information is shared because information sharing involves the sharing of important operational, strategic and financial information with those partners who might be future competitors. Information exchange in supply chains mainly incorporate product and product development information, customer information, supplier information, manufacturing procedure information, transaction information, transportation information, inventory information, supply chain alliance information, competition information, sales and market information, supply chain process and performance information (Hsu et al., 2009). Fawcett et al. (2007a) suggest that at a minimum, firms should be sharing the following types of information: sales data and sales forecasts, inventory levels, order status for tracking/tracing, performance metrics, and capacity and capability information. A frequent, bidirectional, informal and non-coercive information sharing is preferred (Cai et al., 2010) even though the nature of information shared varies from strategic to tactical depending upon the orientation (strategic or operational partnership orientation) of the partners (Mentzer et al., 2000).

Because of the variety of information and the availability of various sharing options, it is difficult to determine the nature or level of information sharing between firms (Feldmann and Müller, 2003). Therefore, Seidmann and Sundararajan (1998) suggest that firms should share information up to the level where it is beneficial for them to do so. It was proposed that the information sharing must be reciprocal, selective and justified - but not necessarily symmetrical (Rashed et al., 2013).

Seidmann and Sundararajan (1998) categorise information sharing into four main categories depending on how the shared information affects buyers and suppliers, 1) transactional level such as order quantities and prices; 2) operational level such as inventory levels; 3) strategic level such as distribution plans; and 4) strategic and competition level such as market information. The four categories of information sharing suggested by Seidmann and Sundararajan (1998) can be condensed into operational information sharing (Short-term) and strategic information sharing (Long-term) as time frame is the major difference between the

four categories (Moberg, 2000). In order to perform short-term activities to achieve operational efficiencies, firms need operational information sharing whereas, firms need to acquire strategic information to perform long-term activities for achieving strategic goals that deliver value to customers and profitability to partners (Lee et al., 2010). To capture the possible differences between firm's incentives to share different levels of information, this study differentiates information sharing as operational and strategic information sharing.

Operational information sharing refers to the sharing of order status, shipment notice, production and delivery, sales, logistics or inventory level information on a daily or weekly basis with an aim to reduce order cycle time and inventory levels and to improve asset utilisation and customer services (Moberg et al., 2002, Patnayakuni et al., 2006, Ramayah and Omar, 2010). Operational information plays an efficient role to leverage operational economies of scale and expertise of an organisation (Patnayakuni et al., 2006). As operational information determines the everyday activity of a firm, the speed of information exchange plays a significant role in lowering inventory costs and enhancing customer services (Moberg, 2000). Unlike strategic information, most of the operational information is quantitative in nature such as order, sales and inventory information which can be obtained in tables and spread-sheets through information technologies such as internet and EDI (Moberg, 2000).

A good example of sharing operational information is vendor managed inventory where a supplier manages its own products' inventory at the buyer's site. This results in cost savings for both parties as both parties experience reduction in inventory costs and lead times. This also reduces the supply-side uncertainty that a buyer normally faces. The supplier on the other hand gains superior knowledge on how well its product is doing which gives it the advantage to bargain for price schedules that are more in its favour (Seidmann and Sundararajan, 1998).

Strategic information refers to information which is strategic in nature and covers long-term issues and has a long term effect on firm business strategies such as marketing, logistics, new product development and other business strategies (Moberg et al., 2002, Ramayah and Omar, 2010). Due to the qualitative nature of the strategic information, managers prefer to share strategic information through face-to-face meetings or phone calls rather than using new advanced technologies (Moberg et al., 2002). Unlike operational information sharing, the speed of strategic information sharing is not likely to significantly affect its value to the

recipient of the information (Moberg, 2000). The exchange of sensitive, long-term strategic information was not common in the past whereas the exchange of operational information such as ordering information started even before the development of information technologies and SCM initiatives (Moberg, 2000).

Sharing point-of-sales (POS) information is a good example of strategic information sharing. POS information can be categorised as operational information as it helps a retailer to derive the inventory positions. However, it can provide strategic benefits to a supplier who can make superior demand forecasts by analysing the POS data (Seidmann and Sundararajan, 1998). The availability of POS information will help suppliers to make superior demand forecast including segment-specific (geographical or seasonal) forecast, which can be of great value to its sales and product development groups improving their internal operating efficiency (Seidmann and Sundararajan, 1998). On the other hand, sharing POS information gives the retailer the power to negotiate on price, payment terms, lead time reduction and sharing IT implementation costs (Lee et al., 2000, Chu and Lee, 2006).

The differences between operational and strategic information sharing is summarised in Table 2.1 (Moberg, 2000).

Table 2.1: Difference between Operational and Strategic Information Sharing

	Types of Information Sharing	
S.N.	**Operational**	**Strategic**
1	Short-term daily information	Long-term information
2	Quantitative in nature	Qualitative in nature
3	Shared through advanced IT	Shared through face-to-face meeting or phone call
4	Less complex	More complex
5	Can be captured in tables and spread-sheets	Cannot be captured in tables and spread-sheets
6	Operational information has been commonly exchanged in the past	Strategic information has not been commonly exchanged in the past
7	Firms are more comfortable sharing operational information	Firms are less comfortable sharing strategic information

Source: Adapted from Moberg (2000)

2.4.3 With Whom Should Information Be Shared?

According to Fawcett et al. (2007a), the functions within an organisation such as purchasing, sales and marketing primarily deal with external organisations and hence, should be the first point of contact between a firm and its external organisations. This is a traditional way where all the information is shared between the buyer of one firm and the seller of the other and the rest of the two firms' functions remain isolated from each other in terms of communication and interaction (Cooper et al., 1997a). The "bow-tie" approach in Figure 2.2 demonstrates the information sharing relationship between the sales unit/department of a company and the purchasing unit/department of the other.

However, it is not necessary that an organisation should communicate with the other organisations through either sales or purchasing personnel. The supply chain information sharing process would be more efficient if different functions within an organisation can directly share information with the corresponding functions of their partner organisations, an approach referred to as "diamond approach" shown in Figure 2.3 (Cooper et al., 1997a). Such an approach will create more close relationships between personnel of the two firms which will further enhance integration and collaboration between firms (Fawcett et al., 2007a).

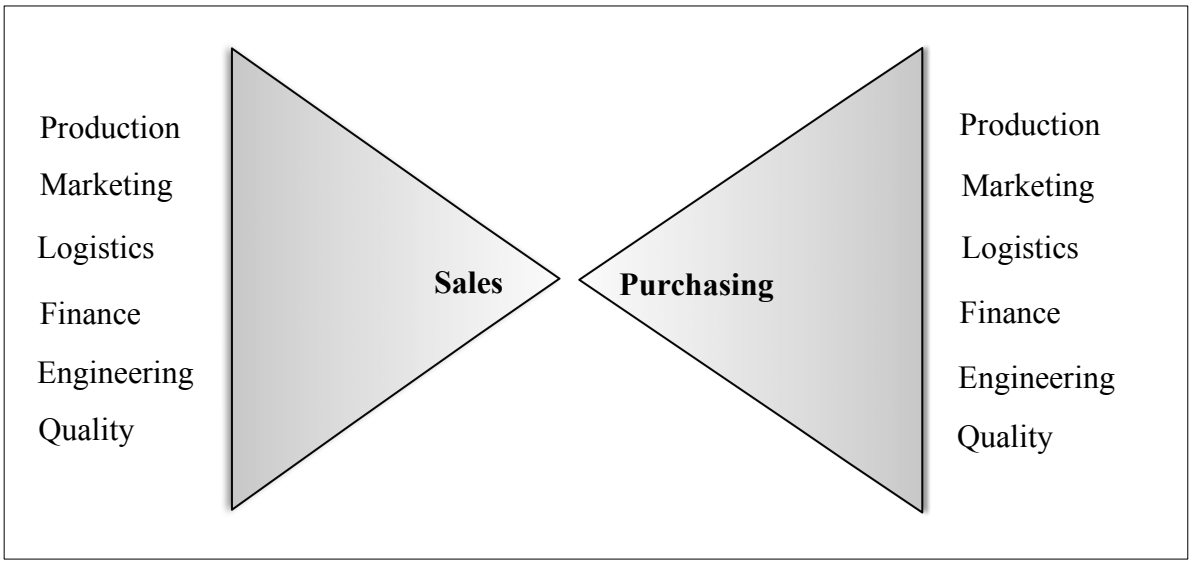

Figure 2.2: Bow-Tie Approach to Information Sharing
Source: Cooper et al. (1997a)

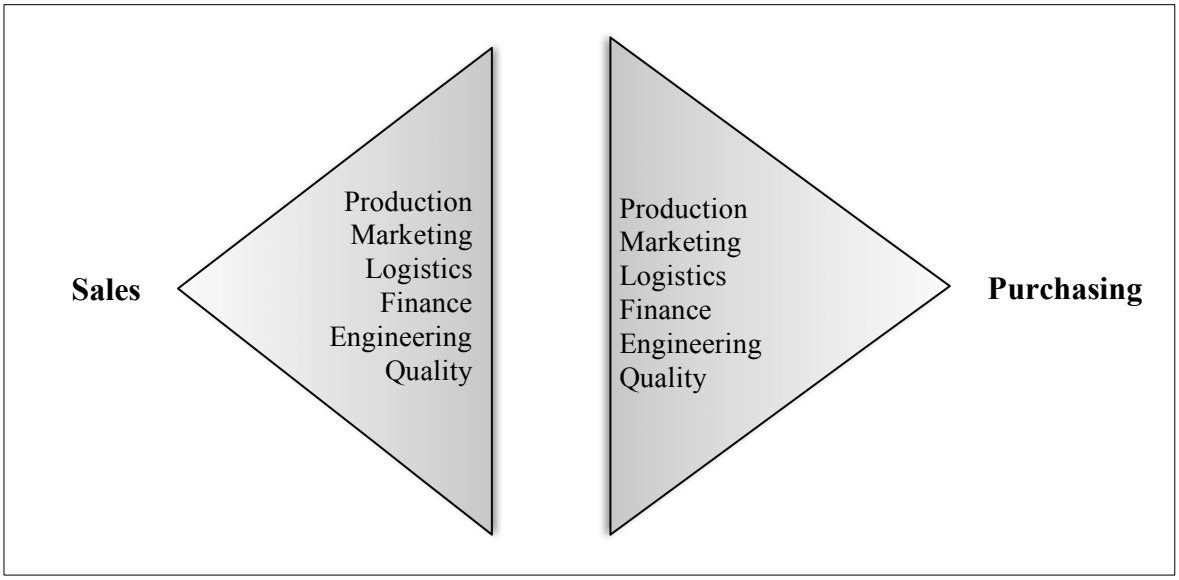

Figure 2.3: Diamond Approach to Information Sharing
Source: Cooper et al. (1997a)

It is clear that the bow-tie approach likely results in lost or incomplete information as there is no direct connection between the various functions of the two partner firms, while the diamond-approach more likely leads to the establishment of closer, partnership style relationships across other functions providing more efficient and effective customer services (Cooper et al., 1997a). However, it is not necessary that firms should only follow the diamond-approach because information sharing should not be confined between the counterparts of the partnering firms, rather information should be made available to all the other functions of the two firms. For example, if the logistics department of the buyer firm, in order to plan their next delivery, needs information regarding the production process, it would be more effective if the logistics department has direct access to the production information of the partner firm to make their delivery decisions rather than spending time to acquire that information through its logistics counterpart.

2.4.4 Information Sharing – A Cross-functional Driver of Connectivity

The connectivity of a country is defined as the position of the country with regards to their business network in terms of physical and non-physical facilitating linkages within and beyond border through the development of required infrastructure for the efficient flow of goods and services to the end users (Bhattacharyay, 2010, Arvis et al., 2014). Globalisation has caused global and regional trade structure to change into more networked structure which

is why the low income countries with limited resources and infrastructure are becoming increasingly disconnected from the global markets (Arvis et al., 2014). This emphasises the fact that low-income countries need to pay more attention to enhance their trade potential to remain connected and reduce their chances of getting excluded from the global trading system (Arvis et al., 2014, De, 2014). Hausman (2004) and Paulraj and Chen (2007) suggest that supply chains are only as strong as their weakest links, which might be another strong reason for global supply chains to exclude those countries that have poor structure design and implementation plan of their supply chain systems.

With the lacking resources for economic development, and hindered by inadequate transportation network, Nepal is one of the least developed nations in the world. Nepal ranks 105th/160 in the Logistics Performance Index (LPI) 2014 ranking (Arvis et al., 2014) and ranks 119th in the ESCAP International Supply Chain Connectivity (ISCC) Index global ranking (De, 2014). Countries like Nepal with abundant natural resources and low labour costs are on the verge of getting excluded from international trade because of poor geographic connectivity. Improving connectivity with its national and international trading partners will help Nepal to recognise its full development potential by reducing trading costs and by helping the country to overcome the disadvantages of small economic size, small market and geographic constraints (Rana and Karmacharya, 2014). Developing predictable and reliable supply chains are central to maintaining and improving the global and regional trade connectivity (De, 2014) whether it is through logistical drivers (such as transportation and facility) or through cross-functional drivers (such as information) (Chopra and Meindl, 2003). The duty to design and implement a well-managed supply chain lies within the country or region. It is important for countries with poor economies to identify their supply chain connectivity weaknesses and find a way to improve them so as to enhance the performance of the overall trade.

In the context of Nepal, the connectivity with national and international trade through physical infrastructure such as transport and logistics services has been studied previously (Rajkarnikar, 2010, Rana and Karmacharya, 2014). However, discussion on connectivity that can be developed and maintained through non-physical or soft infrastructure such as information has been scarce. Logistics connectivity is an important aspect for national and international trade enhancement. For a landlocked and mountainous country like Nepal, establishing and maintaining logistics connectivity is difficult, though continuous attention

has been paid towards it (Rajkarnikar, 2010, Rana and Karmacharya, 2014). Insufficient logistics connectivity results in more time taken to move goods across borders. To mitigate the risks associated with unreliable and untimely delivery, firms have to either increase their inventory holdings or seek alternative modal choice which further push up the already high logistics costs (Arvis et al., 2010). Because of uncertain and unreliable transport delivery, firms in developing countries accumulate high level of safety stocks which might sometimes be equivalent to one year of expected sales (Arvis et al., 2010). As a result of insufficient logistics connectivity, supply chain costs such as transportation costs, inventory costs and warehousing costs are high which will eventually increase the overall trading costs.

Sharing timely and correct information with supply chain partners such as production capacity and schedule, inventory level, delivery schedule and tracking and tracing will help organisations to cope up with logistical issues. If trading partners share necessary and important business information with each other, they can reduce temporal and spatial distance which will help to manage their supply chain operations reducing logistics costs and improving connectivity (Fawcett et al., 2007b). Information sharing is an important non-physical (soft) infrastructure, facilitating supply chain linkage. It has the potential to manage other physical linkages (transportation, inventory and facilities) of SCM which will further enhance connectivity as a whole (Bhattacharyay, 2010, Mirza and Bacani, 2013).

There are studies that have considered telecommunication as a source of physical connectivity (Bhattacharyay, 2010, Rana and Karmacharya, 2014) but have failed to explain the role of information sharing as a non-physical source of connectivity and for which telecommunication technologies are developed. The connectivity through information technology is possible only when trading firms have the ability and willingness to share information which is the soft infrastructure for connectivity. Nepal has realised the importance of information technology in trade and has invested in fibre-optics, data interchangeable capacity, internet and other information and communication technologies (ICT) (Rana and Karmacharya, 2014). However, to augment connectivity via available information, physical infrastructure such as information technology is not sufficient but rather firms should have a willingness to share the information that they possess. This provides a strong justification for researchers to focus on information sharing as an important measure to enhance supply chain connectivity with trading partners within and beyond national border in a low-income country like Nepal with severe geographical constraints for connectivity.

Supply chain management has become an important approach within management in developed countries since the 1990s (Zhang and Chen, 2013). Producing the right products, in the right quantities, at the right time, with good quality, and at a price customers are willing to pay, has been the first priority of supply chain management. However, owing to the differences in the unique set of characteristics maintained by each individual country, the supply chain environment in developing countries may be significantly different from that of developed nations (Yaibuathet et al., 2008). Different characteristics such as economic development, company size, E-commerce, use of technology, national culture and government involvement might affect SCM implementation.

According to Li et al. (2006b), although some organisations have realised the importance of SCM implementation, they often do not know exactly how to implement it due to lack of understanding of what constitutes SCM practices. Similar is the case of Nepal where handful of medium/large companies have realised the importance of SCM implementation, however, successful SCM implementation is still rare. Barriers to effective implementation of SCM include a lack of managerial comfort with the sharing of information with partner firms, an unwillingness to subordinate one firm's goals for the good of the supply chain, employee resistance to change, technological inadequacies, weak relationships among trading partners and lack of human and financial resources to invest in supply chain initiatives (Moberg et al., 2002).

With delayed modernisation and the weak industrial economic sector, many firms in Nepal pay lip-service to the importance of SCM and its implementation. A majority of firms operating in Nepal have little knowledge about SCM and the benefits that it brings to the entire chain. There are a number of problems faced by companies in Nepal including the absence of corporate cultures, weak enforcement of rules and regulations, poor financial management, operational inefficiencies, overstaffing, unskilled employees, growing employee dissatisfaction, increasing quality complaints, government interference and lack of motivation (Adhikari, 2010). Due to these problems, firms in Nepal lack management and technological expertise which are critical to the industrialisation and modernisation and thus, have not been able to implement SCM practices efficiently in their companies.

Nepal is one of the least developed countries in the world with agriculture dominating the national economy whereas the manufacturing industry is still at rudimentary stage (Adhikari

and Pradhan, 2002). While the total number of operating manufacturing establishments have increased by 18.3% during 2011/2012 (Government of Nepal, 2014), people are still not willing to invest in supply chain management as they do not see the benefits of doing this. Firms that have implemented SCM have hardly done it in an appropriate and efficient way. In addition, there is a lack of qualified supply chain management professionals. Consequently, many well-known firms in Nepal are still very uncompetitive in the international market. Moreover, Nepal has been continuously facing the political turmoils for many years, which have not only affected the social and public lives but also affected the nation's businesses. Such insurgency has been disrupting the development of efficient supply chains in the country. The weak economic and political condition and the rudimentary industrial structure along with the scarcity of well qualified and trained people are the main reasons why supply chain management development is dawdling in Nepal in comparison to the developed countries (Adhikari and Pradhan, 2002). Studies conducted in the context of Nepal may help Nepalese companies to understand the importance of supply chain management and information sharing.

2.5 Supply Chain Performance

2.5.1 Supply Chain Performance Measurement

In order to make timely and right decisions regarding supply chain activities, it is crucial for firms to measure the right thing at the right time (Gunasekaran and Kobu, 2007). Performance measures such as financial and non-financial, strategic, tactical or operational are the indicators of showing the effectiveness of the applied business processes, policies and strategies on the ultimate expected output (Chan and Qi, 2003, Ghosh and Fedorowicz, 2008). The main purpose of performance measurement is to stimulate actions for continuous learning and improvement through the use of feedback provided by performance indicators (Neely et al., 1995).

A supply chain consists of several entities including manufacturers, transport providers, distributors, wholesalers, retailers and end customers. Supply chain partners expect timely, reliable and quality delivery of the right quantity of products at low cost at each stage of the process (Mandal, 2012). There is a great need to improve supply chain performance rather than individual firm performance in order to remain competitive in the global market

(Ramayah and Omar, 2010). However, according to Hausman (2004) and Paulraj and Chen (2007), supply chains are only as strong as their weakest link, which means that the performance of the whole supply chain depends upon the performance of individual organisations and their willingness to coordinate and cooperate with all their supply chain partners (Hall and Saygin, 2012). Even if a single entity in the chain performs poorly, the entire chain performance will be affected negatively. Thus, in order to enhance the supply chain performance of the chain as a whole, the initiation should start from enhancing the supply chain performance of individual members first. While it is deemed necessary to improve individual firm performance, it should also be noted that their supply chain performance should be considered first since firm performance significantly depends on supply chain performance of the firm. Therefore, to improve firm performance of the individual member and the supply chain performance of the entire chain, supply chain performance of the individual members needs to be improved first.

Customer satisfaction is the main indication about how a particular company is performing (Fawcett et al., 2007a). Customers have different priorities when it comes to satisfaction, with some focusing on prices and others on quality, delivery or flexibility. Hausman (2004) states that one dimensional performance measures can be dangerous and misleading because when a firm considers only one performance metric and makes an effort to enhance it, there are likely chances that the other performance metrics get affected. There are several things to be considered before using particular metrics to measure supply chain performance. The specific performance metric chosen should align with the chain's business product strategy, objective, value proposition, type of business, nature of the market and technological competence Hausman (2004), (Lockamy III and McCormack, 2004, Gunasekaran and Kobu, 2007, Arzu Akyuz and Erman Erkan, 2010). In addition, it should help in strategy development, decision making and performance improvement (Chan and Qi, 2003). According to Brewer and Speh (2000), performance of supply chains should be evaluated using a performance measurement system that are significantly affected by supply chain improvements. Supply chain members have their own unique selling points (USPs) that make them distinct from other businesses and appealing to customers, hence, they should choose performance measures which will help them to enhance their USP.

An analysis of literature in supply chain performance shows that different researchers have presented different metrics and measures to capture supply chain performance (Kaplan and

Norton, 1992, Neely et al., 1995, Kaplan and Norton, 1996, Beamon, 1999, Brewer and Speh, 2000, Gunasekaran et al., 2001). Kaplan and Norton (1992) introduce Balanced Scorecard (BSC) to measure performance through addressing financial issues along with additional issues such as customer, internal business processes and innovation and growth. Neely et al. (1995) provide categories of performance measures to include time, quality, flexibility and cost. Narasimhan and Jayaram (1998) investigate customer responsiveness and manufacturing performance as the two performance measures. Beamon (1998) and Chan (2003) categorise performance measures into two categories, qualitative (e.g., customer satisfaction and flexibility) and quantitative (cost minimisation and profit maximisation). Beamon (1999) suggests a supply chain performance measurement system consisting of three separate types of measures: a) resource measures (e.g., manufacturing cost, personnel requirements, energy usage etc.), b) output measures (e.g., sales, profit, quality, delivery performance), and c) flexibility measures (volume flexibility, delivery flexibility etc.). Otto and Kotzab (2003) propose six perspectives of measuring supply chain performance that include system dynamics, operations research, logistics, marketing, organisation and strategy area. Gunasekaran et al. (2004) empirically categorise supply chain performance metrics into strategic, tactical and operational measures which are absolutely necessary to monitor supply chain processes (plan-source-make-deliver). While there are several performance measures suggested in the literature, there has been no consensus on measuring supply chain performance with particular measures as each measure has its own strengths and drawbacks (Chow et al., 1994, Tan et al., 1999). However, a performance measurement system should include financial indicators complemented by non-financial indicators based on a firm's strategic goals and objectives (Horváth and Moeller, 2004, Bhagwat and Sharma, 2007, Arif-Uz-Zaman and Nazmul Ahsan, 2014). Based on different views from the literature Gunasekaran and Kobu (2007) analysed and identified 27 key performance indicators categorised into following criteria:

- Balanced score card perspective;
- Components of performance measures;
- Location of measures in supply chain links;
- Decision-making levels;
- Nature of measures;
- Measurement base; and

- Traditional vs. modern measures.

The objective of the current study is not to develop a performance measurement and provide a thorough evaluation of the performance based on SCM. This study rather aims to assess and report the effect of information sharing on supply chain performance to demonstrate the potential association between the two which is reflected in terms of its ability to be responsive to customer demands with reduced costs and improved delivery and flexibility. This provides a sensible ground to choose a small number of supply chain-wide performance metrics that are most likely to be measured by the survey participants (Tsanos et al., 2014).

While different organisations have different goals and objectives, the ultimate common goal of every supply chain is customer satisfaction and increased profitability (Chow et al., 1994, Hausman, 2004). In order to fulfil customer demand and enhance profitability, firms need to manage their resources to produce desirable outputs within customer preferred time and improve their preparedness to face unexpected changes in demand. This is the basis of performance measurement definition provided by Neely et al. (1995) according to which performance measurement is the process of quantifying the effectiveness and efficiency of action. This is supported by the performance measurement concept proposed by Beamon (1999) that includes resource measures, output measures and flexibility measures. On the basis of the concept of supply chain management discussed above, this research has considered cost, quality, delivery and flexibility as the components of performance measurement to discuss how information sharing in a supply chain system helps to achieve simultaneously a high level of efficiency (measured by cost), customer service (measured by quality and delivery) and the ability to respond effectively to a changing environment (measured by flexibility) (Beamon, 1999).

This choice of performance measures is also in line with Kaplan and Norton's Balanced Scorecard model (Kaplan and Norton, 1992) which prioritises on operational measures that includes customer satisfaction, internal processes and the organisation's innovation and improvement activities along with the financial measures. While financial metrics are necessary for strategic decision making, non-financial measures are more important to control day-to-day supply chain activities such as manufacturing and logistics/distribution operations (Gunasekaran et al., 2004). The simultaneous improvement of different operational

performance measures leads to an improved future financial performance (Kaplan and Norton, 1992).

Cost, quality, delivery and flexibility satisfy all the characteristics of supply chain performance metrics illustrated in Figure 2.4. The chosen performance metrics fulfil the requirement of performance metrics to represent main organisational goals (to reduce costs and make their customers happy by providing them whatever they want and whenever they want it) and at the same time reflect a balance between financial and non-financial measures (Kaplan and Norton, 1992, Gunasekaran et al., 2004). The chosen measures can be categorised according to their applicability to the supply chain operations reference (SCOR) model (plan, source, make and deliver) (Shepherd and Günter, 2006). It also fulfils the idea of "less is better" which suggests firms to use the few most important performance measures most critical to success (Gunasekaran et al., 2004, Chae, 2009). Furthermore, they include at least one measure from each of the three identified performance measure types suggested by Beamon (1999) - resource (cost), output (delivery and quality) and flexibility measures. Lastly, they are related to strategic and operational levels of decision making and control.

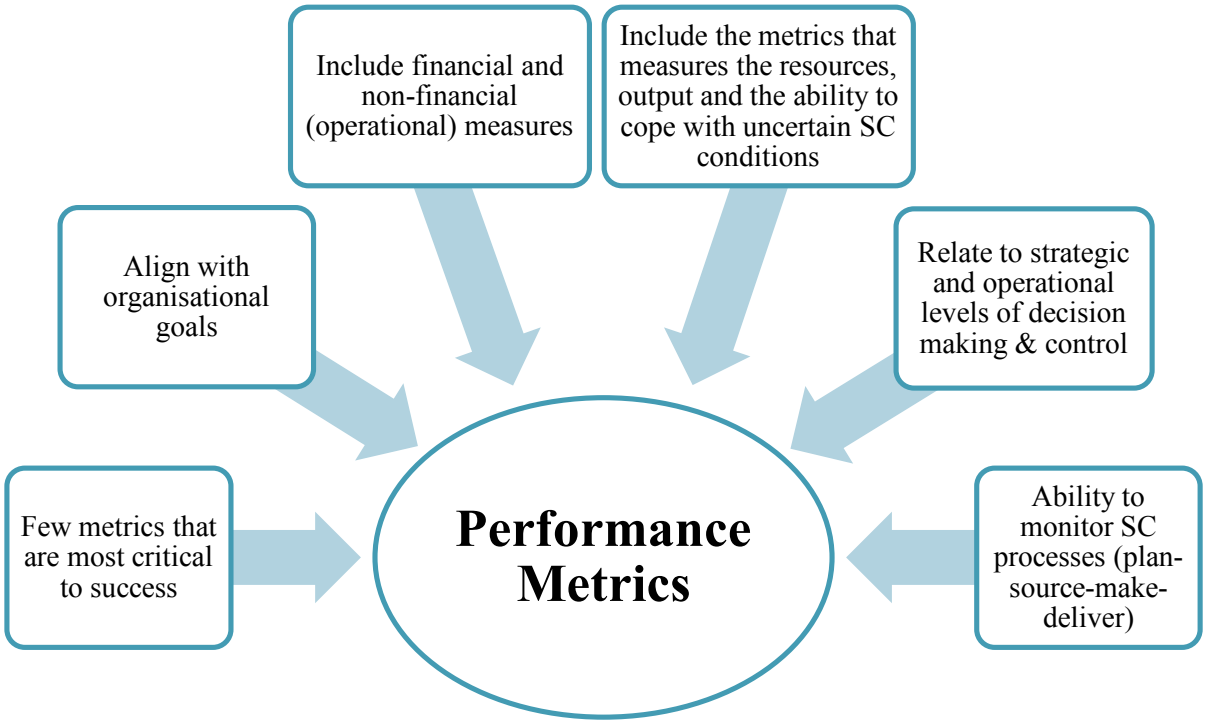

Figure 2.4: Important Characteristics of Supply Chain Performance Metrics
Source: Author

Since people put more effort on improving what is measured, performance measurement through cost, quality, delivery and flexibility will manoeuvre company direction for the accomplishment of the ultimate supply chain organisational goals of achieving customer satisfaction and profit maximisation (Beamon, 1999). While these are the most important non-tangible supply chain performance indicators, they are not the most measured ones because firms still focus on traditional financial measures such as gross revenue and profit before tax (Holmberg, 2000, Gunasekaran and Kobu, 2007, Chia et al., 2009). Performance measurement that employs a combination of different criteria will enable a firm to achieve its overall goals and objectives. Table 2.2 shows the classification of cost, quality, delivery and flexibility on the basis of different criteria identified by Gunasekaran and Kobu (2007).

Table 2.2: Classification of Cost, Quality, Delivery and Flexibility on the Basis of Different Criteria

Criteria	Cost	Quality	Delivery	Flexibility
Balanced Score Perspective	Financial Internal process	Customers	Internal process Customers	Internal process Innovation & improvement
Components of Performance Measures	Resource	Output	Output	Flexibility
Location of Measures in SC Links (SCOR model)	Plan Make Deliver	Source Deliver	Deliver	Make Deliver
Decision Level	Strategic	Operational	Operational	Operational
Financial Base	Financial	Non-financial	Non-financial	Non-financial
Measurement Base	Quantitative	Qualitative	Quantitative	Qualitative
Traditional vs. Modern	Function based	Value based	Value based	Function based

Source: Adapted from Gunasekaran and Kobu (2007)

2.5.2 Effect of information sharing on Supply Chain performance

Several studies have considered information sharing as an important predicting factor for improved supply chain performance (Lee and Whang, 2000, Cachon and Fisher, 2000, Zhou and Benton Jr, 2007, Ramayah and Omar, 2010). However, very few studies have empirically examined the critical role of information sharing in enhancing supply chain performance (Tan et al., 2010, Koçoğlu et al., 2011). Sharing information such as inventory level, sales data, order status, sales forecast, and production/delivery schedule will help supply chain members to lower inventory cost involved, mitigate or reduce bullwhip effect, improve customer service, reduce payment cycle, reduce labour costs and manual operations, and ensure reliable supply and delivery (Lee and Whang, 2000). Focussing on supply chain performance will help supply chain participants enhance their motives towards information sharing. Supply chain partners sharing timely and accurate information gain the advantage to plan their strategies and delegate their functions which will eventually affect their performance level (Kocoglu et al., 2011). Table 2.3 summarises the effect of information sharing on supply chain performance.

Table 2.3: Information Sharing and Performance

Key References	Performance Metrics	Results
Cachon and Fisher (2000)	Supply chain cost	positive effect on SC costs
Lee and Whang (2000)	Cost, customer service and delivery	positive effect on costs, customer service and delivery
Lee et al. (2000)	Inventory reduction and cost reduction	positive effect on inventory reduction and cost reduction
Yu et al. (2001)	Inventory reduction and cost reduction	positive effect on inventory reduction and cost reduction
Fawcett et al. (2007b)	Operational and competitive performance	positive effect on performance
Zhou and Benton Jr (2007)	Delivery performance	positive effect on delivery performance
Sezen and Yilmaz (2007)	Resource, output and flexibility performance	No effect on resource, output and flexibility performance
Hsu et al. (2009)	Transaction flexibility	positive effect on transaction flexibility
Ramayah and Omar (2010)	Reliability, cost, flexibility, and Responsiveness	positive effect on reliability, cost, flexibility, and responsiveness

Key References	Performance Metrics	Results
Yigitbasioglu (2010)	Resource utilisation, output and flexibility	positive effect on buyer performance
Lee et al. (2010)	Efficiency and effectiveness	positive effect on buyer performance
Zelbst et al. (2010)	Cost, delivery and customer satisfaction	positive effect on SC performance
Kocoglu et al. (2011)	Costs, asset utilisation, flexibility, reliability, and responsiveness	positive effect on SC performance
Sanders et al. (2011)	Costs, quality, delivery and new product development	positive effect on supplier performance and indirect positive effect through communication openness
Hall and Saygin (2012)	Cost and customer Responsiveness	positive effect on cost and customer responsiveness
Baihaqi and Sohal (2013)	Delivery, cost, and market and financial	indirect positive effect on performance through collaboration
Ye and Wang (2013)	Cost efficiency and customer responsiveness	positive effect on cost efficiency and customer responsiveness
Wu et al. (2014)	Financial and non-financial measures	positive effect on SC performance
Li et al. (2014)	Efficiency and responsiveness	Information sharing (content and quality) → positive effect on SC performance

2.5.2.1 Cost

Cost and its reduction has always been the first and foremost priority of every supply chain and is considered as an important measure of performance (Ramayah and Omar, 2010). Cost performance comes under resource measures categorised by Beamon (1999) as one of the three types of performance measures. The main goal of measuring cost performance is to achieve a high level of efficiency. Financial performance, in which cost is a critical component, is still the widely used performance measure in the context of logistics and supply chain management (Gunasekaran and Kobu, 2007).

Supply chains face different types of costs such as inventory costs, logistics costs, manufacturing costs, distribution costs and operations costs (Beamon, 1999, Gunasekaran and Kobu, 2007, Lee et al., 2007). Cost is an important and most chosen measure of supply chain performance (Cachon and Fisher, 2000, Lee and Whang, 2000, Ramayah and Omar,

2010, Sanders et al., 2011, Hall and Saygin, 2012). Cost has a direct implication on firm's profitability. Lower the cost higher is the profitability. There is also a trade-off between cost and output and flexibility of a company. Hence, cost performance needs to be improved in order to achieve a balance between a firm's profitability and its output (delivery and quality) and flexibility performance. For example, inventory level that a company maintains will affect delivery performance. If a company has high buffer stocks, they can easily cope up with uncertainties and can make timely delivery. However, maintaining a high buffer stock involves huge costs, which otherwise, could have been used for other company activities or could have been its profits. It also increases the risk of product obsolescence which again will increase costs.

Information sharing between supply chain partners can enhance cost performance by keeping supply chain partners well informed about customer demands, inventory levels, production and delivery schedule and promotion strategies. Based on the inventory levels at the downstream end of the supply chain, upstream chain members can start production only when the inventory level reaches a certain pre-specified level (Lee and Whang, 2000). On the other side, the downstream members can use the production and delivery schedule information to decide how much inventory level to maintain which will help them to minimise their inventory costs, stock-out costs and obsolescence costs.

2.5.2.2 Quality

Quality is critical and determined by defect-free items/services as well as defect-free transactions between supply-chain partners (Babbar et al., 2008). According to Neely et al. (1995), the emphasis of quality is more towards customer satisfaction rather than the traditional focus on "conformance to specification." In order to satisfy customers, firms need to consider the quality of the product, quality of the service (fill rate, on-time deliveries, stock out probability, and backorder/stock out), and conformance to specification. Since the main goal of quality is to provide high level of customer service, there are likely chances that customers will turn to an alternate source if the quality criteria does not meet customer expectations (Beamon, 1999). The number of customer complaints registered will signify the level of customer satisfaction regarding the quality of products/services (Beamon, 1999).

Output performance measures such as quality should focus on fulfilling customer's goals and values. Meeting customer requirements is an indication of the fulfilment of the company's

strategic goals (Beamon, 1999). Customers want products to be of good quality without any damages and service such as logistics to be timely and reliable, delivering the products with low damage/loss rate. The role of information sharing towards enhancing quality performance cannot be underestimated. The downstream partners are the closest to the ultimate customers and will know customers' preferences. If they share information related to the customers' choice to their upstream partners, then the upstream partners can make timely decisions to fulfil customer requirements.

2.5.2.3 Delivery

Delivery performance has become one of the important measures of supply chain performance as customers have become increasingly demanding of suppliers. Customers in today's context expect better delivery service. Delivery performance is a key performance measurement criterion that will enhance a firm's competitiveness. On-time delivery is used as supply chain performance measure by many companies including Supply Chain Council (Zhou and Benton Jr, 2007). Speed, reliability/dependability and order fulfilment rate has been recognised as the important attributes of delivery performance (Milgate, 2001, Zhou and Benton Jr, 2007, Baihaqi and Sohal, 2013). Some customers value speed whereas others consider delivery reliability more important (Beamon, 1999). Focusing on fast, reliable delivery and responsiveness to changing customer needs, organisations like Caterpillar, General Motors, ICL, Philips, and Rank Xerox have achieved integration of their supply chain (Narasimhan and Jayaram, 1998).

Improvement in information flow will reduce supply chain uncertainty, speed up the decision making process and enhance the level of collaboration which will eventually lead to a better supply chain delivery performance (Milgate, 2001, Ramayah and Omar, 2010). Delivery largely depends on operations and managerial decisions made by upstream members of the supply chain (Milgate, 2001). Delivery performance will directly affect the inventory level of firms which will eventually affect cost. For suppliers, keeping extra inventory might help them cope up with supply chain uncertainties and maintain the reliability of their delivery performance. Timely and reliable delivery from the upstream partners will improve the delivery performance of the downstream partners as well.

Information sharing plays a central role in maintaining the speed and reliability of delivery performance. Downstream members can provide accurate and timely information related to customer demands and the inventory levels of the downstream partners to the upstream partners. With this information suppliers or manufacturers can enhance their planning and scheduling to improve their delivery performance. In contrast, upstream members can provide correct information regarding their production schedule, inventory levels, delivery schedules, tracking and tracing and delays if any. With sufficient information both parties can contribute towards better delivery performance. Furthermore, informing downstream partners at the right time about any delays or disruptions in delivery will help them to mitigate the impact of late delivery. Information sharing will not only improve delivery performance, it will also help to minimise the impacts of late deliveries.

2.5.2.4 Flexibility

The ability of supply chain members to adjust to changes such as demand uncertainty, manufacturing unreliability, the introduction of new products, or supplier uncertainty is referred to as flexibility (Beamon, 1999, Beamon, 1998). Flexibility plays an important role in the success of a supply chain since the supply chain exists in an uncertain environment (Beamon, 1999). To satisfy the customer needs, supply chains should demonstrate a great degree of flexibility in the range and volume of products or services they can accommodate (Bhagwat and Sharma, 2007, Babbar et al., 2008). Without flexibility, firms may lose customers who are attracted to alternative products or services provided by competitors, thus affecting their performance.

While the use of flexibility in supply chain analysis has not been frequent, there are a range of advantages that a flexible supply chain can achieve, such as reduction in the number of lost sales, reduction in the number of late orders, increased customer satisfaction and ability to cope with periods of poor supplier performance and poor delivery performance (Beamon, 1999). A supply chain needs to be flexible in different aspects such as volume, delivery, mix (the ability to change the variety of products) and new product (Beamon, 1999, Chan, 2003). Information sharing plays a central role in enhancing supply chain flexibility of firms. For example, volume flexibility is affected by demand uncertainty (Ramayah and Omar, 2010). The downstream supply chain partners need to keep their upstream partners up-to-date about the changing customer demands. The upstream members should also keep their suppliers

updated about their inventory levels. With information sharing the inventories can be replenished timely and quickly and hence, volume flexibility can be achieved. Information sharing can be a better option in terms of costs to deal with demand uncertainty rather than adding buffer stocks (Yigitbasioglu, 2010).

2.6 Summary

This chapter discussed some important aspects of supply chain management and how information sharing may contribute to improving SC performance. The first section of the review focused on the importance of supply chain management and supply chain collaboration. Supply chains consist of a number of entities having different and sometimes conflicting goals which makes supply chains difficult to manage. However, it is crucial for supply chain firms to collaborate with each other focusing on the performance of the entire chain because no individual firms can generate all the necessary resources, skills and expertise alone. With the increasing need of supply chain collaboration, the need to share information between chain participants also increases as information sharing is one of the most important foundations of collaboration. The need for information sharing in supply chain has its theoretical foundation in transaction cost theory (TCT) and resource-based view (RBV). Information sharing with trading partners will help to establish collaborative partner relationship and develop knowledge which is the more valuable and actionable, reducing the overall transaction costs.

The third section provided an overview of supply chain information sharing. It reviewed the literature on information sharing in supply chains and outlined the important issues that need to be considered by supply chain participants before sharing their important business information. Supply chain participants need to understand that sharing information such as inventory, customer demand, tracking and tracing, production schedule, delivery schedule and delays and disruptions will help enhance the performance of the entire chain as well as the performance of the constituent firms. It is critical to identify the influential factors of information sharing in supply chains. While previous studies

With time frame as the major difference, information sharing was considered as a two-dimensional variable, categorised at operational and strategic level. It identified the difference between operational and strategic information sharing and the need to study them

separately. This section also explained that information should be shared between firms and made available to all the functions of the sharing firms. Finally, this section discussed how information sharing can act as soft infrastructure to enhance connectivity of Nepal with its supply chain partners.

The fourth and the final section covered the need for performance measurement and various performance measures used in the past. It provided justification as to why this study has considered cost, quality, delivery and flexibility as performance measures. The reviewed literature on supply chain management, collaboration, information sharing and supply chain performance paved the path to identify the influential factors of information sharing in supply chains and the effect of information sharing on supply chain performance.

Chapter 3 FACTORS AFFECTING INFORMATION SHARING IN SUPPLY CHAINS

3.1 Introduction

The aim of this research is to improve supply chain management through the identification of factors that influence information sharing between supply chain partners. The previous chapter discussed about supply chain, supply chain management and supply chain collaboration and how the need of information sharing accrue from these concepts. The theoretical foundations that justified the need of information sharing in supply chains were discussed next. This was followed by thorough discussions about information sharing and its impact on supply chain performance. Chapter Three is derived from Chapter Two as its primary aim is to identify the factors that affect information sharing in supply chains through a systematic review of the literature. This chapter also helps in the formulation of the conceptual framework of this study which will be discussed in the next chapter (Chapter Four).

Information sharing improves supply chain integration by coordinating supply chain processes, enabling organisations to make reliable delivery and introduces products to the market quickly (Li and Lin, 2006). It reduces uncertainty (Milgate, 2001) and improves partnership quality (Li and Lin, 2006) and helps a firm produce and deliver products or services to customers at lower costs and higher speed through the improvement in coordination between supply chain partners (Lin et al., 2002). The customers, whose satisfaction is the ultimate goal of every firm, can then benefit from these cost savings which are passed on to them in the form of higher perceived value and lower prices (Chen et al., 2004). Thus, it is crucial to study the effects of information sharing on supply chain performance. However, prior to that it is necessary to find out the potential factors that enhance or impede information sharing in supply chains.

The first section of this chapter discusses the systematic literature review process used to identify a comprehensive list of factors affecting information sharing. Further, it explains how each factor influences information sharing and categorises them into four categories based on their characteristics. The third section (Section 3.4) then incorporates the literature

review conducted in Chapter 2 and Chapter 3 to develop the research framework. It shows the essence of the research framework for this study which illustrates that a successful supply chain relationship requires information sharing among supply chain partners to enhance performance. In addition, it also shows that various factors such as relational, inter-organisational, intra-organisational and environmental factors are the critical elements to sustain such information sharing.

3.2. Systematic Literature Review

A systematic literature review (SLR) approach was adopted to capture the wide body of the relevant literature to compile a wide-ranging list of factors affecting information sharing in supply chains (Maskey et al., 2015). The main advantages of this approach are to, overcome the weaknesses of a narrative review, produce a reliable and rigorous knowledge stock, enhance practice by developing context-sensitive research and entail a transparent and replicable process that reduces bias and error (Tranfield et al., 2003, Wong et al., 2012, Kembro and Näslund, 2014, Kembro et al., 2014). A three-stage process was implemented in the SLR as suggested by Tranfield et al. (2003) including, planning the review, conducting the review and reporting and dissemination.

Separate search was conducted in key academic databases and journal content platforms including Google Scholar, Proquest, Emerald Insight, Elsevier (Science Direct), and Taylor and Francis. As the above databases have been identified as relevant to the field of supply chain management, the inclusion of these databases would capture most of the potential relevant papers. The search was carried out by using different combinations of the following groups of keywords, such as: (supply chain, supply network, logistics), (information, data), (share*, exchange, flow, and transfer) and (information technology). An example of a search string used is as following: ("supply chain" OR "supply network" OR logistics) AND ("information, sharing" OR "information exchange" OR "information flow" OR "information transfer") AND ("information technology"). The potential papers were selected on the basis of i) published from 1990 as it was only after 1990 that SCM rose to prominence; ii) published in peer-reviewed journals to ensure academic rigour; and iii) relevance to the research topic (whether the paper discusses about information sharing in supply chains). The selection process is illustrated in Figure 3.1.

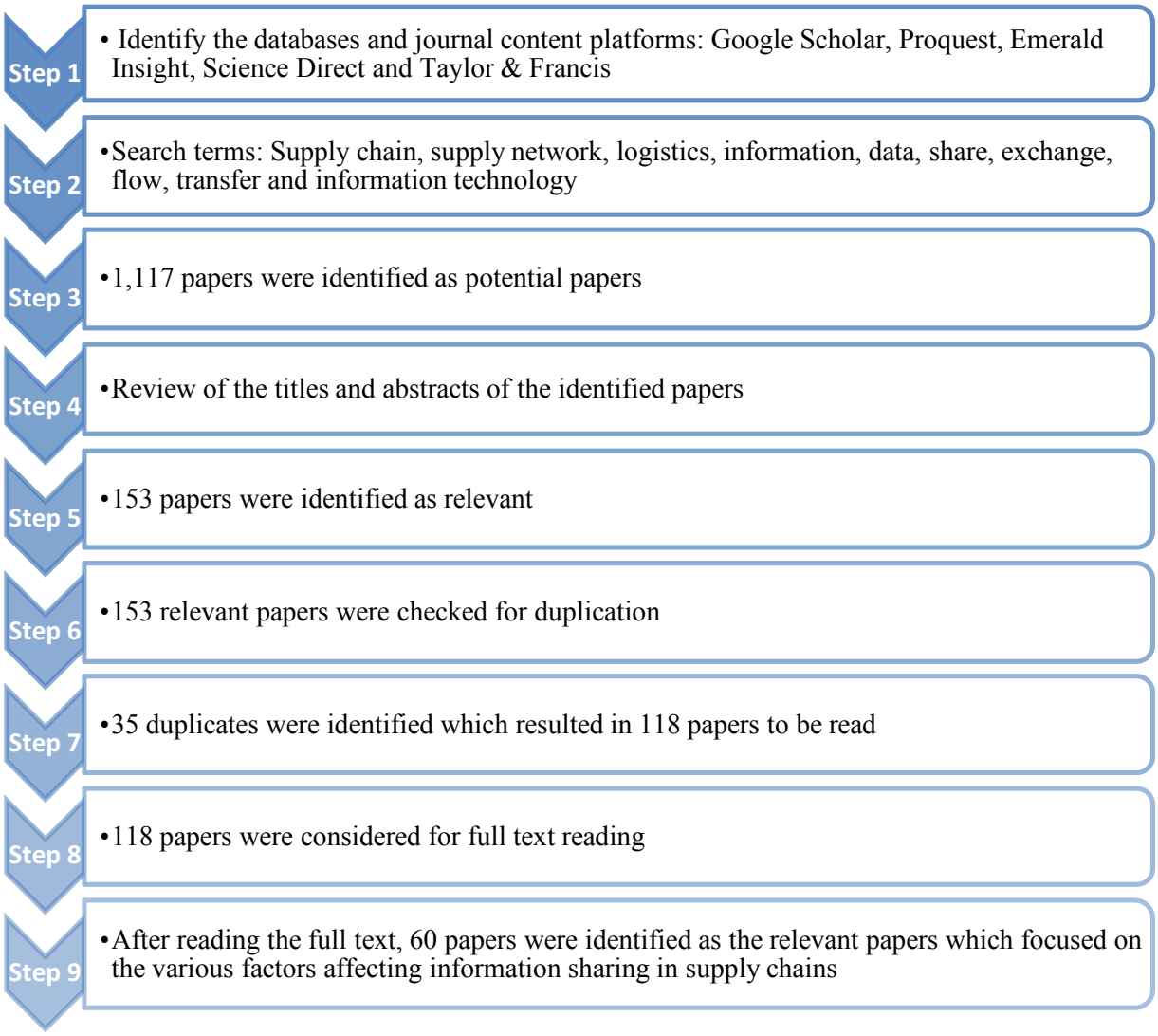

Figure 3.1: Process for Selecting the Relevant Papers

Following the above inclusion criteria, 1,117 papers were initially identified as potential articles related to information sharing in supply chains. The titles and abstracts of the papers that resulted from this initial broad search were scanned, resulting in 153 relevant papers which were then selected for full text review. The remaining papers (964) focused on various aspects of information sharing other than the pre-requisites, barriers and drivers of information sharing. They included areas such as theoretical perspectives of information sharing in supply chains and simulation studies that focused on increasing the value of information sharing in supply chains. Hence, they were excluded from further analysis. The selected 153 papers were checked for duplication as they were selected from different databases resulting in 118 articles for final reading. Of the 118 papers, 60 focused on various

factors affecting information sharing in supply chains including antecedents of information sharing and drivers and barriers of information sharing.

The systematic literature review resulted in a large number of factors affecting information sharing in supply chains. However, most studies have focussed only on a small number of factors and a comprehensive list is non-existent. While a large number of factors appeared in the literature, many of them are repeated, overlapped or conveyed the same meaning using different terminologies. The repeated factors were removed and the overlapping factors were synthesised which resulted in 21 factors that enhanced or impeded information sharing among supply chain partners. Table 3.1 summarises the synthesis of the categories into four main categories.

Table 3.1: Categorisation of Factors Affecting Information Sharing

Relationship Factors	Intra-organisational Factors	Inter-organisational Factors	Environmental Factors
Trust	Top management commitment	IT	Environmental uncertainties
Commitment	Market orientation	Information quality	Government support
Power	Reputation	Interaction Routines	National culture
Personal connection	Project payoffs	Partnership extent	
Organisational compatibility	Monitoring	Legal contract	
	Incentives	Supply network configuration	
		Supply chain integration	

Source: Author

Huge investment in technology will have no significance if there is an unwillingness to share needed information (Jarvenpaa and Staples, 2000, Fawcett et al., 2007b). The literature review shows that the information sharing capability depends upon the willingness of the supply chain partners to share information (Hall and Saygin, 2012). In order for firms to be willing to share information, mutual relationship based on trust is very important (Li et al., 2014). Trust, commitment and power between partners constitute the inter-organisational relationship without which any effort to manage the flow of information across the supply

chain is likely to be unsuccessful (Li and Lin, 2006). Besides the relational factors, environmental, intra- and inter-organisational factors also play an important role in influencing the supply chain members to share business information with their partners (Li and Lin, 2006).

For the first time, Shore (2001) conducts multiple case studies in the US and concludes that industry, competition, culture, organisation size, IT support and IT infrastructure influenced organisations' decision to share information with their trading partners. However, this study lacks an empirical basis to confirm the influential factors of information sharing. An empirical study in the US logistics context carried out by Moberg et al. (2002) identify six antecedents of information sharing and tests the effects of those factors on strategic and operational information sharing. While this was the first empirical study in this field, it tests the effects of only six factors. This study considers information sharing as two-dimensional construct. However, the results conclude that only commitment and information quality affect strategic information sharing. The study could not confirm the influential factors of operational information sharing.

Li and Lin (2006) carry out a research on 196 US manufacturing organisations to examine the effects of environmental uncertainty, intra-organisational facilitators and inter-organisational relationships on information sharing and information quality in supply chain management. The studies of Madlberger (2009) in the Austrian Fast-Moving Consumer Goods (FMCG) sector concludes that the key drivers of information sharing are perceived benefits and the internal factors such as active information policy, top-management policy and internal technical readiness. She examines nine factors and categorises them as internal factors, inter-organisational factors and economic factors. While this is one of the studies that considered the largest number of factors, it did not find any significant relationship between inter-organisational factors and information sharing. Lee et al. (2010) also identify nine factors constituting relationship characteristics, organisational characteristics and information characteristics as the antecedents of information sharing and collaboration. So far, these two papers have considered the largest number of factors that influenced information sharing in supply chains.

Patnayakuni et al. (2006) suggest that collaboration and information integration across a firm's supply chain takes place when formal and informal interaction routines are developed on a foundation of relationship continuity and relationship-specific assets. Fawcett et al.

(2007b) challenge the assumption that IT is the primary enabler of information sharing by comparing the effects of two dimensions connectivity (IT) and willingness. They found that although technological ability and the willingness to share information should go hand in hand to improve the performance of the entire supply chain, firms tend to invest more heavily on IT than on improving willingness (Fawcett et al., 2009). However, this study did not discuss the factors that affect the willingness of supply chain partners to share information with each other.

Yigitbasioglu (2010) develops a model using the transaction cost theory (TCT) framework and compares the effects of environmental uncertainty, demand uncertainty, supplier's dependence and buyer's dependence on the intensity of information shared between Swedish and Finnish companies. The results were similar in the context of both countries indicating that all the above four variables had positive relationships with information sharing. This study compares the context of two European countries that are at same level of development. Prajogo and Olhager (2012) study the effect of long term relationship on information technology, information sharing and performance and find a positive relationship with all the three dependent variables. They considered information having a backward flow, i.e., from end customers to the suppliers. However, information sharing implies in two-way direction.

Chu and Lee (2006), Li and Zhang (2008) and Zhang and Chen (2013) use a Bayesian game model and consider cost of revealing the information and the nature of market demand, confidentiality and contracts respectively as the factors that affect information sharing between a manufacturer and a retailer. The game theory is, however, against the principle of supply chain management where the spirit of collaboration and cooperation is promoted for the betterment of the entire chain members rather than individual chain members looking only towards their own goals. According to Levi et al. (2008), all systems within a supply chain are connected to each other such that the outputs from one system of the chain serves as the input to the other system. Thus, finding out solutions to benefit only one system is not sufficient but rather the entire systems needs to be considered.

Relational factors such as trust (Li and Lin, 2006, Ghosh and Fedorowicz, 2008, Cai et al., 2010, Li et al., 2014), commitment (Sheu et al., 2006, Lee et al., 2010, Prajogo and Olhager, 2012, Chen et al., 2014) and power (Ghosh and Fedorowicz, 2008, Madlberger, 2009, Kähkönen and Tenkanen, 2010, Wu et al., 2014), have been considered as the major influencing factors of information sharing in supply chains. Personal connection (Cai et al.,

2010) is another important factor under relational factors that has not been studied frequently. Personal connection or *Guanxi,* in the context of China has been found to have a direct effect on information sharing (Cai et al., 2010).

The importance of information technology for information sharing has been emphasised by many researchers (Childerhouse et al., 2003, Li and Lin, 2006, Fawcett et al., 2007b, Baihaqi and Sohal, 2013, Ganotakis et al., 2013, Chen et al., 2014). Electronic data interchange (EDI) (Tan et al., 2010) and Radio frequency identification (RFID) (Zelbst et al., 2010) have been identified as technologies that enhance information sharing in supply chains. The importance of IT for information sharing has been recognised in the context of developed countries (Fawcett et al., 2007b, Baihaqi and Sohal, 2013). It is yet to find out how developing countries perceive the role of IT in information sharing.

Besides IT and relational factors, top management commitment (TMC), environmental uncertainties and information quality have been frequently discussed in the literature as important factors that have significant effect on information sharing in supply chains. Top management commitment has been found to have a positive effect on information sharing by Li and Lin (2006), Madlberger (2009) and Lee et al. (2010). While Li and Lin (2006) find that only supplier uncertainty affects information sharing, Zhou and Benton Jr (2007) and Yigitbasioglu (2010) find that environmental uncertainty (supplier, customer and technological) affects information sharing. Information quality is another important factor that has been found to have a positive effect on information sharing (Moberg et al., 2002, Youn et al., 2008, Lee et al., 2010, Baihaqi and Sohal, 2013). While the impacts of TMC, environmental uncertainties and information quality have been examined in the context of developed countries, it will be interesting to find out how they affect information sharing in the context of developing countries.

Müller and Gaudig (2011) study factors such as reputation, monitoring, premiums, asset specificity, frequent meetings and contracts in the context of Germany. These factors have not been studied previously. Müller and Gaudig (2011) find that frequent meetings and monitoring exert positive relationship while contracts exert negative influence on information sharing. This study could not confirm the effect of reputation, asset specificity, monitoring and premiums. Similar is the case for government support, culture and supply network configuration. Cai et al. (2010) find that government support in the context of China plays a significant role to enhance information sharing. Culture (Shore, 2001) and supply network

configuration (Samaddar et al., 2006), on the other hand, have only been studied qualitatively. It requires empirical evidence to confirm the influence of culture and supply network configuration on information sharing.

The recognition of these factors affecting information sharing is a prerequisite to a successful supply chain management. However, a wide-ranging list of factors affecting information sharing in supply chains is lacking in the literature. Hence, this research has carried out a systematic review of the literature to find out a comprehensive list of factors that enhance or impede information sharing in supply chains.

The literature groups the factors into different categories such as organisational characteristics, relationship characteristics and information characteristics (Moberg et al., 2002, Lee et al., 2010), intra-organisational facilitators, inter-organisational relationships and environmental uncertainty (Li and Lin, 2006), internal factors, inter-organisational factors and economic factors (Madlberger, 2009). This study used thematic analysis to identify and categorise the factors into different groups (Braun and Clarke, 2006, Braun and Clarke, 2008, Wong et al., 2012). Some of the categories used by different authors suggest the same meaning but with different terminologies. For example, organisational characteristics used by Moberg et al. (2002) and Lee et al. (2010), intra-organisational facilitators used by Li and Lin (2006) and internal factors used by Madlberger (2009) all mean that the factors under this category arise because of the company and its employees. Similar is the case for relationship characteristics, inter-organisational relationships and inter-organisational factors, which indicate that those factors arise when a company deals with two or more companies. The next category, information characteristics, used by Moberg et al. (2002) and Lee et al. (2010) includes factors such as information quality and IT. These two factors indicate the quality of information shared and the use of IT between supply chain partners. Economic factors, as used by Madlberger (2009), consist of costs and benefits of information sharing for the company. Finally, environmental factors, used by Li and Lin (2006) comprise of customer, supplier and technological uncertainty.

The identified factors are grouped into four main categories including relationship factors, intra-organisational factors, inter-organisational factors and environmental factors by synthesising the various categories identified in the literature. Table 3.2 summarises the categories identified in the literature. Out of the 60 papers reviewed, none of the papers have included all four categories influencing supply chain information sharing. Only five out of the

60 papers have grouped the factors into various categories. The maximum number of factors identified by a single paper is only nine (Madlberger, 2009, Lee et al., 2010) where both the authors have used three different categories. The other three papers (Moberg et al., 2002, Li and Lin, 2006, Chen et al., 2014) that categorised the factors into various categories have identified eight, eight and six factors respectively. The rest of the papers have not categorised the factors at all.

The synthesis of factors into four categories is based on Figure 3.2 depending on whether the factors arise internally within firms, externally between two or more firms or from the external environment. As illustrated in Figure 3.2, the relationship factors and inter-organisational factors can be managed collectively by the two partner firms, the intra-organisational factors depend on the individual organisation and the environmental factors cannot be controlled by either of the two partner firms as they completely depend on the external environment.

Trust, commitment, power and personal connection form the basis of relationship between supply chain partners and thus have been categorised under relationship factors. These factors are considered under a separate category even though they can be categorised under the inter-organisational factors because strong relationships must exist among supply chain partners for successful implementation of SCM programmes (Moberg et al., 2002). They have been considered in many previous studies as the important factors affecting information sharing in supply chains.

Table 3.2: The Categories of Factors Affecting Information Sharing in Supply Chain as Identified in the Literature

Reference	Relationship Characteristics	Organisational Characteristics	Inter-organisational Factors	Environmental Uncertainties	Economic Factors	Information Characteristics
Moberg et al. (2002)	▪ Trust ▪ Commitment	▪ IT commitment ▪ Organisational size ▪ SCM commitment				▪ Information quality
Li and Lin (2006)	▪ Trust ▪ Commitment ▪ Shared vision	▪ Top management support ▪ IT enablers		▪ Environmental uncertainty		
Madlberger (2009)		▪ Top management commitment ▪ Information policy ▪ Internal technical readiness	▪ Trust ▪ Embedded relationship ▪ Power ▪ Trading partners technical readiness		▪ Benefits ▪ Costs	
Lee et al. (2010)	▪ Trust ▪ Commitment ▪ Interdependency ▪ Length of relationship	▪ Top management support ▪ Cultural similarity ▪ Goal compatibility				▪ Information quality ▪ Rate of technological change
Chen et al. (2014)	▪ Trust ▪ Commitment ▪ Shared vision	▪ Top management support ▪ IT enablers		▪ Environmental uncertainty		

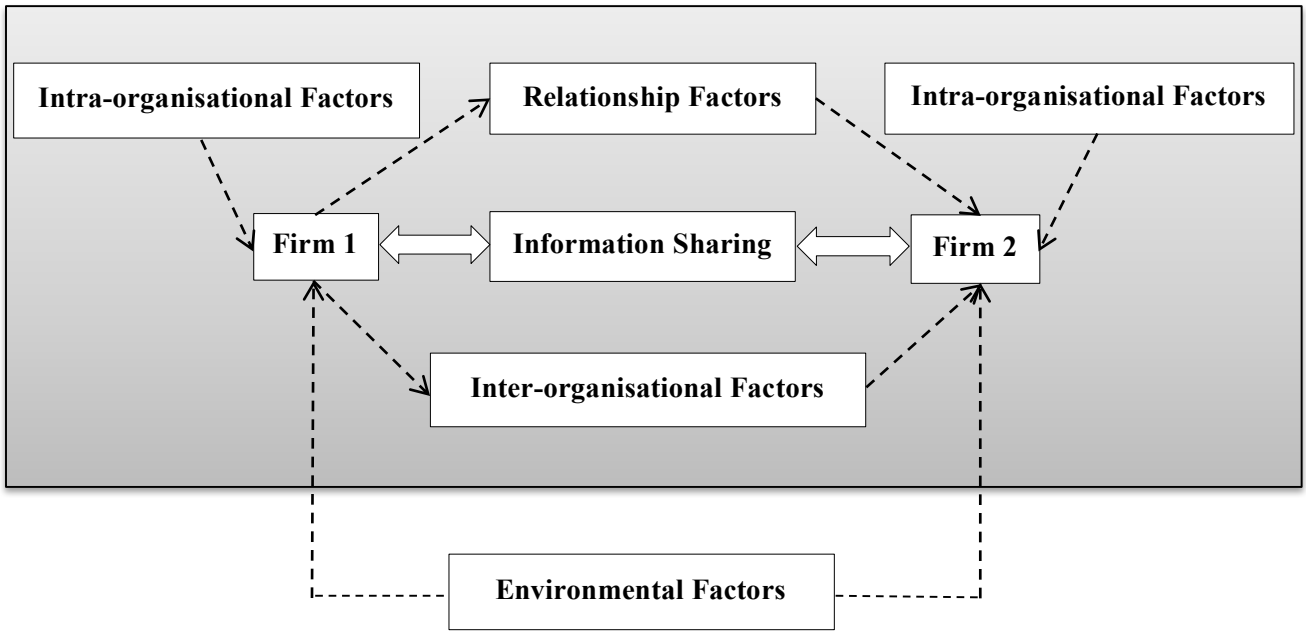

Figure 3.2: Factors Affecting Information Sharing between Firms in Supply Chains
Source: Maskey et al. (2015)

The results further showed that manufacturing dominated the context of study followed by distribution, logistics, and export/import industries. The systematic literature review also revealed that majority of the studies have been conducted in developed countries such as US, UK, Germany, Finland, Netherlands, Australia, New Zealand, Sweden and South Korea with the highest number of studies carried out in the US. After 2010, the studies conducted in Asia such as China and Taiwan are seen to be regular. However, no such studies have been conducted in poor, under-developed countries like Bangladesh, Afghanistan, and Nepal. Moreover, very limited studies were conducted using mixed methods including survey as well as interview data to strengthen their research. Out of the reviewed papers, majority of the papers were statistical studies, followed by qualitative studies, mathematical models and literature reviews.

3.3 Factors Affecting Information Sharing in Supply Chain

3.3.1 Relationship Factors

Relationship is an important aspect for the effective management of supply chains and maintaining a good inter-organisational relationship is one of the fields where firms still struggle (Cooper et al., 1997b, Handfield and Nichols, 1999, Fawcett and Magnan, 2001).

The relationship factors include such attributes as trust, commitment, power and dependence, and personal network (Mohr and Spekman, 1994). The integration and maintenance of a company's relationships is an important managerial ability which help firms to be successful (Lambert et al., 1998). Table 3.3 summarises the effects of relational factors on information sharing.

Studies suggest that good inter-organisational relationships are often associated with better performance including cost reductions, better coordination, reduced inventory and increased fill rates (Ganesan, 1994, Mentzer et al., 2000, Nyaga et al., 2013). Relationships characterised by a higher level of trust, commitment, symmetric power, and personal connection are stronger, which will eventually make the chain members confident enough to share important information.

3.3.1.1 Trust

Trust is one of the most frequently cited factors in the supply chain relationship literature as it constitutes the main attribute of inter-organisational relationship that fosters commitment among supply chain partners (Kwon and Suh, 2004). Trust subsists when one party has confidence in partner's reliability, integrity, fair dealing and a sense of reciprocity (Morgan and Hunt, 1994, Hart and Saunders, 1997). Building trust is not a short-run task as it grows and strengthens only when partners exhibit consistent and reliable behaviour and attitude towards performance improvement for mutual benefits over an extended period (Sahay, 2003).

Lack of trust results in higher transaction costs due to verification, inspections, monitoring, and certifications of their trading partners and agency costs (Beccerra and Gupta, 1999, Kwon and Suh, 2004). Integrity, honesty, benevolence, acceptance, faith, loyalty, consistency, predictability, competence, openness, dependability, respect and keeping commitments are the different aspects of trust (Morgan and Hunt, 1994, Kumar et al., 1995, Beccerra and Gupta, 1999, Kwon and Suh, 2005, Ha et al., 2011). Relationships based on trust deal with situations such as power difference, conflict and lower profitability with mutual understanding and cooperation stimulating firms to display favourable attitudes and behaviours (Mentzer et al., 2000).

Table 3.3: Impact of Relational Factors on Supply Chain Information Sharing (IS)

Components	Context/Country	Results	Reference
Trust and commitment	Logistics- US	Trust → no effect on IS; commitment → positive effect on IS	Moberg et al. (2002)
Trust, commitment and shared vision	Manufacturing- US	Trust and shared vision → positive effect on IS; commitment → no effect on IS	Li and Lin (2006)
Trust and dependence	Automobile dealers-Turkey	Trust → positive effect on IS; dependence → no effect on IS	Sezen and Yilmaz (2007)
Trust and power	Retail and manufacturing in FMCG sector- Austria	Trust and power → no effect on IS	Madlberger (2009)
Trust, commitment Interdependency, cultural similarity and goal compatibility	Manufacturing- S. Korea	Trust, interdependency and goal compatibility → positive effect on strategic and operational IS; commitment →positive effect on strategic IS; Cultural similarity → positive effect on operational IS	Lee et al. (2010)
Trust, personal network	Manufacturing- China	Trust and personal network → positive effect on IS	Cai et al. (2010)
Trust and commitment	Manufacturing- Taiwan	Trust and commitment → positive effect on IS	Hung et al. (2011)
Trust	Auto Manufacturing- China and North America	Trust → positive effect on IS	Liao et al. (2011)
Affective trust and trust in competency	Supplier- S. Korea	Affective trust → positive effect on IS; trust in competency → no effect on IS	Ha et al. (2011)
Trust and commitment	Manufacturing- Turkey	Trust → positive effect on IS; commitment → no effect on IS	Kocoglu et al. (2011)
Commitment	Manufacturing- Australia	Commitment → positive effect on IS	Prajogo and Olhager (2012)
Trust, commitment and power	Manufacturing and service-Taiwan	Trust, commitment and power → positive effect on IS	Wu et al. (2014)
Trust and shared vision	Manufacturing- China	Trust and shared vision → positive effect on IS content and quality	Li et al. (2014)
Cultural sensitivity	Export- Vietnam	Cultural sensitivity → positive effect on IS	Nguyen and Nguyen (2014)

Information sharing sometimes requires the sharing of important financial, strategic and operational information with partners who might have been or may become competitors (Kwon and Suh, 2004). The firm that disseminates information always bears the risk that the information may be abused and the firm becomes vulnerable to the opportunistic behaviour of the other party. On the other hand, the firm that receives the information is exposed to the risk that the information may be incorrect (Moberg et al., 2002, Madlberger, 2009). This is where trust plays a crucial role as it increases the probability of a firm's willingness to share confidential information and discourages opportunistic behaviour. Trust stimulates relational behaviours which are voluntary in nature with an intention to achieve mutual goals (Sezen and Yilmaz, 2007). As a result, in a relationship based on trust, one partner tends to consider the welfare of the other partner and thus will not share faulty information or leak the provided information. Thus, whether it is the risk of information leakage or incorrect information, a trust-based relationship increases the confidence in partnership and reduces the threat of such vulnerabilities (Hart and Saunders, 1997).

3.3.1.2 Commitment (Inter-organisational)

Commitment is the basis on which long-term, strategic partnership is established and maintained. It shows the intention of continuity towards partnership through relation specific investment in resources such as people, lasting assets, IT and information sharing (Morgan and Hunt, 1994, Mentzer et al., 2000, Prajogo and Olhager, 2012). Specific investment made by one partner can act as a barrier to exit and will likely continue the relationship. Hence, asset specificity (Anderson and Weitz, 1992, Ganesan, 1994, Kwon and Suh, 2004, Müller and Gaudig, 2011) is considered as an important component of commitment rather than a standalone factor. While stability and sacrifice are the main attributes of commitment, it urges firms to sacrifice short-term gains to reap long-term benefits from the relationship (Anderson and Weitz, 1992, Wilson, 1995).

Also referred to as “long-term orientation”, commitment results in the development and the maintenance of partner relationship for pursuing common goals of fulfilling customer demands and enhancing mutual benefits (Ganesan, 1994, Wu et al., 2014). It is of utmost importance that supply chain partners have long-term orientation towards their partnership as it not only focuses on present outcomes but is also concerned with the future outcomes (Ganesan, 1994). However, unsatisfactory relationships exist due to asymmetries in commitment as the less committed party will not be affected to a great extent if it decides to

abandon the relationship and hence behaves opportunistically and pays least attention to the sacrifices made by the other party (Anderson and Weitz, 1992).

Commitment is a key attribute which strengthens the motivation and incentives for information exchange between trading partners as it provides the security on the risk associated with the exchange of information (Moberg et al., 2002, Tsanos et al., 2014). Sheu et al. (2006) find that commitment affects supply chain architecture, which includes IT capabilities and information sharing. Since information exchange requires effort and an increase in resource allocation, firms are more likely to share information with committed partners (Moberg et al., 2002, Tsanos et al., 2014).

3.3.1.3 Power

Power of one partner can be defined as the dependence of the other partner on it and can influence the dependent partner's decisions and behaviours, making it act in a manner that the powerful partner desires (Gaski, 1984, Hart and Saunders, 1997, Cheng et al., 2008). Power stems from the Resource Dependence Theory (Pfeffer and Salancik, 1978). It suggests that different organisations have different abilities to develop resources and control the alternative sources of such resources, making them dependent on other firms to acquire the resources that they lack (Schopler, 1987, Fynes et al., 2004).

In a supply chain context, it is likely that partners are dependent on each other for one or more resources. While supply chain partners are dependent on each other, the degree of dependency might be different as one firm might be more dependent because of the other firm's market dominance, sales volume, well-known brand and reputation (Crook and Combs, 2007, Zaheer and Trkman, 2017). This is called interdependence asymmetry which is equal to power asymmetry (Kumar et al., 1995) and determines the degree of power of one firm over the other. Besides dependence, organisational size is also an important source of power as large organisations have greater market dominance and are the early adopters of new innovations (Moberg et al., 2002). On the basis of the above discussions, this study considers power as the factor that arises from the size of an organisation (Moberg et al., 2002) and the interdependence asymmetry (Wilson, 1995).

Powerful firm can influence the less powerful firm's decision-makings which might motivate the dependent firm to reduce its dependence on the powerful firm (Schloetzer, 2012). However, the dependent firm tends to comply with its powerful partner in fear of losing

highly valuable and irreplaceable partner. Powerful firms are often early adopters of various new trends and technologies and have a tendency to impose them on their trading partners (Shore, 2001, Madlberger, 2009). Similarly, the less powerful firms are obliged to share information with the powerful firm because doing otherwise mean jeopardising their business (Sezen and Yilmaz, 2007). Hence, the power of large organisations can demand for more information to be exchanged among trading partners to support supply chain collaboration (Moberg et al., 2002).

However, in a dynamically competitive market, the ability to remain powerful is limited (Cooper et al., 1997a). That is why firms should consider the possibilities of retaliation by the weaker party and the shift of power over time and focus on the long-term effectiveness of power rather than its immediate impact (Ganesan, 1993). Anderson and Weitz (1989) also suggest that relationships with asymmetrical interdependence lack stability and have greater chances of breaking up in future. In such situations, the powerful firm might not use its power explicitly in a negative manner; rather it uses its power in a way to convince the other party about the mutual benefits that they can achieve from information sharing. Effective power management within the supply chain to maximise the benefits of their power is crucial (Maloni and Benton, 2000) because power can only act as a positive force as long as the power is not misused by the powerful firm (Yigitbasioglu, 2010).

3.3.1.4 Personal Connection

Personal relationship is the interpersonal ties built on trust and cooperation constituting informal, personal relationships and exchanges of favours in which firms are committed to each other by social norms of reciprocity and social obligations (Macaulay, 1963, Cai et al., 2010). Exchange of gifts and favours such as priorities in business dealings, access to limited resources and controlled information are demonstrations of such personal relationships (Lee et al., 2001, Shin et al., 2007). Such relationships play a crucial role under conditions such as shortage of critical items, urgent delivery, and uncertain supply and demand. Reciprocity (Wu et al., 2014) is an important feature of such relationship because personal relationship is a behavioural characteristic which can only be flourished based on give-and-take policy. Institutional voids such as unreliability of legal systems and absence of formal contracts and agreements increase the importance of informal personal relationships (Luk et al., 2008). It helps firms to maintain inter-organisational relationship to achieve their performance goals and protect their interests

Individuals who have strong interpersonal relationships tend to be more committed towards maintaining the relationship than less socially bonded partners (Wilson, 1995). Such interpersonal relationships encourage frequent information exchange which in turn will improve business relationships (Rao et al., 2005, Shin et al., 2007). Exchange of favours or reciprocity is the most important attribute of personal relationship and hence, when one partner provides information to another partner, the receiving partner is obliged to return the favour by sharing valuable information later (Cai et al., 2010, Zaheer and Trkman, 2017). Shared goals and cooperation are of great importance in establishing personal relationships (Abramson and Ai, 1997, Murry Jr and Heide, 1998). Moreover, common interests, or even hobby can be more important than 'shared goals' in developing personal relationship. Personal relationship helps to minimise the effect of environmental uncertainties by facilitating better information sharing regarding customers' needs, market trends, new product features, technical advances, and manufacturing or product technologies (Abramson and Ai, 1997, Luk et al., 2008).

3.3.1.5 Organisational Compatibility

Organisational compatibility refers to similar domain, management style, company structure and climate, operating philosophies, company culture, and goal among partners (Ford, 1984, Anderson and Weitz, 1989, Bucklin and Sengupta, 1993, Smith and Barclay, 1997). The term has not been used directly by previous studies as a factor affecting information sharing in supply chains. Organisational compatibility plays an important role in an early relationship when organisations know little of each other and lack a firm basis on which their partners' trustworthiness is evaluated (Smith and Barclay, 1997). It helps individual firms to develop partnership with other firms of similar values and beliefs (Mentzer et al., 2000). In addition, partner firms with comparable products and services find it easy to achieve inter-organisational integration (Rajaguru and Matanda, 2013). Relationships built on organisational compatibilities enhance collaborative relationships which will eventually affect information sharing (Bucklin and Sengupta, 1993, Day, 1995, Fawcett et al., 2007a).

Incompatibilities due to culture and geography create divergent values (Anderson and Weitz, 1989). Incompatibilities in organisational values and beliefs lead to the use of aggressive negotiation strategies (Ganesan, 1993) which undermine the relationship and reduce the chances of information sharing among the trading partners. Due to organisational incompatibilities between firms, clashes in ideas, working principles, styles, attitudes towards

collaboration and coordination with other firms are likely to occur, affecting firms' intentions to share information with their supply chain partners. It is crucial for partner firms to break down the cultural and social barriers between them and understand each other's differences (Ford, 1984, Spekman et al., 1998, Nguyen and Nguyen, 2014). Therefore, organisations should develop and implement management strategies that promote and encourage firms to put in more efforts to achieve organisational compatibility to maintain the relationship (Mohr and Spekman, 1994)

3.3.2 Intra-organisational Factors

Organisational and its management characteristics have been commonly used by researchers as predictors of organisational behaviours (Moberg, 2000). Intra-organisational information sharing requires sufficient internal efforts for its development as a number of organisational factors affect the decision of firms to share information with other members of the supply chain (Premkumar and Ramamurthy, 1995). Factors that arise internally between departments and divisions of the organisation are referred to as intra-organisational factors and the management of which is in the hand of the organisation itself. The intra-organisational factors consist of top management commitment, reputation, market orientation, project payoffs, monitoring and incentives. Table 3.4 summarises the effects of intra-organisational factors on information sharing.

3.3.2.1 Top Management Commitment

The top management of an organisation is directly responsible for shaping the organisation's values, culture, vision, policies, orientation and directions (Mentzer et al., 2000, Li and Lin, 2006). Top management is also responsible for maintaining relationship beyond organisational boundaries with the managers of other firms. Relationship with other managers will provide knowledge on new product development, technology and manufacturing operations (Premkumar and Ramamurthy, 1995, Wang et al., 2014) as well as knowledge

Table 3.4: Impact of Intra-organisational Factors on Supply Chain Information Sharing (IS)

Components	Context/Country	Results	Reference
Top management commitment	Logistics- US	Top management commitment → no effect on IS	Moberg et al. (2002)
Top management commitment	Manufacturing- US	Top management commitment → positive effect on IS	Li and Lin (2006)
Intensity (profit)	Supplier-Retailer Pair - Taiwan	Intensity → positive effect on IS	Sheu et al. (2006)
Cost and profit		Cost → negative effect on IS; profit → positive effect on IS	Chu and Lee (2006)
Top management commitment, information policy and costs	Retail and manufacturing in FMCG sector- Austria	Top management commitment → positive effect on strategic IS; information policy → positive effect on strategic and operational IS; cost → no effect on IS	Madlberger (2009)
Top management support	Manufacturing- S. Korea	Top management support → positive effect on strategic IS	Lee et al. (2010)
Reputation, monitoring and premiums	Various- Germany	Reputation and premiums → no effect on IS; monitoring → positive effect on IS	Müller and Gaudig (2011)
Cost and benefit sharing	Manufacturing- Australia	Cost and benefit sharing → no effect on IS	Baihaqi and Sohal (2013)
Top management commitment	Auto-part industries - Taiwan	Top management commitment → positive effect on IS	Chen et al. (2014)
Market orientation	Export- Vietnam	Market orientation → positive effect on IS	Nguyen and Nguyen (2014)
Managerial ties	Manufacturing- China	Managerial ties → positive effect on the extent of IS	Wang et al. (2014)
Competition	Manufacturing- Taiwan	Competition → positive effect on IS	Wang and Chen (2014)

about changing rules, regulations and government incentives (Cai et al., 2010). Without top management support, it is difficult for companies to compete with others because everything needs to be approved by managers at the top level (Fawcett et al., 2007a). This study has considered managerial ties (Wang et al., 2014) as an attribute of top management commitment because top managers should commit to establish and maintain personal connections with the executives of other firms in order to strengthen their relationship.

The top management team of a company is an important organisational resource which requires long-term business vision and interaction among trading partners for enhancing information sharing (Premkumar and Ramamurthy, 1995). Information sharing involves financial as well as human resource investment. It may face resistance if the top management does not address issues related to necessary investment and changes within the firm (Moberg et al., 2002, Madlberger, 2009). Firms consider information as a source of power and an added advantage over competitors, which may cause reluctance to share information. The commitment of the top management is an important prerequisite for successful organisational change needed for better performance (Cooper and Ellram, 1993, Li and Lin, 2006, Kumar et al., 2011). It is clear that top management plays a critical role in shaping information sharing culture (Li and Lin, 2006).

3.3.2.2 Reputation

The reputation of a firm helps its partners to evaluate the firm's dependability, reliability, trustworthiness and business skills during the early stage of relationship establishment when personal experience is minimal (Anderson and Weitz, 1989, Smith and Barclay, 1997). It is considered as one of the most important intangible resources which make significant contribution to business success (Hall, 1992). A firm's relationship with other chain members is a significant indicator of their attitudes, behaviours and the way they perceive their business relationships. It also shows how much importance it gives to its business partners by being fair and working towards mutual profitability rather than being opportunistic to fulfil its own goals (Ganesan, 1994). The reputation of a firm deteriorates if it terminates relations frequently and is not cooperative (Anderson and Weitz, 1989).

Good reputation is a form of security to guarantee performance and good faith (Macaulay, 1963). A firm with good reputation is considered a good partner and as such long-term collaborative relationships tend to be established with others. Confidentiality of the shared

information is imperative and a partner with good reputation is unlikely to leak and abuse the information it receives. Moreover, a reputable firm makes effort to maintain a trustworthy and reliable relationship with its partner firm, which in turn, enhances information sharing with its partners.

3.3.2.3 Market Orientation

With changing customer demand and globalised market condition, the competition is getting fierce. In order to be competitive and stand out in the market, firms need to keep track of their customers and competitors. Market orientation is a form of business culture which mainly focuses on creating a better customer value than the competitors. Its aim is to achieve sustainable competitive advantage by collecting information about changing customer demands, competitors' market position and their strengths/capabilities, and market conditions (Slater and Narver, 1995, Liu et al., 2013, Nguyen and Nguyen, 2014, Huo et al., 2014). Increased competition is the main factor that causes firms to become market orientated (Wang and Chen, 2014) and hence, is combined with market orientation. Market-oriented firms tend to alter their marketing strategies on a continuous basis to overcome the challenges caused by changing customer demands and market competition (Kumar et al., 2011).

Supply chain firms are more likely to be market oriented as their utmost goal is to enhance customer satisfaction. They tend to collaborate and coordinate with other chain members to acquire information that they need to enhance their competitive advantage and improve customer satisfaction. The acquired information will help to reduce costs, improve on-time delivery, fulfil customer demands and improve their products/service based on customer feedbacks (Kumar et al., 2011, Nguyen and Nguyen, 2014). A market-oriented firm's priority is to be more responsive to markets, which increases their need for information to coordinate its business activities (Nguyen and Nguyen, 2014). Consequently, more information will be shared reciprocally to increase the speed of product innovation and transmission and to develop strategies to make their products unique and in accordance with customer demand (Wang and Chen, 2014). Hence, a market oriented company is ready to share information about their business strategies, market potential and products with its partners in order to adapt its activities in accordance with customer requirements (Nguyen and Nguyen, 2014).

3.3.2.4 Project Payoffs

According to the social exchange theory, firms enter into an exchange relationship and attempt to maintain that relationship only as long as the profits or payoffs are greater than the costs (Emerson, 1976). Before entering into any business relationship and deploying resources into it, firms carefully look at the costs and returns related to that deployment because the expected returns and the required investment determines the implementation and future outcomes (Bucklin and Sengupta, 1993).

Supply chain members need to understand the costs and benefits of sharing information with their partners (Levi et al., 2008). Information sharing is an important attribute of collaboration and the benefits of such collaborative relationship are not cost free. Information sharing may require significant investment in information technology for data capture, transmission, storage, analysis, and site maintenance (Sahin and Robinson, 2002). Moreover, there are times when one partner obtains more benefits than others (Lee et al., 2000, Yu et al., 2001, Baihaqi and Sohal, 2013), which may demotivate firms to share information with their supply chain partners. If a partner perceives that the outcomes of information sharing is poor for its organisation in comparison to the costs incurred (Sheu et al., 2006, Madlberger, 2009), or the sharing only creates humongous benefits for the other partner organisation, it is likely that the firm will not share information with its partners.

3.3.2.5 Monitoring

Monitoring can be defined as a behaviour-based control mechanism referring to a number of supervising actions by which firms make sure that the terms and conditions of the contractual agreement is fulfilled by their partner/s (Müller and Gaudig, 2011). It helps to detect noncompliance and partner opportunism and control the various aspects of performance such as product quality, delivery terms, price competitiveness and order accuracy (Stump and Heide, 1996, Murry Jr and Heide, 1998).

Monitoring involves extra costs caused by the inspections of material, information and financial flows in supply chains (Stump and Heide, 1996, Murry Jr and Heide, 1998). Furthermore, it reduces firms' freedom to make decisions which may be viewed as signals for the partner's distrust. In a relationship with high risk of opportunism, resources such as time and effort need to be invested by firms on monitoring to detect noncompliance (Wathne and

Heide, 2000). Partners not following the compliance rule can be penalised which in turn will motivate them to deliver better performance (Lal, 1990).

Monitoring helps to reduce information asymmetry between partners (Stump and Heide, 1996). It is used as a control mechanism by firms to check whether the information sharing agreement has been executed by its partners (Müller and Gaudig, 2011). As information asymmetry is one of the major cause of opportunism, Wathne and Heide (2000) suggest that monitoring be used to detect opportunistic behaviours of trading partners and force them to improve compliance. This will make firms aware of the fact that agreed amount of information needs to be shared on a timely basis or else they will have to face the penalties for noncompliance.

3.3.2.6 Incentives

Financial incentives offered by one firm to the other as an appreciation for its good deed towards the offering party is referred to as premiums (Müller and Gaudig, 2011). Social exchange theory posits that rewards/incentives or premiums provide economic motivation for a party to exhibit relationship-oriented behaviours and increase the frequency of exchange (Emerson, 1976, Murry Jr and Heide, 1998). In the supply chain context, incentives will encourage firms to meet terms of agreements and work towards collaborative supply chains to reduce the overall supply chain costs (Murry Jr and Heide, 1998).

The economic incentives to be offered by a firm can be decided based on two ways, behaviour-based and output-based (Brttton and Ball, 1999). Behaviour-based incentive mechanism is useful when the party offering the incentive knows and trusts its supply chain partner. According to Murry Jr and Heide (1998), the greater the incentives the greater is the participation in cooperative activities. The motivation to participate aroused by economic incentives causes firms to exchange information with its supply chain partners. It can be used by firms to influence compliance (Murry Jr and Heide, 1998) causing its supply chain partners to share information agreed during their relationship establishment. The main objective of using incentives for supply chain information sharing is to structure the relationship in such a way that supply chain partners find no better option than to participate in sharing information with the chain members (Murry Jr and Heide, 1998). Incentives can also be offered by a firm to its supply chain partners after the benefits are achieved through their information sharing process (output-based). Output-based incentives are considered

more effective because it will encourage trading partners to gather and share accurate, timely and quality information, with desires to gain incentives (Murry Jr and Heide, 1998).

3.3.3 Inter-organisational Factors

Organisations enter into inter-organisational business relationships in order to achieve tangible and intangible benefits. These organisations may develop complex economic and business relationships among themselves that can result in a number of social, economic and legal factors (Premkumar and Ramamurthy, 1995) influencing their information sharing decisions with their trading partners. The inter-organisational factors arise due to systems or relationships between two or more organisations. In the supply chain context, when two or more firms establish business relationship with each other, several factors need to be considered if they wish to enhance the level of information sharing between them. The inter-organisational factors consist of IT, information quality, interaction routines, partnership extent, legal contract, supply network configuration and supply chain integration. Table 3.5 summarises the components of the inter-organisational factors that affect information sharing.

3.3.3.1 Information Technology

Today's globalised supply chains have become more effective and efficient due to the advancement in information technology which has enabled many of the changes taking place in SCM (Fawcett et al., 2007a). These electronic linkages, internally between different departments of a firm and externally between trading partners are known as supply chain enablers (Li and Lin, 2006). They can eliminate manual information transfer, reduce paperwork, enhance the speed, quality and quantity of information transferred, improve communication, coordination and collaboration among supply chain partners and reduce supply chain cycle times if properly implemented (Mason-Jones and Towill, 1997, Hart and Saunders, 1997, Handfield and Bechtel, 2002, Wu et al., 2006).

Table 3.5: Impact of Inter-organisational Factors on Supply Chain Information Sharing (IS)

Components	Context/ Country	Results	Reference
IT and information quality	Logistics- US	IT → no effect on IS; information quality → positive effect on strategic IS	Moberg et al. (2002)
IT	Manufacturing- US	IT → no effect on IS	Li and Lin (2006)
Social interaction routine	Manufacturing and Retail- US	Social interaction routine → positive effect on IS	Patnayakuni et al. (2006)
Supply Network Configuration	Automobile Industry – Japan and US	Supply network configuration affects the type and volume of information shared	Samaddar et al. (2006)
Information quality and SC partnership	Various- S. Korea	Information quality → positive effect on IS; SC partnership → no effect on IS	Youn et al. (2008)
Embedded relationship and IT	Retail and manufacturing in FMCG sector- Austria	Embedded relationship and external IT → no effect on IS	Madlberger (2009)
Information quality	Manufacturing- S. Korea	Information quality → positive effect on strategic IS	Lee et al. (2010)
Legal protection	Manufacturing- China	Legal protection → no effect on IS	Cai et al. (2010)
Frequent meetings and contracts	Various- Germany	Frequent meetings → positive effect on IS; contracts → negative effect on IS	Müller and Gaudig (2011)
EDI	Manufacturing- US, Europe and New Zealand	EDI → positive effect on IS	Tan et al. (2010)
SC integration	Manufacturing- Turkey	SC integration → positive effect on IS	Koçoğlu et al. (2011)
Partnership extent	Various- China	Partnership extent → positive effect on template-based IS and no effect on proactive IS	Du et al. (2012)
IT, information quality and internal integration	Manufacturing- Australia	IT and information quality → positive effect on IS; internal integration → no effect on IS	Baihaqi and Sohal (2013)
Relational benefits and relational risks	Manufacturing- Taiwan	Relational benefits → positive effect on IS; relational risks → negative effect on IS	Cheng et al. (2013)
Social interaction	Manufacturing- China	Social interaction → no effect on IS	Li et al. (2014)

Information technologies play a critical role in facilitating firms to collect, analyse and disseminate quality information among their employees and supply chain members for improved decision making and supply chain performance (Sanders and Premus, 2002, Fawcett et al., 2007a, Fawcett et al., 2007b, Baihaqi and Sohal, 2013). Considered as the backbone of SCM, IT improves the timeliness and accuracy of the shared information as it has the ability to allow the free flow of all needed information electronically with minimum human intervention (Fawcett et al., 2007a, Baihaqi and Sohal, 2013).

Regardless of their physical location, IT has enabled supply chain members around the globe to share real-time information in a fraction of time. ERP, online marketing, electronic catalogues and barcoding/automatic identification system have helped supply chain members to share information and reduce their cost eventually. For example, bar code can be used to inform suppliers about sales data. With the availability of this information they can predict future demand and plan their inventory. With IT, information sharing becomes easy, especially operational information which is mostly quantitative in nature (Moberg, 2000).

3.3.3.2 Information Quality

In the context of supply chain information sharing, the quality of information is emphasised as a critical component for organisational as well as relationship success (Mohr and Spekman, 1994, Moberg et al., 2002). Information quality measures the accuracy, timeliness, adequacy, credibility and completeness of information shared so as to use it for optimum benefit and avoid misleading and faulty information (Li and Lin, 2006, Zhou and Benton Jr, 2007). When the quality of shared information is poor, it results in ineffective decision-making, lack of trust, customer dissatisfaction, inefficiencies in implementing strategies, plans and processes and lack of motivation to share information (Mohr and Spekman, 1994, Ramayah and Omar, 2010).

The benefits of information sharing can be realised only if the shared information is of good quality (Moberg et al., 2002). The motivation to share information will diminish if the information shared is faulty, inaccurate, incomplete, untimely and unreliable (Moberg, 2000). It is unlikely that managers will rely on the information provided by a partner that has regularly provided faulty or inaccurate information. Information sharing will be impeded as a result. In contrast, sharing quality information with supply chain partners enhances satisfaction and establishes trust among them (Mohr and Spekman, 1994, Childerhouse et al.,

2003, Baihaqi and Sohal, 2013). This will in turn motivate firms to improve the quality of the information that they share with their partners. In order to diffuse quality information to external partners to improve the performance of the entire supply chain, the information exchanged within an organisation needs to be accurate, up-to-date, complete and timely.

3.3.3.3 Interaction Routines

Interaction routines is defined as the degree to which business partners communicate frequently either formally or informally in order to exchange information and knowledge most required to strengthen their business relationship (Patnayakuni et al., 2006, Müller and Gaudig, 2011, Li et al., 2014). Two-way interactions regarding plans, programs, expectations, goal setting, market conditions and performance evaluation are important for maintaining coordination and avoiding misunderstanding (Anderson and Weitz, 1989, Anderson and Weitz, 1992). Frequent communication and interactions between firms can be conducted either through face-to-face meetings, emails or telephone conversations.

Well-developed social interaction is a structural capital (Li et al., 2014) that improves coordination and cooperation between supply chain partners (Müller and Gaudig, 2011, Mitchell and Kovach, 2016). It requires supply chain partners to maintain a partner relationship for information and knowledge integration (Patnayakuni et al., 2006). Interaction routines with supply chain partners are prerequisite for the development of trust-based, collaborative relationship which results in better performance and services (Mohr and Spekman, 1994, Wilson, 1995, Large, 2005). Moreover, the interaction process itself is a form of information sharing.

Interaction routines represent communication between supply chain partners to investigate and improve the planning and coordination of supply chain activities (Patnayakuni et al., 2006). They serve the purpose of regular communication and enhancing commitment in a relationship, which further causes firms to encourage information sharing with their partners (Anderson and Weitz, 1992, Ruppel, 2004, Müller and Gaudig, 2011). Relationship structure with frequent interaction routines allow firms to know each other and be aware of each other's needs and requirements, enhancing their confidence regarding the extent of information they should share with their partners (Large, 2005, Müller and Gaudig, 2011).

3.3.3.4 Partnership Extent

Partnership is the mutual ongoing relationship developed between two individual organisations (Mentzer et al., 2000) characterised by its focus on collaboration, longer term relationship, the achievement of shared goals and the sharing of costs and benefits (Cooper and Ellram, 1993, Ellram, 1995, Madlberger, 2009, Du et al., 2012, Baihaqi and Sohal, 2013). It includes the building of an embedded relationship attributed by extensive social, economic, service and technical ties over time (Mentzer et al., 2000) bounded by contractual obligations (Bucklin and Sengupta, 1993, Madlberger, 2009).

Costs and benefits sharing (Cooper et al., 1997a, Barratt, 2004, Cheng, 2011), the amount of time firms invest in developing a strong relationship (Anderson and Weitz, 1989, Bucklin and Sengupta, 1993), and relational benefits (Morgan and Hunt, 1994, Cheng, 2011) are important components of partnership. These components need to be carefully considered because they play crucial roles in enhancing the durability of the partnership and cooperation among all the members (Day, 1995, Cooper et al., 1997b, Mentzer et al., 2001). This research has synthesised all the above components into partnership because a successful partnership can be developed over a period of time through mutual understanding and sharing of risks and benefits.

Strategic advantages such as access to market, product and technical information, enhanced product value and improved market reputation are the key motivational factors for firms to enter into partnership (Bucklin and Sengupta, 1993). According to Mohr and Spekman (1994), successful partnership enhances the quantity and quality of communication and the level of information sharing amongst them. Relationship that delivers mutual benefits and is driven by trust and commitment is a critical factor in determining the extent of information sharing in the supply chain (Cooper et al., 1997a, Du et al., 2012). Partnership with greater relational benefits develops positive and effective collaborative relationships and has a tendency to minimise relational risks which in turn will enhance inter-organisational information sharing in supply chains (Cheng et al., 2013).

3.3.3.5 Legal Contracts

The security provided by the legal system of a country to reduce behavioural insecurities and to generate shared understandings and expectations that others will act appropriately is referred to as legal protection (Cai et al., 2010). The extent of legal protection depends on the

detailed formal legal rules and contracts (Cai et al., 2010). Legal and policy regulations will enhance relationship between partners and reduce risks through trust building (Yang and Maxwell, 2011).

An important component of legal protection is contracts that cover privacy protection and confidentiality agreement (Li and Zhang, 2008). They are the devices used for business transactions with significant considerations of the future possibilities of disputes and non-performance and their required compensation (Macaulay, 1963, Li and Zhang, 2008). Supply chains consist of multiple organisations having different objectives (Ghosh and Fedorowicz, 2008), where legal, written contracts are imperative to guide behaviours of partners towards desired common objectives (Engel et al., 2014). They provide a basis on which partner behaviours are determined and non-performance is penalised (Bucklin and Sengupta, 1993).

Since not all contracts are the same, firms negotiate to determine the various possible conditions of exchange that are beneficial for both parties (Thomas et al., 2013) prior to developing a contract. Pricing, delivery terms, shipment schedules, terms of payment, transportation costs, carrier selection and maintaining quality standards are supply chain and logistics activities and requirements. These activities and requirements need to be coordinated to fulfil end customers' need. The coordination of such activities and requirements involve negotiation on costs and products/services (Thomas et al., 2013) as the main aim of supply chain is to reduce costs and provide improved products/service. Supply chain partners develop their contracts based on the outcomes of their negotiation. Hence, this study will consider negotiation strategy as a constituent of contracts rather than considering it as an individual factor.

On the basis of the above discussions, this study has combined confidentiality (Li and Zhang, 2008), legal protection (Cai et al., 2010) and negotiation strategy (Thomas et al., 2013) into legal contracts (Ghosh and Fedorowicz, 2008, Müller and Gaudig, 2011, Zhang and Chen, 2013) as these components cover the area of information security, negotiation strategies to develop the rules and the consequences of violating the rules.

Lack of legal support to ensure privacy and confidentiality of shared information can prevent firms from sharing information with their partners (Yang and Maxwell, 2011). However, in the supply chain context, it is difficult to specify in advance the type and amount of information that might be required in future and hence, regulating information exchange

through contracts can be problematic (Müller and Gaudig, 2011). Contracts do not embrace the give-and-take needed in business relationships (Macaulay, 1963). Hence, contractual boundaries limit the flexibility of sharing information according to the need and requirement of the trading partners as firms tend to only share information required in the contract. Moreover, contracts may hinder the development of a good business relationship as relationships bounded by contracts lack trust and the performance achievement is limited to the contractual boundary (Macaulay, 1963). Lack of trust makes firms reluctant to share information with their trading partners.

3.3.3.6 Supply Network Configuration

Various structural dimensions of the network such as network patterns (like dyadic, multi-channel and multi-stage) and the horizontal position of firms within the chain constitute supply network configuration (Lambert and Cooper, 2000, Samaddar et al., 2006). With the growing number of suppliers and stages, it becomes difficult to coordinate different processes (Lambert and Cooper, 2000) due to different levels of interactions, varying information needs and incompatible goals (Samaddar et al., 2006, Moser et al., 2011). The amount of time and effort invested in relationship development has to be divided into several partners which might not be sufficient to build a strong relationship. In addition to the network patterns, the position of participants in the supply chain has a direct impact on its experiences and interactions with other members of the chain (Lambert and Cooper, 2000). The possible network configurations are dyadic, multiple dyads, multi-stage dyad and multi-stage multi-dyad relationships (Samaddar et al., 2006) and are illustrated in Figure 3.3.

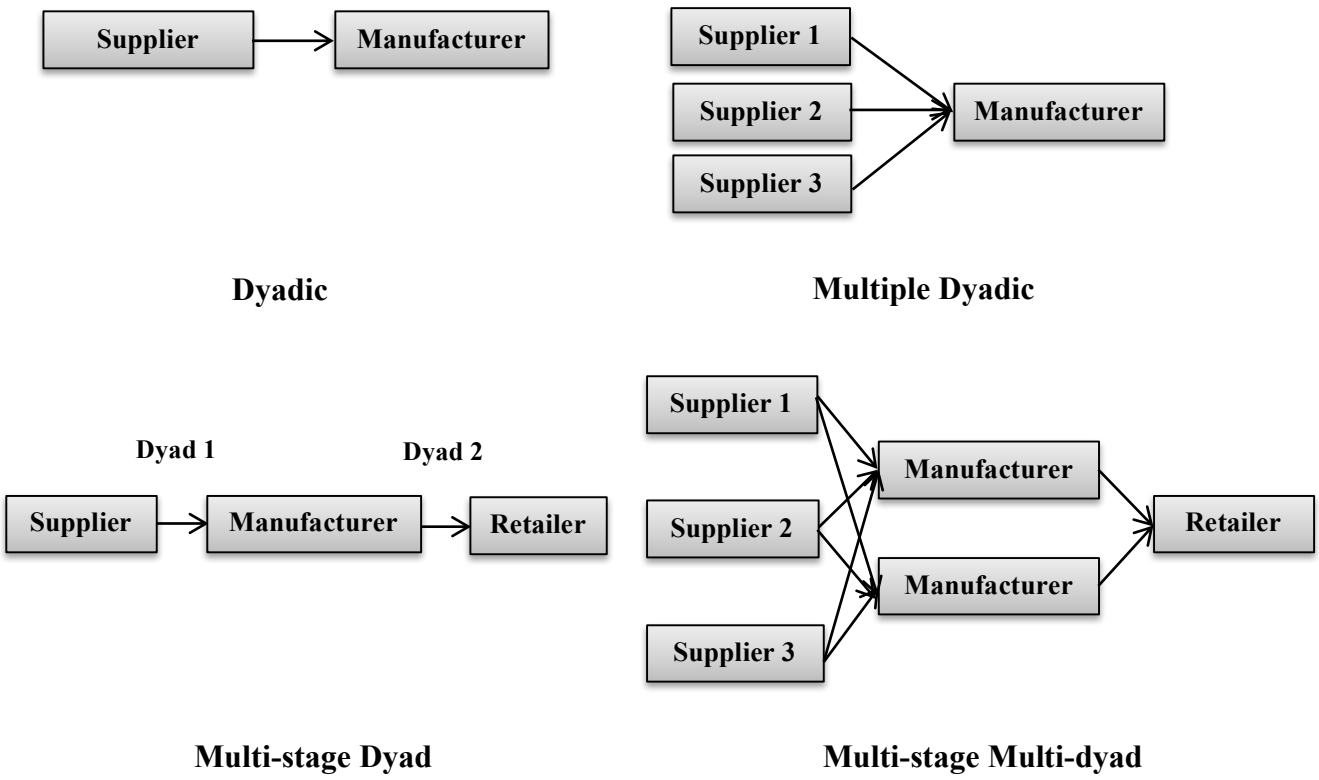

Figure 3.3: Supply Network Configuration with Varying Number of Dyads and Stages
Source: Adapted from Samaddar et al. (2006)

The relationship between two firms is either partnership or arm's-length depending on the supply chain configuration. Firms tend to develop a close collaborative relationship with those firms that are immediately next to them in the chain (Cooper et al., 1997a, Fawcett et al., 2007a). Similarly, firms develop different relationships depending on their position in the supply chain as different firms experience different demand volatility and bargaining power affecting their relationships with other firms. Their need and the potential to develop a collaborative relationship vary in accordance to their supply network configuration which in turn will affect their motives to share information with their partners.

3.3.3.7 Supply Chain Integration

Supply chain integration is the degree to which supply chain partners collaborate with each other to manage internal and external processes and activities to facilitate the efficient flow of products, finance and information with an aim to serve the customers better than their competitors (Flynn et al., 2010, Koçoğlu et al., 2011). According to Flynn et al. (2010), supply chain integration can be categorised as customer, supplier and internal integration in

which customer and supplier integration form the external integration. This study considers supply chain integration as one factor affecting information sharing rather than dividing it into internal integration (Baihaqi and Sohal, 2013, Ganotakis et al., 2013), external and logistics integration (Chinomona and Pooe, 2013).

Organisations integrate internally among various departments as well as externally across firm boundary. The focus of supply chain management is on external integration. However, without achieving internal integration, external integration is likely to be difficult and time consuming (Welker et al., 2008, Flynn et al., 2010, Baihaqi and Sohal, 2013, Huo et al., 2014). Information sharing and operational planning are the key for successful supply chain integration (Levi et al., 2008).

Internal integration between departments creates visibility by the deployment of the information-based linkages which further strengthens external information-based linkages (Barratt and Barratt, 2011). Integrated supply chains strengthen supply chain relationships and facilitate the coordination of information flows between suppliers, manufacturers and customers in both directions. Long-term collaborative relationships among supply chain members as a result of supply chain integration motivate supply chain participants to share accurate, timely and quality information allowing them to be more responsive towards customer needs (Flynn et al., 2010). A strengthened relationship through supply chain integration develops trust among the chain participants which further improve firms' tendency to share information with their partners.

3.3.4 Environmental Factors

The environmental factors refer to the various external conditions and pressures faced by firms due to changing customer demands, new technological development, and supply uncertainties and the management of what is beyond the reach of individual organisations. The major environmental characteristics faced by firms mainly originate from environmental uncertainties (Mentzer et al., 2000), government policies (Cai et al., 2010), and national culture (Shore, 2001). To mitigate the effect of environmental factors on firm performance, inter-organisational relationship should be established so that they can coordinate their processes through information sharing. Table 3.6 summarises the components of the environmental factors which influence information sharing.

Table 3.6: Impact of Environmental Factors on Supply Chain Information Sharing (IS)

Components	Context/ Country	Results	Reference
National culture	Various - US	Information sharing behaviour varies according to the culture of the country	Shore (2001)
Environmental uncertainty	Manufacturing- US	Supplier uncertainty → negative effect on IS; customer uncertainty and technology uncertainty → no effect on IS	Li and Lin (2006)
SC dynamism	Manufacturing- US	SC dynamism → positive effect on IS	Zhou and Benton Jr (2007)
Environmental uncertainty	Non-service- Finland and Sweden	Environmental uncertainty → positive effect on IS	Yigitbasioglu (2010)
Government support	Manufacturing- China	Government support → positive effect on IS	Cai et al. (2010)
Rate of technical change	Manufacturing- S. Korea	Rate of technical change → positive effect on IS	Lee et al. (2010)
Data dynamism	Various- China	Data dynamism → positive effect on proactive IS and no effect on template-based IS	Du et al. (2012)
SC uncertainty	PCB Manufacturing- Taiwan	SC uncertainty → positive effect on IS	Hung et al. (2014)
Environmental uncertainty	Auto parts manufacturing- Taiwan	Environmental uncertainty → no effect on IS	Chen et al. (2014)

3.3.4.1 Environmental Uncertainties

Environmental uncertainties refer to the uncertainties in accurately predicting the environment characterised by volatility and versatility (Ganesan, 1994). In a supply chain relationship, a partner's success or failure is determined by its ability to respond to unexpected variations in demand and supply, technology, or competitive pressures (Stank et al., 1996). Ignoring the effects of uncertainty in the supply chain results in a system that is unable to adapt to future changes and decision making (Beamon, 1999). According to Du et al. (2012), complexity of business depends on their routineness and dependence on other processes. This means that supply chain uncertainty is one the causes of business complexity (Du et al., 2012, Welker et al., 2008) as it affects the company's routineness and its dependence on other processes (supply/manufacturing uncertainty). Hence, this study will only consider environmental uncertainties as a form of business complexity.

Environmental uncertainties are constantly changing (Lee and Billington, 1992) and are inevitable. According to Gupta and Wilemon (1990), and Davis (1993), the three distinct sources of uncertainty that plague supply chains are: suppliers/manufacturers, customers and the rate of technological change. Customer uncertainty or demand uncertainty refers to the demand variations experienced in the supply chain in terms of quantity, quality, flexibility, and delivery that is difficult to predict (Fynes et al., 2004). Supplier uncertainty occurs as a result of manufacturing downtime, quality, rework and yield problems, shortages of materials, order-entry errors, forecast inaccuracies or logistical malfunctioning (Davis, 1993, Fynes et al., 2004, Yigitbasioglu, 2010). Technology dynamism is the unpredictable changes and development in the technology that might cause the present assets and skills to become obsolete (Bucklin and Sengupta, 1993, Varadarajan and Cunningham, 1995).

Firms facing uncertainties caused by demand, supply and technology, will undergo difficulties in formulating effective strategies as the information required to make such strategies keeps changing (Ganesan, 1994). For supply chains to operate efficiently, the changing data and information needs to be updated frequently (Du et al., 2012). With the increase in environmental uncertainties, the need for information exchange increases (Wong et al., 2011). To make informative decisions, reliable and relevant information is needed (Noordewier et al., 1990). Uncertainties faced by supply chain participants encourage them to establish long-term relationships with each other so that they can share necessary information and help each other in making decisions beneficial for everyone in the chain. Collaboration,

coordination and information sharing with business partners is the best way to reduce risks and uncertainties and maintain stability of the supply chain (Mohr and Spekman, 1994, Childerhouse et al., 2003).

3.3.4.2 Government Support

Government of a country plays a significant role in determining business strategies and decision-making of firms. Government mandate is one form of environmental characteristics as it is beyond the control of managers (Cooper et al., 1997a). Some governments have a tendency to exert their influence indirectly through established and transparent industrial policies and regulations, whereas, other governments tend to get directly involved in firms' decision-making processes and at the same time, provide various types of support such as financial aid, favourable policies and reduced land-use fees (Cai et al., 2010).

Government can reduce uncertainty in business transactions and support organisations by providing and enforcing laws and regulations (Rao et al., 2005) under which organisations form, compete, cooperate and exchange (Fligstein, 1996). When government rules and regulations are unstable and unreliable, trust between business partners is deteriorated due to unfair and ineffective government policies (Rao et al., 2005). This will adversely affect the relationships between them and will be difficult to overcome through building close, long-term reciprocal relationships.

While government policies may affect trust building between supply chain members, they may also have the potential to establish policies that can enhance information technology adoption in supply chains. Information sharing requires intensive resources such as networks, computers, telephone service, internet and skilled personnel (Shore, 2001). The costs of these resources are high and is a major inhibitor of IT adoption (Dedrick et al., 2013). Thus, the government plays a crucial role in establishing national policy for the provision of adequate IT infrastructure, training and maintaining an adequate workforce in order to alleviate communication problems (Shore, 2001, Pradhan, 2002).

3.3.4.3 National Culture

As suggested by Andraski (1994), 80 per cent of the problems that arise in real-world retail supply chains are due to people, not technology. Different societies, organisations and groups have different cultures which they have been preserving and passing on from generation to

generation (Hofstede, 1980). The term culture is generally used to signify a nation and thus national culture influences the structure and functioning of a nation (Hofstede, 1980). It influences the way organisations operate their business, the way they establish business relationships with international organisations and the way they communicate with them. National culture is one of the main variables that play a significant role in explaining the nature of supply chain relationships and the degree of information sharing among them (Shore, 2001, Cai et al., 2010, Collins et al., 2012). Cultural differences can be used to explain why organisations in one country may be more inclined to share information with their supply chain partners than those in another country (Shore, 2001).

The cultural differences observed in organisational behaviour are more distinct than the cultural differences observed in individual behaviour (Hofstede, 1980). Moreover, culture has a direct influence on organisations' goals and objectives, decision-making processes, organisation structure and their formal procedures, and reward systems (Hofstede, 1980) which explains the fact that different firms in different countries have different incentives towards information sharing. Hence, supply chain players from a certain country have different inclination towards information sharing which will affect their willingness towards sharing valuable information needed to make wise decisions (Childerhouse et al., 2003).

3.4 Research Framework

Based on above discussion, a research framework is constructed. The framework as shown in Figure 3.4, illustrates the *cause - information sharing - effect* model. A range of factors under each category will be tested for their impact on information sharing. The factors that have a significant effect on information sharing will be considered as important factors in the context of Nepal. The second part of the framework will test the impact of information sharing on supply chain performance. Based on this research framework, a conceptual framework will be constructed in Chapter 4 and will be analysed in Chapter 5.

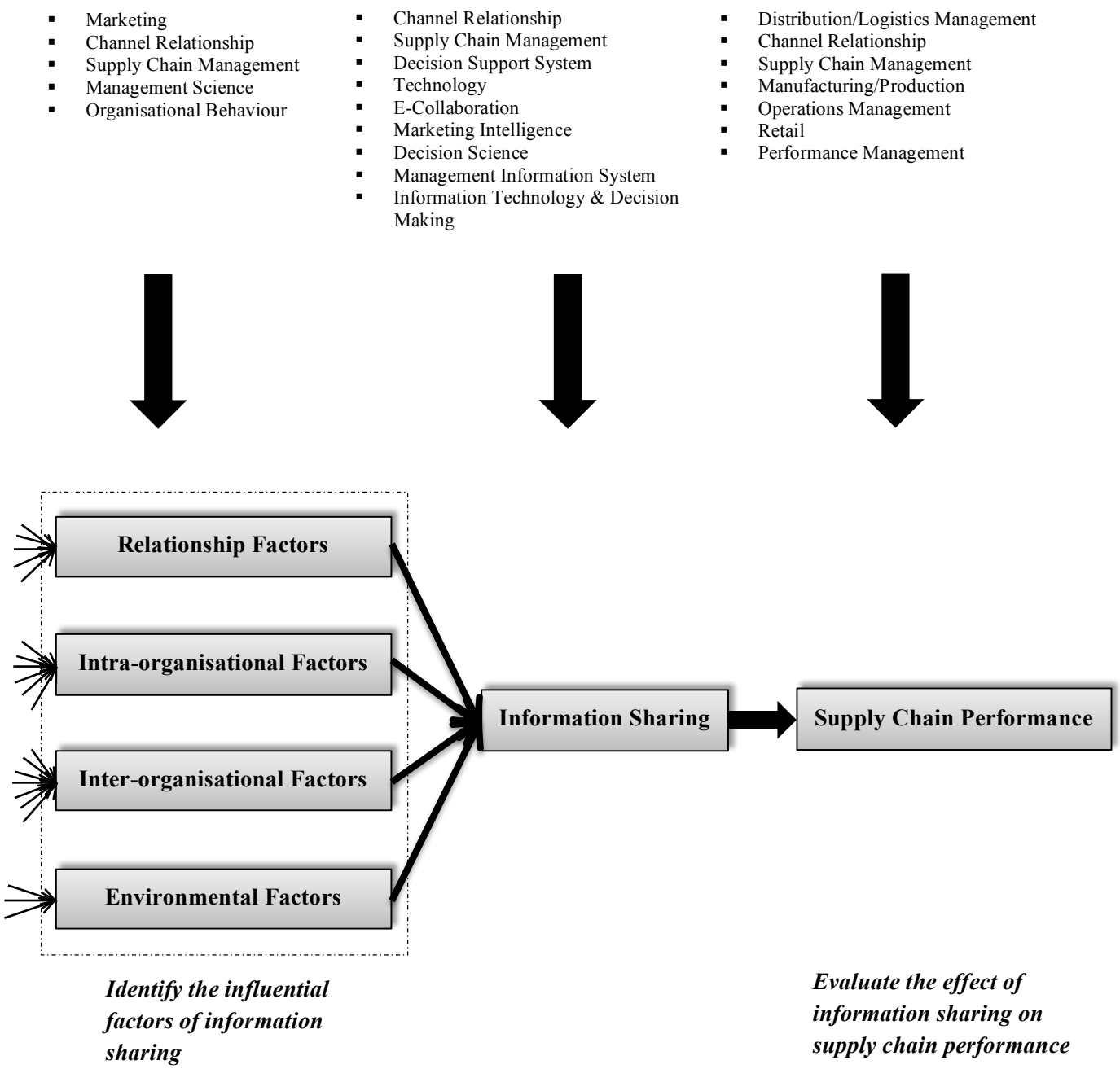

Figure 3.4: Research Framework

3.5 Summary

This chapter provided a review of the literature that helped to develop the theoretical foundation of this research. Supply chain collaboration is an essential requirement to manage various entities of the chain and information sharing has been identified as one of the main foundations of collaboration (Barratt, 2004). Sharing information with supply chain partners will help firms to coordinate and collaborate, improve supply chain relationships, reduce

supply chain costs and improve customer satisfaction. However, there is a reluctance of firms towards information sharing which emphasises the need to identify the factors that influence information sharing. The first section of this chapter explained how systematic review of the literature was carried out to identify a wide-ranging list of factors that influenced information sharing in supply chains.

Previous studies have identified a number of factors that affect supply chain members' decision towards information sharing. However, the literature review revealed that a comprehensive list was lacking. In addition, there has been a dearth of work to analyse and categorise the factors that have been identified so far. A clear framework was necessary to include all identified factors and to illustrate the relationship between the factors and information sharing. Such a framework would provide a better understanding of how information sharing in the supply chain context is facilitated or impeded, thus leading to the development of strategies to improve information sharing among chain participants. The systematic literature review resulted in 21 factors that were anticipated to enhance or impede information sharing in supply chains. Furthermore, it synthesised the different categories used in the literature and categorised the 21 factors into four main categories.

The literature review shows that limited studies have been carried out in supply chain management and information sharing in small under-developed countries like Nepal that are vastly different from developed countries in terms of information technology availability, development of infrastructure, culture, management styles and policies, and organisational size. The adoption of models which was mainly engendered for developed countries might not bear meaningful results in the context of developing countries. There is a clear need to conduct a study in an under-developed country to test the applicability of the findings from previous studies.

Chapter 4 RESEARCH METHODOLOGY AND DESIGN

4.1 Introduction

In the previous chapter, the theoretical framework and the relevant literature was reviewed to design the research. This chapter aims to discuss the research methodology and design used in this research based on the research questions and research objectives. The main purposes of this chapter are to 1) describe the research philosophy; 2) explain the research design; 3) discuss the sample selection process; 4) explain the instrument design and data collection method; and 5) discuss the statistical methods used to analyse the data.

The chapter begins by briefly explaining the purpose and the context of the study that determine the choice of research method. It is followed by a conceptual framework which shows the relationships between the variables. The chapter further explains briefly why mixed methods research design is suitable for this study and the philosophy that supports the author's choice of selection. It also sheds light on how the quantitative and qualitative phases will enhance the ultimate research outputs. The target population and the unit of analysis will be explained followed by the explanation of research ethics. Then the quantitative and qualitative methods are explained separately focusing on sampling strategy, survey instrument development, pre-testing, data collection administration, response rate, non-response bias, validity and reliability and data analysis.

4.2 Research Objective and Context

The decision to choose the best research method lies mainly on what the particular research is trying to do, i.e. the research purpose. It is important to discuss the research purpose and the context before developing a conceptual framework (Rocco and Plakhotnik, 2009). The main focus of this study is to identify the various factors that enhance or impede information sharing in supply chains and to examine the effect of information sharing on supply chain performance. Given the objectives of this research, the research context is likely to make a significant difference to the outcomes. This is because information sharing behaviour may be different due to different social, economic, political and cultural settings.

While a few studies have been carried out to identify the various factors affecting information sharing in supply chains, most of those studies were conducted in developed countries especially in the Unites States. Studies conducted to identify influential factors of supply chain information sharing in developing and under-developed countries are scarce. Companies in developing countries tend to adopt the results and models from developed countries without considering the various aspects that might yield contrasting results (Pradhan, 2002). Research in developing and under-developed countries may reveal significant differences due to their different social, economic, political and cultural background, geographical status, and technological development. This study particularly focuses on Nepal, a small under-developed country with limited resources but rich in natural resources and cheap labour.

For the purpose of this study, mixed methods which comprise of quantitative as well as qualitative methods are likely to produce more meaningful results. Mixed methods are well suited for situations when one data source may be insufficient and hence need a second method to enhance the study (Creswell and Clark, 2011). Furthermore, it will help researchers to draw conclusions that are well justified through convergence and corroboration of findings (Johnson and Onwuegbuzie, 2004). Quantitative methods can be used to answer the research questions of this study. However, it will be wise to collect qualitative data through interviews because this study focuses on Nepal where such studies are limited. The qualitative data will help the researcher to explain the quantitative data in depth.

4.3 Conceptual Framework

A conceptual framework is developed to connect the literature to the concepts that support the needs of the study. The preliminary aim of a conceptual framework is to identify, categorise and describe various concepts, factors and variables from the existing literature and explain the presumed relationships between them (Rocco and Plakhotnik, 2009). A conceptual framework shows a clear picture of the research issues and the important fields to be investigated by refining and narrowing down the topic from a broader aspect leading the researcher towards the choice of strategies and research methods to achieve the target (Rocco and Plakhotnik, 2009). The review of literature in marketing, channel relationships and supply chain and logistics management led to the development of the conceptual framework for this study. As shown in Figure 4.1, the first part of the framework identifies what factors

affect operational and strategic information sharing. The second part shows how operational and strategic information sharing affect supply chain performance in terms of cost, quality, delivery and flexibility. This is a '*precursors – information sharing – effect model*.' While this model has been adapted from previous studies, the cause and effect of information sharing are different in the current study.

4.3.1 Factors Influential to Information Sharing in Supply Chains

Based on the systematic review of the literature in Chapter Three, 21 factors were identified as the antecedents of information sharing in supply chains. The identified factors were then grouped into four categories based on their origin (relationship, intra- or inter-organisational and environmental). Information sharing was divided into two levels as operational and strategic information sharing. The literature lacks a comprehensive list of factors that enhance or impede information sharing between supply chain partners. In addition, the antecedents of information sharing in the context of developing country is lacking in the literature. This study aims to find out the significant factors and the magnitude of their effects on information sharing. Hence, the first primary research question is as follows:

PRQ1: How is information sharing affected in supply chains in the context of Nepal?

The primary research question is divided into two subsidiary questions:

SRQ1.1: What are the critical factors affecting information sharing in the supply chains in Nepal?

The first subsidiary research question aims to test whether the identified 21 factors affect operational and strategic information sharing. It will investigate whether a factor affects operational and strategic information sharing significantly. All the factors that exhibit statistical significance will be considered as the critical factors that will influence information sharing. To answer SRQ1.1, 21 hypotheses were formulated to test the effect of each factor on operational information sharing and another 21 on strategic information sharing.

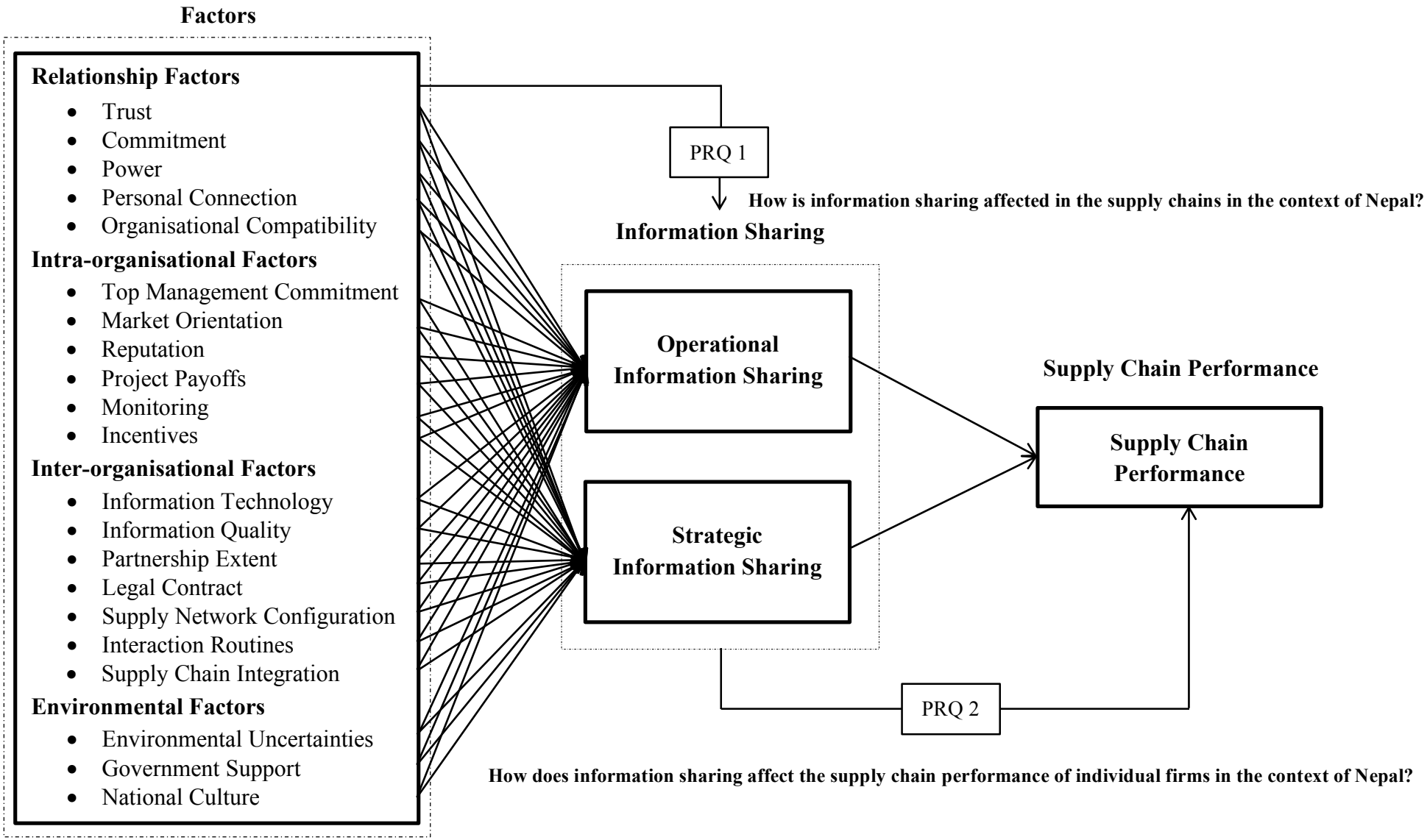

Figure 4.1: Conceptual Framework for the Precursors and Effect of Information Sharing in Supply Chains.

Hypothesis (1-21)a: *Operational information sharing is affected by trust, commitment, power, personal connection, organisational compatibility, top management commitment, market orientation, reputation, project payoffs, monitoring, incentives, information technology, information quality, partnership extent, legal contract, supply network configuration, interaction routines, supply chain integration, environmental uncertainties, government support and national culture.*

Hypothesis (1-21)b: *Strategic information sharing is affected by trust, commitment, power, personal connection, organisational compatibility, top management commitment, market orientation, reputation, project payoffs, monitoring, incentives, information technology, information quality, partnership extent, legal contract, supply network configuration, interaction routines, supply chain integration, environmental uncertainties, government support and national culture.*

After finding out the critical factors affecting information sharing, the next aim is to find out the magnitude and the direction of the effect of the significant factors empirically predicted from SRQ1.1. Hence, the second subsidiary question is as follows:

SRQ1.2: How do these factors affect information sharing at strategic and operational levels?

4.3.2 Effect on Supply Chain Performance

Different supply chains have different aims and objectives, based on which firms employ different supply chain performance metrics. This study has chosen cost, quality, delivery and flexibility as the four components of supply chain performance to investigate how information sharing affects the supply chain performance of individual firms.

Hence, the second primary research question is as follows:

PRQ2: How does information sharing affect the supply chain performance of individual firms in the context of Nepal?

The second primary research question is further divided into two subsidiary questions:

SRQ2.1: How does operational information sharing affect the supply chain performance of individual firms in Nepal?

SRQ2.2: How does strategic information sharing affect the supply chain performance of individual firms in Nepal?

The two subsidiary questions under PRQ2 aim to find out how supply chain performance of individual firms is influenced by operational and strategic information sharing. To answer SRQ2.1 and SRQ2.2, eight hypotheses were framed as follows:

> ***Hypothesis 22a:*** *There is a positive relationship between operational information sharing and cost performance.*
>
> ***Hypothesis 22b:*** *There is a positive relationship between operational information sharing and quality performance.*
>
> ***Hypothesis 22c:*** *There is a positive relationship between operational information sharing and delivery performance.*
>
> ***Hypothesis 22d:*** *There is a positive relationship between operational information sharing and flexibility performance.*
>
> ***Hypothesis 23a:*** *There is a positive relationship between strategic information sharing and cost performance.*
>
> ***Hypothesis 23b:*** *There is a positive relationship between strategic information sharing and quality performance.*
>
> ***Hypothesis 23c:*** *There is a positive relationship between strategic information sharing and delivery performance.*
>
> ***Hypothesis 23d:*** *There is a positive relationship between strategic information sharing and flexibility performance.*

4.4 Research Philosophy

A clear philosophical view about one's research has a direct effect on how a researcher will conduct his/her research, which in turn affects the method of data collection, analysis and interpretation (Creswell, 2014). The research philosophy adopted by any researcher is an indication of how the researcher views the world and decides what is important and useful (Saunders et al., 2009, Creswell, 2014).

The current study is a social science research. The main focus is the social world we live in, and to understand that it is constantly changing. Understanding the factors that are causing the changes is imperative to comprehend why and how such changes occur (Saunders et al., 2009). There are three main research philosophies (paradigms or worldview) prevalent in

management research, which are positivism, interpretivism and pragmatism. The research philosophy determines the epistemology and ontology one adopts (Saunders et al., 2009).

Positivism is an objective philosophy that is based on the belief that an action can be explained as the effects or outcomes of a real cause and hence, positivists focus on identifying and assessing the factors that affect the results of their research problems (Guba and Lincoln, 1982, Creswell, 2014). Positivism adopts deductive approach where existing theories are used and verified by collecting large amount of quantifiable data with the researcher external to the process and analysing it statistically (Saunders et al., 2009, Bryman and Bell, 2011, Creswell, 2014). Interpretivism, on the other hand, is a subjective philosophy that is based on the belief that individuals seek understanding of the world in which they live and work by interacting with social actors, enhancing their own meanings and actions (Saunders et al., 2009, Creswell, 2014). Unlike positivism, interpretivism adopts an inductive approach where the researcher develops a theory through interacting with a human community and interpreting the meanings of their views towards the world (Bryman and Bell, 2011, Creswell, 2014).

While there are researchers with positivist or interpretivist opinion, some researchers believe that research can be conducted by combining the various aspects of the two research paradigms (positivism and interpretivism) (Teddlie and Tashakkori, 2009). Pragmatism is a philosophy that best defines the approach for integrating perspectives and viewpoints and hence, supports mixed methods research (Tashakkori and Teddlie, 2003, Johnson and Onwuegbuzie, 2004, Johnson et al., 2007, Saunders et al., 2009, Creswell, 2014). Pragmatists consider research questions as the main determinant towards the choice of philosophy and pragmatism allows researchers to carry out research of interest in a way that researchers find appropriate to meet their needs and purposes (Greene and Caracelli, 1997, Johnson and Onwuegbuzie, 2004, Saunders et al., 2009). It gives researchers the liberty not to limit their choice on any one particular philosophy and, hence have the flexibility to gain knowledge from both quantitative and qualitative philosophical assumptions to explain the inquired problems (Greene and Caracelli, 1997, Creswell, 2014).

This study is in line with the positivist theory according to which a social phenomenon (information sharing, performance) can be explained as the outcome of real causes (factors). In this sense, quantitative method is the ideal option to answer the research questions. However, the context of the study is Nepal, an under-developed country where such research

is scarce, thus, pragmatism is the appropriate choice. Pragmatism allows researchers to use multiple modes of data collection in a single study to provide detailed information about the problems under study and best answer the research questions. Following the pragmatism philosophy, this study will use mixed methods to conduct and report the research.

4.5 Research Approach, Methods and Design

Research methods involve the proposed form of data collection, analysis and interpretation by the researcher and the research design involves the different types of inquiry (specific procedures) within different research methods that provide the plan and procedure to conduct a research (Creswell, 2014). The various philosophical paradigms (worldviews), methods and designs make up the research approach (Creswell, 2014). According to Greene and Caracelli (1997), the political level (the level of purpose), the philosophical level (level of paradigm) and the technical level (the level of method) are the three important levels that needs to be considered while making the decision as to which research method best suits the purpose.

In the past, there were researchers who had a purist attitude towards two dominant research methods resulting in two research cultures where some considered qualitative methods to be superior with its deep and rich observational data whereas some believed quantitative methods to be superior because of its generalisability attribute (Johnson and Onwuegbuzie, 2004, Zikmund et al., 2014). While quantitative and qualitative methods have dominated the research methods adopted by researchers in the past, a new trend of mixing quantitative and qualitative methods has become prominent since 1980s (Creswell, 2014). With the increasing popularity of incorporating various methods in a single study (Tashakkori and Teddlie, 2003), the current research paradigm world consists of three research methods: quantitative, qualitative and mixed methods (Johnson et al., 2007, Andrew and Halcomb, 2007). The philosophical assumptions, characteristics, research designs, procedures and the sample size of the three research methods are given in Table 4.1. According to Tashakkori and Teddlie (2003) and Johnson and Onwuegbuzie (2004), quantitative, qualitative and mixed methods research all have their significance in different circumstances, and it is the researchers' decision to make a choice on which method best answers the research questions. Answering the research questions in a justified and warranted way is the most important aspect of any research while paradigm issues are secondary which can be dealt with once the researcher confirms the best possible option to serve the purpose (Tashakkori and Teddlie, 2003).

Table 4.1: Quantitative, Qualitative and Mixed Methods Research

Items	Quantitative Research Method	Qualitative Research Method	Mixed Research Method
Philosophical Assumptions	Positivism	Interpretivism	Pragmatism
Characteristics	Deductive, confirmatory, theory/hypothesis testing, standardised data collection, statistical analysis	Inductive, exploratory, theory/hypothesis generation, researcher as the primary instrument of data collection, qualitative analysis	Deductive, inductive, abductive, inclusive, pluralistic and complementary
Research Designs	-Experimental Designs -Correlational Designs -Survey Designs	-Narratives -Ethnography -Phenomenology -Grounded Theory -Case Studies	-Convergent Parallel -Explanatory Sequential -Exploratory Sequential
Techniques for Data Collection, Analysis and Interpretation	-Pre-determined -Instrument based questions -Performance, attitudinal, observational and census data -Statistical analysis -Statistical interpretation	-Emerging methods -Open-ended questions -Interview, observation, document, and audio-visual data -Text and image analysis -Themes, patterns interpretation	-Both pre-determined and emerging methods -Open-ended and closed-ended questions -Multiple ways to collect and mix quantitative and qualitative data -Statistical and text analysis -Across databases interpretation
Sample Size	Large Sample	Small Sample	Large/small

Source: Adapted from Johnson and Onwuegbuzie (2004), Creswell (2008), Creswell (2009), Creswell (2014) and Zikmund et al. (2014)

4.5.1 Quantitative Research Approach, Research Methods and Research Designs

Quantitative approach corroborates positivist philosophy (Tashakkori and Teddlie, 2003, Creswell, 2014). Quantitative methods collect precise, quantitative, numerical data from the respondents which can be statistically analysed in order to generate information needed to describe trends about a large number of people (Johnson and Onwuegbuzie, 2004, Creswell, 2008). The use of statistical software makes data analysis less time consuming generating results that are independent of the researcher (Johnson and Onwuegbuzie, 2004).

Quantitative inquiry is performed at a macro level to produce a collective structure in order to explain the phenomena under observation (Greene and Caracelli, 1997). They are well structured and planned and generate results that are highly precise and mathematically manipulable (Guba and Lincoln, 1982, Tashakkori and Teddlie, 2003).

While quantitative research methods have several strengths, there are some weaknesses that need to be considered while carrying out a quantitative research. Quantitative research builds on already existing theories and categories which might be different from the community's understandings and experiences (Johnson and Onwuegbuzie, 2004). Another restriction is that it generates results that are too abstract and general which limits its applicability to a particular context/situation or individual (Johnson and Onwuegbuzie, 2004).

4.5.2 Qualitative Research Approach, Research Methods and Research Designs

Qualitative approach corroborates interpretivist worldview (Creswell, 2014). Qualitative methods collect qualitative data via methods such as interviews which will provide more detailed information about the research topic. While Qualitative inquiries are unstructured and unplanned (Tashakkori and Teddlie, 2003), they are performed at a micro level focussing on individual beliefs and actions in order to provide a detailed explanation about the phenomena under observation (Greene and Caracelli, 1997). Qualitative methods generate results that are rich with information in order to provide elaborate interpretations of market phenomena and are applicable to evaluate phenomena difficult to explain via numbers (Guba and Lincoln, 1982, Zikmund et al., 2014).

With all the above strengths, a qualitative method seems to be superior, but it too has some weaknesses that need to be considered while designing a qualitative research. Qualitative data collections are time consuming and the results will only be applicable to a particular group or context and hence, cannot be generalised (Creswell, 2008). Data analysis is often time consuming and generates results that are biased by the researchers' personal beliefs and understandings (Johnson and Onwuegbuzie, 2004).

4.5.3 Mixed Methods Research Approach, Research Methods and Research Designs

Mixed methods research approach corroborates pragmatic worldview (Creswell, 2014). Mixed methods research design includes a combination of both qualitative and quantitative research approaches in terms of viewpoints, data collection, analysis and mixing within a single study to enhance the breadth and depth of understanding about the research problems (Tashakkori and Teddlie, 2003, Johnson et al., 2007, Creswell, 2008). It allows researchers to combine empirical data, often quantitative with descriptive data (such as words, pictures and narratives) so that they get additional information to interpret their results (Onwuegbuzie and Leech, 2004).

Recognised as the third major research paradigm (Johnson et al., 2007, Andrew and Halcomb, 2007), the main aim of mixed methods research is to gain the strengths and minimise the weaknesses of each individual methods by incorporating them into one single research (Jick, 1979, Johnson and Onwuegbuzie, 2004, Onwuegbuzie and Leech, 2004). This is the most reasonable justification for mixed methods research because the final output will be superior, complemented by the strengths of the two individual methods (Johnson and Onwuegbuzie, 2004). The compilation of quantitative and qualitative data to execute a mixed methods research design will create knowledge that embraces the participants' real life views and experiences and at the same time it can be generalised to other participants and other contexts (Greene and Caracelli, 1997). However, mixed methods design will be complete only when the findings are mixed or integrated at one point in the research (Johnson and Onwuegbuzie, 2004).

While mixed methods have been proved to be a new and popular trend in research methods, researchers need to be careful while choosing the type of mixed methods research that best suits the study context (Creswell, 2008). There are different mixed methods designs identified

in the literature based on the weight given to each component (equal emphasis or one method given the dominant emphasis) and the sequence in which they are conducted (whether the two phases are carried out sequentially or simultaneously) (Johnson and Onwuegbuzie, 2004, Creswell, 2008, Creswell and Clark, 2011). The primary research designs associated with mixed methods research are convergent parallel or concurrent mixed methods, explanatory sequential mixed methods and exploratory sequential mixed methods (Creswell, 2014).

Based on the research problem and research questions, available resources and available time, one can decide to choose any of the mixed methods design. However, it is not necessary that the researcher has to stick to the methods described in the literature but rather be creative and design other methods that best answers the research questions (Johnson and Onwuegbuzie, 2004).

4.6 Convergent Parallel or Concurrent Mixed Methods – Mixed Methods Design Chosen for this Study

The two main gaps in this study are the absence of a comprehensive list of factors influencing information sharing in supply chains and a dearth of studies done in poor, under-developed countries like Nepal to investigate the cause and effect of supply chain information sharing. It was deemed necessary to study various influential factors of information sharing in supply chains because it has a significant effect on supply chain performance. Thus, the study was extended to examine whether a verifiable relationship exists between information sharing and supply chain performance.

Quantitative research is suitable for this type of study where the main task is to test and validate already constructed theories about how and why a phenomena occur (Johnson and Onwuegbuzie, 2004). The results generated through statistical analysis can be used to describe the trends in information sharing between various supply chain members in Nepal (Tashakkori and Teddlie, 1998). However, looking at the context of this study where very limited number of such studies has been carried out, it will be worth collecting qualitative data as well to add insight and understandings about the issues under study. The terms that are used in the academic language might not be used in real time, but through simple language, the researcher might obtain rich information that can be categorised into different themes relevant to the current study. With that objective, interviews with the owners,

managers, and CEOs of the focal firms will be conducted to provide further explanation to the results of quantitative research.

To strengthen the research and justify the findings, this study will opt for mixed methods where both the quantitative and qualitative data will be collected simultaneously. Convergent parallel or concurrent mixed methods are chosen as the mixed methods design to provide a detailed analysis of the research problems by merging quantitative and qualitative data to interpret the overall results. A questionnaire survey will be conducted amongst the various supply chain members including manufacturers, agro-based companies, logistics service providers (LSP) and retailers/dealers/distributors/wholesalers in Nepal. In addition to the survey questionnaires distributed to a large group of professionals, in-depth interviews amongst recruited participants will be carried out in parallel with the survey. The main reason for collecting interview data is to supplement the quantitative data by providing detailed information to help understand and explain the reasons for the validated relationships between variables.

4.6.1 Unit of Analysis

Unit of analysis is an important aspect of conducting research. It is the level at which the data needs to be collected (Creswell, 2008). Decisions need to be made on the primary unit of measurement and analysis such as individuals (e.g., managers or shop floor employees); groups (e.g., HR department); organisations; and societies (Bryman and Bell, 2011). Depending on the research questions or hypotheses, it is possible for researchers to select only one level or multiple levels as their unit of analysis (Morse, 2000, Creswell, 2008, Bryman and Bell, 2011).

This study is labelled as organisational-level research because it will collect information from representatives of different organisations to examine the organisational-level phenomenon (Baruch and Holtom, 2008). Since the core aspect of this research concerns information sharing in supply chains, it is imperative to consider individuals representing supply chain member companies. Thus the unit of analysis for this study is the individual representatives from different supply chain organisations such as the owners, managers, managing directors, CEOs, logistics or supply chain managers. These are the individuals who can provide the researcher information to answer the research questions. While the quantitative phase will involve a large number of individuals from various supply chain members, the qualitative

phase will only recruit a small number of participants to get in-depth information about the research problems.

4.6.2 Target Population and Sampling Frame

The aim of every research is to find something that can be applied to an entire population of interest (people or things). The full set of individuals, organisations, groups or things that have the same characteristics and from which a sample is taken is called the population (Creswell, 2008, Saunders et al., 2009). While population can be very general or very narrow, findings that refer to general population will have greater impact than narrow one (Field, 2013). It would be better if researchers could collect data from each member of the population. However, it is difficult for researchers to access each individual member of the population due to constraints such as time and resources. Hence, researchers need to use sampling to choose a subset from the target population, the study of which will result in the overall trend in the attitudes and behaviours of the entire population.

Probability and convenience sampling techniques were used respectively to select the sample for the survey and the interviews. Since this study is aimed at studying the strategies and practices in supply chains in the context of Nepal, the appropriate target population for this study is the members of different supply chains in Nepal. The sample size for the survey was calculated and the respondents were sampled from two databases, FNCCI and NEFFA. The membership roster for the Federation of Nepalese Chambers of Commerce and Industry (FNCCI) (http://www.fncci.org/) and Nepal Freight Forwarders Association (NEFFA) (www.neffa.org.np) were used as the sampling frame for this study. This study focuses on supply chains rather than individual members. It is difficult to find a comprehensive list of industries that consists of various supply chain members from a single source. FNCCI and NEFFA were chosen because they were national official bodies that had up-to-date membership lists. Furthermore, their websites, which are publicly accessible, provide the contact details of all of its members. The Top decision makers of the supply chain companies were selected as the key informants. The survey instrument was developed using some existing items from the literature and adapting some existing ones to suit this study. The interview questions focused mainly on the respondents' description about their relationships with their partners, information sharing and supply chain performance. Careful attention was paid to control bias and increase the response rate.

4.6.3 Data Collection

In this study, quantitative and qualitative data were collected simultaneously. The quantitative data was collected through a sample survey and the qualitative data was collected through face-to-face interviews.

The quantitative data collection tool used in this study is a survey design. It is aimed at collecting a large amount of information by studying a sample from the population of interest to describe the trends, characteristics, behaviours, attitudes and opinions of that population (Salant and Dillman, 1994). Survey designs use questionnaires for data collection which consist of predetermined sets of questions in a predetermined order distributed to a group of respondents that are likely to represent the target population (Saunders et al., 2009). The primary purpose of a survey design is to generalise the results from a sample to an entire population (Fowler, 2009). Surveys are the best and most cost-effective tool for data collection that provide insight into individual perceptions and attitudes. However, it fully depends upon the willingness of the people to respond to these questionnaires (Baruch and Holtom, 2008).

In the current study, the survey was carried out amongst the representatives of various supply chain member organisations. They represent the population under study and the results generated will help to explain the behaviours and attitudes of different supply chain members when it comes to sharing information with their trading partners. The survey was a cross-sectional survey. The plan was to conduct it by direct visitation to the participants considering the context of Nepal where electronic surveys and mail surveys were not likely to generate sufficient response rates. This is because emails/internet has not been fully developed in Nepal and with the growth of modern communication technologies the use of postal service is minimal. Direct visitation will give the researcher the opportunity to meet the respondents and explain them about the research.

Initial telephone calls were made to the participants to invite them to participate in the survey. The researcher physically met only those who have accepted the invitation and were willing to participate in the survey and to receive the questionnaire in a sealed envelope. In Nepal, the development of information technology is still at an initial phase and companies do not receive as many surveys as the companies in developed countries. This implies that while not all companies keep themselves up to date with emails, the ones that check their emails

regularly might not be convinced to complete the survey sent by a stranger. The participants were also given the option to complete the survey online or to receive an electronic version of the questionnaire via email. After the initial telephone conversation, all the necessary documents (cover letter, initial invitation letter and information sheet – see Appendix I and II) were emailed to them. In addition, the electronic version of the survey (See Appendix III) as well as the link to the survey was included in the invitation letter.

Semi-structured interviews with company representatives were conducted in parallel to the questionnaire survey. Qualitative data collected from interviews are useful for answering questions such as what, why and how (Fawcett et al., 2007b). The main purpose of collecting qualitative data is to collect information about the research issues based on the respondents' understandings and their real-life experiences regarding the issue under observation. This will help the researcher to provide in-depth explanation on quantitative data collected via surveys. The researcher will use the qualitative data to explain the 'why' of the themes that may have been raised from quantitative data (Tashakkori and Teddlie, 1998).

Interviews can be conducted in many different ways. In this study, interviews were conducted face-to-face. When the researcher visited the companies for the purpose of the survey, she also asked the respondents if they would be interested to do an interview on the subject under study. Based on their preference, some interviews were conducted during the visit whereas some were conducted at a later date chosen by the respondent. Semi-structured interviews consisted of a list of themes and questions that needed to be covered (see Appendix VII).

4.6.3.1 Sampling

An important practice in designing a good survey is sampling which is the process of selecting a reasonably sufficient number of respondents that can represent the whole population (Salant and Dillman, 1994, Fowler, 2009). In many research cases it is possible to collect and analyse data from the whole population. However, it does not mean that it will provide more useful and reliable outputs than from the data collected from a sample that represents that population (Saunders et al., 2009). The results generated through a survey that has implemented a good sampling technique in which the respondents are good representation of the target population will be equally useful and reliable (Yu and Cooper, 1983).

The use of sampling is important because it is unlikely that researchers can collect and analyse every bit of data available due to limitations caused by time, money and access (Saunders et al., 2009). Hence, the rationale behind sampling is to gain efficiency as it involves less time and money (Salant and Dillman, 1994). The sampling design for the quantitative data collection will involve the determination of the sampling method, sampling frame, sample size and selection of key informants.

Probability and non-probability sampling are the two sampling techniques broadly used in research. Probability sampling technique was used to select the sample for the survey as it is characterised by equal chances of each individual case being selected (Creswell, 2008). It minimises selection bias and hence, the results from this sample can be generalised to the population (Hair et al., 2003, Creswell, 2008, Saunders et al., 2009, Fowler, 2009, Creswell, 2014). The individual companies were selected randomly based on a random number table. The target population for this study was 558 and the sample size as calculated in the next section was 215. To generate a simple random sample of that population, a numbered list of population was acquired by sequentially numbering the companies from 1 to 558. A random number table was generated in Microsoft Excel and the first 215 companies were selected (see Appendix VIII) that constituted a simple random sample of that population (Fowler, 2009, Creswell and Clark, 2011).

While probability sampling technique was used for selecting the survey respondents, non-probability sampling based on the researcher's subjective judgement was used as a sampling technique for selecting the interview respondents (Zikmund et al., 2014). Non-probability sampling techniques are used due to many reasons such as the time and costs involved, extreme difficulty in obtaining probability samples and the need to study a particular sample out of a population (Bryman, 2016). Since the aim is to get in-depth information about the topic under study, it will be wise to select people that are assumed to provide the best help in understanding the phenomenon (Creswell, 2008). This technique suits best to fulfil the need of this study to collect in-depth information from a small number of respondents through interviews (Saunders et al., 2009). Convenience (purposeful) sampling which is a form of non-probability sampling was used in particular as it allows the researcher to select eligible participants who can provide rich information; are willing and available in a most convenient and economical way (Teddlie and Yu, 2007, Creswell, 2008, Zikmund et al., 2014). In particular, maximal variation sampling was used to select participants that differ on some

traits, such as manufacturers, retailers and LSPs (Creswell, 2008). The target population of this study comprise majority of manufacturers and it is easy for the researcher to select more manufacturers for interviews. The use of Maximal variation sampling will minimise this bias by avoiding the selection of manufacturers only.

It was expected that the number of participants for the interviews will be much less than that of questionnaire survey as the main objective of conducting the interviews was to provide better understanding of, and complementary information to the quantitative data. According to Kvale (1996), interviews can be conducted until a point of saturation is reached where further interviews are unlikely to generate new knowledge. In this study, fifteen large and medium sized firms from the sampling frame were chosen for interviews. The size of the firm was determined based on the total number of employees. Large and medium firms were chosen as the potential respondents for interviews because: 1) they were most likely to comprise of supply chains with a number of national and international members; 2) they were expected to have knowledge about supply chain management and inter-organisational relationships; and 3) with the availability of sufficient funding, they were likely to use new technologies for business operations (Yigitbasioglu, 2010, Singh, 2011). Small firms in Nepal are most likely to have little knowledge about the importance of SCM, organisational relationships and information technology, and may not provide useful insights for this study.

There were three databases available, consisting of companies that are relevant to this study. The first list consisted of industries registered in the Ministry of Industry, Government of Nepal and the second list consisted of the associate members of the Federation of Nepalese Chamber of Commerce & Industries (FNCCI). Since only few logistics companies were listed in these two databases, a third list was considered which consisted of logistics service providers only. It is always advisable to use the most comprehensive list available as the sampling frame in order to minimise the coverage error (Salant and Dillman, 1994). Two databases amongst the three were selected as the sampling frame.

The list of associate members of the Federation of Nepalese Chamber of Commerce & Industries (FNCCI) was chosen as one of the sampling frame because it is an up-to-date list consisting of active members (Federation of Nepalese Chambers of Commerce & Industries, 2015). FNCCI was established in 1965 and is represented in almost all national councils/boards/committee/policy advisory bodies concerned with business and industry. FNCCI membership list consists only of those companies with paid up capital of more than

ten million Nepali Rupees (USD 96,645.00) (Federation of Nepalese Chambers of Commerce & Industries, 2015). This means that the list does not include small sized industries as their members. Furthermore, it provides current contact details of all the members.

On the contrary, the list obtained from the Ministry of Industry, Government of Nepal had many drawbacks. Firstly the database consisted of the list of companies registered since 1972 which means that amongst the listed companies there were companies registered four decades ago. According to Government of Nepal Ministry of Industry (2015), most of the information provided in the database has been collected during the time of registration only and are in the process of updating it. This signifies that the information provided is not up-to-date and may contain wrong information. Moreover, it is unclear whether all the companies listed are still operating or not. Secondly, the database does not provide any contact information of the companies. It is uncertain that the contact details of every sample member can be located. Thirdly, the list comprises of 62.5% of small, 26.3% of medium and 11.2% of large size companies which clearly means that the random sampling will result in the selection of mostly small sized companies. This will cause the medium and the large sized companies that are more likely to provide better information regarding the topic of interest, to be under-represented.

The membership roster of Nepal Freight Forwarders Association (NEFFA) was considered as a sampling frame for the logistics service providers which consisted of 113 general members in 2015. NEFFA is a national organisation of freight forwarders in Nepal which was established in 1998 as a non-political, non-profit making and non-government association (Nepal Freight Forwarders Association, 2016). Its main objective is to safeguard the rights and privileges of freight forwarders and transportation entrepreneurs of Nepal (Nepal Freight Forwarders Association, 2016).

Choosing key informants is another important aspect while selecting a sample that could yield results generalisable to an entire population. A key informant according to Campbell (1955), is the one who is well informed about the issue under study and at the same time has the ability to communicate with the researcher. Campbell's criteria were used in this study to select key informants. The top decision makers of the focal firms were selected as key informants with knowledge about their supply chain partners, processes and important trading partners (John and Reve, 1982). Most of the company details obtained from the above-mentioned lists provide the contact details of the top decision makers. The contact details of

the decision makers of the remaining firms can be obtained by contacting their offices. When looking at the business culture of Nepal, most of the small and medium sized businesses are entrepreneur owned which means that the owner of the business is responsible for looking after the business, maintaining the business relationships and improving the performance of the firm (Biggs et al., 2000, Thagurathi, 2007). In other cases, managing directors, CEOs, logistics or supply chain managers would be the key informants with sufficient knowledge about the issues covered in the survey.

4.6.3.2 Sample Size for the Survey

The sample size chosen for the study is another aspect that needs to be considered while designing a survey as it determines how similar the sample is to the population (Creswell, 2008). Larger sample size also generates better estimates of the psychometric properties, such as reliability (Lounsbury et al., 2006). The target sample size chosen for this study was calculated as follows (Hair et al., 2003):

$$\textbf{Sample Size (n)} = (DC \times V / DP)^2$$

Where,

DC (Degree of Confidence) = the number of standard errors for the degree of confidence specified for the research results.

V (Variability) = the standard deviation of the population.

DP (Desired Precision) = the acceptable difference between the sample estimate and the population value.

According to Zikmund et al. (2010), a rule of thumb for estimating the value of the standard deviation is to expect it to be about one-sixth of the range. Since the majority of the questions in the survey used a five point Likert scale, the range will be (5-1) = 4. Therefore,

$$\textbf{Variability (V)} = 1/6 \text{ of the range} = 1/6 \times 4 = 2/3$$

Zikmund et al. (2010) further states that the decision for allowable error and confidence level are manager's or researcher's decision. For 95% confidence interval, the confidence level score = 1.96 and the desired precision is 0.07 (7%) (Zikmund et al., 2014).

$$\mathbf{n} = [(1.96 \times 2/3) / 0.07]^2$$

$$\mathbf{n} = (8.67)^2 = 348$$

While the above formula to compute the sample size is independent of the population size, it may lead to an unnecessary large sample size when the population is small (Hair et al., 2003, Zikmund et al., 2010). Hence, Hair et al. (2003) suggests that if the sample size calculated from the above formula is larger than five percent of the population then the sample size needs to be adjusted. The calculated value of 'n' is quite large when compared to the target population of this study which is 558. The sample size can be adjusted using the following formula based on the population size.

$$\mathbf{n'} = (n \times N) / (n + N - 1)$$

Where, n' = adjusted sample size

n = initial sample size

N = population size

Therefore,

$$\mathbf{n'} = (348 \times 558) / (348 + 558 - 1)$$

$$\mathbf{n'} = 194184 / 905 = 214.568 \sim 215$$

An alternative way to determine the sample size is by using a sample size table (Table 4.2) provided by Saunders et al. (2009). The calculated sample size is consistent with the sample size suggested by Table 4.2.

Table 4.2: Sample Sizes for Different Sizes of Population at a 95% Confidence Level

	Margin of error			
Population	**5%**	**3%**	**2%**	**1%**
50	44	48	49	50
100	79	91	96	99
150	108	132	141	148
200	132	168	185	196
250	151	203	226	244
300	168	234	267	291
400	196	291	343	384
500	**217**	340	414	475
750	254	440	571	696
1000	278	516	706	906
2000	322	696	1091	1655
5000	357	879	1622	3288
10000	370	964	1936	4899
100000	383	1056	2345	8768
1000000	384	1066	2395	9513
10000000	384	1067	2400	9595

Source: *Saunders et al. (2009)*

4.6.3.3 Survey Questionnaire Design

The design of the survey instrument plays a vital role in obtaining a credible output because it will affect the response rate and the reliability and validity of the data collected (Saunders et al., 2009). Questions in a survey should be designed in such a way that the respondents are comfortable to answer them willingly and accurately (Salant and Dillman, 1994). Questions that are vague and ambiguous will cause measurement errors as it will confuse the respondent resulting in wrong answers (Salant and Dillman, 1994). Since there is no existing survey instrument suitable for the current study, a survey questionnaire was designed and developed with some items being developed by the authors based on relevant literature and the authors' understanding of the constructs, and others being adapted from components of existing instruments to suit the context of the current study. Figure 4.2 illustrates the process of questionnaire development.

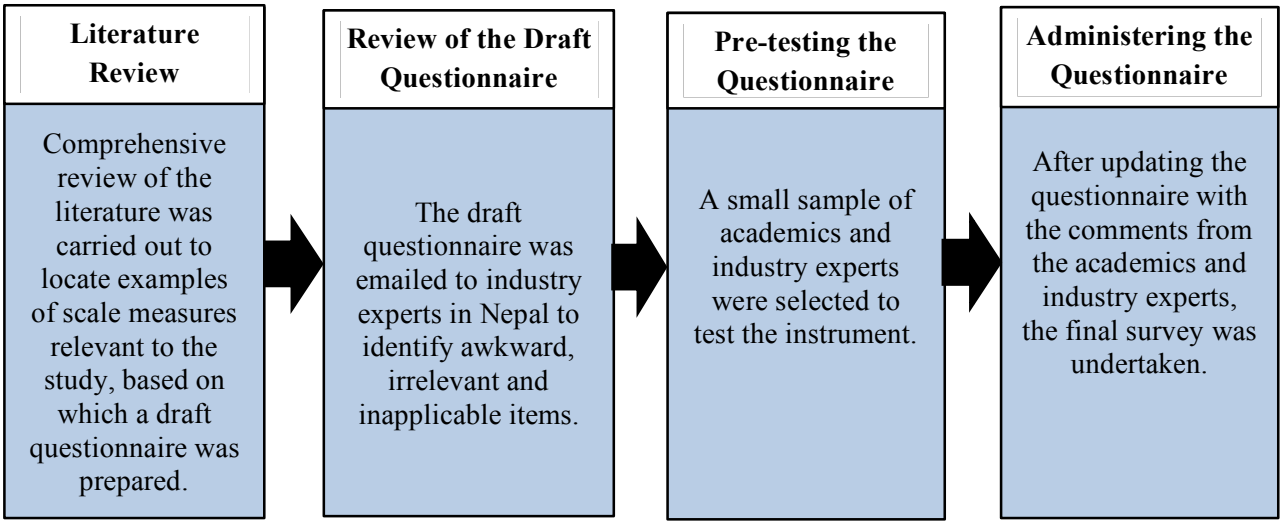

Figure 4.2: Process of Survey Instrument Development
Adapted from (Hsiao, 2006)

The questionnaire consists of four sections with close-ended/multiple choice questions and Likert-scale questions measured on a five-point scale (see Appendix III). Section A comprises of the respondents' profile with seven questions each with multiple choices and the respondent had to choose one answer. The remaining three sections comprise of questions relating to the factors, information sharing and supply chain performance each with Likert-scale questions measured on a five-point scale. It is not advisable to use single-item measures to quantify constructs that are not directly measurable because a single item cannot fully represent a complex construct (Gliem and Gliem, 2003a, Meyers et al., 2013). All the constructs in Sections B to D were measured by multiple items with a minimum of three items for each construct (except power, market orientation, reputation, supply chain integration and environmental uncertainties). Multiple-item measures were considered where each item represented the underlying construct which was combined into a single indicator to show how people think about an issue (Gerbing and Anderson, 1988, Salant and Dillman, 1994).

Likert-type rating scales provide information regarding the direction and the intensity of an individual's choice about the question asked (Matell and Jacoby, 1971). There are different formats to capture the survey responses with different number of alternative scale points. According to Matell and Jacoby (1971), since reliability and validity are not affected by the rating scale format (differing number of response categories), it will be practically desirable if the respondents' are allowed to choose the rating format that best suits their needs. While

more scale choice points are expected to increase the scale variances, in this study, we have used a standard five-point Likert scale with scores from 1 to 5 representing Strongly Disagree, Disagree, Neither Agree Nor Disagree, Agree and Strongly Agree respectively for Sections B and D (Lounsbury et al., 2006). Section C used a five-point Likert scale with scores from 1 to 5 representing Very Little Extent, Little Extent, Some Extent, Great Extent and Very Great Extent. Each of the five scale points used can be assigned a verbally clear descriptors which are precisely defined providing the respondents greater comfort while choosing their response (Lounsbury et al., 2006, Dawes, 2008).

Table 4.3 consists of the factors, the number of items, scale type and the relevant references from which the items have been taken or modified. Due to lack of previously developed items, the items for some factors were developed by the author based on a detailed review of the literature. The items for supply chain performance were developed by the author based on various literatures in order to suit the context of study and the nature of organisation from which the respondents were chosen. The survey instrument is provided in Appendix III.

Table 4.3: Items in the Questionnaire

Sections	Number of Questions	Scale Type	Reference
B. Factors			
Trust	3	5-point Likert scale	Ganesan (1994); Kumar et al. (1995); and Doney and Cannon (1997)
Commitment	3	5-point Likert scale	Ganesan (1994); Kumar et al. (1995); and Morgan and Hunt (1994)
Power	2	5-point Likert scale	Kumar et al. (1995); Author
Personal Connection	3	5-point Likert scale	Wang et al. (2014); and Author
Organisational Compatibility	3	5-point Likert scale	Developed by Author
Top Management Commitment	3	5-point Likert scale	Moberg et al. (2002);
Market Orientation	2	5-point Likert scale	Developed by Author
Reputation	2	5-point Likert scale	Anderson and Weitz (1989); Ganesan (1993); and Author
Project Payoffs	3	5-point Likert scale	Developed by Author

Sections	Number of Questions	Scale Type	Reference
Monitoring	3	5-point Likert scale	Developed by Author
Incentives	3	5-point Likert scale	Developed by Author
Information Technology	3	5-point Likert scale	Li and Lin (2006); and Zhou and Benton Jr (2007);
Information Quality	3	5-point Likert scale	Mohr and Spekman (1994);
Partnership Extent	3	5-point Likert scale	Developed by Author
Legal Contracts	3	5-point Likert scale	Developed by Author
Supply Network Configuration	3	5-point Likert scale	Developed by Author
Interaction Routines	3	5-point Likert scale	Developed by Author
Supply Chain Integration	2	5-point Likert scale	Developed by Author
Environmental Uncertainties	2	5-point Likert scale	Li and Lin (2006);
Government Support	3	5-point Likert scale	Developed by Author
National Culture	3	5-point Likert scale	Developed by Author
C. Information Sharing			
Operational Information Sharing	5	5-point Likert scale	Moberg et al. (2002);
Strategic Information Sharing	4	5-point Likert scale	Moberg et al. (2002);
D. Supply Chain Performance			
Cost	3	5-point Likert scale	Baihaqi and Sohal (2013)
Quality	3	5-point Likert scale	Developed by Author
Delivery	3	5-point Likert scale	Doney and Cannon (1997);
Flexibility	5	5-point Likert scale	Developed by Author
TOTAL	**81**		

4.6.3.4 Interview Questionnaire Design

Interviews create knowledge based on the viewpoints of the interviewee and the interviewer (Kvale, 1996). Semi-structured face-to-face interviews were chosen as a tool to collect data about the sample members' description about their relationships with their trading partners, types of information shared, the factors that affect their information sharing process and the relationship between information sharing and their supply chain performance. While semi-structured interviews consists of a sequence of themes and questions to be covered, it gives flexibility to the interviewer to alter the sequence and forms of the questions as the conversation unfolds (Saunders et al., 2009).

It was advisable to use questions that are simple (free from academic language), short, and easy to understand. The interview questions should be designed in such a way that the 'why' and 'what' questions should be asked prior to asking 'how' questions (Kvale, 1996). The interview questions were divided into four main sections as: respondent's profile, supply chain and supply chain partners, information sharing, and effect of information sharing on supply chain performance.

The first section included questions regarding the respondents' background and the company background. The second section included questions regarding the respondent's supply chain structure, their position in the supply chain, their most important supply chain partner and the measures that they have adopted to maintain good relationship with their partners. The aim of asking these questions was to find out their supply chain structure and their position in it. It also aimed at finding out how they maintain good relationship with their important partners. The third section incorporated questions regarding information sharing and its influential factors. It included questions such as their opinion about information sharing, the type of information they shared with their partners, the type of information that they felt uncomfortable to share and why, the kind of arrangement they have for information sharing (contracts, IT) and why, and the efforts that they have made to improve information sharing with their supply chain members. These questions were asked with the aim to find out the importance of information sharing, influential factors of information sharing and the measures they have adopted to enhance information sharing. The last section included questions regarding the effect of information sharing and the instances where their performance was affected due to the lack of proper information availability. There were additional questions asked in between during the interview to clarify the statements made by

the interviewee which was also a signal to the interviewee that the interviewer was attentive and interested. The interview questions are provided in Appendix VII.

4.6.3.5 Pretesting

Conducting a pre-test before distributing the final questionnaire to the final respondents is vital as it will help to diagnose problems with the scales, its wordings and appropriateness and response format (John and Reve, 1982, Collins, 2003). A pre-test will signify the researcher whether the participants can understand the instructions and questions and can complete the questionnaire. The interview questions also needed pretesting in order to identify faults and ambiguity, so that precautionary measures can be taken before the main interview.

As the survey was to be conducted in Nepal where most people did not speak English, the questionnaire was translated into Nepali by a colleague who is a Nepali Language Teacher and then the Nepali version was back-translated into English by a professional translator (McKay et al., 1996, Harkness et al., 2004). The differences and similarities between the initial English version of the questionnaire and the back-translated English version was compared to check for inconsistency (Harkness et al., 2004, Xu et al., 2014). The Nepali version of the questionnaire was then emailed to five randomly selected managers/owners from manufacturing and retail sectors in Nepal to review the draft questionnaire and identify any awkward, irrelevant or inapplicable items. The English version was distributed to a group of PhD students and academic staff in the National Centre for Ports and Shipping (NCPS), Australian Maritime College (AMC), University of Tasmania (UTAS).

All the selected people were sent a hard copy of the survey instrument and the interview questions, a cover letter, a pre-testing letter and participant reminder letter. They were asked to evaluate the questionnaire and give their opinion on wording, format, layout, length, order of questions, item scaling, navigation indication, information and timing. Taking into consideration the feedback and suggestions from the pre-test participants, a final version of the questionnaire was prepared. An online version of the final questionnaire was developed in QuestionPro (http://www.questionpro.com/au/).

4.6.3.6 Administering Data Collection

One of the critical aspects for a successful research is to get access to the most required data to generate reliable and credible results (Saunders et al., 2009). When a research is carried out that involves human participation, it is of utmost importance that the researcher respects the participants' privacy and the voluntary nature of their involvement (Zikmund et al., 2014). The essence of ethics in research is to gain consent by convincing people to participate rather than forcefully compelling them to participate, and to maintain confidentiality (Salant and Dillman, 1994). There are mainly four areas that researchers' need to consider regrading ethical principles: a) no harm to participants (such as physical harm or harm to participants' self-esteem); b) approval of informed consent; c) no invasion of privacy; and d) no involvement of deception (Bryman and Bell, 2011). Researchers need to obtain a formal approval from the university's Research Ethics Committee to grant access towards their data collection process in order to make sure that the four ethical principles are strictly followed (Guillemin and Gillam, 2004). However, it is important that the ethical principles are considered throughout the research procedure (Creswell and Clark, 2011). All the required documents along with the ethics application was submitted to the Human Research Ethics Committee of Tasmania (HREC) for approval. The ethics approval number for this study is **H0015234** (see Appendix IX). The ethics approval confirms that the researcher can administer data collection.

According to Fowler (2009), it is important that a researcher chooses the best possible procedure to conduct his/her research because it will have a major effect on the survey results and its intended purpose. However, the choice of a particular method depends on the specific study topic, population, budget, staff and time constraints (Salant and Dillman, 1994). In this study, the researcher physically met the respondents, handed over the questionnaire and asked them to fill up the questionnaire. This is called a drop-off survey (Salant and Dillman, 1994). Drop-off surveys are mostly suitable when the respondents belong to a small community, not spread over a large area and when the project has a small staff with large sample size (Salant and Dillman, 1994). This way of conducting a survey gives the survey a human face and is mostly effective when the survey is left with intended respondents (Salant and Dillman, 1994).

Considering the length of the questionnaire, it was a wise decision to personally meet the respondents and explain them the purpose of this study. The main rationale behind choosing

the drop-off survey was to exhibit the survey's importance to the potential respondents so as to increase the response rate. The link to the online version of the questionnaire as well as its electronic version (Word and PDF – see Appendix III) was also sent out to each respondent via email to provide them with different options to complete the survey. In addition, a cover letter and an invitation letter were attached to the questionnaire to explain the research purpose, the importance of the participants' cooperation and the confidentiality and anonymity of the respondents' identity (see Appendix I and II).

The questionnaires were completed by the respondents (self-administered questionnaires) rather than being recorded by the researcher based on each respondent's answers (interviewer-administered questionnaires) (Saunders et al., 2009). Best efforts were made to collect the completed surveys at the same time. However, there were some respondents who proposed a later date for collection. Since it was logistically difficult to visit one company twice due to resource and time limitations, the researcher requested such respondents to scan it and email it back once they have completed, which they accepted happily. If the respondent decided to complete the survey in the presence of the researcher, then the researcher guided the respondents through the questionnaire helping them to clear their doubts or confusions if required (Salant and Dillman, 1994). Follow-up (either through email or telephone) was made with those who did not complete the survey in two weeks. The follow-up reminder email is included in Appendix IV.

When the researcher visited the companies for the survey, the respondents were asked if they would be ready to accept an interview invitation regarding the topic under study (see Appendix V for Interview Invitation Letter). Priority was given to their convenience and hence, interviews were conducted either on the same day or on a different date proposed by the participant. Only nine out of the selected 15 agreed to do the interview where seven were conducted during the visit while two were conducted at a later date proposed by the respondents. The interviewees were asked to read and sign the Consent Form (see Appendix VI) before starting the interview. The interview sessions took approximately 30 minutes to one hour depending upon the convenience of the participants and the interviewer. With the participants' permission, the interviews were recorded for transcript. The purpose of recording the interview was clearly explained to the participants. It was important that the researcher created a contact and a sense of trust and respect with participants so that a normal conversation could be developed (Kvale, 1996, DiCicco-Bloom and Crabtree, 2006).

Throughout the interview session, the researcher maintained a courteous, friendly and conversational tone (Berg and Lune, 2004).

4.6.3.7 Response Rate

Due to the voluntary nature of survey response, it is highly unlikely to achieve a full response rate (Baruch and Holtom, 2008). However, the researcher should always aim at achieving as high response rate as possible in order to reduce nonresponse error, increase statistical power and generate results with greater credibility (Dillman, 1991). To improve the quality of empirical studies the researcher should consider the fact that the respondents are the representatives of the population under observation (Cook et al., 2000) and one way to achieve this is by achieving a higher response rate (Saunders et al., 2009).

While it is important to achieve as high as possible response rate, researchers struggle to attain them due to unsuccessful attempts to deliver the questionnaire to the target population, the unwillingness of people to respond, inability and ineligibility of the selected respondents and over surveying (Baruch, 1999, Baruch and Holtom, 2008, Saunders et al., 2009). The post-hoc analysis from Baruch and Holtom (2008) shows that surveys that are completed in person or on a drop-in basis have higher response rate than online surveys and regular mail surveys. Other ways to increase response rate is via preliminary notification, a clear cover letter, incentives (monetary and non-monetary), personalisation, follow-up reminders, anonymity of response, and questionnaire layout/length/colour (Yu and Cooper, 1983, Dillman, 1991). The context of Nepal was well-thought-out to carry out the survey and hence, several techniques were used to convince and encourage the participants to complete the survey (Hsiao, 2006):

1. The survey questionnaire included a cover letter with the letterhead of the "Australian Maritime College (AMC), University of Tasmania (UTAS), Australia" because international universities are looked at with more respect in Nepal. The cover letter clearly explained the purpose of the study and the confidentiality criteria and encouraged the sample members to participate.
2. In addition to the cover letter, the researcher paid visit or talked to the respondents over the phone and explained the purpose of the study and offered to guide the respondents through the questionnaire in case of any doubts or confusions.

3. Considerable amount of time was spent to identify the key informant from each organisation in order to address the questionnaire to the right person.
4. For convenience, participants were provided with four options to complete and return the survey (Dilman et al., 2009): 1) complete electronically and return by email; 2) complete manually, scan them and return by email; 3) complete manually and leave it for the researcher to collect; and 4) complete the survey online. The completed survey can be collected at the same time or on a later date as proposed by the respondents.
5. Follow-up procedures are considered as a useful way to improve response rate. Two weeks after distributing the questionnaires, emails were sent out to thank those who had already returned the questionnaire and to remind the ones who had not. After the sixth week, a final reminder was made through phone to encourage them to complete the survey.
6. Respondents were offered a copy of the final report that summarised the results of the study.

According to Baruch (1999), the norm for average response rate for studies directed towards top management (CEO/MD etc.) may be 36 percent +/- 13 (standard deviation). With all the efforts made to increase the response rate, the researcher was able to collect 135 responses representing an effective response rate 62.8 percent. This response rate was sufficient considering the fact that the target population was the organisational representatives of medium and large sized business in Nepal where the numbers of such companies are limited. In addition, the composition of respondents as presented in Table 5.1 in **Chapter 5** adequately represents the targeted companies (Baihaqi and Sohal, 2013).

4.6.3.8 Control of Biases

The concepts used in social science research are difficult to be measured directly which is why a set of survey items (usually three or more) that define the concept are used to measure them (Schreiber et al., 2006). The survey output will not be accurate if the survey instrument is not properly designed. While it is in researcher's best interest to frame questions and statements that are clear and specific, there may be items that are vague because of the use of double–barrelled questions, words with multiple meanings, technical jargons or unfamiliar words (Podsakoff et al., 2003, Lietz, 2010).

Item ambiguity is a source of bias that causes the respondents to come up with their own meaning of the item increasing random responding (Podsakoff et al., 2003). In order to control this bias, the researcher used different strategies for conceptualising and framing the items. Careful attention was paid to develop survey instrument with clear and easy-to-understand questions and instructions. Wherever possible, items from the existing literature were used or adapted existing ones to suit this study. The survey instrument was pre-tested by both industry experts and academics, after which a final version was approved by the researcher with the supervisory team.

Another major source of bias in social science study might arise when people, the researcher tend to survey are not cooperative. This causes nonresponse error or do not tend to give truthful answers which cause response bias (Zikmund et al., 2010). Non-response bias occurs when the non-respondents are different from the respondents in such a way that is important to the study (Salant and Dillman, 1994). Reasons such as refusals due to company policies, the key informant being too busy, lack of knowledge in the topic under study and the ongoing political turmoil in the country were the major cause of non-response. Amongst the logistics companies, the major cause of non-response was the blockade from Indian border at the time of the study when they were busy sorting out alternate routes for imports.

Besides non-response bias, there are likely chances of bias caused by distortion of measurement occurring because of the respondents' misrepresentation of the truth either consciously or unconsciously (Zikmund et al., 2010). Consistency motif, implicit theories and illusory correlations, social desirability, leniency bias, acquiescence, positive and negative affectivity and transient mood state are the various types of response biases that may occur in behavioural research (Podsakoff et al., 2003). While deliberate alteration may occur due to reasons such as to appear intelligent or favourable or lenient, to conceal personal information, and to avoid embarrassment, survey instrument characteristics such as question format or question content may cause unconscious misrepresentation. Substantial amount of time and effort was made to reduce response bias that includes assuring anonymity of respondents, improving the scale items, avoiding sensitive questions and organising the flow of the questions and the layout of the entire questionnaire.

The length of the questionnaire was a major issue in this study despite several attempts to reduce it. However, Harrison et al. (1996) suggest that it is highly likely that instrument with fewer items may influence the way the respondents answer the current question because they

will have greater accessibility to answers to previous questions. Therefore, while short surveys help to reduce bias caused by respondent fatigue and carelessness, they have the potential to introduce other forms of bias caused by the chances of the influence of the responses to previous items on the current items (Podsakoff et al., 2003).

Lastly, there may be potential bias caused due to the data for both independent and dependent variables used in the multiple regression exercise being collected using the same medium (survey instrument). As a measure to control such bias, anything that was common in the measures of independent and dependent variables were identified and then eliminated or minimised through the design of the study (Podsakoff et al., 2003). In addition, the common method bias was assessed by conducting Harman's single-factor test as suggested by Podsakoff and Organ (1986). All the variables of interest were entered into exploratory factor analysis which resulted in 24 factors accounting for 77% of the total variance while the first factor accounted for only 16% of the total variance. Based on the above analysis it can be concluded that common method bias is not an issue as not the majority of the total variance is accounted for by a single factor.

4.6.3.9 Data Analysis

IBM SPSS (version 22.0) was used to analyse the data. The demographic data was analysed to get the demographic information about the respondents. The remaining data was analysed to test the reliability and validity of the data and then to examine the hypothesised relationships amongst variables. The transcripts of the nine interviews were analysed through content analysis. The data analysis procedure is explained in detail in the next chapter (Chapter Five).

4.7 Data Triangulation

According to Jick (1979), considering the strengths and weaknesses found in single method designs, quantitative and qualitative methods should be used together to complement rather than challenge each other. The aim to collect qualitative data in this study is to complement the quantitative data to enhance the accuracy of the results through multiple kinds of data for the same phenomenon. The accuracy of the result will be improved when the results from different methods are congruent and comparable providing more certain portrayal of the phenomenon under study (Jick, 1979). With that motivation, triangulation strategy will be

used to combine the quantitative and qualitative results. Triangulation will also help the researchers to identify the emergence of new dimensions which might not acknowledged by the other method (Jick, 1979).

The results from quantitative and qualitative data analyses will be used to find out 1) the most significant factors that affected information sharing in supply chains in Nepal; and 2) the relationship between information sharing and supply chain performance. In addition, the qualitative analysis will be used to provide supplementary results for 1) the interpretation of significant relationships; 2) the interpretation of non-significant relationships; 3) the explanation for unexpected findings; 4) the explanation for the contradictory findings; and 5) uncovering factors which might not be acknowledged by the statistical analysis and its rationale.

4.8 Summary

This chapter has presented the research methodology and the design used in this research focussing mainly on the research philosophy, research design, sampling strategy, instrument design and data collection and the statistical tools used to analyse the data. The research purpose and context were discussed first as they were likely to affect the choice of research method and the outcomes. The conceptual framework was developed based on the review of the literature. The two parts of the conceptual framework were used to formulate the two primary research questions. The conceptual framework shows the need to study how information sharing is affected and how it affects supply chain performance. Based on the conceptual framework, data will be collected and analysed to answer the research questions.

The conceptual framework was followed by the discussion of research philosophies. While this study was in line with positivist theory, bearing in mind the research context, pragmatism was considered appropriate. With justified reasons, this study used a mixed methods design incorporating both quantitative and qualitative methods. It explained about quantitative, qualitative and mixed methods design and explained why mixed methods will best answer the research questions. Convergent parallel mixed methods design was used in this study. The unit of analysis was the individual representatives from different organisations and the target population was the members of different supply chains in Nepal. In Chapter Three, it was identified that not many studies used mixed methods to solve the research problem. Using

qualitative data in addition to the quantitative data will confirm the quantitative results, help to explain the results better and provide supplementary information about the topic under study.

This chapter also described in detail about the quantitative and qualitative phase including the tool (survey and interview), sampling strategy, instrument design, pre-test, data collection, response rate and data analysis. For data collection, surveys were carried out for quantitative data and interviews were carried out for qualitative data. The survey was conducted by direct visitation to the participants because of limited use of emails and internet in Nepal. However, options to complete the survey online or to receive an electronic version of the questionnaire were also provided as a measure to give different options to the respondents. Due to financial and time constraints, the respondents were also invited to participate in the interview when the researcher visited the companies for the purpose of the survey. This strategy worked as seven out of nine interviews were conducted during the visit while two were conducted at a later date proposed by the respondents.

With research philosophy, research method and data collection explained in this chapter, the next chapter will discuss in detail the data analysis process and the findings.

Chapter 5 DATA ANALYSIS AND RESULTS

5.1 Introduction

The previous chapter discussed the research methodology. It also explained how the survey questionnaire and interview instrument were designed and finalised. This chapter provides a detailed explanation of the data analysis process used to answer the research questions. This chapter is divided into two sections. The first section explains the quantitative data analysis including coding technique, missing value analysis, demographic data analysis, assessment of validity and reliability and analysis to test the relationships between variables. Various statistical techniques such as, frequency test, reliability test, factor analysis and multiple regression analysis were conducted to answer the research questions in the best possible way. The second section explains the qualitative data analysis process including demographic information, transcribing, coding technique and content analysis.

5.2 Quantitative Data Analysis

The questionnaire for this study consists of four sections (see Appendix III). The first section collects information about the respondents' and respondents' company profile. Sections B to D comprise of questions related to the factors, information sharing and supply chain performance. A five-point Likert scale was used in these three sections.

The analysis was carried out using IBM SPSS, version 22. Before carrying out the analysis, all the responses were numerically coded and then were checked for errors. The information collected from Section A was used to analyse the characteristics of the respondents. The remaining sections were used to examine the cause and effect of information sharing. Using multiple-item measures for each construct, the reliability and validity of the measurement model were assessed first. Once the reliability and validity criteria were met, regression analysis was conducted to examine the relationship between the factors and information sharing and between information sharing and supply chain performance.

5.2.1 Coding Responses

It was necessary to assign each response for all the questions in the survey with a coding variable before entering it into IBM SPSS. Numbers are used for coding variables to represent different groups of data. Coding allows the transfer of data from questionnaire forms (large quantities of information) into a form that can be more easily handled by computer programs such as SPSS (Zikmund et al., 2010). For example, the first question in our questionnaire asked the respondents to indicate their position in the company (CEO/President/Owner, Director/Managing Director, General Manager/Manager and Other). Hence, in SPSS, each option was assigned a number, 1 through 4 instead of using the positions (Field, 2013).

There are seven questions related to demographic information of the respondents (Section A). The convention chosen for coding was to code the first listed response as 1, the second as 2 and so on as suggested by Pallant (2013). The coding was done when the questionnaire was developed. For sections B, C and D, each question or statement had numbers to label the responses. The responses for sections B and D were coded as 5 = Strongly agree, 4 = Agree, 3 = Neither agree nor disagree, 2 = Disagree, 1 = Strongly disagree and 0 = Not applicable. The responses for Section C were coded as 5 = Very great extent, 4 = Great extent, 3 = Some extent, 2 = Little extent, 1 = Very little extent and 0 = Not applicable.

5.2.2 Data Entry, Screening and Cleaning

After coding the data, it was ready to be entered in SPSS. While online survey software allows data to be transferred automatically to SPSS, in this study, the respondents answered the survey in three different ways. Some completed the survey online and some responded on the electronic version through emails whereas some responded on hard copy of the questionnaire. Hence, the data was entered manually into SPSS. The manual entry of data has greater chances of causing errors. While careful attention was paid during data entry, it was important to screen the data to locate errors if any. After entering all the data in SPSS, it was checked for errors. Data entry errors cause outliers that are well above or below the other score generating a distorted result (Pallant, 2013). To identify any out-of-range values, frequency, mean, standard deviation and box plot for each variable were examined using SPSS.

The assessment of frequency also provided information about the missing values. There are a number a reasons for missing values such as respondents not wanting to answer personal questions, lack of knowledge on a particular topic or electronic malfunctions (Tabachnick and Fidell, 2007, Meyers et al., 2013). Four responses were deleted in the initial stage because of large number of missing values. The pattern of the missing values in the remaining 131 responses were checked to determine whether they were a function of a random or a systematic process (Meyers et al., 2013) so that a decision could be made to deal with missing values. According to Tabachnick and Fidell (2007), the pattern of missing data is more of a concern than the amount of missing values as missing values that occur randomly through a data set pose less serious threat than those that occur non-randomly.

There are three missing data mechanisms, 1) MCAR (missing completely at random); 2) MAR (missing at random); and 3) MNAR (missing not at random or non-ignorable) (Tabachnick and Fidell, 2007). Little's MCAR test was conducted to assess whether the missing values occurred completely at random. The test suggested that the missing values occurred completely at random (p = 1.00) suggesting that the problems were less serious (Tabachnick and Fidell, 2007). Based on this output, Expectation Maximisation (EM) method was adopted to generate missing data values as suggested by Tabachnick and Fidell (2007).

5.2.3 Respondent's Demographics

The survey instrument included a few demographic variables in order to collect the information that will help to define the characteristics of the respondents. The first section of the survey instrument included seven questions related to the company/respondent profile such as the respondent's position in the company, number of years the respondent have been in that position, number of years the company has been established, company's main business/businesses, the industry type, number of employees and the engagement in international trade. Table 5.1 provides the demographic information of the respondents which are discussed in the next paragraphs.

Table 5.1: Respondent's Profile

Demographic Variable		Responses	Percent
Main Business	Supplier	17	13.0
	Producer/Grower	8	6.1
	Manufacturer	73	55.7
	Dealer/Distributor	35	26.7
	Wholesaler	11	8.4
	Retailer	12	9.2
	Transport/Logistics Service Provider	22	16.8
Respondent's Position	CEO/President/Owner	21	16.0
	Director/Managing Director	20	15.3
	General Manager/Manager	66	50.4
	Other	24	18.3
Years of Company Establishment (age)	Less than 5 Years	15	11.5
	5 - 10 Years	25	19.1
	11 - 20 Years	32	24.4
	More than 20 Years	58	44.3
Number of Years in this Position	Less than 5 Years	47	35.9
	5 - 10 Years	48	36.6
	11 - 20 Years	22	16.8
	More than 20 Years	13	9.9
Type of Industry	Food, Beverage, Tobacco	28	21.4
	Textile, Clothing, Footwear, Leather	6	4.6
	Soap, Detergent, Chemical, Paint	7	5.3
	Wood, Paper, Jute	8	6.1
	Brick, Cement, Marble, Tiles	13	9.9
	Pharmaceutical, Herbal Medicine	5	3.8
	Iron, Steel, Pipes, Aluminium	7	5.3
	Plastic, Foam, Polythene, Rubber	3	2.3
	Electric, Electronics, Battery	16	12.2
	Other	38	29.0
Number of Employees	Less than 50	51	38.9
	50 - 99	17	13.0
	100 - 199	16	12.2
	More than 200	47	35.9
International Trade	Yes	105	80.2
	No	26	19.8

It was imperative that the survey was answered by someone with good knowledge about the company and its supply chain partners. It is likely that the people at managerial positions have knowledge about the company's operational and strategic activities and hence, were considered to be capable of answering the questionnaire. With regards to the respondents' position in the company, 16% are at a position of CEO/President/Owner and 15% are at a position of Director/Managing Director. Half (50.4%) of the respondents are at managerial positions which comprised of general manager, senior/deputy manager logistics/procurement/supply chain manager, operations manager, HR manager, business development manager, sales & marketing manager, accounts manager, customer service manager, brand manager and relationship manager. The remaining 18% of the respondents hold other positions in the company such as engineer, retail sales executive, executive secretary, logistics officer, sales/marketing executive, finance officer, accountant, business operations executive, senior officer and office assistant. Based on this respondent pool, most of the questionnaires (81.7%) have been answered by someone that hold a managerial position or above and thus the answers can be considered reliable.

Table 5.1 also shows the number of years the respondents have been working in that position and the number of years the companies have been established. Majority (36.6%) of them have been working in their respective positions for 5-10 years. Only 9.9% of them have held that position for more than 20 years. However, 53.4% of the respondents have been working in their current position between 5-20 years which shows that most of the respondents were experienced in their job. For the company's age, 69% of the respondent companies have been established for more than 10 years, of which 44.3% have been established for more than 20 years and 24.4% have been established for 11-20 years. This means that majority of the companies have been in business for quite long time. This signifies that the respondent companies know the market well and have gained experience in dealing with their suppliers, customers and service providers.

The next question asked the respondents about their main business and asked them to choose all the options that were applicable because a company might be involved in more than one business (e.g., a company can be a grower as well as a manufacturer). Table 5.1 indicates that out of 131 respondents, more than half (55.7% or 73) are manufacturers. Distributors/dealers constitute 26.7% whereas transport/logistics service providers account for 16.8% and suppliers constitute 13% of the total respondents. Producers/growers constitute the lowest

percentage (6.1%) of respondents followed by wholesalers (8.4%) and retailers (9.2%). While manufacturers constitute the highest percentage, the respondent pool exhibits a good representation of the target population.

Various industries were grouped into nine categories by grouping similar types of industries together (e.g., iron, steel, pipe and aluminium formed one group whereas textile, clothing, footwear and leather formed another group). Twenty nine percent of the respondents chose the option "other" mainly because all the respondents that were transport/logistics provider did not belong to any particular industry as they were service providers. The final sample represented major industrial groups in Nepal including food, beverage, tobacco (21.4%), electric, electronics, battery (12.2%), brick, cement, marble, tiles (9.9%), wood, paper, jute (6.1%), soap, detergent, chemical, paint (5.3%), iron, steel, pipes, aluminium (5.3%), textile, clothing, footwear, leather (4.6%), pharmaceutical, herbal medicine (3.8%) and plastic, foam, polythene, rubber (2.3%).

The number of employees is one way to determine a firm size (Lee et al., 2010). Table 5.1 shows the size of the respondent company based on the number of employees. Biggs et al. (2000) categorise the companies in Nepal as small, medium and large if their number of employees are up to 50, 50 – 99 and more than 100 respectively. A little more than half (51.9%) of the firms have less than 100 employees, out of which 13% of the firms have 50-99 employees. The remaining 48% of the companies employed more than 100 employees of which 35.9% have more than 200 employees. This result matched with Biggs et al.'s finding (2000) where large companies were 58% and medium companies were 18% indicating that the composition of respondents adequately represents the targeted population in terms of firm size.

Involvement with international buyers or suppliers increases the level of interactions and information sharing. When goods have to travel beyond country borders, there are a number of aspects that need to be considered, such as quantity of cargo, cost of export/import and lead time. All these aspects directly or indirectly affect the transaction cost and hence, it increases the need for communication and the amount of information to be shared so that everything is planned appropriately. In addition, it might also be possible that the international partners have more stringent requirements related to information sharing. In contrast, domestic supply chains involve less cost, mainly because of shorter distance that goods need to travel and hence, the need to share information might be low. A significantly

high, i.e. 80.2% of the companies have international partners whether they are buyers, suppliers or service providers. This result might be an indication that supply chain participants in Nepal are aware of the need to share information with their partners.

The comparisons between different groups of respondents provide more detailed information about the characteristics of each group. A cross-tabulation of three demographic variables (business sector, number of employees and international trade) was carried out (Table 5.2). The comparisons were done for seven business sectors based on their international engagement and the number of employees.

Table 5.2 shows that out of 73 manufacturing companies, 69.9% (51) are engaged in international trade and 30.1% (22) are not. Of those manufacturing companies engaged in international trade, 32.9% of the companies have more than 200 employees and 16.4% have less than 50 employees. Forty eight percent of manufacturing companies (35) have more than 200 employees whereas amongst the logistics service providers, none of the companies have more than 100 employees. Logistics service providers tend to be small in size with a majority (81.8%) of them having less than 50 employees and almost 91% of them are engaged in international trade. This comparison indicates that in Nepal, transport and logistics service businesses are run on a small scale while manufacturing companies are relatively large. A majority of the companies in these two sectors are involved in international trade.

Most of the suppliers (64.7%), wholesalers (72.7%), retailers (66.7%) and logistics service providers (81.8%) have less than 50 employees. None of the producers/growers, wholesalers, retailers and logistics service providers have 100-199 employees. However, 23.5% (4) of suppliers, 37.5% (3) of producers/growers, 27.3% (3) of wholesalers and 25% (3) of retailers have over 200 employees. This shows that while most of the suppliers, producers/growers, wholesalers and retailers tend to be small in size, there are some big players in the market. More than 50% of the companies in all the business sectors are engaged in international trade with retailers having the highest percentage (91.7%) of international trade.

Table 5.2: Company Profile

Business Sector	International Trade	Frequency & Percentage	Number of Employees				Total
			> 50	50-99	100-199	< 200	
Supplier	Yes	Count	9	0	1	3	13
		%	69.2%	0.0%	7.7%	23.1%	100.0%
		% of Total	52.9%	0.0%	5.9%	17.6%	76.5%
	No	Count	2	1	0	1	4
		%	50.0%	25.0%	0.0%	25.0%	100.0%
		% of Total	11.8%	5.9%	0.0%	5.9%	23.5%
	Total	Count	11	1	1	4	17
		%	64.7%	5.9%	5.9%	23.5%	100.0%
		% of Total	64.7%	5.9%	5.9%	23.5%	100.0%
Producer or Grower	Yes	Count	1	3		3	7
		%	14.3%	42.9%	-	42.9%	100.0%
		% of Total	12.5%	37.5%		37.5%	87.5%
	No	Count	0	1		0	1
		%	0.0%	100.0%	-	0.0%	100.0%
		% of Total	0.0%	12.5%		0.0%	12.5%
	Total	Count	1	4		3	8
		%	12.5%	50.0%	-	37.5%	100.0%
		% of Total	12.5%	50.0%		37.5%	100.0%
Manufacturer	Yes	Count	12	5	10	24	51
		%	23.5%	9.8%	19.6%	47.1%	100.0%
		% of Total	16.4%	6.8%	13.7%	32.9%	69.9%
	No	Count	4	3	4	11	22
		%	18.2%	13.6%	18.2%	50.0%	100.0%
		% of Total	5.5%	4.1%	5.5%	15.1%	30.1%
	Total	Count	16	8	14	35	73
		%	21.9%	11.0%	19.2%	47.9%	100.0%
		% of Total	21.9%	11.0%	19.2%	47.9%	100.0%
Distributor or Dealer	Yes	Count	12	3	2	15	32
		%	37.5%	9.4%	6.3%	46.9%	100.0%
		% of Total	34.3%	8.6%	5.7%	42.9%	91.4%
	No	Count	1	1	1	0	3
		%	33.3%	33.3%	33.3%	0.0%	100.0%
		% of Total	2.9%	2.9%	2.9%	0.0%	8.6%
	Total	Count	13	4	3	15	35
		%	37.1%	11.4%	8.6%	42.9%	100.0%
		% of Total	37.1%	11.4%	8.6%	42.9%	100.0%

Business Sector	International Trade	Frequency & Percentage	Number of Employees				Total
			> 50	50-99	100-199	< 200	
Wholesaler	Yes	Count	7			3	10
		%	70.0%	-	-	30.0%	100.0%
		% of Total	63.6%			27.3%	90.9%
	No	Count	1			0	1
		%	100.0%	-	-	0.0%	100.0%
		% of Total	9.1%			0.0%	9.1%
	Total	Count	8			3	11
		%	72.7%	-	-	27.3%	100.0%
		% of Total	72.7%			27.3%	100.0%
Retailer	Yes	Count	7	1		3	11
		%	63.6%	9.1%	-	27.3%	100.0%
		% of Total	58.3%	8.3%		25.0%	91.7%
	No	Count	1	0		0	1
		%	100.0%	0.0%	-	0.0%	100.0%
		% of Total	8.3%	0.0%		0.0%	8.3%
	Total	Count	8	1		3	12
		%	66.7%	8.3%	-	25.0%	100.0%
		% of Total	66.7%	8.3%		25.0%	100.0%
Logistics Service Provider	Yes	Count	17	3			20
		%	85.0%	15.0%	-	-	100.0%
		% of Total	77.3%	13.6%			90.9%
	No	Count	1	1			2
		%	50.0%	50.0%	-	-	100.0%
		% of Total	4.5%	4.5%			9.1%
	Total	Count	18	4			22
		%	81.8%	18.2%	-	-	100.0%
		% of Total	81.8%	18.2%			100.0%

5.2.4 Measurement Instrument Validation

The notions (e.g., human behaviour) that are used in social science research often cannot be measured directly and are hence measured through a set of observed variables (survey items) (Ahire and Devaraj, 2001, Schreiber et al., 2006, Drost, 2011). Social science research is often convoyed by measurement errors because the measurement scale used to measure different constructs do not always measure the theoretical concept of interest resulting in measurement errors (Bagozzi et al., 1991).

Measurement errors are either systematic or random. These measurement errors tend to affect researchers' aim of testing relationships among variables as they distort (attenuate or inflate) the observed relationship among variables (Bagozzi et al., 1991, Bagozzi and Edwards, 1998, O'Leary-Kelly and Vokurka, 1998). Consequently, measurement errors pose as a threat to the validity of research findings. Hence, before examining the relationship between various constructs, it is imperative to test the validity and reliability of the measurements to ensure that the indicator variables are quantifying the constructs that are intended to be measured (Golafshani, 2003, Drost, 2011). Correct operationalisation, measurement and statistical validation becomes indispensable to reach a robust conclusion regarding the anticipated relationships between latent variables (Ahire and Devaraj, 2001).

While some of the scale items used in this study were adapted from previous studies, there were several items developed by the author based on a thorough review of the literature. This imposes the need to validate the measurement model to ensure that the indicator variables of a construct are measuring that construct. To assess validity of the measurement model, reliability, unidimensionality, convergent validity and discriminant validity of the measurement items were investigated. The assessment of these measures will substantiate 1) the use of important content outlining each construct; 2) the repeatability of the measurement scale; 3) the existence of a single trait underlying a set of measures; and 4) whether multiple measures of the same concept are in agreement (Bagozzi et al., 1991, O'Leary-Kelly and Vokurka, 1998, Ahire and Devaraj, 2001). The assessment of content validity was established while the survey instrument was developed in Chapter Four (Section 4.6.3.5). Hence, this section will only examine unidimensionality, convergent validity, discriminant validity and reliability of the measured items.

5.2.4.1 Unidimensionality, Convergent Validity and Discriminant Validity

Factor analysis (FA) was conducted to assess the dimensionality and the measurement properties of the survey items to ensure the validity of the observed measures. Since multiple indicators were used for each construct, it is always wise to test the measurement model first before considering it for final analyses (Schreiber et al., 2006). FA has been considered as one of the best tool to test the relationship between the observed variables and their underlying constructs (latent variable) (Byrne, 2010). Considering the moderate sample size compared to the large number of items in the data set, factor analysis was carried out

separately for the factors, information sharing and supply chain performance (O'Leary-Kelly and Vokurka, 1998, Sezen, 2008).

Exploratory factor analysis (EFA), unlike confirmatory factor analysis (CFA), explores the underlying factor structure of a set of observed variables without imposing a preconceived structure on the outcome (Suhr, 2006). CFA requires the researchers to have a strong theory underlying their measurement model (Hurley et al., 1997, Suhr, 2006, Byrne, 2010). EFA is more appropriate in the early stages of scale development as it shows how well the items load on different factors (Hurley et al., 1997). In this study, EFA was preferred over CFA as some survey questions were designed based on literature and others being adapted from components of existing instruments to suit the context of the current study.

The aim of EFA was threefold: 1) to uncover the factors underlying the data set; 2) to assess the validity (unidimensionality, convergent validity and discriminant validity) of the factors; and 3) to compute the factor scores to be used in subsequent analyses (regression analysis in this study). Based on how the questions in the survey are framed, EFA will also examine which items have the strongest association with a given factor (DiStefano et al., 2009).

Among the previous studies using factors scores, some calculated the mean as the factor scores (Lee et al., 2010, Baihaqi and Sohal, 2013), some summed the raw scores corresponding to all items loading on a factor (Comrey and Lee, 1992, Zikmund et al., 2010) while others used factors scores following EFA. There are some obvious drawbacks of using the mean or the sum scores because all items on a factor are given equal weight regardless of their loadings. According to Ford et al. (1986), these procedures yield composite scores rather than factor scores and is inappropriate to refer them as factor scores. This will result in less reliable factor score because it ignores the amount of variability in the observed variable caused by the factor (DiStefano et al., 2009).

While the sum score and mean score have some limitations, it is not clear how the factor scores are computed in SPSS based on each item's factor loadings. It is rare to get a perfect factor solution as it most of the time results in some items with cross loadings and some items with low factors loadings (below the acceptable cut-off value). This gives rise to the fact that a unique solution for the factor analysis results is exceptional. Depending on a researcher's decision, EFA can result in an infinite number of solutions accounting for the relationships between the items and factors (Tabachnick and Fidell, 2007, DiStefano et al., 2009). In this

study, factor scores were required to examine the relationship between factors and information sharing and information sharing and supply chain performance. In order to calculate the factor scores, it is important to obtain a clear pattern of factor loadings so that the factor scores can be calculated with only those items that have the strongest association with that particular factor. In addition, this will also make the interpretation easy as the items used to compute each factor score are independent. Hence, the output of EFA will confirm unidimensionality, convergent validity and discriminant validity.

The survey questionnaire comprised of 58 items based on 21 factors. All the items were identified based on the literature. Principle Component Analysis (PCA), with Varimax rotation (Fabrigar et al., 1999, Hair et al., 2003) were used to analyse the factors. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett's test of sphericity were used to assess the suitability of the sample for principle component analysis. With the decision to retain multi-item factors with eigenvalues above one (Hair et al., 2003), only 17 factors were extracted initially. However, there were some items with factor loadings below the cut-off value of 0.5 (Comrey and Lee, 1992, Costello and Osborne, 2005, Tabachnick and Fidell, 2007, Field, 2013) and some items with cross-loadings (some items loaded positively on two factors, some items loaded positively on one factor and negatively on the other). The main aim of factor analysis is to acquire a set of theoretically meaningful factors with easy interpretation and account for the bulk of the variance (Hair et al., 2003). Hence, it was necessary to exclude those items that disturbed the factor structure. Those items with loadings below the cut-off value and cross loadings were excluded. However, it was not clear which sequence to follow. The researcher tried three different conditions as detailed below and chose the one which caused fewer number of item deletion with a satisfactory factor solution (Maskey et al., 2017).

In the first condition, the sequence was to first delete items with loadings below the cut-off value of 0.5 (Hair et al., 2003, Field, 2013) and then look for items with cross loadings. The second condition was to first delete items with cross-loadings and then look for items with loadings below cut-off values. The third condition did not follow a particular sequence because the decision to exclude items was aimed at achieving a satisfactory factor structure with justifiable interpretation. The item deletion criteria remained the same. After trying all three procedures, the factor structure acquired from the third condition was selected as the number of item deletion was fewer from this procedure.

The initial factor analysis resulted in a factor structure where *Item 7* loaded on *Factor 17* with factor loading less than 0.5 (see Appendix XI). EFA was run again without *Item 7* which resulted in a slightly different factor structure. The factor structure resulted with two items (*Item 39* = 0.474 and *Item 3* = -0.473) with loadings below 0.5 (see Appendix XII). With only one item excluded the factor structure changes. Hence, the decision was to exclude only one item at a time so as to acquire a perfect factor solution while excluding as few numbers of items as possible. After *Item 3* (negative loading less than 0.5) was deleted, *Item 39* still remained the one with the factor loading less than 0.5. However, in the new factor structure, *Item 2* loaded positively on one factor and negatively on the other (see Appendix XIII). This item seemed problematic in the sense that it cross-loaded negatively on one factor. Hence, it was decided to exclude this item first. The EFA output after removing *Item 2* resulted in two items, *Item 37* and *Item 43* each loading on two factors with almost same factor loadings (*Item 37* = 0.488 and 0.487; and *Item 43* = 0.503 and 0.506). *Item 37* was considered for exclusion and the EFA was re-run again (see Appendix XIV).

In the new factor structure, *Item 43* still loaded on two factors with loadings 0.490 and 0.500 and thus, was deleted (see Appendix XV). Now, *Item 39* had a loading on factor two which was less than 0.5 and also cross-loaded on factor three (see Appendix XVI). After deleting *Item 39*, the EFA extracted 16 factors and resulted in a factor structure with no cross-loadings. However, there was one item (*Item 8*) with loading below the cut-off value (see appendix XVII). Since the aim was to include only those items with loadings greater than 0.5, it was decided to delete *Item 8*. The EFA result after deleting *Item 8* yielded a factor solution with no cross-loadings and all the item loadings greater than 0.5.

In order to name the factors, the factor structure was compared with the survey items. While all the loadings made sense, there were two items; *Item 51* and *Item 52* which needed further consideration (see Appendix XVIII). *Item 51*, "We face uncertainties due to changing customer demand" loaded with items that were related to personal connection between supply chain partners and hence, did not make much sense. However, *Item 52*, "We face difficult situations due to supply uncertainties" negatively loaded with items related to trust which quite made sense. It is likely that supply chain participants may find it too risky to trust suppliers with high uncertainties. Therefore, it was decided to delete *Item 51* while retaining *Item 52*.

The remaining items were factor analysed one more time which resulted in a satisfactory and interpretable factor structure (see Appendix X). The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) was 0.628 (> 0.50) (Hair et al., 1998) which was acceptable and Bartlett's test of sphericity was significant ($p < 0.001$) meaning that the correlations between variables are significantly different from zero (Field, 2013). The KMO and Bartlett's test of sphericity is presented in Table 5.3. The final factor solution extracted 16 factors that accounted for 75.9% of the variance and were named based on the factors identified from the literature (Table 5.4). Although careful attention was paid so as not to reduce the number of items to less than three for each factor (Stage et al., 2004, Costello and Osborne, 2005, Tabachnick and Fidell, 2007, Meyers et al., 2013), supply network configuration and market orientation scales had two items each (Henson and Roberts, 2006).

Table 5.3: KMO and Bartlett's Test (Factors)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.628
Bartlett's Test of Sphericity	Approx. Chi-Square	3883.192
	df	1326
	Sig.	.000

Table 5.4: EFA – Factors Influential to Information Sharing in Supply Chains

Item Description	Item	Factor Loading	Eigen Value	% of Variance
Interaction Routines				
Our company and our partners meet regularly to discuss *market condition.*	Item 47	0.803		
Our company and our partners meet regularly to discuss *mutual goals and objectives.*	Item 46	0.801		
Our company and our partners meet regularly to discuss *quality improvement.*	Item 48	0.765	7.988	15.976
We have collaborative relationship with our partners.	Item 50	0.655		
Our company makes joint plans with our partners	Item 49	0.579		
National Culture				
National culture has affected the amount of information we share with our partners.	Item 57	0.921		
National culture has affected the way we communicate with our partners.	Item 56	0.912	3.762	7.524
National culture has affected our relationships with our international business partners.	Item 58	0.844		
Organisational Compatibility				
Our company and our partners have *similar views towards inter-organisational relationship.*	Item 14	0.703		
Our company and our partners have *similar views towards information sharing.*	Item 13	0.703	3.270	6.541
We gain mutual benefits from the relationship with our partners.	Item 38	0.688		
Our company and our partners have *similar goals and objectives.*	Item 12	0.661		

Item Description	Item	Factor Loading	Eigen Value	% of Variance
Information Quality				
Our partners provide us with timely information.	Item 35	0.850	2.564	5.128
Our partners provide us with easy-to-understand information.	Item 36	0.844		
Our partners provide us with useful information.	Item 34	0.826		
Government Support				
The government has enforced laws/regulations that provide stable and reliable conditions for business operations.	Item 53	0.905	2.431	4.862
Government policies have increased our confidence to establish collaborative relationships with our partners.	Item 54	0.884		
Government policies support the development of information technology.	Item 55	0.738		
Incentives				
We offer *incentives* to our partners to provide improved products/service.	Item 28	0.852	2.382	4.764
We offer *incentives* to our partners to contribute to increasing our profits.	Item 30	0.835		
We offer *incentives* to our partners to provide us with useful information.	Item 29	0.716		
Project Payoffs				
Our company will invest in information sharing with our partners if *the costs and benefits are shared between both companies*.	Item 24	0.777	2.057	4.113
Our company will invest in information sharing with our partners if *the outcome is immediate*.	Item 23	0.747		
Our company will invest in information sharing with our partners if *the costs are high but the outcome is valuable*.	Item 22	0.695		
Commitment				
We intend to strengthen our relationship with our partners.	Item 5	0.861	1.960	3.919
We intend to continue the relationship with our partners for a long term.	Item 4	0.816		
Both sides in the relationship make decisions that are mutually beneficial.	Item 6	0.701		
Personal Connection				
Personal connections with our partner companies are an added advantage in business decision making.	Item 10	0.824	1.790	3.580
Personal connections play an important role in our business.	Item 11	0.759		
The owner/manager of our company attends the social functions organised by the owner/manager of our partner companies.	Item 9	0.685		
Monitoring				
Our company monitors our partners to detect whether they have provided any incorrect information.	Item 26	0.802	1.723	3.447
Our company monitors our partners to detect their wrongful actions for personal benefits.	Item 27	0.783		
Our company monitors our partners to detect whether they comply with established agreements.	Item 25	0.705		
Information Technology				
We share information with our partners via *online marketing*.	Item 31	0.826	1.623	3.245
We share information with our partners via *electronic catalogues*.	Item 32	0.810		
We share information with our partners via *bar coding/automatic identification system.*	Item 33	0.682		
Legal Contract				
Contracts will hinder the development of a good business relationship.	Item 41	0.870	1.538	3.077
Contracts will limit the communication and information-based operations between our company and our partners.	Item 42	0.754		
There is no need of contracts in our relationship with our partners.	Item 40	0.713		

Item Description	Item	Factor Loading	Eigen Value	% of Variance
Trust				
Our partners have a good overall reputation in the market.	Item 20	0.735	1.383	2.767
Our partners have always helped us in need.	Item 1	0.698		
Our partners do not change their partners very often.	Item 21	0.656		
We face difficult situations due to supply uncertainties.	Item 52	-0.519		
Market Orientation				
Our company is concerned about *competitors' strength.*	Item 19	0.855	1.282	2.564
Our company is concerned about *competitors' market position.*	Item 18	0.851		
Top Management Commitment				
Our top management team considers *information sharing with trading partners* to be important to enhance supply chain performance.	Item 16	0.791	1.120	2.240
Our top management team considers *relationships with trading partners* to be important to enhance supply chain performance.	Item 15	0.762		
Our top management team considers *managerial ties with the top executives of our partner companies* to be important to enhance supply chain performance.	Item 17	0.534		
Supply Network Configuration				
Our indirect supply chain partners are of no concern to us.	Item 45	0.852	1.054	2.107
We never deal with our indirect supply chain partners.	Item 44	0.837		
Total Variance Explained (%)				**75.853**

The second EFA was conducted with nine items under information sharing. The KMO and Bartlett's test of sphericity showed the suitability of the data for factor analysis (Table 5.5). The factor analysis resulted in two factors, consistent with the number of underlying factors (operational and strategic information sharing). However, *IS4* loaded on two factors and was hence, discarded (see Appendix XIX). The resulting factor structure had two distinct factors with all loadings above 0.5 as shown in Table 5.6 and Appendix XX.

Table 5.5: KMO and Bartlett's Test (Information Sharing)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.769
Bartlett's Test of Sphericity	Approx. Chi-Square	353.258
	df	36
	Sig.	.000

Table 5.6: EFA – Information Sharing

Item Description	Item	Factor Loading	Alpha	Eigen Value	% of Variance
Strategic Information Sharing					
Distribution Plans	IS8	0.851			
New Product Development	IS7	0.833	0.66	3.016	37.694
Upcoming Promotions	IS9	0.711			
Pricing	IS6	0.504			
Operational Information Sharing					
Delivery Schedule	IS3	0.876			
Order Status	IS2	0.805	0.75	1.544	19.301
Inventory Level	IS5	0.517			
Changing Customer Demand	IS1	0.506			
Total Variance Explained (%)					**56.995**

The third EFA was carried out with 14 items of supply chain performance. With acceptable KMO and Bartlett's test results (Table 5.7), the EFA resulted into four factors as predicted (Table 5.8). While all the items loaded well above 0.5, *P11* loaded on component 1 with loading 0.455 and *P4* loaded on two components (see Appendix XXI). *P11* was discarded and the EFA was run again. *P4* still loaded on two components which prompted its deletion (see Appendix XXII). With the deletion of *P4*, all the remaining items loaded on their underlying components with factor loadings greater than 0.5 (Table 5.8). See Appendix XXIII for complete EFA output.

Table 5.7: KMO and Bartlett's Test (Supply Chain Performance)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.746
Bartlett's Test of Sphericity	Approx. Chi-Square	658.379
	df	91
	Sig.	.000

Table 5.8: EFA – Supply Chain Performance

Item Description	Item	Factor Loading	Alpha	Eigen Value	% of Variance
Flexibility Performance					
We cope well with our *capacity* to meet customer needs.	P12	0.842	0.80	3.963	33.029
We cope well with *delivery requirements*.	P13	0.780			
We cope well with *uncertain customer demand*.	P10	0.778			
We cope well with *storage/warehousing* facility	P14	0.669			
Delivery Performance					
Our partners' deliveries are *reliable*.	P8	0.830	0.80	1.758	14.647
Our partners deliver orders at *our preferred time*.	P7	0.827			
Our partners' deliveries are *always accurate*.	P9	0.805			
Cost Performance					
Our *operations costs* are kept at a minimum level.	P3	0.845	0.66	1.333	11.109
Our *logistics costs* are kept at a minimum level.	P1	0.814			
Our *inventory costs* are kept at a minimum level.	P2	0.610			
Quality Performance					
Our partners' products have *low defect rate*.	P5	0.895	0.73	1.226	10.219
Our partners' product *damages/loss* on arrival is very low.	P6	0.829			
Total Variance Explained (%)					**69.006**

Tables 5.4, 5.6 and 5.8 show that each item loaded strongly under only one factor (factor loadings below 0.5 are neglected) confirming unidimensionality and discriminant validity (Cortina, 1993, Ahire and Devaraj, 2001). In addition, all the items loaded substantially (factor loadings above 0.5) on their underlying constructs, confirming convergent validity (Tabachnick and Fidell, 2007, Ahire and Devaraj, 2001, Du et al., 2012). The factors were named based on the factors identified from the literature. Hence, the factor analysis conducted on the factors, information sharing and supply chain performance confirmed the suitability of the data for further analysis. In addition, the factor scores were computed through EFA via the Anderson-Rubin method (option in SPSS) because it ensures that the factor scores are uncorrelated so that it can be used for multiple regression analysis (Tabachnick and Fidell, 2007, Field, 2013). According to Hair et al. (2003), while in real world, factors are always correlated, researchers can choose to represent the factors as uncorrelated to meet the statistical assumptions of the research problem.

5.2.4.2 Reliability

According to Nunnally (1967), reliability is the extent to which measurements are repeatable, i.e. consistency, stability, accuracy and dependability of the measurements regardless of the occasions, conditions, instruments and the person performing the measurement (Cronbach, 1951, Nunnally, 1967, Drost, 2011). The five methods to assess reliability are: test-retest reliability, alternative forms, split-halves, inter-rater reliability and internal consistency (Drost, 2011). The choice of reliability test depends on the sources of variation that one considers relevant such as passing of time or use of different items (Cortina, 1993). In the current study, we assessed the internal consistency (interrelatedness among the items) estimate, i.e. coefficient alpha. This decision highlights the fact that the main concern about this study was the error factors associated with the use of multiple items (how well a set of items can measure a construct) (Cortina, 1993, Drost, 2011).

Cronbach's alpha value is calculated to assess the internal consistency of constructs. The alpha value is based on the extent of correlation of each item in the scale with at least one other item in the scale (Cortina, 1993, Drost, 2011). Alpha value closer to 1.0 suggests greater internal consistency of the items in the scale. According to Meyers et al. (2013), reliability values of 0.6 may be acceptable for research purposes. According to Nunnally (1967) and Kline (1999), a threshold of 0.5 may be acceptable for early exploratory work and psychological constructs because of the diversity of the constructs being measured in social science research. According to Hair et al. (2003), coefficients lower than 0.7 may be acceptable depending on the research objectives. However, it is better if the reliability values are 0.7 and above (Nunnally, 1978, Hair et al., 2003, Tabachnick and Fidell, 2007, Drost, 2011, Meyers et al., 2013). Low alpha values can be due to small number of items in the scale or a newly developed scale (Cronbach, 1951, Cortina, 1993, Ahire and Devaraj, 2001, Gliem and Gliem, 2003b, Streiner, 2003).

According to Cortina (1993), alpha is a function of the number of items in a scale as well as a function of item inter-correlation. However, it must be interpreted with number of items in mind because a scale with large number of items can have an alpha value greater than 0.7 even though the average inter-item correlation is very small. Although longer tests yields better reliability (Cronbach, 1951), it is very likely that lengthy survey instrument gives rise to boredom and fatigue, especially when there are no incentive for the respondent to

participate in such a lengthy survey. This in turn can offset the internal consistency of the scale.

Following Cortina (1993), reliability test was carried out after the existence of a single construct was determined as a confirmatory measure of unidimensionality. Prior to calculating the alpha values, *Item 52* which loaded negatively on *Factor 13* (trust) was reverse coded (Field, 2013). For trust, after reverse coding *Item 52*, $\alpha = 0.596$. However, if the reverse coded *Item 52* was deleted, the alpha value will improve to 0.676. Thus, *Item 52* was deleted to get a better alpha value. Based on the reliability test, all but three factors had alpha values less than 0.7. The three factors, trust ($\alpha = 0.68$), operational information sharing ($\alpha = 0.66$) and cost performance ($\alpha = 0.66$) had alpha values above 0.65 which is close to the threshold value of 0.7 and hence, were retained for further analysis (Du et al., 2012). The inter-item correlations for all three factors were above 0.2 which means that the items in the scales were correlated (Streiner, 2003). Table 5.9 shows the results of the reliability test after deleting items for better alpha value.

Table 5.9: Reliability Output

Antecedents	Alpha (α)
Interaction Routine	0.84
National Culture	0.90
Organisational Compatibility	0.76
Information Quality	0.87
Government Support	0.87
Incentive	0.85
Project payoffs	0.80
Commitment	0.78
Personal Connection	0.77
Monitoring	0.75
Information Technology	0.73
Legal Contract	0.74
Trust	0.68
Market Orientation	0.91
Top Management Commitment	0.71
Supply network Configuration	0.81

Information Sharing	Alpha (α)
Operational Information Sharing	0.66
Strategic Information Sharing	0.75
Supply Chain Performance	**Alpha (α)**
Cost Performance	0.66
Quality Performance	0.73
Delivery Performance	0.80
Flexibility Performance	0.80

5.2.5 Multiple Regression Analysis

Multiple regression analysis was selected as the statistical tool to examine the relationships between the identified factors and information sharing and information sharing and supply chain performance as outlined in this study. Regression analysis will fit a linear model to the available data set to predict the values of a dependent variable based on one or more independent variables (Field, 2013). Following the conceptual research model, the regression model comprised of factors on the left, information sharing (operational and strategic) in the middle and supply chain performance (cost, quality, delivery and flexibility) on the right. With six dependent variables (operational and strategic information sharing and cost, quality, delivery and flexibility performance), six linear regressions were performed using IBM SPSS (version 22).

An examination of the assumptions of multiple regression such as multicollinearity and singularity, outliers, normality, linearity, homoscedasticity (Tabachnick and Fidell, 2007, Meyers et al., 2013, Field, 2013) were conducted to ensure that the data was suitable for regression analysis. Multicollinearity was tested based on whether the independent variables correlate with each other. Since the factor scores were calculated via the Anderson-Rubin method, the resulting factor scores were uncorrelated and standardised (mean = 0 and standard deviation = 1) (Field, 2013). By using uncorrelated factor scores as predictors in the regression analysis, it is ensured that there is no issue of multicollinearity.

To check for any possible outliers, normality, linearity and homoscedasticity, Normal Probability Plot (P-P) of the Regression Standardised Residual and the Scatterplot were obtained. In all the six Normal P-P Plots (Figure 5.1 to 5.6), the points lied in a reasonably

straight diagonal line from bottom left to top right indicating no major deviations from normality. The scatterplots of the standardised residuals for each regression analysis resulted in the residuals to be approximately rectangularly distributed, with most of the scores concentrated in the centre, indicating no violation of linearity and homoscedasticity (Tabachnick and Fidell, 2007).

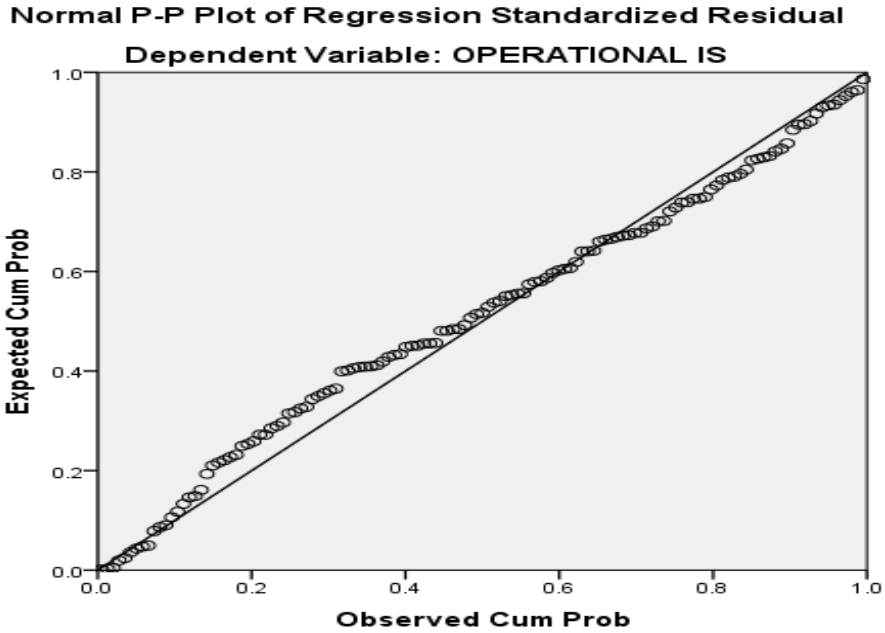

Figure 5.1: Normal P-P Plot - Operational IS

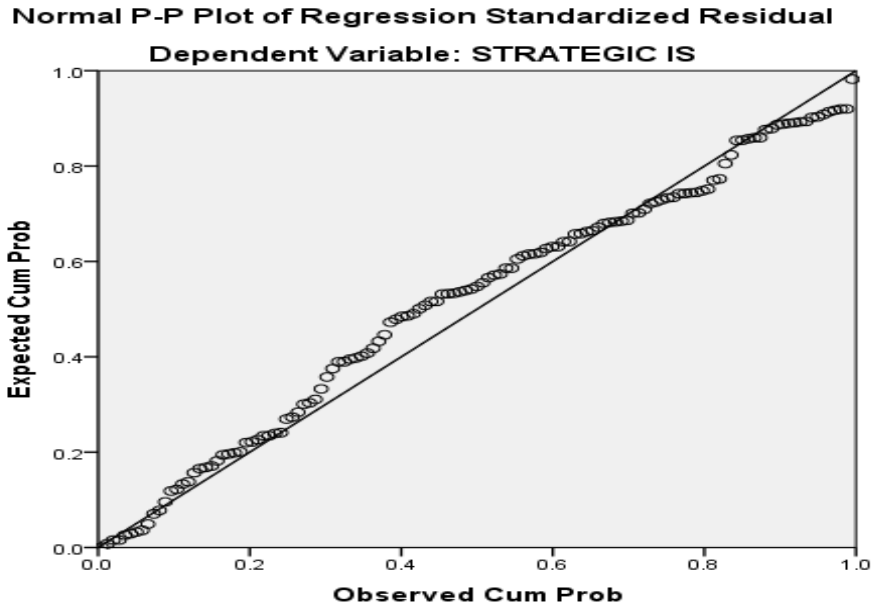

Figure 5.2: Normal P-P Plot - Strategic IS

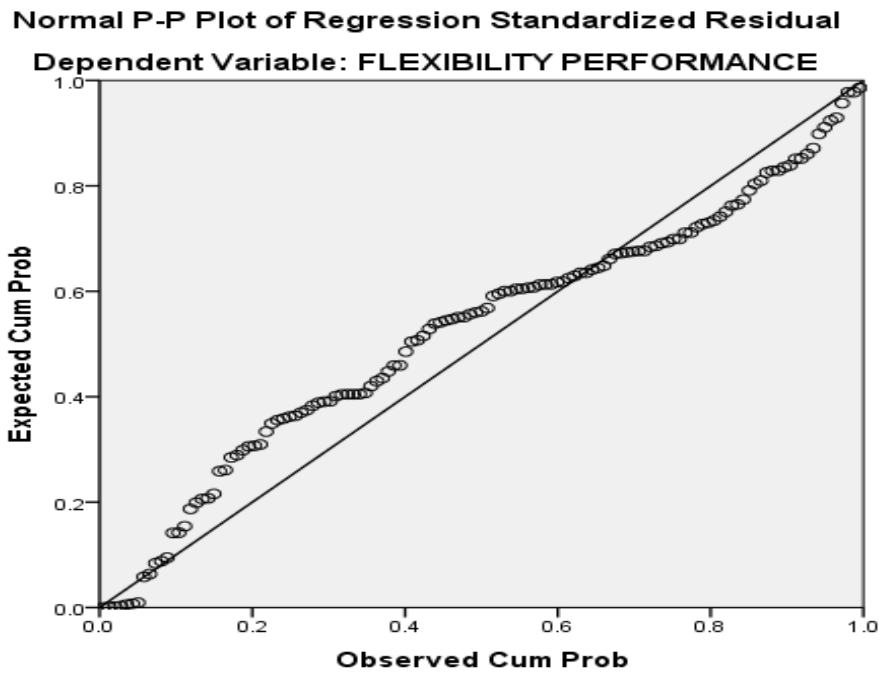

Figure 5.3: Normal P-P Plot - Flexibility Performance

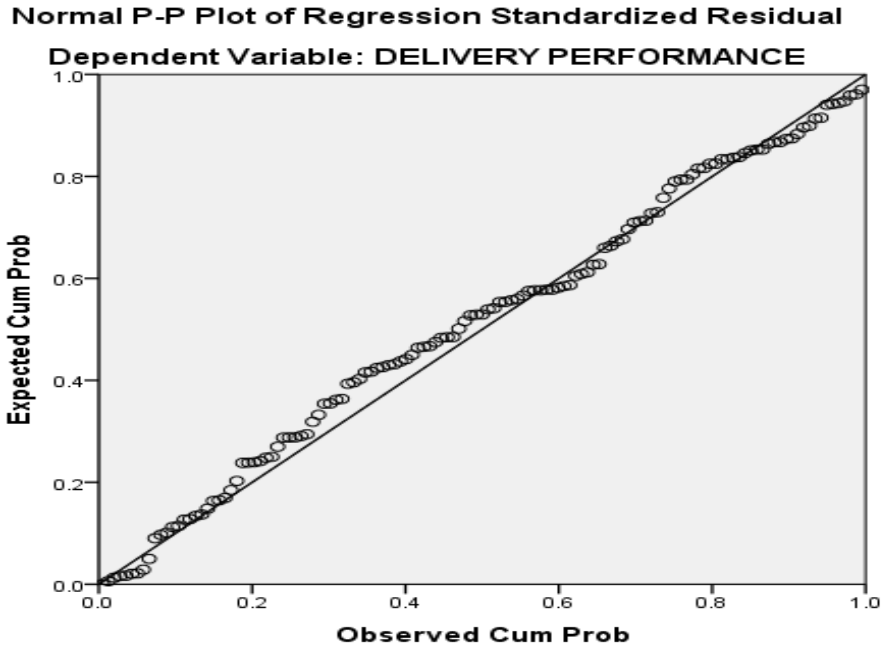

Figure 5.4: Normal P-P Plot - Delivery Performance

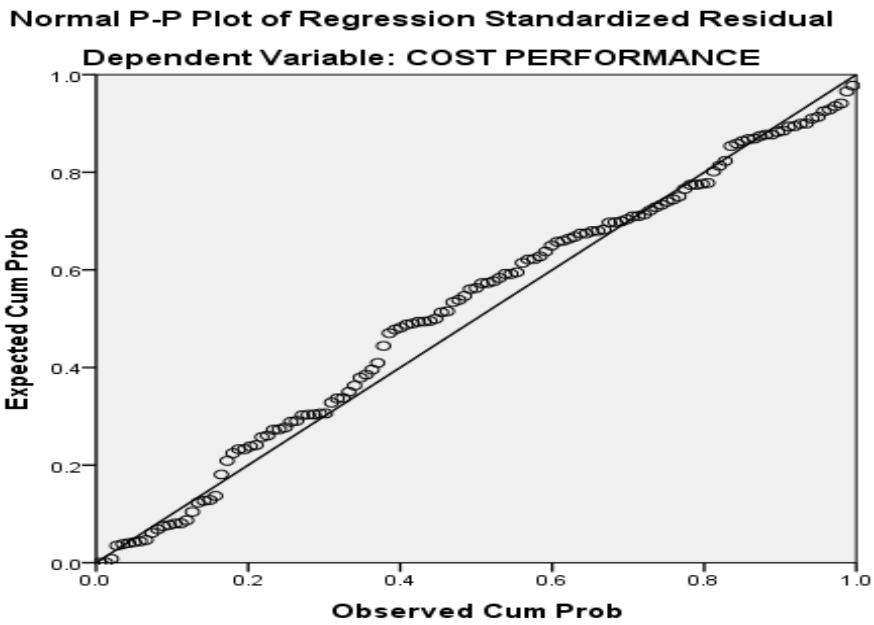

Figure 5.5: Normal P-P Plot - Cost Performance

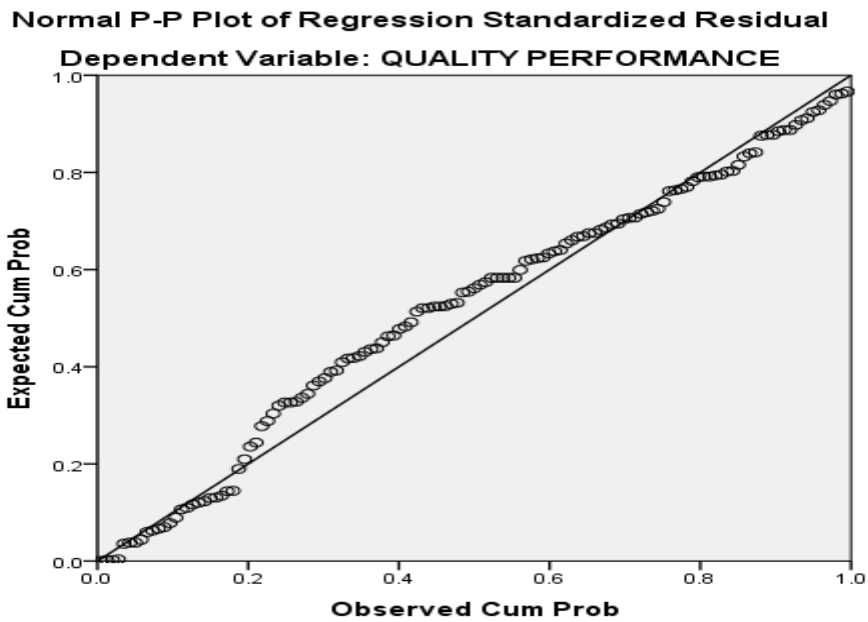

Figure 5.6: Normal P-P Plot - Quality Performance

In addition, the scatterplot can also be used to detect outliers. According to Tabachnick and Fidell (2007) outliers are the cases with standardised residuals of more than 3.3 or less than -3.3. Table 5.10 shows that cases 27, 54 and 122 had standardised residual values less than -3.3. Case 27 had a slightly less value than -3.3 which can be considered acceptable leaving only cases 54 and 122 with outlying residuals. However, as suggested by Pallant (2013), it may not be necessary to take any action if there are only a few outliers in the data set, it was

decided to keep it as it is. Hence, the above tests for the assumptions confirm that the data was suitable for multiple regressions.

Table 5.10: Case-wise Diagnostics

	Standardised Residual		
Regression Model	**Minimum**	**Maximum**	**Case No.**
1	-2.981	2.202	-
2	-3.301	2.102	27
3	**-4.368**	2.196	54
4	**-3.572**	1.881	27
5	-3.294	2.006	8 and 97
6	**-4.036**	1.232	122

Besides multicollinearity and singularity, outliers, normality, linearity and homoscedasticity, sample size is one of the most important assumptions of multiple regression analysis. As suggested by Tabachnick and Fidell (2007), a simple rule of thumb is that $N > 50 + 8m$, where m is the number of independent variables (IVs) required for reliable equation. There were 16 IVs in the study and hence the required number of responses based on the above formula was 178. While the calculated sample size for this study was 215, only 131 usable responses were received. Because of the large number of factors (IVs) in the model compared to the moderate sample size, the sample size assumption could not be met. However, according to Field (2013), if the expectation is to achieve a medium to large effects (i.e. $0.13 \leq R^2 \geq 0.26$), small sample size will suffice, regardless of the number of independent variables. For example, Field (2013) suggests that if a researcher expects to find a large effect ($R^2 \geq 0.26$) then a sample size of 77 will be sufficient with up to 20 predictors.

5.2.5.1 Testing the Effect on Information Sharing (Regression Models 1 and 2)

Following the tests of assumptions as explained above, the next step was to identify the critical factors and examine their effect on information sharing in supply chains in Nepal (*Research Question 1*). The first two regression analyses examined the effect of sixteen factors on operational and strategic information sharing respectively in order to answer the first research question.

From Table 5.11, it can be seen that the R^2 for the two regression models are 0.376 and 0.312 respectively. This means that the model as a whole explains 37.6 per cent of the variance in operational information sharing and 31.2 per cent of variance in strategic information sharing. The ANOVA provided in both regression results (Table 5.12) shows that *F*-ratio is significant at $p < 0.001$ which means that the two regression models predict operational and strategic information significantly well. Table 5.13 and 5.14 provide the estimates of the model parameter (the beta values) and the significance of these values.

Table 5.11: Model Summary – Regression Models 1 and 2

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.613	**.376**	.288	.84382852	.376	4.286	16	114	.000
2	.559	**.312**	.215	.88579656	.312	3.230	16	114	.000

Model 1. Dependent Variable: OPERATIONAL IS
Model 2. Dependent Variable: STRATEGIC IS

Table 5.12: ANOVA – Regression Model 1 and 2

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	48.827	16	3.052	4.286	**.000**
	Residual	81.173	114	.712		
	Total	130.000	130			
2	Regression	40.552	16	2.534	3.230	**.000**
	Residual	89.448	114	.785		
	Total	130.000	130			

Model 1. Dependent Variable: OPERATIONAL IS
Model 2. Dependent Variable: STRATEGIC IS

Table 5.13 exhibits the factors that have a significant effect on operational information sharing along with the contribution made by each independent factor. The results show that operational information sharing is significantly affected by interaction routines, organisational compatibility, incentives, project payoffs, commitment, personal connection and top management commitment. While the remaining factors did not have a significant effect ($p > 0.05$) on operational information sharing, supply network configuration has a *p*-

value (p = 0.075) greater than 0.05 and less than 0.1. Amongst all the factors having a significant effect on operational information sharing, organisational compatibility has the largest beta coefficient (β = 0.392 and p < 0.001), which is the strongest relationship observed in this study. This means that if a firm intents to improve operational information sharing then trying to do so by enhancing the level of compatibility with its supply chain partners will increase it by 39%. While interaction routines, incentives, commitment, personal connection and top management commitment have beta values in the range of 0.177 to 0.195, project payoffs contributed the least to operational information sharing with β = 0.155.

Table 5.13: Coefficients – Regression Model 1

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-7.554E-18	.074		.000	1.000
	Organisational Compatibility	**.392**	**.074**	**.392**	**5.292**	**.000**
	Commitment	**.194**	**.074**	**.194**	**2.617**	**.010**
	Incentives	**.190**	**.074**	**.190**	**2.571**	**.011**
	Interaction Routines	**.181**	**.074**	**.181**	**2.440**	**.016**
	Top Management Commitment	**.178**	**.074**	**.178**	**2.407**	**.018**
	Personal Connection	**.177**	**.074**	**.177**	**2.395**	**.018**
	Project Payoffs	**.155**	**.074**	**.155**	**2.089**	**.039**
	Supply Network Configuration	.133	.074	.133	1.796	.075
	Legal Contract	.053	.074	.053	.711	.478
	Trust	.052	.074	.052	.697	.487
	Government Support	-.046	.074	-.046	-.627	.532
	Market Orientation	.038	.074	.038	.510	.611
	Information Quality	-.034	.074	-.034	-.460	.646
	Information Technology	.024	.074	.024	.320	.750
	Monitoring	-.018	.074	-.018	-.241	.810
	National Culture	-.011	.074	-.011	-.148	.882

Model 1. Dependent Variable: OPERATIONAL IS

**All the highlighted paths are significant at either $p \leq 0.05$ or $p \leq 0.01$ or $p \leq 0.001$.*

Similarly, Table 5.14 exhibits the factors that have a significant effect on strategic information sharing along with the contribution made by each independent factor. Strategic information sharing is significantly ($p < 0.05$) affected by interaction routines, government support and monitoring. Information quality ($p = 0.090$) and market orientation ($p = 0.093$) have p values greater than 0.05 and less than 0.1 and hence, are not considered to make a significant effect on strategic information sharing. However, personal connection ($p = 0.056$) has a p value in the borderline and is considered to have an effect on strategic information sharing (Hair et al., 2003).

Table 5.14: Coefficients – Regression Model 2

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
2	(Constant)	-1.008E-16	.077		.000	1.000
	Interaction Routines	**.349**	**.078**	**.349**	**4.493**	**.000**
	Government Support	**.250**	**.078**	**.250**	**3.212**	**.002**
	Monitoring	**.183**	**.078**	**.183**	**2.361**	**.020**
	Personal Connection	**.150**	**.078**	**.150**	**1.931**	**.056**
	Information Quality	.133	.078	.133	1.708	.090
	Market Orientation	.131	.078	.131	1.692	.093
	Incentives	.115	.078	.115	1.486	.140
	Trust	.070	.078	.070	.905	.367
	Information Technology	.066	.078	.066	.848	.398
	Legal Contract	-.066	.078	-.066	-.856	.394
	Organisational Compatibility	-.056	.078	-.056	-.717	.475
	Project Payoffs	.047	.078	.047	.601	.549
	Supply Network Configuration	.039	.078	.039	.499	.619
	Top Management Commitment	.038	.078	.038	.489	.626
	Commitment	.038	.078	.038	.491	.624
	National Culture	.009	.078	.009	.120	.905

Model 2. Dependent Variable: STRATEGIC IS

**All the highlighted paths are significant at either $p \leq 0.05$ or $p \leq 0.01$ or $p \leq 0.001$.*

5.2.5.2 Testing the Effect on Supply Chain Performance (Regression Models 3, 4, 5 and 6)

The second part of the conceptual framework aims to examine the effect of information sharing on supply chain performance as measured by cost, quality, delivery and flexibility. Four regression analyses were performed. From Table 5.15, it can be seen that the R^2 for the two regression models are 0.193 and 0.071 (see Appendix XXIV for Model Summary- Model 3, 4, 5 and 6). This means that operational and strategic information sharing as a model explains 19.3 per cent of variance in flexibility performance and seven per cent of variance in delivery performance while the other two variances are negligible. Table 5.16 provides the ANOVA result which shows that *F*-ratio is significant for flexibility performance ($p < 0.001$) and delivery performance ($p < 0.01$) only (see Appendix XXV for ANOVA Output for Regression Models 3, 4, 5 and 6). This means that regression models 3 and 4 respectively predicted flexibility performance and delivery performance significantly well. The *F*-ratio for regression models 5 and 6 were not significant and hence the predictions of cost and quality performance were not significant.

Table 5.15: Model Summary – Regression Models 3 and 4

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
3	.439	**.193**	.180	.90535360	.193	15.301	2	128	.000
4	.267	**.071**	.057	.97120045	.071	4.912	2	128	.009

Model 3. Dependent Variable: FLEXIBILITY PERFORMANCE
Model 4. Dependent Variable: DELIVERY PERFORMANCE
Predictors: (Constant), OPERATIONAL IS, STRATEGIC IS

Table 5.17 exhibits the beta values and the significance of the effect of operational and strategic information sharing on flexibility and delivery performance. It shows that both operational and strategic information sharing had a significant effect on flexibility performance. The contribution made by operational information sharing was greater than strategic information sharing. While the beta coefficient for operational information sharing is 0.364 significant at $p < 0.001$, the beta coefficient for strategic information sharing is 0.246 significant at $p < 0.01$. It also exhibits that both operational and strategic information sharing significantly affects delivery performance with $\beta = 0.191$ and $p < 0.05$ and $\beta = 0.187$ and $p < 0.05$ respectively.

Table 5.16: ANOVA – Regression Models 3 and 4

Model		Sum of Squares	df	Mean Square	F	Sig.
3	Regression	25.083	2	12.541	15.301	**.000**
	Residual	104.917	128	.820		
	Total	130.000	130			
4	Regression	9.267	2	4.633	4.912	**.009**
	Residual	120.733	128	.943		
	Total	130.000	130			

Model 3. Dependent Variable: FLEXIBILITY PERFORMANCE
Model 4. Dependent Variable: DELIVERY PERFORMANCE
Predictors: (Constant), OPERATIONAL IS, STRATEGIC IS

Table 5.17: Coefficients – Regression Models 3 and 4

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
3	(Constant)	1.714E-16	.079		.000	1.000
	Strategic IS	**.246**	**.079**	**.246**	**3.102**	**.002**
	Operational IS	**.364**	**.079**	**.364**	**4.580**	**.000**
4	(Constant)	2.121E-16	.085		.000	1.000
	Strategic IS	**.187**	**.085**	**.187**	**2.190**	**.030**
	Operational IS	**.191**	**.085**	**.191**	**2.242**	**.027**

Model 3. Dependent Variable: FLEXIBILITY PERFORMANCE
Model 4. Dependent Variable: DELIVERY PERFORMANCE
**All the highlighted paths are significant at either $p \leq 0.05$ or $p \leq 0.01$ or $p \leq 0.001$.*

While flexibility and delivery performance were affected by both operational and strategic information sharing, information sharing had no effect on cost and quality performance. The insignificant *F*-ratio for cost and quality performance means that model 5 and 6 could not predict the outcome variables significantly.

5.2.5.3 Overall Result

The results from Sections 5.2.5.1 and 5.2.5.2 are summarised in Table 5.18. Interaction routines, organisational compatibility, incentives, project payoffs, commitment, personal connection, top management commitment, government support and monitoring are the

factors that affect information sharing in supply chains in Nepal. Out of these factors operational information sharing is significantly affected by interaction routines, organisational compatibility, incentives, project payoffs, commitment, personal connection and top management commitment while strategic information sharing is affected by interaction routines, government support, personal connection and monitoring.

Table 5.18: Summary of Test Results

Independent Latent Variable	Information Sharing		Supply Chain Performance			
	Operational	Strategic	Cost	Quality	Delivery	Flexibility
Organisational Compatibility	✓	×				
Interaction Routines	✓	✓				
Government Support	×	✓				
Commitment	✓	×				
Incentives	✓	×				
Monitoring	×	✓				
Top Management Commitment	✓	×				
Personal Connection	✓	✓				
Project Payoffs	✓	×				
National Culture	×	×				
Information Quality	×	×				
Information Technology	×	×				
Legal Contract	×	×				
Trust	×	×				
Market Orientation	×	×				
Supply Network Configuration	×	×				
Operational Information Sharing			×	×	✓	✓
Strategic Information Sharing			×	×	✓	✓

The results also show that information sharing has a significant effect on supply chain performance where delivery and flexibility is significantly affected by both operational and strategic information sharing. While the effect of operational and strategic information sharing on flexibility and delivery performance were significant, the effects on cost and quality performance were not significant.

5.3 Qualitative Data Analysis

As a mixed method research, this study is comprised of quantitative and qualitative aspects. The quantitative discussion was presented in Section 5.2 of this chapter. This section focuses on qualitative data analysis and its results obtained through content analysis. While there are no strict rules for analysing qualitative data, it largely depends on the researchers' judgement, intuition and ability to highlight issues (Carcary, 2011).

In this research, content analysis was used to analyse interview transcripts to complement the results from the quantitative data analysis. The aim of content analysis was to attain a broad description of a phenomenon through concepts or categories. It is a systematic and objective analysis technique (Elo and Kyngäs, 2008). Different words and phrases that share the same meaning are grouped into same categories. The reliability of the analysis can be increased by crafting a link between the results and the data which can be done by describing the analysis process in as much detail as possible. Content analysis is a flexible analysis tool and requires the researcher's skills, insights and analytical abilities cautiously to come up with valid and reliable results (Elo and Kyngäs, 2008).

Interviews were conducted with four groups of companies in the supply chains: producer, manufacturer, distributor and logistics service provider. Open-ended questions were asked followed by probes to explore participants' opinion on the subject matter (Hsieh and Shannon, 2005, Burnard et al., 2008). All interviews were recorded and transcribed verbatim. Since the aim is to test previous theories, deductive content analysis was employed. The themes of the interviews were pre-determined based on previous knowledge. However, it remained open to new topics that might emerge from the interviews. Due to the small size of participants (nine interviewees), a manual content analysis technique was used rather than using any qualitative data analysis software such as N-vivo (Carcary, 2011).

5.3.1 Response Rate and Demographics

From the list of 215 medium and large-scale supply chain companies in Nepal, 15 companies were chosen for interviews. The selected sample represents 15 companies that operate at different stages of supply chains. When the researcher visited the companies for the survey, the respondents were asked if they would be able to do an interview on the same subject matter as the survey. Out the selected fifteen companies, nine agreed to do the interviews.

The nine interviewees were designated as I1, I2, I3, I4, I5, I6, I7, I8 and I9 respectively. The participation of nine companies from a sample size of fifteen represents a response rate of 60 percent. Of the remaining six companies, four did not participate in the interview due to time constraint as the survey had already taken enough of their time. While their busy schedule was one of the prime reasons for the rejection of four interviews, the remaining two interviews could not be conducted due to the researcher's time limitation. The proposed dates by the two companies were beyond the researcher's stay in Nepal. Staying extra days in Nepal to conduct the two interviews could have delayed the timely execution of the study.

The nine interviewed participants hold managerial positions or above. Table 5.19 exhibits the profile of the companies and their representatives who participated in the interviews. The table shows that the largest number of interviewees (six companies, 66.7%) was representatives of manufacturing companies. This was followed by two (22%) logistics companies and one (11%) automobile distributor. Except two logistics service providers, all the other companies have more than hundred employees and hence, are large companies. While 66.7% (six) of the companies have been established for more than 20 years, one has been established for 12 years and one for less than five years. In terms of international trade, 100 percent of the companies are involved in international trade. This is an indication that the interviewed companies were aware of information sharing in supply chains because information sharing increases when distance between partners increases.

Table 5.19: Profile of Interview Participants

Interviewee	Main Business	Years of Est.	Position	Experience	Number of employees	International trade
I1	Manufacturer-shoe	> 20 Years	Sales/Marketing Manager	> 5 Years	> 200	Yes
I2	Manufacturer-steel	> 20 Years	Brand Manager	3 Years	800	Yes
I3	Manufacturer-cement	< 5 Years	Marketing Manager	4 Years	125	Yes
I4	Logistics Service Provider	26 Years	CEO	26 Years	14	Yes
I5	Manufacturer-steel/cement	-	Senior Manager	2 Years	500	Yes

Interviewee	Main Business	Years of Est.	Position	Experience	Number of employees	International trade
I6	Distributor-automobile	> 20 Years	Marketing Manager	< 1 Year	> 600	Yes
I7	Manufacturer-steel	> 20 Years	Marketing Manager	2 Years	> 200	Yes
I8	Logistics Service Provider	12 Years	Station Manager	9 Years	45	Yes
I9	Producer/ Exporter-organic tea	> 20 Years	Marketing Manager	5 Years	> 300	Yes

5.3.2 Data Immersion, Reduction (Coding) and Representation

The qualitative data was analysed through content analysis. In the first stage, the transcribed data was read thoroughly with the aim of developing a general understanding of the data. Based on the thoughts that triggered while reading the transcripts, memos were written in the margins of the transcripts to link these to relevant themes. According to Braun and Clarke (2006), a theme is something that captures important information from the data in relation to the research question. All the pre-identified themes that emerged while reading the transcripts and could be used to explain the research and its context were highlighted. Then, the highlighted passages were first condensed and then coded using the predetermined codes based on the questions asked in the interviews (Forman and Damschroder, 2008). The rationale for using the predetermined codes was to check whether the responses correspond to the various factors identified from the literature. Texts that could not be categorised with the initial coding scheme were given a new code. In addition, there were instances when the participants talked about something that was not related to the topic under study and hence, careful attention was paid as to looking for only those contents that have relevance to the research (Burnard et al., 2008, Elo and Kyngäs, 2008).

The aim of coding is to reduce the data by grouping it into different categories in a way that facilitates interpretation and enables the researcher to address the research questions. Initially, the data were categorised into 13 themes. A data display matrix was created in Microsoft Excel where analytically meaningful themes were displayed vertically and the cases or the participants were displayed horizontally across the top (Forman and Damschroder, 2008). Each cell in the matrix is filled in with texts that summarise the characteristics of that theme

in each case. Preliminary conclusions were drawn by looking at the matrix and detecting patterns in the data which lead to further coding.

The iterative coding process continued with the second stage where the initial 13 themes were compressed into five main themes: information sharing, supply chain relationship, factors affecting information sharing, communication tools and IT and supply chain performance (Burnard, 1991, Graneheim and Lundman, 2004, Forman and Damschroder, 2008). Table 5.20 shows the five main themes and their sub-themes. The aim was to bring together or synthesise the smaller themes into major themes that would result in a high-quality conceptualisation. With these five themes the researcher aims to find out, 1) the current status of supply chain information sharing in Nepal; 2) how do firms in Nepal maintain relationship with their partners; 3) factors that affect information sharing; 4) status of IT in Nepal; and 5) effect of information sharing on supply chain performance.

Table 5.20: Second Stage – Generation of Five Themes

Information sharing	SC Relationship	Factors affecting IS	Communication tools and IT	Supply Chain Performance
What is IS/IS in Nepal	Important partners	Supply network configuration	Communication tools	Effect of IS on SC Performance
Types of information shared/uncomfortable to share	Maintaining a good relationship	Factors	Role of IT/Limitations to use IT	Effect of SC performance on firm performance
Efforts to enhance IS in Supply chain	Contracts			
Suggestions to improve IS in Nepal				

5.3.3 Qualitative Results

In qualitative research, results are the direct outcome of the discussion of the evidence for the themes emerged from the data (Creswell and Clark, 2011). In order to confirm the themes, several strategies were used including citing specific quotes, using different sources of data to cite multiple items of evidence and providing multiple perspectives from individuals in the study to show divergent views (Creswell and Clark, 2011). The reports generated after coding

were further analysed, interpreted and synthesised in order to articulate results. The results of the analysis are explained under the five themes identified in the previous section.

5.3.3.1 Supply Chain Information Sharing and Its Status in Nepal

A supply chain consists of many members upstream and downstream and coordination among all of them is imperative for effective supply chain management. Information sharing among supply chain partners improves coordination (Barratt, 2004) and hence is an important aspect of running a business in the present context. According to the interviewees (I1, I2, I3, I4, I5 and I8), firms believe that possessing information will keep them ahead of their competitors, which is why they are hesitant to share information with each other to prevent it from leaking. However, they (I3 and I6) also mentioned that information sharing is important and hence, partners should learn to keep the shared information confidential.

Information is the basis and strength of a supply chain which needs to be shared to benefit from it, emphasised the interviewees (I4 and I8). "*It will not make any sense if you just keep it within yourself*," quoted one participant (I6) and was supported by the literature too (Kwon and Suh, 2004, Rashed et al., 2013). The interviewees perceived that information when shared with supply chain partners will provide mutual benefits, improve coordination, strengthen the relationship, improve business and help in decision making to improve supply chain performance (I1, I2, I3, I4, I6 and I9). While 67% of the participants believed that information sharing is important to improve their business (I1, I2, I3, I4, I6 and I9), one participant mentioned that it is the strength of supply chain without which doing business in the present context is impossible (I8). Another participant (I9) considered it as an integral part of his business: '*In supply chains, it [information sharing] is very significant. For example, without good information sharing, the good and well maintained relationship we have with the farmers might break. And such break might cause us to pay a huge sum of money.'*

Information sharing is progressing at a slow pace in Nepal because most of the interviewees believed that even though people are aware of the importance of information sharing, they are not sharing enough. While the awareness is there, some firms do not prefer to share information because they are still running their business in a traditional mode (I2 and I7). According to one interviewee the status of information sharing in Nepal is neither very good nor very bad because supply chain itself is a new concept in Nepal (I8). While another

manager (I9) believed that*, 'the importance given to information sharing is increasing now as people have realised its significance.'* Reasons such as firms not believing that information sharing will have any effect on their business, traditional practices, limitations to resources (technology), education and experience and lack of joint effort from partners were mentioned by the interviewees.

It is difficult to encourage information sharing because it requires the involvement of all the partners and as previously discussed firms are not convinced about sharing their information with others. However, many big and well-established companies have realised this and have paid considerable attention towards information sharing as reflected by three participants (I1, I2 and I3). For example, amongst the interviewees, three companies (I2, I6 and I8) have installed ERP system realising the importance of information sharing. Looking at their company profile, these three companies are established manufacturer, distributor and logistics service provider. Compared to small companies, large companies in Nepal have more exposure to information because they have access to modern ITs which provide them information about domestic and international buyers/suppliers. Many small companies have limited market exposure and there is no such platform that connects them to large companies. Referring to this, one participant (I2) stated that "*because of this there are certain products which actually can be sourced within Nepal but due to lack of information, they are being imported*." According to this participant, it is beneficial to have information about buyers and suppliers both domestic and international so that firms have options to select their buyers/suppliers. He further stated that "*through IT, all the industries, people, suppliers and manufacturers can be brought under one umbrella and with a click of a button can source their raw materials or buy finished goods*."

One interviewee (I8) complained that "*firms share information on a 'need to know' basis only rather than sharing it for further development as well*." This means that firms are sharing operational information only (facts that they need to know at the time they need to know them), the information that is necessary for the conduct of their business. There is other information (strategic information) that they are not sharing. Strategic information would help them improve their business, e.g., product development, competitive pricing strategy and marketing information. Strategic information contains important and confidential business information that covers long-term issues and has a long-term effect on company business strategies. For companies to be ready to share such information, they need to have long-term,

committed relationship with their partners. Information is mostly shared verbally, with firms sometimes denying or contradicting the information that they have provided due to lack of written evidence. "*They don't give the right information,*" whined some managers (I3 and I4) due to which firms in Nepal are suffering because it becomes difficult to predict the production quantity, customer demand and the supply updates.

"*We, as a multinational company, are trying to build a supply chain network in Nepal but we are facing a lot of friction especially with regards to drawing information from our suppliers and clients*" quoted one (I8) participant. Although supply chain participants are not receiving the information they actually need to run their business efficiently, they have revealed the types of information that they need for their daily business operations and long-term business plans (Table 5.21). In addition, they have also revealed the information that they do not want to share with their partners.

Table 5.21: Types of Information Shared and Uncomfortable to Share

Operational Information	Strategic Information	Information Uncomfortable to Share
Stock Position	Competitors' Position	Internal Matters (costing, strategies, commissions)
Payment Status	Upcoming Product	Information related to other partner or given by other partners
Order Information	Suppliers/Customer Status	Inventory (raw material as well as finished goods)
Delivery and dispatch	Market Information/Trends	Detailed product development or product delivery
Tracking and tracing	New Target Market	Competitive Pricing Strategy
Delivery trucks/vehicle placement	Customers' Feedback	Market Information
Latest Trends	Product Line	Resources
Customer Demand/Need/ Specification	Competitive Pricing	Information about competitive advantages
Marketing Plans	New Product Development	
Production Schedule/quantity/techniques	Promotions	
Updates on rates/pricing/cost	New Target Markets	

Operational Information	Strategic Information	Information Uncomfortable to Share
New Design/Technology	Government Policies	
Changing policy/rules & regulations	Distribution Plans	
	Production Capacity	

"*Although the concept of information sharing in Nepal is at a preliminary stage, people have started to realise its importance,*" reflected one interviewee (I9). This has led them towards making various efforts to enhance information sharing. Table 5.22 illustrates the participants' efforts and suggestions to improve information sharing in Nepal. Information technology implementation and mobile communication and SMS are the top two criteria that firms consider important for better information sharing. Out of nine, seven (78%) (I1, I2, I4, I5, I6, I8 and I9) interviewees considered IT as important in order to augment information sharing. According to one interviewee (I2), "*mobile and SMS are simple and cheap adaptation of technology which can be used as a quick way for communication to start with*."

Table 5.22: How can Information Sharing be Improved in Nepal?

Participants' Efforts to Enhance IS	Suggestions to Improve IS in Nepal
Encourage timely IS	Share correct, accurate and timely information
More attention and investment in IT (software and apps)	IT implementation (software, RFID, online marketing/catalogues/buying/selling) for better IS
Provide telephone, mobile, computer and internet facilities to all staffs	Can start with a simple adaptation of technology such as SMS platform which is cheap
Bilateral agency agreements and contracts	More transparency on the logistics side Improve the effectiveness of customs
Share information on a daily basis	Improve personal connection
Link up with partners and with different functions within the firm through IT	Government support (IT implementation, regulating the industry, education, employment, salary scale)
Enhance personal relationship with partners	Information should be shared by all the parties involved
Target mutual benefits	Focus on better education, human resource, employment, salary scale

Participants' Efforts to Enhance IS	Suggestions to Improve IS in Nepal
Mobile communication and SMS	Frequent communication or visits
Monitoring as to what kind of information needs to be supplied and received	Identify the constraints in SC
Frequent interaction/regular meetings	Increase awareness about IS for the benefit of the firm as well as the overall chain
	Organise trainings and workshops

Providing telephones, mobiles, computers and internet facilities to all staff is another simple but very effective way to encourage timely information sharing, as described by three participants (I5, I8 and I9). Information technology definitely improves the quality and speed of information sharing but mobile phones and internet are the basic forms of IT that is cheaper and easy to access. "*It does not have to be advanced level of IT,*" stressed one interviewee (I2). Although all the interviewed firms considered IT as an important measure, five participants (I2, I5, I6, I8 and I9) emphasised more on IT implementation. Investment in and proper implementation of IT such as software, RFID, online marketing, electronic catalogues and online buying/selling have been suggested by the interviewed companies as the best means to improve information sharing in Nepal. Others considered frequent two-way communication/meetings/interactions, encouraging timely information sharing, bilateral agency agreements and contracts, sharing information on a daily basis, enhancing personal relationship with partners, monitoring and targeting for mutual benefits as measures they have adopted to improve information sharing. This highlights that the medium of information sharing is important but not sufficient to enhance information sharing.

Awareness about the benefits of information sharing is essential to improve information sharing in Nepal, highlighted two interviewees (I8 and I9). According to an interviewee (I8), "*more focus towards better education, better human resource, better technology and changing the attitude towards business is obligatory for which the government plays a dominant role*."

5.3.3.2 Maintaining a Good Relationship in Supply Chain

A good relationship with supply chain partners is the stepping stone towards a successful business. While supply chain participants consider their immediate supply chain partners as most important, they also know that each member of the chain is equally important. Most of the interviewed firms (I1, I3, I6, I7 and I9) considered their downstream partners such as their dealers or traders or customers as their important partners with whom they do voluminous business. Four interviewees (I2, I5, I7 and I9) mentioned that due to various levels of contribution, partners in all sectors are considered equally important. The two interviewed logistics companies (I4 and I8) mentioned that their supply chain partners such as the customs brokers, shipping companies, trucking companies, terminal operators and insurance companies are more important to them compared to their suppliers and clients as they are the ones who make things happen. While the level of importance might vary, all participants believed that maintaining a good relationship with supply chain partners is imperative. Table 5.23 displays the important criteria mentioned by the interviewees to maintain a good relationship.

Table 5.23: How to Maintain a Good Relationship

Maintaining a Good Relationship	Frequency
Frequent two way communication, interaction, meetings, visits	9
Contracts	8
Commitment	4
Trust	3
Aim for mutual benefits/goals	3
Tell the truth/clear all the confusions	2
Personal connection	2
Timely payment	2
Incentives/bonus	1

Frequent two-way communication either through telephone or direct visits has been considered by all nine interviewees as an important tool for maintaining a good relationship within the supply chain. Aiming for mutual benefit is the key to a good relationship (I1, I6 and I9). When both sides in the relationship benefit equally, they tend to have more trust and commitment towards each other. In addition, always telling the truth, timely payment and

incentive/bonus are also considered to make a difference towards achieving a good supply chain relationship (I1, I3, I5 and I7).

While trust, commitment and personal connection were considered important by the interviewees (I5, I6, I7, I8 and I9), they believed that contracts are equally important to be on a safe side and to ensure ones benefits (I1, I2, I3, I4, I5, I6, I7 and I8). As mentioned in the literature (Moberg et al., 2002, Cai et al., 2010), the participants underscored (I1, I2, I5 and I6) that "*contracts guarantees commitment and honesty and ensure mutual understanding amongst partners*." Some firms believed that contracts are mostly important when the business with a partner is voluminous (large transaction) (I5 and I7) or when the partners are multinational companies (I8). One firm (I9) in particular believed that when there is a trust-based relationship with partners, there will be no need of contracts while rest of the participants believed that contracts are vital even though trust persists in the relationship.

5.3.3.3 Factors Affecting Information Sharing in Supply Chains

This section illustrates the factors considered important by the interviewees to affect information sharing. All nine interviewed firms emphasised on the importance of two way ***interaction routines*** in order to improve information sharing in supply chains. They have used different terms such as '*regular touch*,' '*time to time visit or communication through telephone*,' '*regular communication*,' '*two-way communication*,' '*regular meetings*' and '*continuous communication*' to highlight the importance of interaction routines. Since the development of IT is still at an initial stage, meetings and communication becomes an important means for sharing information. Firms should communicate frequently with each other to exchange information related to production, quality, delivery, rates and commissions. The support from the ***government*** has been referred by the interviewed firms to be important to enhance supply chain information sharing. Seven (I1, I2, I3, I4, I5, I8 and I9) (78%) participants emphasised the critical role of government in enhancing information sharing through proper implementation of law and developing IT throughout the country. According to an interviewee (I8), "*laws and legislation are not implemented properly by the government; we have to push it to the government. The government is frequently changing the laws. You have one set of regulation today which changes tomorrow without any instruction. It creates a lot of havoc in our daily schedule*.'

Different supply chains have different ***network patterns*** and the location of supply chain participants vary accordingly. Most of the interviewed firms said that they communicate with other chain members other than their direct partners (I1, I2, I3, I4, I5 and I8). Elaborating on what and with whom information should be shared, one participant (I3) mentioned that "*type of information shared depends on party to party and the information shared to one will not be shared with other parties.*" One manufacturer (I1) stated that, "*we communicate with retailers and wholesalers too but the relationship with them is different than our relationship with our dealers*." The other manufacturer (I2) stated that, *"we communicate with the retailers and sub-dealers to learn about the market conditions, to help them to promote their business and to make them feel that they are being taken care of*." One particular interviewee (I7) mentioned that they have never felt the need to approach other partners. Hence, this shows that the level of information sharing varies according to the network configuration.

The interviewees highlighted ***supply uncertainty*** as one of the biggest problems that they are facing. Six (I1, I3, I4, I5, I7 and I8) out of nine interviewees supported this claim. However, the uncertainty in supply is not because of their supplier but because of logistics uncertainty caused by unanticipated causes like blockade, natural calamities (earthquake) and strikes. Uncertainty increases the need of information sharing. "*During such uncertain situation predictability plays an important role for which people need correct and timely information*," elaborated one manager (I4). While uncertainties will increase the need for more information, it will also increase their reluctance to share information. One participant (I3) mentioned that if he is sure that the raw material will come on time, it will not be a problem to share the information about his stock or inventory. However, since it is difficult to forecast whether the raw material is coming to their factory or not, he will have to be careful about sharing such information.

The ***accuracy and timeliness of information*** (information quality) are important criteria that firms consider as a motivating factor to share information with partners. Information which is correct and is received on time will yield a positive result. "*Information if shared on time with concerned party will be of great help to us,*" stressed one interviewee (I3). To benefit from shared information, it has to be accurate, timely and reliable. However, there are people who share false information for their sole benefits. "*Information needs to be shared instantly but it is not done so as people have a tendency to act deceitfully in order to succeed*,' emphasised one manager (I1). Another interviewee (I2) also underscored the need to share

information on time, "*We make sure that we share information timely. So, let's say, we have a new product development, and we have a plan to bring it out in the market. So, we do it timely."* This was further supported by another participant (I8) who highlighted that "*we seek a lot of information, timely information basically. In Nepal, there is a big problem of sharing information on time."* Another participant (I1), stressing on quality of information said that the quality of information will decrease if it is shared tomorrow when it was supposed to be shared today. He further stated that, "*information will be more valuable when it is fresh*."

Another important factor mentioned by the interviewees is that they will share information with their partners if they ***benefit*** from it (I1, I4, I6, I7, I8 and I9). "*I think it is all selfish needs*," stated one participant (I8). Businesses are always calculative about their benefits and thus if they do not get anything in return, they are not likely keen to share information with others (I1). "*We can become better by sharing information with our partners*," stated one participant (I9) highlighting the importance of information sharing for their benefits. Information if shared will benefit all the parties involved. There is no misunderstanding and both companies are in win-win situation (I6). Adding to it, one manager stated that, "*as long as both parties are benefitting from the business with each other, the relationship will continue*."

It is imperative to have a good relationship between supply chain partners to augment information sharing. However, most of the interviewed firms believed that while trust based relationship is important, it is not sufficient to do business on compassionate grounds. Thus, more than considering trust as a basis for information sharing, firms tend to share information with those partners who demonstrate a long-term ***commitment*** to the relationship which can be guaranteed through contracts. "*Yes, trust will affect our relationships. It is always good when business is done with trust. But there are situations when people are not ethical in business and things happen in a different way. We are in a very precarious position, geographically located. Even a very good client can turn its back very easily. We always prefer having a contract so that we are on a safe side and to avoid last moment confusions*" – CEO (I4).

Personal connection is another important factor that will affect information sharing in supply chains (I1, I2, I6, I7 and I9). Because of the small size of the market, personal connections are very common in Nepal. "*Personal connection creates informal environment where people can talk freely about anything,"* mentioned one participant (I2). He further stated that it is not

always necessary that the communication between two companies has to be work related. Sometimes they can give courtesy call to enquire about each other. Such informal relationship with supply chain partners will provide information about market trends, customer demands, latest technology and changing policies. According to another participant (I7), "*We give them gifts on festivals, incentives and bonuses. If it's a good trader, we call him for a dinner. If it is a very good seller of our product, we call him in the office, we discuss with them, and we give them the best rate, then we go for lunch*."

Organisational compatibility refers to firms having similar goals, objectives, management style and similar infrastructure. Five interviewees (I2, I4, I5, I6 and I8) believed that organisational compatibility is important. The interviewed firms especially focussed on compatible goals and IT infrastructure necessary to enhance information sharing. Aiming to achieve similar goals motivate partners to share the necessary information required to achieve their target. Highlighting the importance of IT compatibility, one interviewee (I4) stated, "*If a company has a well-established IT system, they will succeed only when their counterpart working together with them in that particular area also is as good as them, you know IT compatibility*." According to another participant (I2), "*Technology is there but its adaptation is slow because of traditional practices, generation gap and the distribution of technology. So, that's a big challenge*." To make the most out of IT to improve the speed and accuracy of information sharing, it is essential that all the partners are at the same level of IT implementation.

Similar to organisational compatibility, ***reputation*** of a firm plays an important role in an early relationship when organisations know little of each other and lack a firm basis on which their partners' trustworthiness is evaluated. According to one interviewee (I8), "*reputation is a direct result of your experience and your know-how in the market*." It is reliable to do business with someone that is experienced and competent in the market. "*A reputed firm gets respect and recognition in the market and tend to get more business too*" – Sales & Marketing Manager (I1). When asked, "how do you deal with small scale businesses with whom you have no contractual agreements," one participant (I7) answered, "*we see the record of that trader, like, how many years he has been doing business, his banking status and his personal background. If this party does not have a good record then we will know that this is not the type of partner we are looking for*." Thus, firms are not hesitant to share information with those partners that have built a strong reputation in the market.

In order to compete in this ever competitive market, firms need to be aware of customer demands and the competitors' position in the market (I1, I2, I5, I6, and I8). "*Keeping track of customers and the competitors should be the aim of every supply chain participant and is a healthy thing*," stated one participant (I6). In order to be market oriented, firms need more information about the market, how the competitors are approaching, their branding strategy and promotion strategy. According to one participant (I8), "*we need to know the market direction, overall direction, which industry is moving forward, what competitors are planning and overall the customers' needs. Such information play important role in planning and capacity management in the long term.*" With increased competition, the need to share information such as the market information, competitors' position, their new product and their branding strategy increases (I1). "*To stay competitive it is important to get competitors' information and the latest happenings in the market, be it in product line or production process,*" – Brand Manager (I2). Thus, ***market orientation*** is one core reason that will enhance information sharing in supply chains.

5.3.3.4 Status of Information Technology in Nepal

Information technology has been deemed very important by all the interview participants. "*It minimises human error, increases the speed of communication, is independent and not biased*," stated one interviewee (I2). According to them there is no tendency of investing in IT in Nepal as businesses are still running on traditional practices (I1, I2, I7 and I8). According to one interviewee (I8), "*apart from IT companies and e-commerce players, the rest are still lagging behind in terms of IT use*." While the use of IT in Nepal is growing, its basic adaptations such as internet/email and SMS are more prevalent. Even though people are aware of the benefits of IT, they are not being able to implement it appropriately because of the existing problems such as availability, accessibility, compatibility and feasibility (I2, I4, I5 and I9). Lack of education is another problem that has hindered the development of IT in Nepal (I2).

The government effort towards the growth of information technology in Nepal is not up to the mark. According to one interviewee (I5), the support from the government towards the development of IT is very trifling but the government has paid attention towards the accessibility of mobile phone technology. All the interviewed firms rely mainly on telephone/mobile and internet/email for communicating with their supply chain partners. While three of the interviewed firms (I2, I6 and I8) said that they use ERP system, the other

three firms (I3, I5 and I9) mentioned that they use software only for accounting purpose. Table 5.24 shows the different communication tools used by supply chain participants in Nepal.

Table 5.24: Communication Tools Used in Nepal

Communication Tools	Frequency
Telephone	9
Internet	9
Meetings/personal visits	9
Email	8
Mobile and mobile apps	6
SMS	5
ERP	3
Intranet	2
Surveys and focus group discussions	2
Letters and correspondence	1
CCTV	1
Social media	1
EDI	1
Fax	1

5.3.3.5 Information Sharing and Supply Chain Performance

Information sharing within the supply chain will help supply chain participants to make wise decision about their future business plans (I1 and I6). It will help firms to coordinate with each other in order to achieve mutual benefits which will eventually improve their relationship (I6). Information when shared at the right time will help supply chain participants to improve their supply chain performance which will eventually enhance the performance of the entire chain. It will help supply chain partners to reduce their cost, improve the quality of their product/service, delivery and flexibility.

One participant (I2) explained how information sharing will affect supply chain performance, "*when firms receive information from their customers about the quantity, the time and the location of delivery, they can plan the vehicle requirement and can estimate the dispatch and*

delivery date. When the distributor or the wholesaler receives the dispatch/delivery and tracking/tracing information, they can plan for delivery at their end. On the basis of the received information, they can plan accordingly to fulfil their commitment to their customers or put it on hold and inform them. In this way the chances of losing business is also low." "*When information is correct, planning will be correct, result will be correct and hence we get benefit*," stated another participant (I1). This example shows how information sharing will affect delivery, flexibility and the quality of service of supply chain participants.

Information sharing will also have a significant effect on cost. One participant explained how their cost gets affected because of late or wrong information. "*Being a landlocked country, Nepal is using Calcutta Port in India, a different territory. When importing raw materials, our supply chain partners like* *** (identity hidden due to ethical reasons)*, that's our custom clearing agent, and our transporter might give us the wrong information about the vessel berth. If they will not update us on time, we might have to pay the detention and demurrage charge*," – Senior Manager (I5). This is an example which illustrates how supply chain cost is affected due to information sharing. Improvement in supply chain performance will improve the overall firm performance because it has a direct effect on firm performance such as profitability (I1, I2, I4, I5, I6, I7, I8 and I9). While smooth supply chain gives a positive result to a firm's profitability, "*for logistics companies supply chain performance will have 100% effect on firm performance*," pinpointed one participant (I8).

5.4 Summary

This chapter explained in detail how the quantitative and quantitative data were analysed in this study to answer the research questions. The quantitative data analysis process was explained first followed by the qualitative analysis. The quantitative analysis phase included descriptive analysis, exploratory factor analysis for convergent validity, discriminant validity and unidimensionality, Cronbach's alpha for reliability test and regression analyses to test the relationship between constructs.

Data coding and data screening/cleaning process to make the data ready for further analysis in SPSS were explained first. The demographic information was analysed to reveal the suitability of the respondents. A cross-tabulation of three demographic variables business sector, international trade and number of employees was also carried out. The descriptive

analysis revealed that the respondent pool meets the criteria of the target population in terms of business sector, respondent's position/experience and size of the company (number of employees). Majority of the respondents are manufacturers, who in the context of Nepal own relatively large companies compared to other business sectors (retailers, wholesalers or logistics service providers). Other sectors usually are small or medium sized with a few big players. The involvement of significantly large number of companies in international trade shows that import/export is an important business activity for Nepalese firms. This also means that information sharing may be critical in dealing with international partners and hence, Nepalese firms should pay considerable attention towards enhancing it.

The measurement instrument was assessed through reliability, unidimensionality, convergent validity and discriminant validity of the measured items. Exploratory factor analysis was conducted to ensure unidimensionality and validity of the survey instrument. Trial-and-error method was employed for selecting the final factor structure. EFA was re-run nine times, deleting different items one at a time. This technique allowed the researcher to check different factor structure and select the one that is most appropriate. After discarding the items with loadings below 0.5 and items with cross loadings, a factors structure with sixteen factors was extracted. All items loaded significantly and substantially on their underlying constructs confirming unidimensionality, convergent validity and discriminant validity. The factors scores were computed from EFA via Anderson-Rubin method. Cronbach's alpha values were calculated for each construct. All, except three constructs (0.66 – 0.68), had alpha values greater or equal to 0.7 which were all retained for further analysis.

Multiple regression analysis was applied to find out the significant factors affecting operational and strategic information sharing and the effect of information sharing on supply chain performance. The tests for the assumptions confirmed that the data was suitable for regression analysis. The regression analysis results suggested that operational information sharing was affected by relationship, intra- and inter-organisational factors while strategic information sharing was affected by factors across all four categories. Furthermore, interaction routines, organisational compatibility, incentives, project payoffs, commitment, personal connection and top management commitment have significant effect on operational information sharing. Whereas strategic information sharing was significantly affected by interaction routines, government support, personal connection and monitoring. The regression analysis also examined the effect of information sharing on supply chain performance. The

results show that both operational and strategic information sharing affects delivery and flexibility performance only. Information sharing had the greatest impact on flexibility as the model explained 18% of the variation in flexibility due to information sharing.

Content analysis was used to analyse the qualitative data in order to supplement the quantitative results. The qualitative results revealed that factors such as interaction routines, government support, supply network configuration, supply uncertainty, information quality, benefits, commitment, personal connection, organisational compatibility, reputation, and market orientation were considered by the interviewees as important factors to influence information sharing. It explained how supply chain participants in Nepal perceived information sharing with their partners and their outlooks on how it affects their supply chain performance. Furthermore, it explained the status of IT in Nepal and the barriers towards its successful implementation. While the qualitative results were in-line with the quantitative results, it identified additional factors that were not identified quantitatively. This will be discussed in detail in the next chapter.

The next chapter will merge the quantitative and qualitative results and then discuss the findings in detail. It will compare the results with the previous studies and explain the likely reasons for the similarities and differences.

Chapter 6 DISCUSSIONS OF FINDINGS

6.1 Introduction

The previous chapter explained the data analysis process and presented the results. This chapter will discuss the findings from both the quantitative and qualitative approaches. The discussion of the findings will be organised based on two primary research questions and their corresponding secondary questions. Following the first primary research question, Section 6.2 will discuss the critical factors affecting information sharing in supply chains and how they affect operational and strategic information sharing. Section 6.3 will discuss the effect of information sharing on supply chain performance of individual firms including how supply chain performance is affected by operational and strategic information sharing.

6.2 Research Question 1

This section will address the first primary research question that includes two subsidiary questions. The research question is as follows:

PRQ1: How is information sharing affected in supply chains in the context of Nepal?

SRQ1.1: What are the critical factors affecting information sharing in the supply chains in Nepal?

To answer this subsidiary research question, 42 hypotheses were postulated as follows:

> ***Hypothesis (1 - 21)a:*** *Operational information sharing is affected by trust, commitment, power, personal connection, organisational compatibility, top management commitment, market orientation, reputation, project payoffs, monitoring, incentives, information technology, information quality, partnership extent, legal contract, supply network configuration, interaction routines, supply chain integration, environmental uncertainties, government support and national culture.*
>
> ***Hypothesis (1 -* 21)b:** *Strategic information sharing is affected by trust, commitment, power, personal connection, organisational compatibility, top management*

commitment, market orientation, reputation, project payoffs, monitoring, incentives, information technology, information quality, partnership extent, legal contract, supply network configuration, interaction routines, supply chain integration, environmental uncertainties, government support and national culture.

SRQ1.2: How do these factors affect information sharing at strategic and operational levels?

To answer this subsidiary research question, the standardised beta coefficients of the significant factors and their direction (positive or negative) and the R square values of the two regression models will be explained (Section 6.2.2.). The effect of the factors on operational and strategic information sharing are considered as weak, moderate, moderately strong and strong effects depending on their beta coefficients. Furthermore, the coefficient of determination or R^2 is considered as small, medium and large to explain the variation caused by the research model on operational and strategic information sharing.

6.2.1 Factors Affecting Information Sharing in Supply Chains in Nepal

Two regression analyses were conducted in Chapter Five to examine the effects of the identified factors on operational and strategic information sharing. Based on the regression analyses results presented in Table 6.1, the 42 *hypotheses* under SRQ1.1 were reviewed.

Table 6.1: Results for Research Question 1

	Operational IS				Strategic IS		
Factors	***p*-value**	**Beta**	**R^2**	**Factors**	***p*-value**	**Beta**	**R^2**
Organisational Compatibility	0.000^{***}	0.392		Interaction Routines	0.000^{***}	0.349	
Commitment	0.010^{**}	0.194		Government Support	0.002^{**}	0.250	
Incentives	0.011^{*}	0.190		Monitoring	0.020^{*}	0.183	**0.312**
Interaction Routines	0.016^{*}	0.181	**0.376**	Personal Connection	0.056^{*}	0.150	
Top Management Commitment	0.018^{*}	0.178					
Personal Connection	0.018^{*}	0.177					
Project Payoffs	0.039^{*}	0.155					

**** Significant at $p \leq 0.001$; ** Significant at or $p \leq 0.01$; and * Significant at $p \leq 0.05$.*

The first regression analysis revealed that only seven out of 16 factors significantly affected operational information sharing. This confirmed ***Hypothesis 2a, 4a, 5a, 6a, 9a, 11a and 17a*** which postulated that operational information sharing was affected by commitment, personal connection, organisational compatibility, top management commitment, project payoffs, incentives and interaction routines respectively. The second regression analysis exhibited that only four out of 16 factors significantly affected strategic information sharing. This confirmed ***Hypothesis 4b, 10b, 17b and 20b*** which postulated that strategic information sharing was affected by personal connection, monitoring, interaction routines and government support respectively. Table 6.2 shows the summary of hypotheses testing.

Table 6.2: Summary of Hypotheses Testing (Influential factors of information sharing)

Hypothesis	Path	Test Results
1a	Trust → operational information sharing	Reject
1b	Trust → strategic information sharing	Reject
2a	**Commitment → operational information sharing**	**Accept**
2b	Commitment → strategic information sharing	Reject
3a	Power → operational information sharing	x
3b	Power → strategic information sharing	x
4a	**Personal connection → operational information sharing**	**Accept**
4b	**Personal connection → strategic information sharing**	**Accept**
5a	**Organisational compatibility → operational information sharing**	**Accept**
5b	Organisational compatibility → strategic information sharing	Reject
6a	**Top management commitment → operational information sharing**	**Accept**
6b	Top management commitment → strategic information sharing	Reject
7a	Market orientation → operational information sharing	Reject
7b	Market orientation → strategic information sharing	Reject
8a	Reputation → operational information sharing	x
8b	Reputation → strategic information sharing	x
9a	**Project payoffs → operational information sharing**	**Accept**
9b	Project payoffs → strategic information sharing	Reject
10a	Monitoring → operational information sharing	Reject
10b	**Monitoring → strategic information sharing**	**Accept**
11a	**Incentives → operational information sharing**	**Accept**

Hypothesis	Path	Test Results
11b	Incentives → strategic information sharing	Reject
12a	Information technology → operational information sharing	Reject
12b	Information technology → strategic information sharing	Reject
13a	Information quality → operational information sharing	Reject
13b	Information quality → strategic information sharing	Reject
14a	Partnership extent → operational information sharing	x
14b	Partnership extent → strategic information sharing	x
15a	Legal contracts → operational information sharing	Reject
15b	Legal contracts → strategic information sharing	Reject
16a	Supply network configuration → operational information sharing	Reject
16b	Supply network configuration → strategic information sharing	Reject
17a	**Interaction routines → operational information sharing**	**Accept**
17b	**Interaction routines → strategic information sharing**	**Accept**
18a	Supply chain integration → operational information sharing	x
18b	Supply chain integration → strategic information sharing	x
19a	Environmental uncertainties → operational information sharing	x
19b	Environmental uncertainties → strategic information sharing	x
20a	Government support → operational information sharing	Reject
20b	**Government support → strategic information sharing**	**Accept**
21a	National culture → operational information sharing	Reject
21b	National culture → strategic information sharing	Reject

X → factors that either got deleted or synthesised with other factors based on EFA

The regression analyses results showed a number of critical factors across all four categories that had a significant effect on information sharing in supply chains in Nepal. This indicates that information sharing cannot be initiated by a firm alone. "*It requires the involvement of all the partners*", highlighted one interviewee. Besides internal and inter-organisational facets, environmental aspects also play a central role to initiate and enrich information sharing between supply chain partners. The influence of strong relationship between supply chain partners, characterised by a higher level of trust and commitment, on information sharing has been long-established by many authors (Kumar, 1996, Hart and Saunders, 1997, Moberg et al., 2002, Sahay, 2003, Sheu et al., 2006, Sezen and Yilmaz, 2007, Lee et al., 2010). This study provided empirical evidence that besides maintaining a strong relationship with supply

chain partners, firms need to consider the role of intra-organisational, inter-organisational and environmental facets in improving supply chain information sharing.

6.2.1.1 Factors Acknowledged by Quantitative and Qualitative Results

Effect of Interaction Routines on Information Sharing

As shown in Chapter Five and summarised in Table 6.1, interaction routines exerted a significant effect on both operational and strategic information sharing. The qualitative results fully supported this fact as all the nine interviewees emphasised the significance of regular two-way communication between supply chain partners to augment information sharing. "S*upply chain partners should communicate with each other at three levels, 1) on a day to day basis; 2) review basis; and 3) feedback basis.*" stated one manager.

Studies conducted by Patnayakuni et al. (2006) and Müller and Gaudig (2011) demonstrated similar results while the study conducted by Li et al. (2014) exhibited that interaction routines have no effect on information sharing and its content. Besides the use of technological means, interaction routines are one of the best and consistently used way to share information. According to the interviewees, in Nepal the development of technology has only reached to a level where most of the firms are adapting to simple form of technology such as internet and SMS. This emphasises the role of interaction routines as an important means to share information with each other. Interaction routines involve frequent communication between supply chain partners, either formally or informally. This includes face-to-face meetings, telephone conversations and social/informal gatherings/parties. These kinds of activities will improve their level of knowledge about each other and their needs. It will enhance their relationship which is the foremost contributor of information sharing.

Advanced technology is not the only important medium for information sharing. One participant emphasised that the focus should be more on sharing the necessary information rather than how they share it. Moreover, the qualitative nature of strategic information emboldens supply chain partners to discuss them via face-to-face meetings or telephone. Unlike operational information, strategic information cannot be captured in tables and spread sheets. Sharing of strategic information requires supply chain partners to involve in detail discussion or conversation. The empirical result supports this fact as the β-value for strategic information sharing is almost double to that of operational information sharing. Moreover, the strongest effect exerted on strategic information sharing was by interaction routines.

Frequent meetings, either face-to-face or through telephone tend to improve relationship between supply chain partners which in turn increase the quantity of information shared.

Effect of Organisational Compatibility on Information Sharing

In this study, organisational compatibility covers factors such as shared vision, goal compatibility, cultural sensitivity and partner goal congruence. All these different factors basically mean that when business partners are compatible in terms of goals, vision, beliefs, geography and culture, they tend to share more information. Hence, it has been collectively labelled as organisational compatibility. The effect of the individual components under organisational compatibility on information sharing has been studied previously, for example Li and Lin (2006), Samaddar et al. (2006), Lee et al. (2010) and Nguyen and Nguyen (2014). However, there has been no empirical investigation undertaken to examine the relationship between organisational compatibility and information sharing. This study considered organisational compatibility as a factor to affect information sharing and the results confirmed the relationship between two.

Incompatibilities between supply chain partners will create divergent values causing problems such as clashes in ideas, working principles, styles, attitudes towards collaboration and coordination with other firms (Ford, 1984, Anderson and Weitz, 1989, Ganesan, 1993). The interviewed firms especially focussed on the need for supply chain partners to be compatible in terms of goals and IT infrastructure as a measure to improve information sharing. This is supported by literature as Rajaguru and Matanda (2013) suggest that organisational compatibility can be achieved through similar technological infrastructure, cultural fit and comparable goals and objectives. "*Same or similar level of technology is important to be at equal level, for example, I can look forward to video conferencing with my trade partner in Kathmandu but I cannot do that with my trade partner who is away from Kathmandu*," stated one interviewee. What he means is that in Nepal, IT facilities are better in the capital (Kathmandu) than the rest of the country. When his partners are located outside the capital then he has to deal with such type of incompatibility issues. His company is a well-established company and has already invested in advanced IT systems. However, if the partner that he is dealing with does not have the same facility then what is the justification for investing in such expensive assets? The company might use IT to deal with their international partners. While they might receive information from their international partners through their ERP system, they might end up passing on that information to their domestic partners

verbally over the phone or through email. This is what Kembro and Selviaridis (2015) meant when they highlighted that not all members in the supply chain are technologically connected and have the capability to exchange data.

Supply chain partners aiming to achieve similar goals are likely to share the necessary information required to achieve their target. Compatible IT infrastructure between supply chain partners is another important criterion to enhance the speed and quality of information sharing. For a country like Nepal with restricted IT development, it is crucial for Nepalese firms to ensure that their partners also have or are ready to install similar IT infrastructure before investing in more advanced IT initiatives.

Lee et al. (2010) considered cultural similarity and goal compatibility as separate factors to affect information sharing and found that cultural similarity only affected operational information sharing while goal compatibility affected operational as well as strategic information sharing. In this study, while strategic information sharing was not affected, operational information sharing was significantly affected by organisational compatibility and is the strongest relationship observed in this study. The combination of different aspects in the current study must have influenced the effect of organisational compatibility on information sharing. Smith and Barclay (1997) highlight the fact that organisational compatibility is especially useful for the early stage of relationships when firms know very little of each other. At such early stage of relationship, the trust between firms is at a minimal level. A high level of compatibility can facilitate working relationship and develop partnership among firms with similar beliefs. Organisational compatibility is one of the important requirements to establish partnership although the partnership may only be up to an operational level. With the establishment of operational partnership, firms might be comfortable to share operational information only (Du et al., 2012). For firms to be confident enough to share strategic information, they should enhance their partnership to the next level, that is, strategic partnership (Du et al., 2012).

Effect of Incentives on Information Sharing

The results of regression analyses showed that incentives have a significant effect on operational information sharing only. This result is different from that of Müller and Gaudig (2011) who found no relationship between monetary incentives and information sharing. Müller and Gaudig (2011) conducted their study in Germany where the supply chain

participants involved were most likely to be medium and large scale companies. In contrast, the supply chain participants in Nepal are mostly small companies. These small companies, especially, the retailers, wholesalers and distributors tend to get motivated to perform better if they are offered monetary incentives. Following Murry Jr and Heide (1998), it is more effective if companies adopt a policy to reward their supply chain partners after the benefits (from information sharing) are achieved as it has a tendency to encourage them to perform even better in future (share timely and accurate information).

While incentives might seem attractive for firms to share their operational information with their partners, it might not appeal to the top management who has the control over strategic information sharing. In contrast, managers or general managers may not have access to strategic information. Since a majority (50.4 per cent) of the respondents in this study were managers or general managers, it is explainable why incentives had no effect on strategic information sharing.

Effect of Project Payoff on Information Sharing

The study conducted by Madlberger (2009) in Austria concluded that there is no indication of negative impact of perceived cost on information sharing practices. The current study supports and provides further explanation to this conclusion as the empirical result illustrates that project payoff has a significant effect on operational information sharing. This means that while cost is something that every company will consider before investing, the immediate and valuable outcomes tend to outweigh the cost involved. Moreover, firms also tend to invest in information sharing if the costs and benefits are shared between supply chain partners. The interviewed firm representatives also highlighted that they would share information with their partners if they *benefit* from it.

Effect of Commitment (inter-organisational) on Information Sharing

The results showed that commitment has a significant effect on information sharing which means that firms tend to share information with those partners who demonstrate a long-term commitment to the relationship. This result is consistent with the literature (Moberg et al., 2002, Lee et al., 2010, Hung et al., 2011, Prajogo and Olhager, 2012, Wu et al., 2014) and empirically ascertains that commitment is a key to strengthen the motivation for information sharing.

While trust between supply chain partners fosters commitment (Kwon and Suh, 2004), firms consider trust as necessary but not sufficient condition to commit to a relationship. Out of the nine interviewed firms, eight of them stated that while trust cannot be guaranteed, commitment can be guaranteed through contracts and hence, is important. They believe that contracts are necessary to have a healthy business relationship as it serve as a guideline and avoid confusion. Hence, firms with committed relationships with their supply chain partners through contractual agreements are assertive to share information with their supply chain partners.

While commitment has a significant effect on operational information sharing, it has no effect on strategic information sharing. This result contradicts with the previous studies where commitment between supply chain partners affects strategic information sharing only (Moberg et al., 2002, Lee et al., 2010). Since sharing strategic information might bring considerable business risks (Moberg, 2000), none of the committed partners are willing to share the unanticipated risks. Contracts guarantee long-term relationship. However, it does not safeguard firms from the consequences of risks that might be brought through sharing strategic information. This might be the primary reason why companies in Nepal might not be ready to share their strategic business information even with their long-term business partners. Their policy is to share strategic information only when it will bring them substantial amount of benefits in the long run.

Effect of Personal Connection on Information Sharing

Personal connection is another factor that has a significant effect on information sharing which confirms the literature (Cai et al., 2010). Cai et al. (2010) find that guanxi or informal personal network had a direct effect on information sharing. Personal contact plays a major role in Nepal due to the small size of market where there is very little anonymity between firms and hence in most cases managers from both companies know each other quite well. Culture also plays a role in the development of such relationship between supply chain partners. In Nepal, business partners also meet outside their business territory. They invite each other in social functions such as marriage or other traditional functions. Exchanging gifts and favours, informal gatherings and attending social functions are the signs of such interpersonal relationships which are common in Nepal.

While Cai et al. (2010) did not consider information sharing as a multidimensional measure, this study provided further information confirming that personal connection affects operational and strategic information sharing separately. Personal connection plays a crucial role under conditions such as shortages of critical items, urgent delivery, and uncertain supply and demand. The exchange of help and favours might build up a sense of reciprocity. When one partner provides information to another partner, the receiving partner is obliged to return the favour by sharing valuable information later.

Effect of Top Management Commitment on Information Sharing

The results demonstrated that top management commitment has a significant effect on operational information sharing and no effect on strategic information sharing. The role of top management commitment in supply chain information sharing has been ambiguous from previous studies as some authors found no association (Moberg et al., 2002) and others found the relationship to be significant (Li and Lin, 2006, Wang et al., 2014) between top management commitment and information sharing. Some authors concluded that top management commitment only affected strategic information sharing (Madlberger, 2009, Lee et al., 2010).

Top management commitment towards information sharing is important because they are the ones to provide vision, guidance, support and resources for its implementation (Li and Lin, 2006). When the top management team is aware of the importance of information sharing, they will motivate their staff and make all necessary efforts to enhance it. In this study, the role of top management commitment was only limited to enhancing operational information sharing which contradicts Madlberger (2009) and Lee et al. (2010). While strategic information sharing decision is expected to be determined by the top management team (Madlberger, 2009), in this study, the majority (50.4%) of the respondents were at a managerial position who might have limited authority to decide strategic matters. However, the department managers or general managers have greater influence on sharing operational information which is predetermined, structured and routine. This outcome must have resulted mainly because the number of managers who answered the survey questionnaire was much higher than that of CEO/President/Owner/Director or Managing Director. Hence, the respondent profile may partly explain why top management commitment had no effect on strategic information sharing.

Effect of Government Support on Information Sharing

Government support exerted a significant impact on strategic information sharing while its impact on operational information sharing was not significant. This is explainable in the context of Nepal similar to China where law enforcement is not consistent, which increases the risks that parties in a relationship may violate the contract terms (Cai et al., 2010). Businesses in Nepal are constantly facing havoc because of the changing government laws resulting in an unhealthy environment for business operations. While many large businesses have close relationships with influential government officials, they too do not feel fully protected under such changing laws and constitutions. The influence of government support towards improving information sharing in the context of developed country might not be as significant as in the case of developing countries. Developed countries have well defined laws which are well executed and enforced providing businesses with assurance to conduct business in a healthy way. Without the certainty of protection from the laws, companies do not feel fully secure or confident to establish a relationship with their supply chain partners where they can confidently share their strategic business information.

The interviewees also supported that government of Nepal has a great influence on how firms run their businesses. According to them, the government can play a significant role in improving supply chain information sharing by maintaining a healthy industry (industry that abides by the law), regulating the industry, improving the effectiveness of customs, increasing the overall literacy rate and implementing information technology. According to one participant, IT incompatibilities are caused because of uneven distribution of investment in information technology throughout the country and it is the government's duty to ensure that all parts of the country are equally connected. The role of government is significant for the proper application of IT by developing the necessary infrastructure for training and education to support the development and use of IT. Government can facilitate planning, development and management of the IT use.

Effect of Monitoring on Information Sharing

Monitoring is another factor that has significant effect on strategic information sharing only. While Müller and Gaudig (2011) conclude that monitoring exerts a significant effect on information sharing, their study did not differentiate information sharing at two levels. However, they argue that monitoring measures should be applied in long-term trusted relationships. In addition, they also state that monitoring measures involve certain costs and

hence, firms need to achieve a balance between costs and the potential benefits of information sharing (Müller and Gaudig, 2011).

Operational information such as order status, shipment notice, production and delivery schedules, sales, logistics or inventory level information is required on a daily or weekly basis as it determines the everyday activities of a firm. Firms have no choice but to share essential operational information to operate their businesses. Considering the cost involved, it might not be necessary to apply monitoring measures while sharing operational information. However, when firms use strategic information to make firm-wide long-term changes, it becomes imperative to share well-advised, timely and accurate information to prevent firms from making poor decision that might have a long-term impact on their business. For fear that some firms may misguide or mislead other chain members for their own benefit or convenience, monitoring is needed to ensure that correct and timely information is shared and that opportunistic behaviour is detected and prevented wherever possible.

Effect of Supply Network Configuration on Information Sharing

The relationship between supply network configuration and information sharing behaviour has not been empirically studied. Samaddar et al. (2006) use theoretical arguments and analysis of secondary data to develop propositions regarding the association between supply network configuration and information sharing. The result in this study shows that, while supply network configuration has a positive effect on operational information sharing, it has a p value of 0.075, thus is not considered statistically significant. However, the interview participants confirmed that supply network configuration affects their communication with their supply chain partners.

Different supply chains have different network patterns and the relevant location (first or second tier supplier/customer) of supply chain participants vary accordingly. Similarly, some supply chains are short while others are long with large number of vendors and clients. Depending on the number of supply chain stages and channels, their position in the chain and the length of the chain, supply chain participants tend to build different relationships with different chain members. Firms tend to share more operational information with their immediate supply chain partners or when their supply chain consists of fewer members. With the growing number of partners and stages in the supply chain, the relationship (arm's length or long-term), level of interactions, the information needs and the level of information shared

will decrease. For example, when it is a dyadic, single-stage relationship, survival depends on both parties and hence, the relationship is more interactive, strong and long-term. However, when the number of supply chain participants increases, a company might not be able to maintain the same kind of relationship with every member of the chain.

In Nepal, due to the small market size, firms usually know most of their domestic supply chain members. While they may not be sharing information on a regular basis with their indirect partners, they may communicate with them to get customer feedback about their products or to get other market information. Furthermore, some firms communicate with their indirect partners to help them promote their business (for example: a large manufacturer might help the dealer/distributor or the retailer by giving them sales training to increases sales target which will eventually help the manufacturer) and to make them feel that they are being taken care of as their performance will affect the overall performance of the chain.

The qualitative results of this study confirmed Samaddar, Nargundkar and Daley's proposition. Their proposition was that the dyadic configurations are associated with strategic information sharing while multi-channel, multi-stage supply network configurations are associated with high volume of operational information. The quantitative results might have been affected by the way that the items were framed to measure supply network configuration. Out of the three items measuring supply network configuration, one item was deleted during EFA due to cross-loading. The remaining two items resulted in $\alpha = 0.81$ which might have been due to similarity between the two items. Hence, future research needs to improve the items that are used to measure supply network configuration to improve the reliability of the outcomes.

Effect of Information Quality on Information Sharing

Similar to supply network configuration, the qualitative result confirmed the association between information quality and information sharing. While the quantitative result illustrated a positive relationship, it did not reach statistical significance ($p = 0.090$). Information quality encompasses accuracy and the timeliness of the information shared among supply chain partners. Quality information received on time will assist the chain members to make the right decision in a timely manner helping them to yield positive results. Highlighting the importance of the quality of information, one interviewee stated, "s*haring information is not enough but sharing quality information (accurate and timely) is the foundation of a profitable*

business." Sharing quality information will enhance the relationship with partners. If the quality of the shared information is useful and reliable, supply chain partners will be motivated to share information with that partner.

Previous studies have verified the relationship between information quality and information sharing to be positive and significant (Youn et al., 2008, Baihaqi and Sohal, 2013). This study established that information quality has a significant effect on strategic information sharing and has no effect on operational information sharing. This result conforms with the studies conducted by Moberg et al. (2002) and Lee et al. (2010) who concluded that the non-significant relationship between information quality and operational information sharing may be most probably due to the increased use and effectiveness of newer information technologies. With the use of the advanced information technologies such as EDI, ERP and RFID, firms are able to ensure the accuracy and timeliness of the operational information (Lee et al., 2010). In Nepal, although the use of sophisticated IT is at a preliminary stage, the use of internet and mobile applications has significantly improved the accuracy and timeliness of the operational information and hence quality is of less concern for operational information sharing.

However, due to unstructured and qualitative nature of strategic information, firms prefer to discuss strategic information via face-to-face meetings or other traditional means. As previously mentioned, since firms use strategic information to make firm-wide long-term decisions, it becomes imperative to share well-advised, timely and accurate information to prevent firms from making poor decision that might have a long-term impact on their business. In addition, firms share their strategic information only with few of their most important supply chain partners. When sharing information with such important partners, firms give topmost priority to the quality of the shared information.

Effect of Market Orientation on Information Sharing

The effect of market orientation on information sharing was confirmed by the interviewees. However, statistical significance was not reached (p = 0.093) for the relationship between market orientation and strategic information sharing even though the result exhibited a positive relationship. Similar to supply network configuration, the market orientation scale consists of only two items with very high reliability value, α = 0.91 which might have been due to likeness between the two items. According to Streiner (2003), reliability value over

0.90 most likely indicate unnecessary redundancy rather than a desirable level of internal consistence.

With increasing competition, it is imperative for firms to know about their competitors and understand the market demand. For firms to stay up-to-date about market and competitors position, they have to constantly seek information such as changing customer demand, product specification, forecast information, business information and competitors' strength and weaknesses. A highly market-oriented firm is likely to exchange more information with their partners (Nguyen and Nguyen, 2014).

6.2.1.2 Factors Not Predicted by Quantitative Result

The quantitative results could not confirm the effect of environmental uncertainties and reputation on information sharing. However, the qualitative results confirmed that supplier uncertainty (one component of environmental uncertainties) and reputation as other important factors affecting information sharing. While the quantitative analysis failed to confirm the prediction, the divergence can be taken as an opportunity for enriching the explanation (Jick, 1979) and finding out the issues in quantitative analysis if there was any (such as the wording of the measurement scale). Furthermore, the effects of power, partnership extent, supply chain integration, national culture and legal contract on information sharing could not be verified.

Supply chain uncertainty is a frequently cited factor affecting information sharing (Li and Lin, 2006, Zhou and Benton Jr, 2007, Yigitbasioglu, 2010). Li and Lin (2006) consider supplier uncertainty, customer uncertainty and technological uncertainty as three separate factors and find that only supplier uncertainty affected information sharing. In this study, these three uncertainties were synthesised under supply chain uncertainties. It was presumed that supplier, customer and technological uncertainties were the components of supply chain uncertainties. However, the result suggests that the three should be considered as stand-alone factors. The quantitative data was unable to establish the relationship. However, the qualitative data emphasised that the uncertainties in supply caused by logistics issues are an important factor affecting information sharing behaviour. This discrepancy between the quantitative and qualitative result may have been caused by the measurement items of supply chain uncertainties. Three items were included in supply chain uncertainties scale covering diverse themes related to customers, suppliers and technological uncertainties. This resulted

in poor reliability and validity of the scale. Consequently, the uncertainty factor had to be removed from further analysis to test its effect on information sharing.

In contrast, the interviews revealed that supply uncertainty is of major concern. When looking at the individual survey item, the mean score for the statement "we face difficult situations due to supply uncertainties," was 3.76 which was consistent with the qualitative data. Supply chain connectivity has always been one of the major cause in Nepal for high logistics cost. Because of the lack of direct sea access, Nepal's connectivity level with the rest of the world is poor and hence is dependent too much on Indian seaports. The time taken to move goods is much longer in Nepal because of the delays and unreliability and unpredictability of services. "*We are trying to be very predictable but it is one of the biggest constraints in Nepal*," complained one participant. While businesses in Nepal are already facing the problem of high logistics costs and unreliable and unpredictable transport/logistics and customs services, the 7.8 magnitude earthquake in 2015 and the blockade imposed by India in 2015/16 escalated the problem. The interviews made it clear that firms in Nepal consider supply uncertainty as a major factor affecting information sharing and is mainly caused by logistical issues. The interviewees stated that the need for information sharing increases with increased uncertainty. However, they also mentioned that the uncertainty may also increase reluctance towards information sharing. Because of uncertainty, firms are unable to predict the arrival of their shipments and as such they do not want to reveal their inventory position in order to maintain their bargaining power.

There was one more discrepancy between the qualitative and quantitative results as the quantitative analysis did not exhibit any association between information sharing and reputation while qualitative analysis did. Müller and Gaudig (2011) consider reputation as an independent factor that was anticipated to influence information sharing in supply chains. However, in this study, EFA identified reputation to be an indicator of trust (the items under trust and reputation loaded together with factor loading > 0.6). It is reasonable that for one business partner to trust the other, a good reputation is important. This might have been caused either by improper framing of the items used to measure reputation or by the fact that reputation may not be a stand-alone factor but rather an important component of trust.

The interviewees highlighted the importance of a firm's reputation in the market, especially at an initial phase of relationship development. Good reputation of a firm is the foundation of trust and commitment which is the utmost requirement for a close and long-term relationship.

One interviewed manager particularly mentioned that the reputation of a firm will help him to decide whether to do business with that firm because reputation is a reflection of their experience and know-how in the market. A firms' experience and competencies in the market are appealing for other firms to initiate business with it. Hence, it is possible that firms will share information with those partners that have built a strong reputation in the market as a strategy to enhance relationship with them or gain mutual benefits.

This study also could not examine the relationship of power, partnership extent and supply chain integration with information sharing. There were two items under power which had to be deleted while conducting EFA due to low factor loadings. Similarly, out of three items under partnership extent, two were deleted due to low factor loadings while one item (*Item 38*) loaded with the items of organisational compatibility. *Item 38*, which states, "*We gain mutual benefits from the relationship with our partners*," implies that compatible organisations work towards gaining mutual benefits. As previously discussed, organisational compatibility is an important aspect for partnership development. Finally, the two items under supply chain integration loaded with other items under interaction routine. *Item 49*, "*Our company makes joint plans with our partners*," and *Item 50*, "*We have collaborative relationship with our partners*," require extensive interaction routines between supply chain partners. According to Stank et al. (2001), series of interactions is an important perspective of integration.

Finally, the effect of national culture and legal contracts on information sharing was not significant. Legal contracts, according to the interviewees, were important tool to guarantee commitment. However, it might not be important for information sharing with their supply chain partners. In Nepal, there are no stringent laws related to information misuse or confidentiality. This might be the reason why they did not consider contracts as an influential factor of information sharing. Similarly, the effect of national culture on information sharing could not be confirmed. Although culture has a great importance in Nepal, it might not have any impact on how people conduct their business. While culture might affect the way they communicate with their partners, it might not affect what or how much information they share with them.

6.2.1.3 Some Expected and Unexpected Results

In this study, some of the results were expected while others were unexpected. For example, the results revealed no relationship between information technology and information sharing

which in the case of Nepal was not surprising. It is beneficial for organisations to invest in IT to enhance their businesses. However, successful IT implementation does not only depend on monetary resources. It largely depends on the ability of the people to use it and also on other partners' capabilities. "*It is not only about IT, firms should be connected internally as well as externally regardless of the medium used*," emphasised one participant. Another participant had a similar view who mentioned that their focus was more towards making their partners feel comfortable to share information rather than guiding them. He further stated, "*For us it is very important that we receive information irrespective of how we receive it. We want them to be comfortable; at least they are sharing information with us rather than focusing on investing or stopping to share*." While information technology is one of the important factors that may facilitate information sharing, it might not be as important in developing countries because of its high cost and compatibility issues. Rather than focussing on IT, firms in Nepal pay more attention to building solid inter-organisational relationships. Building strong relationship is much more difficult and time consuming than the installation of IT software because strong inter-organisational relationship will have a lasting effect on businesses. A recent study conducted by Huo et al. (2016) concluded that social resources such as inter-organisational relationships are more effective at improving information sharing than technical resources.

Another unexpected result was the effect of trust on information sharing. Trust has no effect on information sharing at both operational and strategic levels. This is probably due to the fact that although supply chain members in Nepal consider trust to be very important, they do not consider it as a sufficient condition to share information. As long as the firms demonstrate a long-term commitment to the relationship, which can be guaranteed through contracts (Moberg et al., 2002, Chopra and Meindl, 2003), trust can be sidelined. This was supported by the majority of the participants as they believe that contracts are vital even though trust persists in the relationship.

6.2.2. Effect of Significant Factors on Operational and Strategic Information Sharing

The first secondary question identified the significant factors affecting information sharing in supply chains in Nepal. To answer the first secondary question, the study found that interaction routines, organisational compatibility, incentives, project payoff, commitment, personal connection, top management commitment, supply network configuration,

government support and monitoring are the significant factors affecting supply chain information sharing in Nepal. The next step is to find out the magnitude and direction of the effects of the identified factors on operational and strategic information sharing. To answer this question, the standardised beta coefficients of the significant factors and their direction and the R square values of the two regression models are presented in Table 6.1.

Beta coefficient can be used to distinguish the better predictor amongst all the predictors of information sharing (Hair et al., 2003, Zikmund et al., 2010). As a rule of thumb, β-value of less than 0.2 is considered as weak effects, 0.2 - 0.3 moderate effects, 0.3 - 0.5 moderately strong effects, 0.5 - 0.8 strong effects and over 0.8 extremely strong effects. In addition, the direction of the beta coefficient will signify whether a factor has a positive or a negative effect on information sharing. For example, the β-value for the effect of personal connection on operational information sharing is 0.177 which is less than 0.2. This signifies that enhancing the level of personal connection with their supply chain partners will have only a negligible impact on improving operational information sharing.

The relationship between organisational compatibility and operational information sharing was of highest strength (β = 0.392 ~ 40%) observed in this study which was a moderately strong positive relationship. The interviewed participants especially considered the compatibility level with their supply chain partners in terms of goals and IT infrastructure as important. Companies working together to achieve common goals may develop a good relationship and are willing to share important business information with each other. Moreover, companies with compatible IT infrastructure may find it easy to share operational information as they are usually in the form of spread sheets and tables.

On the other hand, the effect of interaction routines had the strongest positive effect on strategic information sharing with moderately strong β-value (0.349 ~ 35%). In contrast, its effect on operational information sharing was positive, however, weak with β = 0.181 ~ 18%. As discussed above in Section 6.3.1.1, in Nepal, the importance of interaction routines on information sharing is high as IT development in Nepal is at a preliminary stage. Its high positive impact on strategic information sharing is explainable as the qualitative nature of strategic information emboldens supply chain partners to discuss them via face-to-face meetings or telephone calls.

The impacts of incentives and commitment on operational information sharing are positive and moderate with β = 0.190 and 0.194 respectively. The moderate impact of incentives on operational information sharing may have resulted because majority of the respondents were manufacturers, who, in the context of Nepal, are large companies compared to dealers/distributors (Table 5.2). While dealers/distributors may get motivated to share information if they are offered monetary incentives, its impact might be indifferent to the manufacturers. The remaining factors exerted weak positive effects on operational information sharing. Besides interaction routines, none of the factors exerted a strong effect on strategic information sharing. Government support (β = 0.250 ~ 25%) had a moderate positive effect while personal connection and monitoring exerted weak positive effects on strategic information sharing with β = 0.150 and 0.183 respectively.

The coefficient of determination or R^2 is the percentage of total variation in the dependent variable accounted for by all the independent variables (Hair et al., 2003, Zikmund et al., 2010). According to Meyers et al. (2013), R^2 value equal to .10, .25 and .40 might be considered to be small, medium and large respectively. From Table 6.1, the first regression model explains 38% of the variation in operational information sharing whereas the second regression model explains 31% of the variation in strategic information sharing. Hence, the variation caused by the research model on operational and strategic information sharing can be considered as medium. Studies that are conducted to predict human behaviour, that is, information sharing behaviour in this study, R^2 value below 50% is usual because human behaviours are hard to predict (Onditi, 2013).

6.3 Research Question 2

This section will address the second primary research question that includes two subsidiary questions.

PRQ2: How does information sharing affect the supply chain performance of individual firms in the context of Nepal?

SRQ2.1: How does operational information sharing affect the supply chain performance of individual firms in Nepal?

SRQ2.2: How does strategic information sharing affect the supply chain performance of individual firms in Nepal?

To answer SRQ2.1 and SRQ2.2 eight hypotheses were postulated as follows:

Hypothesis 22a: *There is a positive relationship between operational information sharing and cost performance.*

Hypothesis 22b: *There is a positive relationship between operational information sharing and quality performance.*

Hypothesis 22c: *There is a positive relationship between operational information sharing and delivery performance.*

Hypothesis 22d: *There is a positive relationship between operational information sharing and flexibility performance.*

Hypothesis 23a: *There is a positive relationship between strategic information sharing and cost performance.*

Hypothesis 23b: *There is a positive relationship between strategic information sharing and quality performance.*

Hypothesis 23c: *There is a positive relationship between strategic information sharing and delivery performance.*

Hypothesis 23d: *There is a positive relationship between strategic information sharing and flexibility performance.*

Four regression analyses were conducted for four dependent variables of supply chain performance with operational and strategic information sharing as independent variables. The result of regression analyses are presented in Table 6.3.

Table 6.3: Results for Research Question 2

Information Sharing	Supply Chain Performance							
	Cost		Quality		Delivery		Flexibility	
	p-value	β	*p*-value	β	*p*-value	β	*p*-value	β
Operational IS	x	x	x	x	0.027*	0.191	0.000***	0.364
Strategic IS	x	x	x	x	0.030*	0.187	0.002**	0.246
R square	0.028		0.004		0.071		0.193	

**** Significant at p ≤ 0.001; ** Significant at or p ≤ 0.01; and * Significant at p ≤ 0.05.*

6.3.1 Effect of Information Sharing on Supply Chain Performance

From Table 6.3, it can be seen that out of the four components of supply chain performance, only delivery and flexibility performance were significantly affected by operational information sharing. This supports ***Hypothesis 22c and 22d*** which postulates that there is a positive relationship between operational information sharing and delivery and flexibility performance respectively. Furthermore, operational information sharing has a moderately strong effect on flexibility performance (β = 0.364 ~ 36%) and has the strongest effect amongst the four components of supply chain performance.

The regression analyses revealed that strategic information sharing significantly affected delivery and flexibility performance while it had no effect on cost and quality performance. This result supports ***Hypothesis 23c and 23d*** which states that there is a positive relationship between strategic information sharing and delivery and flexibility performance respectively. Strategic information sharing exerted a weak (β = 0.187 ~ 19%) effect on delivery performance and a moderate (β = 0.246 ~ 25%) effect on flexibility performance. Table 6.4 provides the summary of eight hypotheses testing. Following Meyers et al. (2013), the effect of information sharing on flexibility and delivery are medium (19%) and small (7%) effects respectively.

Table 6.4: Summary of Hypotheses Testing (Effect of information sharing on SC performance)

Hypothesis	Path	Test Results
22a	Operational information sharing → cost performance	Reject
22b	Operational information sharing → quality performance	Reject
22c	**Operational information sharing → delivery performance**	**Accept**
22d	**Operational information sharing → flexibility performance**	**Accept**
23a	Strategic information sharing → cost performance	Reject
23b	Strategic information sharing → quality performance	Reject
23c	**Strategic information sharing → delivery performance**	**Accept**
23d	**Strategic information sharing → flexibility performance**	**Accept**

The second research question aimed to find out how information sharing will affect the supply chain performance of individual firms in Nepal. Some authors examined the effect of information sharing on supply chain performance as a whole (Ramayah and Omar, 2010, Sanders et al., 2011) while others looked at the effect of information sharing on individual components, for example, cost, quality and market & financial performance (Baihaqi and Sohal, 2013), delivery performance (Zhou and Benton Jr, 2007), efficiency and effectiveness (Lee et al., 2010) and resource, output and flexibility performance (Sezen and Yilmaz, 2007, Yigitbasioglu, 2010, Wu et al., 2014). In addition, few studies have considered information sharing as two distinct variables (Lee et al., 2010, Ramayah and Omar, 2010). Baihaqi and Sohal (2013) and Wu et al. (2014) found that collaboration between supply chain partners play an important mediating role in improving supply chain performance. Whereas Kaliani Sundram et al. (2016) suggest that the effect of supply chain management practices such as information sharing on supply chain performance might not be direct but through supply chain integration. Similarly, Jonsson and Myrelid (2016) suggest that shared information needs to be utilised to perceive its impact on performance. Hence, according to Jonsson and Myrelid, information utilisation plays a mediating role between information sharing and performance. While this study showed that information sharing has a positive effect on individual firms' supply chain performance, which is consistent with previous studies (Yigitbasioglu, 2010, Lee et al., 2010, Ramayah and Omar, 2010, Zelbst et al., 2010, Sanders et al., 2011), it provided additional evidence by distinguishing the effect of operational and strategic information sharing on the four components of supply chain performance.

As mentioned above, information sharing (operational and strategic) affects delivery and flexibility performance in this study. The results show that information sharing has no effect on cost performance of supply chain participants in Nepal. Information sharing helps firms to make better business decisions related to ordering, capacity allocations, production and material planning. Sharing strategic information such as demand forecasting and marketing strategy will help supply chain partners to mitigate bullwhip effect and achieve a balance between supply and demand which will lead to significant reduction in inventory costs.

While the literature explicates the important role of information sharing in supply chain cost reduction, it might not be so in Nepal. Nepal is a mountainous landlocked country and has to depend on its neighbouring country India for its seaborne trade. Because of its poor logistics and supply chain connectivity, Nepal bears considerably high transaction costs (Arvis et al.,

2010, Mirza and Bacani, 2013). In addition, insufficient logistics connectivity considerably increases the time taken to move goods across borders. As an alternative to this, some firms may decide to increase their inventory holdings while others may decide to opt for an alternative modal choice, both of which will further push up the already high logistics costs (Arvis et al., 2010, Hall and Saygin, 2012). Because of uncertain and unreliable transport delivery, firms in developing countries accumulate high level of safety stocks which might sometimes be equivalent to one year of expected sales (Arvis et al., 2010). Hence, firms in Nepal may share information with each other, but it might not be of significant importance in terms of reducing inventory cost.

One way to enhance information sharing is through better IT infrastructure. Firms might have invested to develop better IT facilities which might have increased their costs. This might have outweighed the cost savings made through information sharing. It is also possible that there is an indirect cost reduction which the individual firms might not have understood. For example, if the supplier informs a manufacturer on time about the delay in the delivery of the raw materials then the manufacturer will have time to make an alternate arrangement so that there will be no shortage of raw materials in the factory. The manufacturer has to find a replacement supplier for the raw materials which may increase cost because the new supplier may charge more. While the manufacturer most likely only notices the increase in cost because of the new supplier, s/he may not have realised that it would have incurred more cost (due to production delay) if her/his regular supplier had not informed her/him on time.

The effect of operational as well as strategic information sharing on quality performance was not significant. Meeting and exceeding the quality criteria is the objective of every supply chain. To achieve this objective, firms need to constantly share information such as customer demand, customer product specification and customers' delivery requirements. Quality performance incorporates product quality and service quality which comes under output measure defined by Beamon (1999) and corresponds to customers' goals and values. Product availability, short lead time and accurate and reliable delivery is an indication of good supply chain service. Transport and logistics play a critical role in enhancing the quality of supply chain services and as discussed previously, Nepal is lagging behind in this particular area because of its geographical position.

The effect of transport and logistics has been felt in terms of availability, reliability and lead time. Since most of the seaborne cargoes come from the Indian ports, there are many

procedures that need to be followed and fulfilled. There are many documents that need to be filled up which causes delays. There are further delays caused by the inland transport mode. Furthermore, frequent strikes and natural calamities will affect the on time delivery of goods. The logistical delays largely affect production due to long lead time and unreliable delivery schedules. This effect will be carried over in terms of product unavailability in stores which will cause customers to seek alternate product or go to an alternate store. The fact that information sharing had no effect on service quality might be because the influence of logistical challenges is far more significant than the effects of shared information.

With the availability of relevant information, firms can determine customer expectations and work towards fulfilling those expectations. However, there is a trade-off between quality and cost as cost increases when firms attempt to improve quality. For a developing country like Nepal, the need to lower the cost might be greater than the need to improve the quality of the services. Manufacturers focus more on producing cheaper products than producing high quality, expensive products. Hence, the effect of information sharing on quality performance was not obvious.

According to Beamon (1999), output measures comprise of delivery performance also. However, this study looked at it separately because fast and reliable delivery is considered as a competitive advantage used by several firms such as Dell, Ford and Wal-Mart that has a significant impact on supply chain performance (Zhou and Benton Jr, 2007). The results showed that delivery performance is significantly affected by operational and strategic information sharing. Moreover, the standardised path coefficient (β) is same for both paths ($\beta \sim 0.19$) which means that operational and strategic information sharing have equal effect on delivery performance. In order for a firm to fulfil its customer's delivery requirement (fast and reliable delivery), information such as customers' need, availability of delivery trucks or other mode of transportation, the time required for delivery, tracking and tracing and disruptions or delays if any, becomes essential. In addition, delivery performance can also be improved if the upstream partners such as suppliers share information such as production planning, inventory and capacity information (Li et al., 2014). With high logistics and transport uncertainties faced by Nepalese firms, it is imperative that they share such information with their supply chain partners so that they can prepare themselves or plan for alternate solutions when needed.

E-commerce in Nepal is also growing as people prefer their shopping to be delivered to their doorsteps. There are some established online retailers in Nepal such as *Thamel.com* and *Muncha.com*. There are many small retailers in Nepal who are selling their products online by advertising them on social media such as Facebook. Information sharing becomes a must for such businesses as they need accurate information about the products and the customers for delivery purpose.

Flexibility performance was significantly and positively affected by operational as well as strategic information sharing. The results show that the effect of information sharing on flexibility performance (β = 0.364 and 0.246) was the strongest. Supply chains exist in an uncertain environment as they persistently face uncertain situations caused by suppliers, customers or technological advancements. Flexibility is an important performance measure as it reduces the number of backorders, lost sales and late orders in supply chain; responds to and accommodates demand variations, manufacturing unreliability, supplier uncertainties, delivery uncertainties and introduction of new products or markets or competitors (Beamon, 1999). For a firm to be flexible, it is vital that it receives information from its upstream and downstream partners such as production schedule, production capacity, delivery schedule, tracking and tracing, disruptions and changing customer specifications. Environmental uncertainties are one of the major causes of logistics and supply chain disruptions in Nepal as it faces many natural calamities and political instabilities. During the time of data collection for this study, Nepal was facing a blockade from the Indian border which amplified the delays and disruptions caused by the massive earthquake in the same year. Hence, Nepalese firms need to prepare themselves to cope with such uncertainties for which information sharing becomes a prerequisite.

While Yigitbasioglu (2010) found that the impact of information sharing was the strongest on output performance, this study exhibited that the relationship between information sharing and flexibility performance was the strongest. The context of and the time difference between the two studies is sufficient to change the priorities of supply chains or the customers. Customer demands and technology are changing expeditiously, both escalating the need to develop new products with variety (colour, size and functionalities) of options to choose from. With the need for quality products and fast delivery already brought to the attention of vendors or manufacturers, customers are now demanding for flexible products and services that they pay for. To be able to cope well and to be flexible with regards to uncertain

customer demands, changing product specification, capacity and the delivery requirements, information from the upstream and downstream sides of the supply chain is critical.

6.4 Summary

This chapter discussed in detail about the findings of the qualitative and quantitative research on information sharing in Nepal. The quantitative results identified a list of factors affecting information sharing in supply chains in Nepal which were consistent with the qualitative results. Furthermore, the qualitative results acknowledged supply uncertainties, information quality, reputation and market orientation to influence information sharing which could not be empirically identified from the quantitative data. The discrepancy in quantitative and qualitative data reflects the difference between quantitative and qualitative research. The former is specific and generalisable, while the latter is more insightful but non-generalisable.

Seven out of twenty one factors postulated to affect operational information sharing were significant. Strategic information sharing was affected by only four factors while it was hypothesised to be affected by 21 factors. The second subsidiary question explained the effect of the significant factors on information sharing. Furthermore, the research model explained 38 and 31 percent of variance in operational and strategic information sharing respectively.

The results have supported the fact that the strategies and behaviours of supply chain participants varies according to social, cultural, economic and political environment. While the supply chain participants in Nepal know the importance of IT, they believe that sharing information is the primary concern, 'how it is shared' is secondary. They are making efforts from their side. However, they believe that the government plays a significant role towards better implementation of IT in Nepal. The participants have given importance to factors such as personal connection and interaction routines. While personal connection can be a context-specific aspect, interaction routines are important ways of sharing information even in developed countries as most strategic information are shared through face-to-face meetings.

The second research question and the results related to it were discussed next. Two subsidiary questions and eight hypotheses were formulated to answer Research Question 2. The hypotheses were to investigate if information sharing affected the four components of supply chain performance of individual firms positively. Four out of eight hypotheses were

confirmed. Furthermore, the effect of information sharing on delivery performance (7%) was small, while its effect on flexibility performance (19%) was medium.

The logistical challenges seemed to have great impacts on Nepalese businesses as they significantly affected their costs and service quality. The benefits achieved through information sharing were suppressed by such challenges. In contrast, the logistical challenges along with natural calamities and political instabilities created uncertainties in the supply chains. This required supply chain participants to pay more attention towards their delivery and flexibility performance.

While this study aimed to examine the effect of twenty one factors on information sharing, the effect of some factors could not be established. The regression analyses revealed that the impact of some of factors on information sharing and the impact of information sharing on cost and quality performance were poor. These issues will be addressed and discussed in the next chapter. The final chapter will discuss the summary of major findings, contribution of the research and its limitations and the pathway for future research.

Chapter 7 CONCLUSION AND LIMITATIONS

7.1 Introduction

The previous chapter discussed the research questions and how they have been answered. The objectives of the current chapter are to summarise the main findings of this research, highlight the contribution of the study, discuss the limitations, and identify potential areas for future research as well as provide some recommendations for the improvement of information sharing in Nepal. The chapter begins with a summary of the findings, followed by a discussion of the main contributions of this study. The third section discusses the limitations of this research, which will then be concluded by some directions for future research.

7.2 Summary of the Findings

The status of information sharing in Nepal has been analysed through qualitative data. The results showed that industries in Nepal acknowledge the importance of information sharing in their supply chains. They are making efforts at each level to improve information sharing internally as well as externally with their partners. The top management team of each company is emphasising the importance of sharing timely information with their supply chain partners. While there is increasing attention paid towards enhancing information sharing, the progress is slow as supply chain management is developing at a slow pace.

The first research question intended to find out how information sharing in supply chains in the context of Nepal was affected. Similar to previous studies carried out in developed countries, information sharing in supply chains in Nepal was also affected by a range of factors across relational, organisational (inter and intra) and environmental categories. However, when compared, some factors had more significance in Nepal such as government support, whereas, some had very little significance such as information technology. The findings reveal that while developed countries are focussing on new and better ways (e.g., using new IT such as VMI, ERP and RFID), developing countries still rely on customary ways (e.g., meetings and incentives) to enhance information sharing with their supply chain partners.

The first subsidiary question (SRQ1.1) under Research Question 1 aimed to find out the influential factors of information sharing in supply chains in Nepal. Among these factors, some factors had not been examined before while some had been examined frequently because of their importance and some factors needed further examination to confirm their impact on information sharing. Hypotheses were developed to investigate the relationship between factors and information sharing in the context of Nepal. The findings revealed that information sharing in supply chains in Nepal was affected by interaction routines, organisational compatibility, government support, incentives, project payoffs, commitment, personal connection, monitoring and top management commitment. From this study, 1) organisational compatibility and project payoffs (not studied before) have been proven to have an impact on supply chain information sharing; 2) commitment (inter-organisational) and top management commitment (frequently studied) were found to be important factors affecting information sharing in the context of Nepal as well; and 3) interaction routines, government support, incentives, personal connection and monitoring (needed further examination) received further support as factors affecting information sharing in supply chains.

The qualitative analysis supported the quantitative findings. However, there were few additional factors identified through the interviews which failed to achieve statistical significance in the quantitative analysis. Supply network configuration, information quality and market orientation were considered by the interviewees as factors that affect information sharing. While the quantitative results also showed that these factors influenced information sharing, they failed to achieve statistical significance at the 5% level chosen by this study. In addition, the qualitative results identified supply chain uncertainties and reputation as influential factors for information sharing in supply chains. In quantitative analysis (EFA), some of the items intended to measure these factors had to be deleted due to low factor loadings while some were combined with the items measuring trust. The likely reason for this is the improper phrasing of the items in the survey instrument.

The second subsidiary question under Research Question 1 aimed at discovering how the factors identified from SRQ1.1 affected operational and strategic information sharing. Amongst previous studies, some considered information sharing as one-dimensional while others considered it as multi-dimensional (operational and strategic). In previous studies, the impacts of interaction routines, incentives, personal connection, government support and

monitoring have not been examined at operational and strategic levels. Moreover, the impacts of commitment (inter-organisational) and top management commitment contradicted with the previous studies.

While operational and strategic information sharing was affected by different factors, interaction routines and personal connection affected both. In addition, operational information sharing was affected by organisational compatibility, incentives, project payoffs, commitment and top management commitment, whereas strategic information sharing was affected by government support and monitoring. This showed that the precursors of operational and strategic information sharing are different mainly due to the fact that operational and strategic information sharing affect organisations at different levels. According to the results, organisational compatibility and interaction routines had the strongest positive impact on operational and strategic information sharing respectively. Furthermore, incentives, commitment and Government support exerted a mild positive effect, while the impacts of project payoffs, personal connection, top management commitment and monitoring were weak although they were positive. The research model explained 38% of the variation in operational information sharing and 31% of variation in strategic information sharing.

The second research question focused on the effect of operational and strategic information sharing on supply chain performance. Different components of supply chain performance have been considered in previous studies as it is measured based on the chain's business goals and strategies. Cost is an important aspect of supply chain performance that has been theorised to be significantly affected by information sharing. While majority of the studies empirically reported information sharing to have a significant effect on cost performance, this study revealed no relationship between them. Both operational and strategic information sharing affected delivery and flexibility performance only. Their effect on cost and quality performance was negligible. The effect of operational and strategic information sharing on delivery performance was weak and flexibility performance was mild and moderately strong respectively.

7.3 Contributions of the Research

This study makes several contributions to the literature as well as to practitioners. The first contribution of this study is the identification of a comprehensive list of factors that influence supply chain participants' decision to share information with other chain members. In addition, it extends the model to examine the effect of information sharing on supply chain performance. With increased benefits, supply chain participants are supposed to share more information with other chain members. However, in reality, supply chain members do not share as much information as is actually required. In order to augment information sharing between supply chain partners, it is imperative to find out why supply chain members are willing or reluctant to share information with other members of the chain. This has amplified the need to identify the influential factors of information sharing in supply chains.

According to Hair et al. (2003), more independent variables in a model will increase the predictive capability of that model, which will eventually help to develop more effective plans. While the existing literature has identified various antecedents of information sharing, the maximum number of factors identified or included by a single study has been only nine (Madlberger, 2009, Lee et al., 2010). Through a systematic literature review (SLR), capturing a wide body of the relevant literature, this study identifies a list of 21 factors that enhanced or impeded information sharing among supply chain partners. The large number of factors that appeared in the literature, with repetitive, overlapping and duplicating contents were thematically analysed and wherever necessary were synthesised, resulting in 21 factors affecting information sharing.

Furthermore, the current study categorises the identified factors into four groups. While the categorisation could not be verified empirically, it contributes to the literature as large number of factors have not been categorised previously. Among 60 reviewed papers, only five papers (with maximum nine factors) have categorised the factors into different groups as shown in Table 3.2. Moreover, the categorisation provides a basis for future researchers to conduct empirical analysis to substantiate the grouping.

The supply chain management literature is scant with studies carried out to identify antecedents and consequences of supply chain information sharing. This study contributes to the literature by examining the cause and effect of information sharing in supply chains simultaneously. This study provides a *precursors – information sharing – effect model* with

different causes (21 factors) and effects (cost, quality, delivery and flexibility performance) of information sharing and tests it in a different context. This study supports the fact that a firm's supply chain performance is affected by information sharing with its supply chain partners. Because of its effect on performance, it is essential to enhance the level of information sharing between supply chain participants. This further supports the need to identify and examine potential influential factors of information sharing in supply chains. Moreover, supply chain firms in Nepal and other similar countries can use this model to improve their supply chain performance through the improvement of information sharing with their partners.

In addition, this study has confirmed the effect of factors across relational, organisational (inter and intra) and environmental dimensions on information sharing and the effect of information sharing on supply chain performance as proposed by previous studies. For example, commitment, personal connection and organisational compatibility (relational), top management commitment, project payoffs, monitoring and incentives (intra-organisational), interaction routines (inter-organisational) and government support (environmental) are found to affect information sharing in Nepal. It also provides support to previous studies by showing that information sharing affects delivery and flexibility performance of supply chain members, assessing information sharing and supply chain performance as multidimensional variables. It also confirms that the precursors of operational and strategic information sharing are different. Moreover, this study examines factors which have not been previously tested or confirmed through quantitative and/or qualitative evidence to see whether they indeed affect information sharing. The results also provide further evidence that inter-organisational commitment and top management commitment are important factors that affect information sharing.

This study, through quantitative and qualitative methods, provides deeper understanding of the issues being investigated and more insights into the interpretation of research findings. Qualitative data were collected to complement the quantitative data to enhance the accuracy of the results. While it supported the quantitative results, it provided supplementary results to interpret the observed relationships and uncover those factors that were not acknowledged by the statistical analysis and its rationale.

The systematic literature review also revealed that the majority of studies have been conducted in developed countries such as the US, UK, Germany, Finland, Netherlands, Australia, New Zealand, Sweden and South Korea with the highest number of studies carried out in the US. While a few studies were conducted in Asia such as China and Taiwan, there were no such studies conducted in poor, under-developed countries like Nepal or Bangladesh. Hence, by conducting the research in a poor and landlocked country such as Nepal, this study has made its second contribution. Conducting the study in Nepal provides context-specific research which is necessary to enrich SCM research. Context-specific research identifies the best practices around the globe based on their specifications.

The results of this study show that there is a gap between previous studies and practice. While previous studies suggested a range of factors that influenced information sharing in supply chains, not all factors were applicable in the context of Nepal. Compared to previous studies, some factors had strong effect while others had mild or poor effect on information sharing in the context of Nepal. This study also features different results to previous studies in terms of factors such as commitment, incentives, monitoring, top management commitment, IT and trust. Specifically, this study provides empirical evidence to show that in the context of developing countries, building a strong inter-organisational relationship may have greater impact than investing in IT on improving information sharing. The results reveal that factors such as interaction routines and personal connection are more important in the context of Nepal. Besides, it also confirms the role of government towards enhancing information sharing, which is different from developed countries where the laws and regulations are stringent. Furthermore, it also illustrates that incentives were important to motivate firms to share information. This is typical as many firms in Nepal are small in size and financial incentives may encourage them towards information sharing. This shows that supply chain practices vary according to country's economic, political, legal and cultural settings and hence, they focus on different issues and aspects of SCM. It also shows that context-specific results are imperative to find the best supply chain practices. The factors that have significant impact in one country may not be significant in another country. Models built for developed countries may not yield meaningful results in the context of developing countries (Pradhan, 2002). The results of this study may be applicable to other countries with similar background and contribute to improving connectivity of the least-developed countries through better SCM.

The *precursors – information sharing – effect* model examined in this study reveals some different and some similar results with the previous studies. As mentioned above, it was important to test the applicability of such models in different context with different specifications. The findings of this study can help practitioners in Nepal to improve those factors that had a significant effect on information sharing rather than focussing on all the factors that previous studies suggest. Efficient information sharing will help businesses to make timely and wise decisions and improve supply chain efficiency. For example, the literature suggests the importance of IT which the interview participants also agree to. However, in the context of Nepal, IT development is still at a preliminary stage and according to the interviewees, there are compatibility issues. Hence, more than IT, managers can focus on increasing the number of interaction routines with their supply chain partners. The initiation to share information should come from the top management team. They should encourage information sharing culture within the organisation first and then beyond the organisational border. Managers also need to monitor their employees and supply chain partners to check if the necessary requirements have been fulfilled. It is necessary to establish a sense of responsibility such that the required information is being provided in an accurate and timely manner. Unlike traditional approach where firms tended to maintain an arm's-length relationship with other firms, establishing a personal connection may have positive impact in today's business scenario. This is applicable not only to the top management team of the company but also to the employees. A sense of managerial ties or non-business or informal relationship with the managers and employees of other firms can also be encouraged as a measure to enhance information sharing.

Returns and benefits are imperative in business. Managers should understand that other firms will agree to share information only if they are to benefit from it. Managers should convince their supply chain partners to share information with them by emphasising the benefits they may get out of it. In case they are not going to benefit from it directly, they should be offered monetary incentives to persuade them to engage in information sharing. Inter-organisational commitment is an important aspect that firms consider important. Managers need to establish committed relationships with important partners by making decisions that are mutually beneficial. It is important to make partners feel important and taken care of. This will have a great impact on their willingness to share information. For new business relationship, managers need to pay considerable attention to establishing mutual goals and objectives. When supply chain partners realise that they are working towards common goals they may

have greater enthusiasm to share information. Hence, by providing managerial implications concerning opportunities to enhance information sharing, this study makes its third contribution.

While some of the items in the survey questionnaire were adapted from existing instruments to suit the context of the current study, other items were developed by the author based on relevant literature and the author's understanding of the constructs. With the application of exploratory factor analysis (EFA) and Cronbach's alpha test, the reliability and validity of the measurement variables were confirmed. While organisational compatibility and project payoffs are new factors that have not been examined previously, supply network configuration has been anticipated theoretically only to affect information sharing. The measurement tool for these factors was developed by the author, which provides the first measurement scale for these constructs. The impacts of organisational compatibility and project payoffs were confirmed and have been successfully introduced to the research model. However, supply network configuration was not significant in spite of the validity and reliability of measurement tool. In addition, this study also provides the measurement tools for factors such as market orientation, monitoring, incentives, legal contracts, interaction routines, government support and national culture. Furthermore, it also provides measurement tools for quality, delivery and flexibility performance.

In addition, this study also contributes by providing the readers more insights on conducting EFA. It explains the approaches that can be undertaken to attain a factor solution that fulfils the criteria of factor analysis. It especially suggests researchers to employ trial-and-error method for selecting the final factor structure that captures the necessary information to answer the research question without losing much information. Since the deletion of one item changes the factor structure, it is advisable to re-run the EFA couple of times, deleting different items, one at a time. This will allow the researcher to check different factor structures and select the one that is most appropriate. Hence, this is the fourth contribution of this study.

Finally, this study contributes to the theory as well. RBV and TCT were the theoretical glue that welded the research model together. The key theories studied were related to inter-organisational trading relationships, collaboration and information sharing in the context of resource-based view and transaction cost theory. The current research model justifies how information as a strategic resource needs to be used or exploited effectively to create valuable

capabilities (supply chain performance). More than information, the knowledge created through information transfer may be more valuable resource which can be used by firms to enhance their performance. Moreover, information sharing, an important aspect of collaborative supply chain practices (Wiengarten et al., 2010), will help to reduce uncertainty, opportunistic behaviour and transaction costs.

7.4 Limitations

This study had some limitations which need to be considered while interpreting the results. While efforts had been made to minimise them as much as possible, some of them could not be avoided. The limitations of this study are addressed below.

Firstly, considering the context of Nepal, the researcher decided to collect the data by direct visitation with the aim of increasing the response rate. However, during the time of data collection, Nepal was facing a political blockade imposed by India which caused a shortage of fuel all over the country. This created logistical difficulties, requiring more time and resources for the visits. In addition, many companies refused to participate as they were busy trying to recover from the loss caused by the 7.8 magnitude earthquake in 2015. Amongst logistics companies, the major cause of non-response was the blockade from the Indian border at the time of the study as they were busy sorting out alternate routes for imports. These unexpected circumstances affected the response rate causing limitations on the sample size requirement of some statistical analyses. The logistical challenges also limited the number of interviews that could be conducted.

This study incorporates only four aspects of supply chain performance, cost, quality, delivery and flexibility. Due to research design, this study could not include other measures of supply chain performance. Cross-sectional data was used in this study which was collected at one point in time. However, the factors, information sharing and supply chain performance are constructs that are dynamic in nature and change over time.

A methodological limitation of this research was the moderate sample size compared to the large number of items in the data set. Specific attempts to increase the sample size were made following suggestions in the literature, including well-written cover letter, multiple options to complete the survey, direct visitations and telephone contacts. The large number of variables covered by the analysis reduced the power of statistical analysis, and limited the number of

items that could be included for each construct which might have resulted in the lower reliability of some constructs. Therefore, a larger sample size may further strengthen the outcomes of the study. EFA was conducted as a tool to reduce the large number of measured variables in the data set. This resulted in some of the items under five factors, supply chain integration, partnership extent, reputation, supply chain uncertainties and power, having to be deleted (either due to low factor loadings or cross loadings) or combined with items of other factors. The low- or cross- loadings might have been partly caused by improper framing of the items that were intended to measure their corresponding factors.

Furthermore, some of the items under supply chain performance were about respondents' "partners" while the rest were about their own. While this was done mainly to avoid potential bias that may have caused due to social desirability (Podsakoff et al., 2003), this may not have provided a clear picture of individual firms' supply chain performance. By asking performance questions related to respondents' "partners" (to avoid bias), the author assumed that the respondents' partners performance will affect the respondents' performance. Hence, there is a trade-off between potential bias and getting the accurate information about individual firms' supply chain performance.

Medium and large firms were chosen as the potential respondents in this study as it was anticipated that data collected from small firms may not provide useful insights. As supply chain itself is an emerging concept in Nepal, small firms are most likely to have limited knowledge about SCM and information sharing. While small firms may not have good knowledge of SCM, they are important part of SCs, thus inevitably share information. Future research may consider to frame their survey/interview instrument in such a way that they can get the right information from the managers of small firms.

7.5 Future Research

The limitations of this study, as discussed in the previous section, suggest directions for possible future research. Moreover, some of the findings themselves could be probed and developed for further research. Future research can be conducted to avoid the issues and limitations of this study as well, in order to achieve better results.

First, while supply chain uncertainties have been mentioned many times in the literature as having an effect on information sharing, this study could not examine its effect on

information sharing. Although the qualitative data confirmed the influence of supplier uncertainty on information sharing, it could not be confirmed quantitatively. Based on the EFA results, the two items measuring uncertainty had to be deleted due to their low factor loadings and the third item loaded negatively with items related to trust. The supply chain uncertainties scale consisted of three items that covered a diverse range of uncertainties, i.e. supply uncertainty, customer demand uncertainty and technological uncertainty. Respondents might have answered the three questions related to supply chain uncertainties in different ways, resulting in divergent measurements of supply chain uncertainties. Hence, future research can be carried out considering supply uncertainty, customer demand uncertainty and technological uncertainty as three different factors. Furthermore, this study did not find any empirical relationship between information sharing and factors such as national culture and legal contract. This urges future research to examine the effect of these factors on information sharing behaviour.

While the results showed that information sharing positively affected supply chain performance, the effect was moderate. Moreover, the results showed that there was no relationship between information sharing and cost and quality performance. The second suggestion for future research is to strengthen the supply chain performance measurement instrument through further refinement of measures. Supply chain performance should incorporate other measures such as customer service and other financial measures other than cost (e.g., ROI).

As this study is conducted in Nepal, its capability to generalise research findings is limited. As an effort to improve the generalisability of the findings, a study could be conducted in another landlocked, low-income country like Nepal using the same research instrument in order to identify similarities. Furthermore, a comparative study could be conducted between a landlocked and coastal country, or between a developed and developing country to identify potential differences in their supply chain practices. Sample size was another limitation of this study. Hence, future research should consider larger sample size which may further strengthen the outcomes of this study.

This study has identified a comprehensive list of factors affecting information sharing in supply chains through a systematic review of the literature. The identified factors were then categorised into four categories based on whether they arose internally within firms, externally between two firms, or from the external environment. While the categorisation was

done qualitatively, it could not be confirmed empirically. Hence, future research could conduct empirical analysis to categorise the identified factors into various categories.

This study has considered the relational factors as precursors of information sharing. Conversely, information sharing can enhance a relationship between supply chain partners. When one partner shares information with the other, the other can feel obliged to do the same. The sharing of information can then strengthen the level of trust and commitment between supply chain partners. Similar is the case for supply chain integration. Hence, future research can consider a feedback loop from information sharing to relational factors and supply chain integration.

REFERENCES

Abramson, N. R. & Ai, J. X. (1997), "Using guanxi - style buyer - seller relationships in China: Reducing uncertainty and improving performance outcomes", *The International Executive,* Vol. 39, No. 6, pp. 765-804.

Adhikari, D. R. (2010), "Human resource development (HRD) for performance management: The case of Nepalese organizations", *International Journal of Productivity and Performance Management,* Vol. 59, No. 4, pp. 306-324.

Adhikari, S. & Pradhan, D. B. (2002), "Nepal", *Asian Cases on Supply Chain Management for SMEs,* Vol. 1, No., pp. 102-108.

Ahire, S. L. & Devaraj, S. (2001), "An empirical comparison of statistical construct validation approaches", *IEEE Transactions on Engineering Management,* Vol. 48, No. 3, pp. 319-329.

Anderson, E. & Weitz, B. (1989), "Determinants of continuity in conventional industrial channel dyads", *Marketing Science,* Vol. 8, No. 4, pp. 310-323.

Anderson, E. & Weitz, B. (1992), "The use of pledges to build and sustain commitment in distribution channels", *Journal of Marketing Research,* Vol. 29, No. 1, pp. 18-34.

Andraski, J. C. (1994), "Foundations for successful continuous replenishment programs", *International Journal of Logistics Management, The,* Vol. 5, No. 1, pp. 1-8.

Andrew, S. & Halcomb, E. J. (2007), "Mixed methods research is an effective method of enquiry for community health research", *Contemporary Nurse,* Vol. 23, No. 2, pp. 145-153.

Arif-Uz-Zaman, K. & Nazmul Ahsan, A. (2014), "Lean supply chain performance measurement", *International Journal of Productivity and Performance Management,* Vol. 63, No. 5, pp. 588-612.

Arvis, J. F., Raballand, G. & Marteau, J. F. (2010). *The Cost of Being Landlocked: Logistics, Costs, and Supply Chain Reliability,* The World Bank, Washington D.C.

Arvis, J. F., Saslavsky, D., Ojala, L., Shepherd, B., Busch, C. & Raj, A. (2014), "Connecting to Compete 2014: Trade Logistics in the Global Economy -The Logistics Performance Index and Its Indicators", *Connecting to Compete, 4th ed.* WORLD BANK. Available at: http://www.worldbank.org/content/dam/Worldbank/document/Trade/LPI2014.pdf (Accessed on: 25 August 2016).

Arzu Akyuz, G. & Erman Erkan, T. (2010), "Supply chain performance measurement: A literature review", *International Journal of Production Research,* Vol. 48**,** No. 17**,** pp. 5137-5155.

Babbar, S., Addae, H., Gosen, J. & Prasad, S. (2008), "Organizational factors affecting supply chains in developing countries", *International Journal of Commerce and Management,* Vol. 18**,** No. 3**,** pp. 234-251.

Bagozzi, R. P. & Edwards, J. R. (1998), "A general approach for representing constructs in organizational research", *Organizational Research Methods,* Vol. 1**,** No. 1**,** pp. 45-87.

Bagozzi, R. P., Yi, Y. & Phillips, L. W. (1991), "Assessing construct validity in organizational research", *Administrative Science Quarterly,* Vol. 36**,** No. 3**,** pp. 421-458.

Baihaqi, I. & Sohal, A. S. (2013), "The impact of information sharing in supply chains on organisational performance: An empirical study", *Production Planning & Control,* Vol. 24**,** No. 8-9**,** pp. 743-758.

Barney, J. (1991), "Firm resources and sustained competitive advantage", *Journal of Management,* Vol. 17**,** No. 1**,** pp. 99-120.

Barney, J. B. (2001), "Resource-based theories of competitive advantage: A ten-year retrospective on the resource-based view", *Journal of Management,* Vol. 27**,** No. 6**,** pp. 643-650.

Barratt, M. (2004), "Understanding the meaning of collaboration in the supply chain", *Supply Chain Management: An International Journal,* Vol. 9**,** No. 1**,** pp. 30-42.

Barratt, M. & Barratt, R. (2011), "Exploring internal and external supply chain linkages: Evidence from the field", *Journal of Operations Management,* Vol. 29**,** No. 5**,** pp. 514-528.

Baruch, Y. (1999), "Response rate in academic studies-A comparative analysis", *Human Relations,* Vol. 52**,** No. 4**,** pp. 421-438.

Baruch, Y. & Holtom, B. C. (2008), "Survey response rate levels and trends in organizational research", *Human Relations,* Vol. 61**,** No. 8**,** pp. 1139-1160.

Beamon, B. M. (1998), "Supply chain design and analysis: Models and methods", *International Journal of Production Economics,* Vol. 55**,** No. 3**,** pp. 281-294.

Beamon, B. M. (1999), "Measuring supply chain performance", *International Journal of Operations & Production Management,* Vol. 19**,** No. 3**,** pp. 275-292.

Beccerra, M. & Gupta, A. K. (1999), "Trust within the organization: Integrating the trust literature with agency theory and transaction costs economics", *Public Administration Quarterly,* Vol. 23**,** No. 2**,** pp. 177-203.

Berg, B. L. & Lune, H. (2004). *Qualitative Research Methods for the Social Sciences,* Pearson, Boston, MA.

Bhagwat, R. & Sharma, M. K. (2007), "Performance measurement of supply chain management: A balanced scorecard approach", *Computer & Industrial Engineering* Vol. 53**,** No.**,** pp. 43-62.

Bhattacharyay, B. N. (2010), "Institutions for Asian connectivity", *ADBI Working Paper Series, No. 220, Asian Development Bank Institute, Tokyo, Japan, June 2010.* (Accessed on: 28 October 2016).

Biggs, T., Nasir, J., Pandey, K. & Zhao, L. (2000), "The Business Environment and Manufacturing Performance in Nepal", *World Bank, Regional Program for Enterprise Development*. WORLD BANK. http://documents.worldbank.org/curated/en/385541468215096250/pdf/336960rev0NEP0ICA.pdf (Accessed on: 28 April 2016).

Braun, V. & Clarke, V. (2006), "Using thematic analysis in psychology", *Qualitative Research in Psychology,* Vol. 3**,** No. 2**,** pp. 77-101.

Braun, V. & Clarke, V. (2008), "Using thematic analysis in psychology", *Qualitative Research in Psychology,* Vol. 3**,** No. 2**,** pp. 77-101.

Brewer, P. C. & Speh, T. W. (2000), "Using the balanced scorecard to measure supply chain performance", *Journal of Business logistics,* Vol. 21**,** No. 1**,** pp. 75-93.

Brttton, L. & Ball, D. (1999), "Trust versus opportunism: Striking the balance in executive search", *Service Industries Journal,* Vol. 19**,** No. 2**,** pp. 132-149.

Bryman, A. (2016). *Social Research Methods,* Oxford University Press, New York,

Bryman, A. & Bell, E. (2011). *Business Research Methods,* Oxford University Press, New York.

Bucklin, L. P. & Sengupta, S. (1993), "Organizing successful co-marketing alliances", *The Journal of Marketing,* Vol. 57**,** No. 2**,** pp. 32-46.

Burnard, P. (1991), "A method of analysing interview transcripts in qualitative research", *Nurse Education Today,* Vol. 11**,** No. 6**,** pp. 461-466.

Burnard, P., Gill, P., Stewart, K., Treasure, E. & Chadwick, B. (2008), "Analysing and presenting qualitative data", *British Dental Journal,* Vol. 204**,** No. 8**,** pp. 429-432.

Byrne, B. M. (2010). *Structural Equation Modeling with AMOS: Basic Concepts, Applications, and Programming,* Routledge, New York.

Cachon, G. P. & Fisher, M. (2000), "Supply chain inventory management and the value of shared information", *Management Science,* Vol. 46**,** No. 8**,** pp. 1032-1048.

Cai, S., Jun, M. & Yang, Z. (2010), "Implementing supply chain information integration in China: The role of institutional forces and trust", *Journal of Operations Management,* Vol. 28**,** No. 3**,** pp. 257-268.

Campbell, D. T. (1955), "The informant in quantitative research", *American Journal of Sociology,* Vol. 60**,** No. 4**,** pp. 339-342.

Carcary, M. (2011), "Evidence analysis using CAQDAS: Insights from a qualitative researcher", *The Electronic Journal of Business Research Methods,* Vol. 9**,** No. 1**,** pp. 10-24.

Chae, B. (2009), "Developing key performance indicators for supply chain: An industry perspective", *Supply Chain Management: An International Journal,* Vol. 14**,** No. 6**,** pp. 422-428.

Chan, F. T. (2003), "Performance measurement in a supply chain", *The International Journal of Advanced Manufacturing Technology,* Vol. 21**,** No. 7**,** pp. 534-548.

Chan, F. T. & Qi, H. J. (2003), "An innovative performance measurement method for supply chain management", *Supply Chain Management: An International Journal,* Vol. 8**,** No. 3**,** pp. 209-223.

Chen, I. J., Paulraj, A. & Lado, A. A. (2004), "Strategic purchasing, supply management, and firm performance", *Journal of Operations Management,* Vol. 22**,** No. 5**,** pp. 505-523.

Chen, J. V., Wang, C.-L. & Yen, D. C. (2014), "A causal model for supply chain partner's commitment", *Production Planning & Control,* Vol. 25**,** No. 9**,** pp. 800-813.

Cheng, J.-H. (2011), "Inter-organizational relationships and information sharing in supply chains", *International Journal of Information Management,* Vol. 31**,** No. 4**,** pp. 374-384.

Cheng, J.-H., Chen, S.-W. & Chen, F.-Y. (2013), "Exploring how inter-organizational relational benefits affect information sharing in supply chains", *Information Technology and Management,* Vol. 14**,** No. 4**,** pp. 283-294.

Cheng, J.-H., Yeh, C.-H. & Tu, C.-W. (2008), "Trust and knowledge sharing in green supply chains", *Supply Chain Management: An International Journal,* Vol. 13**,** No. 4**,** pp. 283-295.

Chia, A., Goh, M. & Hum, S.-H. (2009), "Performance measurement in supply chain entities: Balanced scorecard perspective", *Benchmarking: An International Journal,* Vol. 16**,** No. 5**,** pp. 605-620.

Childerhouse, P., Hermiz, R., Mason-Jones, R., Popp, A. & Towill, D. R. (2003), "Information flow in automotive supply chains – Identifying and learning to overcome barriers to change", *Industrial Management & Data Systems,* Vol. 103**,** No. 7**,** pp. 491-502.

Chinomona, R. & Pooe, R. D. (2013), "The influence of logistics integration on information sharing and business performance: The case of small and medium enterprises in South Africa: Original research", *Journal of Transport and Supply Chain Management,* Vol. 7**,** No. 1**,** pp. 1-9.

Chopra, S. & Meindl, P. (2003). *Supply Chain Management. Strategy, Planning & Operations,* Prentice Hall, Upper Saddle River, New Jersey.

Chow, G., Heaver, T. D. & Henriksson, L. E. (1994), "Logistics performance: Definition and measurement", *International Journal of Physical Distribution & Logistics Management,* Vol. 24**,** No. 1**,** pp. 17-28.

Chu, W. H. J. & Lee, C. C. (2006), "Strategic information sharing in a supply chain", *European Journal of Operational Research,* Vol. 174**,** No. 3**,** pp. 1567-1579.

Collins, D. (2003), "Pretesting survey instruments: An overview of cognitive methods", *Quality of Life Research,* Vol. 12**,** No. 3**,** pp. 229-238.

Collins, R., Sun, X. & Li, C. G. (2012), "Are supply-chain relationships more influenced by buyer-supplier relationships or the business environment of the country itself? Evidence from the 'China-Australia' trading relationship", *Asia Pacific Business Review,* Vol. 18**,** No. 3**,** pp. 391-405.

Comrey, A. L. & Lee, H. B. (1992). *A First Course in Factor Analysis,* Lawrence Erlbaum Associates, Hillsdale, NJ.

Conner, K. R. (1991), "A historical comparison of resource-based theory and five schools of thought within industrial organisation economics: Do we have a new theory of the firm?", *Journal of Management,* Vol. 17**,** No. 1**,** pp. 121-154.

Constant, D., Kiesler, S. & Sproull, L. (1994), "What's mine is ours, or is it? A study of attitudes about information sharing", *Information Systems Research,* Vol. 5**,** No. 4**,** pp. 400-421.

Cook, C., Heath, F. & Thompson, R. L. (2000), "A meta-analysis of response rates in web-or internet-based surveys", *Educational and Psychological Measurement,* Vol. 60**,** No. 6**,** pp. 821-836.

Cooper, M. C. & Ellram, L. M. (1993), "Characteristics of supply chain management and the implications for purchasing and logistics strategy", *The International Journal of Logistics Management,* Vol. 4**,** No. 2**,** pp. 13-24.

Cooper, M. C., Ellram, L. M., Gardner, J. T. & Hanks, A. M. (1997a), "Meshing multiple alliances", *Journal of Business Logistics,* Vol. 18**,** No. 1**,** pp. 67-89.

Cooper, M. C., Lambert, D. M. & Pagh, J. D. (1997b), "Supply chain management: More than a new name for logistics", *The International Journal of Logistics Management,* Vol. 8**,** No. 1**,** pp. 1-14.

Cortina, J. M. (1993), "What is coefficient alpha? An examination of theory and applications", *Journal of Applied Psychology,* Vol. 78**,** No. 1**,** pp. 98-104.

Costello, A. B. & Osborne, J. W. (2005), "Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis", *Practical Assessment, Research & Evaluation,* Vol. 10**,** No. 7.

Creswell, J. W. (2008). *Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research,* Pearson Education Inc., New Jersey, US.

Creswell, J. W. (2009). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches,* Sage Publications Inc., Thousand Oaks, CA.

Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches,* Sage Publications Inc., Thousand Oaks, CA.

Creswell, J. W. & Clark, V. L. P. (2011). *Designing and Conducting Mixed Methods Research,* Sage Publications Inc., Thousand Oaks, CA.

Cronbach, L. J. (1951), "Coefficient alpha and the internal structure of tests", *Psychometrika,* Vol. 16**,** No. 3**,** pp. 297-334.

Crook, T. R. & Combs, J. G. (2007), "Sources and consequences of bargaining power in supply chains", *Journal of Operations Management,* Vol. 25**,** No. 2**,** pp. 546-555.

Davis, T. (1993), "Effective supply chain management", *Sloan Management Review,* Vol. 34**,** No.**,** pp. 35-35.

Dawes, J. G. (2008), "Do data characteristics change according to the number of scale points used? An experiment using 5 point, 7 point and 10 point scales", *International Journal of Market Research,* Vol. 51**,** No. 1**,** pp. 61-77.

Day, G. S. (1995), "Advantageous alliances", *Journal of the Academy of Marketing Science,* Vol. 23**,** No. 4**,** pp. 297-300.

De, P. (2014), "Strengthening Regional Trade and Production Networks Through Transport Connectivity in South and South-West Asia", *Development Papers 1401, United Nations - Economic and Social Commission for Asia and the Pacific (ESCAP), New Delhi, India, July 2014*. (Accessed on: 28 April 2016).

Dedrick, J., Kraemer, K. L. & Shih, E. (2013), "Information technology and productivity in developed and developing countries", *Journal of Management Information Systems,* Vol. 30**,** No. 1**,** pp. 97-122.

Dicicco-Bloom, B. & Crabtree, B. F. (2006), "The qualitative research interview", *Medical Education,* Vol. 40**,** No. 4**,** pp. 314-321.

Dillman, D. A. (1991), "The design and administration of mail surveys", *Annual Review of Sociology,* Vol. 17**,** No.**,** pp. 225-249.

Dilman, D. A., Phelps, G., Tortora, R., Swift, K., Kohrell, J., Jodi, B. & Messer, B. L. (2009), "Response rate and measurement differences in mixed-mode surveys using mail, telephone, interactive voice response (IVR) and the internet", *Social Science Research,* Vol. 38**,** No. 1**,** pp. 1-18.

Distefano, C., Zhu, M. & Mindrila, D. (2009), "Understanding and using factor scores: Considerations for the applied researcher", *Practical Assessment, Research & Evaluation,* Vol. 14**,** No. 20**,** pp. 1-11.

Doney, P. M. & Cannon, J. P. (1997), "An examination of the nature of trust in buyer-seller relationships", *The Journal of Marketing,* Vol. 61**,** No. 2**,** pp. 35-51.

Drost, E. A. (2011), "Validity and reliability in social science research", *Education Research and Perspectives,* Vol. 38**,** No. 1**,** pp. 105.

Du, T. C., Lai, V. S., Cheung, W. & Cui, X. (2012), "Willingness to share information in a supply chain: A partnership-data-process perspective", *Information & Management,* Vol. 49**,** No. 2**,** pp. 89-98.

Ellram, L. M. (1995), "Partnering pitfalls and success factors", *International Journal of Purchasing and Materials Management,* Vol. 31**,** No. 1**,** pp. 35-44.

Elo, S. & Kyngäs, H. (2008), "The qualitative content analysis process", *Journal of Advanced Nursing,* Vol. 62**,** No. 1**,** pp. 107-115.

Emerson, R. M. (1976), "Social exchange theory", *Annual Review of Sociology,* Vol. 2**,** No.**,** pp. 335-362.

Eng, T.-Y. (2006), "An investigation into the mediating role of cross-functional coordination on the linkage between organizational norms and SCM performance", *Industrial Marketing Management,* Vol. 35**,** No. 6**,** pp. 762-773.

Engel, T., Englschalk, A., Guner, N., Goswami, S. & Krcmar, H. (2014). "Investigating information sharing behavior in supply chains: Evidence from an embedded single case study", in*: System Sciences (HICSS), 2014 47th Hawaii International Conference*. 170-179.

Fabrigar, L. R., Wegener, D. T., Maccallum, R. C. & Strahan, E. J. (1999), "Evaluating the use of exploratory factor analysis in psychological research", *Psychological Methods,* Vol. 4**,** No. 3**,** pp. 272-299.

Fawcett, S. E., Ellram, L. M. & Ogden, J. A. (2007a). *Supply Chain Management: From Vision to Implementation,* Pearson Prentice Hall, New Jersey.

Fawcett, S. E. & Magnan, G. M. (2001). *Achieving World-class Supply Chain Alignment: Benefits, Barriers, and Bridges,* Center for Advanced Purchasing Studies Tempe, AZ,

Fawcett, S. E., Osterhaus, P., Magnan, G. M., Brau, J. C. & Mccarter, M. W. (2007b), "Information sharing and supply chain performance: The role of connectivity and willingness", *Supply Chain Management: An International Journal,* Vol. 12**,** No. 5**,** pp. 358-368.

Fawcett, S. E., Wallin, C., Allred, C. & Magnan, G. (2009), "Supply chain information-sharing: Benchmarking a proven path", *Benchmarking: An International Journal,* Vol. 16**,** No. 2**,** pp. 222-246.

Federation of Nepalese Chambers of Commerce & Industries. (2015). Online]. Available: http://www.fncci.org/ [Accessed on: 30/6/2015].

Feldmann, M. & Müller, S. (2003), "An incentive scheme for true information providing in supply chains", *Omega,* Vol. 31**,** No. 2**,** pp. 63-73.

Fiala, P. (2005), "Information sharing in supply chains", *Omega,* Vol. 33**,** No. 5**,** pp. 419-423.

Field, A. (2013). *Discovering Statistics Using IBM SPSS Statistics,* Sage Publications Ltd, London.

Fligstein, N. (1996), "Markets as politics: A political-cultural approach to market institutions", *American Sociological Review,* Vol. 61**,** No. 4**,** pp. 656-673.

Flynn, B. B., Huo, B. & Zhao, X. (2010), "The impact of supply chain integration on performance: A contingency and configuration approach", *Journal of Operations Management,* Vol. 28**,** No. 1**,** pp. 58-71.

Ford, D. (1984), "Buyer/seller relationships in international industrial markets", *Industrial Marketing Management,* Vol. 13**,** No. 2**,** pp. 101-112.

Ford, J. K., Maccallum, R. C. & Tait, M. (1986), "The application of exploratory factor analysis in applied psychology: A critical review and analysis", *Personnel Psychology,* Vol. 39**,** No. 2**,** pp. 291-314.

Forman, J. & Damschroder, L. (2008), "Qualitative content analysis", in: JACOBY, L. & SIMINOFF, L. A. (eds.) *Empirical Research for Bioethics: A Primer*, Elsevier Ltd., Oxford, UK, 39-62.

Forrester, J. W. (1958), "Industrial dynamics: A major breakthrough for decision makers", *Harvard Business Review,* Vol. 36**,** No. 4**,** pp. 37-66.

Fowler, F. J. (2009). *Survey Research Methods,* Sage Publications Inc., Thousand Oaks, CA.

Fynes, B., De Búrca, S. & Marshall, D. (2004), "Environmental uncertainty, supply chain relationship quality and performance", *Journal of Purchasing and Supply Management,* Vol. 10**,** No. 4**,** pp. 179-190.

Ganesan, S. (1993), "Negotiation strategies and the nature of channel relationships", *Journal of Marketing Research,* Vol. 30**,** No. 2**,** pp. 183-203.

Ganesan, S. (1994), "Determinants of long-term orientation in buyer-seller relationships", *The Journal of Marketing,* Vol. 58**,** No. 2**,** pp. 1-19.

Ganotakis, P., Hsieh, W.-L. & Love, J. H. (2013), "Information systems, inter-functional collaboration and innovation in Taiwanese high-tech manufacturing firms", *Production Planning & Control,* Vol. 24**,** No. 8-9**,** pp. 837-850.

Gaski, J. F. (1984), "The theory of power and conflict in channels of distribution", *The Journal of Marketing,* Vol. 48**,** No. 3**,** pp. 9-29.

Gerbing, D. W. & Anderson, J. C. (1988), "An updated paradigm for scale development incorporating unidimensionality and its assessment", *Journal of Marketing Research,* Vol. 25**,** No. 2**,** pp. 186-192.

Ghosh, A. & Fedorowicz, J. (2008), "The role of trust in supply chain governance", *Business Process Management Journal,* Vol. 14**,** No. 4**,** pp. 453-470.

Gliem, J. A. & Gliem, R. R. (2003a). "Calculating, interpreting, and reporting Cronbach's alpha reliability coefficient for Likert-type scales", in*: Midwest Research to Practice Conference in Adult, Continuing, and Community Education 2003*, The Ohio State University, Columbus, OH.

Gliem, R. R. & Gliem, J. A. (2003b). "Calculating, interpreting, and reporting Cronbach's alpha reliability coefficient for Likert-type scales", in*: Midwest Research-to-Practice Conference in Adult, Continuing, and Community Education, 2003, 82-88*, The Ohio State University, Columbus, OH. 82-88.

Golafshani, N. (2003), "Understanding reliability and validity in qualitative research", *The Qualitative Report,* Vol. 8**,** No. 4**,** pp. 597-606.

Government of Nepal 2014. National Census of Manufacturing Establishments Nepal. *In:* NATIONAL PLANNING COMMISSION SECRETARIAT (ed.). Nepal: Central Bureau of Statistics.

Government of Nepal Ministry of Industry. (2015). *Industrial Information System* Online]. Available: http://www.doind.gov.np/en/ [Accessed on: 30/06/2015].

Graneheim, U. H. & Lundman, B. (2004), "Qualitative content analysis in nursing research: Concepts, procedures and measures to achieve trustworthiness", *Nurse Education Today,* Vol. 24**,** No. 2**,** pp. 105-112.

Grant, R. M. (1991), "The resource-based theory of competitive advantage: Implications for strategy formulation", *California Management Review,* Vol. 33**,** No. 3**,** pp. 114-135.

Greene, J. C. & Caracelli, V. J. (1997), "Defining and describing the paradigm issue in mixed - method evaluation", *New Directions for Evaluation,* Vol. 1997**,** No. 74**,** pp. 5-17.

Guba, E. G. & Lincoln, Y. S. (1982), "Epistemological and methodological bases of naturalistic inquiry", *Educational Communication and Technology,* Vol. 30**,** No. 4**,** pp. 233-252.

Guillemin, M. & Gillam, L. (2004), "Ethics, reflexivity, and "ethically important moments" in research", *Qualitative Inquiry,* Vol. 10**,** No. 2**,** pp. 261-280.

Gunasekaran, A. & Kobu, B. (2007), "Performance measures and metrics in logistics and supply chain management: A review of recent literature (1995–2004) for research and applications", *International Journal of Production Research,* Vol. 45**,** No. 12**,** pp. 2819-2840.

Gunasekaran, A., Patel, C. & Mcgaughey, R. E. (2004), "A framework for supply chain performance measurement", *International journal of production economics,* Vol. 87, No. 3, pp. 333-347.

Gunasekaran, A., Patel, C. & Tirtiroglu, E. (2001), "Performance measures and metrics in a supply chain environment", *International journal of operations & production Management,* Vol. 21, No. 1/2, pp. 71-87.

Gupta, A. K. & Wilemon, D. L. (1990), "Accelerating the development of technology-based new products", *California Management Review,* Vol. 32, No. 2, pp. 24-44.

Gustin, C. M., Daugherty, P. J. & Stank, T. P. (1995), "The effects of information availability on logistics integration", *Journal of Business Logistics,* Vol. 16, No., pp. 1-1.

Ha, B.-C., Park, Y.-K. & Cho, S. (2011), "Suppliers' affective trust and trust in competency in buyers: Its effect on collaboration and logistics efficiency", *International Journal of Operations & Production Management,* Vol. 31, No. 1, pp. 56-77.

Hair, J. F., Anderson, R. E., Tatham, R. L. & Black, W. C. (1998). *Multivariate Data Analysis,* Prentice Hall, New Jersey.

Hair, J. F., Babin, B., Money, A. H. & Samouel, P. (2003). *Essentials of Business Research Methods,* John Wiley & Sons, USA.

Hall, D. C. & Saygin, C. (2012), "Impact of information sharing on supply chain performance", *The International Journal of Advanced Manufacturing Technology,* Vol. 58, No. 1-4, pp. 397-409.

Hall, R. (1992), "The strategic analysis of intangible resources", *Strategic Management Journal,* Vol. 13, No. 2, pp. 135-144.

Hall, R. (1993), "A framework linking intangible resources and capabilities to sustainable competitive advantage", *Strategic Management Journal,* Vol. 14, No. 8, pp. 607-618.

Handfield, R. B. & Bechtel, C. (2002), "The role of trust and relationship structure in improving supply chain responsiveness", *Industrial Marketing Management,* Vol. 31, No. 4, pp. 367-382.

Handfield, R. B. & Nichols, E. L. (1999). *Introduction to Supply Chain Management,* Prentice Hall, Upper Saddle River, New Jersey.

Harkness, J., Pennell, B.-E. & Schoua-Glusberg, A. (2004), "Survey questionnaire translation and assessment", in: GROVES, R. M., KALTON, G., RAO, J. N. K., SCHWARZ, N. & SKINNER, C. (eds.) *Methods for Testing and Evaluating Survey Questionnaires*, John Wiley & Sons Inc., New Jersey, 453-473.

Harrison, D. A., Mclaughlin, M. E. & Coalter, T. M. (1996), "Context, cognition, and common method variance: Psychometric and verbal protocol evidence", *Organizational Behavior and Human Decision Processes,* Vol. 68**,** No. 3**,** pp. 246-261.

Hart, P. & Saunders, C. (1997), "Power and trust: Critical factors in the adoption and use of electronic data interchange", *Organization Science,* Vol. 8**,** No. 1**,** pp. 23-42.

Hausman, W. H. (2004), "Supply chain performance metrics", *The Practice of Supply Chain Management: Where Theory and Application Converge*, Springer,, US, pp. 61-73, 61-73.

Heide, J. B. (1994), "Interorganizational governance in marketing channels", *The Journal of Marketing,* Vol.**,** No.**,** pp. 71-85.

Henson, R. K. & Roberts, J. K. (2006), "Use of exploratory factor analysis in published research - Common errors and some comment on improved practice", *Educational and Psychological Measurement,* Vol. 66**,** No. 3**,** pp. 393-416.

Hofstede, G. (1980), "Culture and organizations", *International Studies of Management & Organization,* Vol. 10**,** No. 4**,** pp. 15-41.

Holmberg, S. (2000), "A systems perspective on supply chain measurements", *International Journal of Physical Distribution & Logistics Management,* Vol. 30**,** No. 10**,** pp. 847-868.

Horváth, P. & Moeller, K. (2004), "Supply chain performance measurement: A transaction cost theory and value-based approach", *Studies in Managerial and Financial Accounting,* Vol. 14**,** No.**,** pp. 155-184.

Hoyt, J. & Huq, F. (2000), "From arms-length to collaborative relationships in the supply chain: An evolutionary process", *International Journal of Physical Distribution & Logistics Management,* Vol. 30**,** No. 9**,** pp. 750-764.

Hsiao, J.-M. M. (2006). "*The Impact of Retailer-Supplier Cooperation and Decision-Making Uncertainty on Supply Chain Performance",* Doctor of Philosophy, Institute of Transport and Logistics Studies, Faculty of Economics and Business, The University of Sydney.

Hsieh, H.-F. & Shannon, S. E. (2005), "Three approaches to qualitative content analysis", *Qualitative Health Research,* Vol. 15**,** No. 9**,** pp. 1277-1288.

Hsu, C.-C., Kannan, V. R., Tan, K.-C. & Leong, G. K. (2008), "Information sharing, buyer-supplier relationships, and firm performance: A multi-region analysis", *International Journal of Physical Distribution & Logistics Management,* Vol. 38**,** No. 4**,** pp. 296-310.

Hsu, L.-L., Chiu, C.-M., Chen, J. C. & Liu, C.-C. (2009), "The impacts of supply chain management systems on information sharing and integrated-performance", *Human Systems Management,* Vol. 28**,** No. 3**,** pp. 101-121.

Hult, G. T. M., Jr. Ketchen, D. J. & Slater, S. F. (2004), "Information processing, knowledge development and strategic supply chain performance", *Academy of Management Journal,* Vol. 47**,** No. 2**,** pp. 241-253.

Hung, W.-H., Ho, C.-F., Jou, J.-J. & Tai, Y.-M. (2011), "Sharing information strategically in a supply chain: Antecedents, content and impact", *International Journal of Logistics: Research and Applications,* Vol. 14**,** No. 2**,** pp. 111-133.

Hung, W.-H., Lin, C.-P. & Ho, C.-F. (2014), "Sharing information in a high uncertainty environment: Lessons from the divergent differentiation supply chain", *International Journal of Logistics Research and Applications,* Vol. 17**,** No. 1**,** pp. 46-63.

Huo, B., Han, Z. & Prajogo, D. (2016), "Antecedents and consequences of supply chain information integration: A resource-based view", *Supply Chain Management: An International Journal,* Vol. 21**,** No. 6**,** pp. 661-677.

Huo, B., Zhao, X. & Zhou, H. (2014), "The Effects of Competitive Environment on Supply Chain Information Sharing and Performance: An Empirical Study in China", *Production and Operations Management,* Vol. 23**,** No. 4**,** pp. 552-569.

Huong Tran, T. T., Childerhouse, P. & Deakins, E. (2016), "Supply chain information sharing: Challenges and risk mitigation strategies", *Journal of Manufacturing Technology Management,* Vol. 27**,** No. 8**,** pp. 1102-1126.

Hurley, A. E. S., Terri A., Schriesheim, C. A., Brannick, M. T., Seers, A., Vandenberg, R. J. & Williams, L. J. (1997), "Exploratory and confirmatory factor analysis: Guidelines, issues and alternatives", *Journal of Organisational Behaviour* Vol. 18**,** No. 6**,** pp. 667-683.

Jarvenpaa, S. L. & Staples, D. S. (2000), "The use of collaborative electronic media for information sharing: An exploratory study of determinants", *The Journal of Strategic Information Systems,* Vol. 9**,** No. 2**,** pp. 129-154.

Jick, T. D. (1979), "Mixing qualitative and quantitative methods: Triangulation in action", *Administrative Science Quarterly,* Vol. 24**,** No. 4**,** pp. 602-611.

John, G. & Reve, T. (1982), "The reliability and validity of key informant data from dyadic relationships in marketing channels", *Journal of Marketing Research,* Vol. 19**,** No. 4**,** pp. 517-524.

Johnson, R. B. & Onwuegbuzie, A. J. (2004), "Mixed methods research: A research paradigm whose time has come", *Educational Researcher,* Vol. 33**,** No. 7**,** pp. 14-26.

Johnson, R. B., Onwuegbuzie, A. J. & Turner, L. A. (2007), "Toward a definition of mixed methods research", *Journal of Mixed Methods Research,* Vol. 1**,** No. 2**,** pp. 112-133.

Jonsson, P. & Myrelid, P. (2016), "Supply chain information utilisation: Conceptualisation and antecedents", *International Journal of Operations & Production Management,* Vol. 36**,** No. 12**,** pp. 1769-1799.

Kähkönen, A.-K. & Tenkanen, M. (2010), "The impact of power on information sharing in the Finnish food industry", *British Food Journal,* Vol. 112**,** No. 8**,** pp. 821-835.

Kaipia, R. & Hartiala, H. (2006), "Information-sharing in supply chains: Five proposals on how to proceed", *International Journal of Logistics Management, The,* Vol. 17**,** No. 3**,** pp. 377-393.

Kaliani Sundram, V. P., Chandran, V. & Awais Bhatti, M. (2016), "Supply chain practices and performance: The indirect effects of supply chain integration", *Benchmarking: An International Journal,* Vol. 23**,** No. 6**,** pp. 1445-1471.

Kaplan, R. S. & Norton, D. P. (1992), "The Balanced Scorecard - Measures That Drive Performance", *Harvard Business Review,* Vol. 70**,** No. 1**,** pp. 71-79.

Kaplan, R. S. & Norton, D. P. (1996), "Using the balanced scorecard as a strategic management system", *Harvard Business Review,* Vol. 74**,** No. 1**,** pp. 75-85.

Kembro, J. & Näslund, D. (2014), "Information sharing in supply chains, myth or reality? A critical analysis of empirical literature", *International Journal of Physical Distribution & Logistics Management,* Vol. 44**,** No. 3**,** pp. 179-200.

Kembro, J. & Selviaridis, K. (2015), "Exploring information sharing in the extended supply chain: An interdependence perspective", *Supply Chain Management: An International Journal,* Vol. 20**,** No. 4**,** pp. 455-470.

Kembro, J. H., Selviaridis, K. & Näslund, D. (2014), "Theoretical perspectives on information sharing in supply chains: A systematic literature review and conceptual framework", *Supply Chain Management: An International Journal,* Vol. 19**,** No. 5/6**,** pp. 609-625.

Kline, P. (1999). *The Handbook of Psychological Testing,* Routledge, London.

Kocoglu, I., Imamoglu, S. Z. & Ince, H. (2011), "Inter-organizational Relationships in Enhancing Information Sharing: The Role of Trust and Commitment", *The Business Review, Cambridge,* Vol. 18**,** No. 2**,** pp. 115-123.

Koçoğlu, I., İmamoğl, S. Z., İnc, H. & Keskin, H. (2011), "The effect of supply chain integration on information sharing: Enhancing the supply chain performance", *Procedia-Social and Behavioral Sciences,* Vol. 24**,** No.**,** pp. 1630-1649.

Kumar, N. (1996), "The power of trust in manufacturer-retailer relationships", *Harvard Business Review,* Vol. 74**,** No. 6**,** pp. 92-106.

Kumar, N., Scheer, L. K. & Steenkamp, J.-B. E. (1995), "The effects of perceived interdependence on dealer attitudes", *Journal of Marketing Research,* Vol. 32**,** No. 3**,** pp. 348-356.

Kumar, V., Jones, E., Venkatesan, R. & Leone, R. P. (2011), "Is market orientation a source of sustainable competitive advantage or simply the cost of competing?", *Journal of Marketing,* Vol. 75**,** No. 1**,** pp. 16-30.

Kvale, S. (1996). *Interviews: An Introduction to Qualitative Research Interviewing,* Sage Publications Inc., Thousand Oaks, CA.

Kwon, I.-W. G. & Suh, T. (2005), "Trust, commitment and relationships in supply chain management: A path analysis", *Supply Chain Management: An International Journal,* Vol. 10**,** No. 1**,** pp. 26-33.

Kwon, I. W. G. & Suh, T. (2004), "Factors affecting the level of trust and commitment in supply chain relationships", *Journal of Supply Chain Management,* Vol. 40**,** No. 1**,** pp. 4-14.

Lal, R. (1990), "Improving channel coordination through franchising", *Marketing Science,* Vol. 9**,** No. 4**,** pp. 299-318.

Lambert, D. M. & Cooper, M. C. (2000), "Issues in supply chain management", *Industrial Marketing Management,* Vol. 29**,** No. 1**,** pp. 65-83.

Lambert, D. M., Cooper, M. C. & Pagh, J. D. (1998), "Supply chain management: Implementation issues and research opportunities", *The International Journal of Logistics Management,* Vol. 9**,** No. 2**,** pp. 1-20.

Large, R. O. (2005), "Communication capability and attitudes toward external communication of purchasing managers in Germany", *International Journal of Physical Distribution & Logistics Management,* Vol. 35**,** No. 6**,** pp. 426-444.

Lee, B. C., Kim, P. S., Hong, K. S. & Lee, I. (2010), "Evaluating antecedents and consequences of supply chain activities: An integrative perspective", *International Journal of Production Research,* Vol. 48**,** No. 3**,** pp. 657-682.

Lee, C. W., Kwon, I.-W. G. & Severance, D. (2007), "Relationship between supply chain performance and degree of linkage among supplier, internal integration, and customer", *Supply Chain Management: An international journal,* Vol. 12**,** No. 6**,** pp. 444-452.

Lee, D.-J., Pae, J. H. & Wong, Y. (2001), "A model of close business relationships in China (guanxi)", *European Journal of Marketing,* Vol. 35**,** No. 1/2**,** pp. 51-69.

Lee, H. L. & Billington, C. (1992), "Managing supply chain inventory: Pitfalls and opportunities", *Sloan Management Review,* Vol. 33**,** No. 3**,** pp. 65-73.

Lee, H. L., Padmanabhan, V. & Whang, S. (1997), "Information distortion in a supply chain: The bullwhip effect", *Management Science,* Vol. 43**,** No. 4**,** pp. 546-558.

Lee, H. L., So, K. C. & Tang, C. S. (2000), "The value of information sharing in a two-level supply chain", *Management Science,* Vol. 46**,** No. 5**,** pp. 626-643.

Lee, H. L. & Whang, S. (2000), "Information sharing in a supply chain", *International Journal of Manufacturing Technology and Management,* Vol. 1**,** No. 1**,** pp. 79-93.

Lehoux, N., D'amours, S. & Langevin, A. (2013), "Inter-firm collaborations and supply chain coordination: Review of key elements and case study", *Production Planning & Control,* Vol. 25**,** No. 10**,** pp. 858-872.

Levi, D. S., Kaminsky, P. & Levi, E. S. (2008). *Designing And Managing The Supply Chain: Concepts, Strategies And Case Studies,* McGraw-Hill, New York.

Li, G., Lin, Y., Wang, S. & Yan, H. (2006a), "Enhancing agility by timely sharing of supply information", *Supply Chain Management: An International Journal,* Vol. 11**,** No. 5**,** pp. 425-435.

Li, L. & Zhang, H. (2008), "Confidentiality and information sharing in supply chain coordination", *Management Science,* Vol. 54**,** No. 8**,** pp. 1467-1481.

Li, S. & Lin, B. (2006), "Accessing information sharing and information quality in supply chain management", *Decision Support Systems,* Vol. 42**,** No. 3**,** pp. 1641-1656.

Li, S., Ragu-Nathan, B., Ragu-Nathan, T. & Subba Rao, S. (2006b), "The impact of supply chain management practices on competitive advantage and organizational performance", *Omega,* Vol. 34**,** No. 2**,** pp. 107-124.

Li, Y., Ye, F. & Sheu, C. (2014), "Social capital, information sharing and performance: Evidence from China", *International Journal of Operations & Production Management,* Vol. 34**,** No. 11**,** pp. 1440-1462.

Liao, K., Ma, Z., Lee, J. J.-Y. & Ke, K. (2011), "Achieving mass customization through trust-driven information sharing: A supplier's perspective", *Management Research Review,* Vol. 34**,** No. 5**,** pp. 541-552.

Lietz, P. (2010), "Research into questionnaire design", *International Journal of Market Research,* Vol. 52**,** No. 2**,** pp. 249-272.

Lin, F. R., Huang, S. H. & Lin, S. C. (2002), "Effects of information sharing on supply chain performance in electronic commerce", *IEEE Transactions on Engineering Management,* Vol. 49**,** No. 3**,** pp. 258-268.

Liu, H., Ke, W., Kee Wei, K. & Hua, Z. (2013), "Effects of supply chain integration and market orientation on firm performance: Evidence from China", *International Journal of Operations & Production Management,* Vol. 33**,** No. 3**,** pp. 322-346.

Lockamy Iii, A. & Mccormack, K. (2004), "Linking SCOR planning practices to supply chain performance: An exploratory study", *International Journal of Operations & Production Management,* Vol. 24**,** No. 12**,** pp. 1192-1218.

Lounsbury, J. W., Gibson, L. W. & Saudargas, R. A. (2006), "Scale development", in: LEONG, F. T. L. & AUSTIN, J. T. (eds.) *Psychology Research Handbook: A Guide for Graduate Students and Research Assistants,* Second ed, Sage Publications Inc., Thousand Oaks, CA, 125-146.

Luk, C.-L., Yau, O. H., Sin, L. Y., Tse, A. C., Chow, R. P. & Lee, J. S. (2008), "The effects of social capital and organizational innovativeness in different institutional contexts", *Journal of International Business Studies,* Vol. 39**,** No. 4**,** pp. 589-612.

Macaulay, S. (1963), "Non-contractual relations in business: A preliminary study", *American Sociological Review,* Vol. 28**,** No. 1**,** pp. 55-67.

Madlberger, M. (2009), "What drives firms to engage in interorganizational information sharing in supply chain management?", *International Journal of e-Collaboration,* Vol. 5**,** No. 2**,** pp. 18-42.

Maloni, M. & Benton, W. (2000), "Power influences in the supply chain", *Journal of Business Logistics,* Vol. 21**,** No. 1**,** pp. 49-74.

Mandal, S. (2012), "Supply chain performance: Review of empirical literature", *Romanian Review of Social Sciences,* Vol.**,** No. 3**,** pp. 24-34.

Maskey, R., Fei, J. & Nguyen, H.-O. (2017). "Exploratory factor analysis – Antecedents of information sharing in supply chains", in*: Maritime Transport Quality in the Evolving World Trade: International Association of Maritime Economics 2017, 27 - 30 June 2017*, Kyoto, Japan. 1-25.

Maskey, R., Fei, J. & Nguyen, H. O. (2015). "Identifying the factors affecting information sharing in supply chain - A systematic review of the literature", in*: The Role of Maritime Clusters and Innovation in Shaping Future Global Trade: International Association of Maritime Economics 2015 Conference, 23-26 August 2015*, Kuala Lumpur, Malaysia. 1-21.

Mason-Jones, R. & Towill, D. R. (1997), "Information enrichment: Designing the supply chain for competitive advantage", *Supply Chain Management: An International Journal,* Vol. 2**,** No. 4**,** pp. 137-148.

Mason-Jones, R. & Towill, D. R. (1999), "Using the information decoupling point to improve supply chain performance", *The International Journal of Logistics Management,* Vol. 10**,** No. 2**,** pp. 13-26.

Matell, M. S. & Jacoby, J. (1971), "Is there an optimal number of alternatives for likert scale items? Study I: Reliability and validity", *Educational and Psychological Measurement,* Vol. 31**,** No. 3**,** pp. 657-674.

Mckay, R. B., Breslow, M. J., Sangster, R. L., Gabbard, S. M., Reynolds, R. W., Nakamoto, J. M. & Tarnai, J. (1996), "Translating survey questionnaires: Lessons learned", *New Directions for Evaluation,* Vol. 1996**,** No. 70**,** pp. 93-104.

Mena, C., Humphries, A. & Wilding, R. (2009), "A comparison of inter-and intra-organizational relationships: two case studies from UK food and drink industry", *International Journal of Physical Distribution & Logistics Management,* Vol. 39**,** No. 9**,** pp. 762-784.

Mentzer, J. T., Dewitt, W., Keebler, J. S., Min, S., Nix, N. W., Smith, C. D. & Zacharia, Z. G. (2001), "Defining supply chain management", *Journal of Business Logistics,* Vol. 22**,** No. 2**,** pp. 1-25.

Mentzer, J. T., Min, S. & Zacharia, Z. G. (2000), "The nature of interfirm partnering in supply chain management", *Journal of Retailing,* Vol. 76**,** No. 4**,** pp. 549-568.

Meyers, L. S., Gamst, G. & Guarino, A. J. (2013). *Applied Multivariate Research: Design and Interpretation,* Sage Publications Inc., California, USA.

Milgate, M. (2001), "Supply chain complexity and delivery performance: An international exploratory study", *Supply Chain Management: An International Journal,* Vol. 6**,** No. 3**,** pp. 106-118.

Mirza, T. & Bacani, E. (2013), "Addressing hard and soft infrastructure barriers to trade in South Asia", *South Asia Working Paper Series No. 16, Asian Development Bank, Philippines, February 2013*. (Accessed on: 28 October 2016).

Mitchell, E. M. & Kovach, J. V. (2016), "Improving supply chain information sharing using design for six sigma", *European Research on Management and Business Economics,* Vol. 22**,** No. 3**,** pp. 147-154.

Moberg, C. R. (2000). "*Identifying the Antecedents of Information Exchange Among Buyers and Sellers",* Doctor of Business Administration, D.B.A., Cleveland State University.

Moberg, C. R., Cutler, B. D., Gross, A. & Speh, T. W. (2002), "Identifying antecedents of information exchange within supply chains", *International Journal of Physical Distribution & Logistics Management,* Vol. 32**,** No. 9**,** pp. 755-770.

Mohr, J. & Spekman, R. (1994), "Characteristics of partnership success: Partnership attributes, communication behavior, and conflict resolution techniques", *Strategic Management Journal,* Vol. 15**,** No. 2**,** pp. 135-152.

Morgan, R. M. & Hunt, S. D. (1994), "The commitment-trust theory of relationship marketing", *The Journal of Marketing,* Vol. 58**,** No. 3**,** pp. 20-38.

Morse, J. M. (2000), "Determining sample size", *Qualitative Health Research,* Vol. 10**,** No. 1**,** pp. 3-5.

Moser, R., Kern, D., Wohlfarth, S. & Hartmann, E. (2011), "Supply network configuration benchmarking: Framework development and application in the Indian automotive industry", *Benchmarking: An International Journal,* Vol. 18**,** No. 6**,** pp. 783-801.

Müller, M. & Gaudig, S. (2011), "An empirical investigation of antecedents to information exchange in supply chains", *International Journal of Production Research,* Vol. 49**,** No. 6**,** pp. 1531-1555.

Murry Jr, J. P. & Heide, J. B. (1998), "Managing promotion program participation within manufacturer-retailer relationships", *The Journal of Marketing,* Vol. 62**,** No. 1**,** pp. 58-68.

Narasimhan, R. & Jayaram, J. (1998), "Causal linkages in supply chain management: An exploratory study of North American manufacturing firms", *Decision Sciences,* Vol. 29**,** No. 3**,** pp. 579-605.

Neely, A., Gregory, M. & Platts, K. (1995), "Performance measurement system design: A literature review and research agenda", *International Journal of Operations & Production Management,* Vol. 15**,** No. 4**,** pp. 80-116.

Nepal Freight Forwarders Association. (2016). Online]. Available: http://neffa.org.np/ [Accessed on: 5 December 2015].

Nguyen, T. T. & Nguyen, T. D. (2014), "The impact of cultural sensitivity and information exchange on relationship quality", *Marketing Intelligence & Planning,* Vol. 32**,** No. 7**,** pp. 754-768.

Noordewier, T. G., John, G. & Nevin, J. R. (1990), "Performance outcomes of purchasing arrangements in industrial buyer-vendor relationships", *The Journal of Marketing,* Vol. 51**,** No. 4**,** pp. 80-93.

Nunnally, J. C. (1967). *Psychometric Theory,* McGraw-Hill, New York.

Nunnally, J. C. (1978). *Psychometric Theory,* McGraw-Hill, New York.

Nyaga, G. N., Lynch, D. F., Marshall, D. & Ambrose, E. (2013), "Power asymmetry, adaptation and collaboration in dyadic relationships involving a powerful partner", *Journal of Supply Chain Management,* Vol. 49**,** No. 3**,** pp. 42-65.

O'leary-Kelly, S. W. & Vokurka, R. J. (1998), "The empirical assessment of construct validity", *Journal of Operations Management,* Vol. 16**,** No. 4**,** pp. 387-405.

Onditi, A. A. (2013), "Relationship between customer personality, service features and customer loyalty in the banking sector: A survey of banks in Homabay County, Kenya", *International Journal of Business and Social Science,* Vol. 4**,** No. 15**,** pp. 132-150.

Onwuegbuzie, A. J. & Leech, N. L. (2004), "Enhancing the interpretation of significant findings: The role of mixed methods research", *The Qualitative Report,* Vol. 9**,** No. 4**,** pp. 770-792.

Otto, A. & Kotzab, H. (2003), "Does supply chain management really pay? Six perspectives to measure the performance of managing a supply chain", *European Journal of Operational Research,* Vol. 144**,** No. 2**,** pp. 306-320.

Pallant, J. (2013). *A Step By Step Guide To Data Analysis Using IBM SPSS,* Allen & Unwin, Australia.

Patnayakuni, R., Rai, A. & Seth, N. (2006), "Relational antecedents of information flow integration for supply chain coordination", *Journal of Management Information Systems,* Vol. 23**,** No. 1**,** pp. 13-49.

Paulraj, A. & Chen, I. J. (2007), "Strategic buyer-supplier relationships, information technology and external logistics integration", *Journal of Supply Chain Management,* Vol. 43, No. 2, pp. 2-14.

Paulraj, A., Lado, A. A. & Chen, I. J. (2008), "Inter-organizational communication as a relational competency: Antecedents and performance outcomes in collaborative buyer–supplier relationships", *Journal of Operations Management,* Vol. 26, No. 1, pp. 45-64.

Peteraf, M. A. (1993), "The cornerstones of competitive advantage: A resource‐based view", *Strategic Management Journal,* Vol. 14, No. 3, pp. 179-191.

Pfeffer, J. & Salancik, G. R. (1978). *The External Control of Organizations: A Resource Dependence Perspective,* Harper and Row, New York.

Podsakoff, P. M., Mackenzie, S. B., Lee, J.-Y. & Podsakoff, N. P. (2003), "Common method biases in behavioral research: A critical review of the literature and recommended remedies", *Journal of Applied Psychology,* Vol. 88, No. 5, pp. 879.

Podsakoff, P. M. & Organ, D. W. (1986), "Self-reports in organizational research: Problems and prospects", *Journal of management,* Vol. 12, No. 4, pp. 531-544.

Pradhan, J. (2002), "Information technology in Nepal: what role for the government?", *The Electronic Journal of Information Systems in Developing Countries,* Vol. 8, No.

Prajogo, D. & Olhager, J. (2012), "Supply chain integration and performance: The effects of long-term relationships, information technology and sharing, and logistics integration", *International Journal of Production Economics,* Vol. 135, No. 1, pp. 514-522.

Premkumar, G. & Ramamurthy, K. (1995), "The role of interorganizational and organizational factors on the decision mode for adoption of interorganizational systems", *Decision Sciences,* Vol. 26, No. 3, pp. 303-336.

Rajaguru, R. & Matanda, M. J. (2013), "Effects of inter-organizational compatibility on supply chain capabilities: Exploring the mediating role of inter-organizational

information systems (IOIS) integration", *Industrial Marketing Management,* Vol. 42**,** No. 4**,** pp. 620-632.

Rajkarnikar, P. R. (2010), "Adequacy and effectiveness of logistic services in Nepal: Implication for export performance", *Asia-Pacific Research and Training Network on Trade Working Paper Series, No. 79, April 2010*. (Accessed on: 28 October 2016).

Ralston, P., Richey, R. G. & Grawe, S. (2017), "The past and future of supply chain collaboration: A literature synthesis and call for research", *The International Journal of Logistics Management,* Vol. 28**,** No. 2**,** pp. 508-530.

Ramayah, T. & Omar, R. (2010), "Information exchange and supply chain performance", *International Journal of Information Technology & Decision Making,* Vol. 9**,** No. 01**,** pp. 35-52.

Ramdas, K. & Spekman, R. E. (2000), "Chain or shackles: Understanding what drives supply-chain performance", *Interfaces,* Vol. 30**,** No. 4**,** pp. 3-21.

Rana, P. & Karmacharya, B. K. (2014), "A Connectivity-Driven Development Strategy for Nepal: From a Landlocked to a Land-Linked State ", *Asian Development Bank Institute (ADBI) Working Paper Series, No. 498, September 2014*. (Accessed on: 28 October 2016).

Rao, A. N., Pearce, J. L. & Xin, K. (2005), "Governments, reciprocal exchange and trust among business associates", *Journal of International Business Studies,* Vol. 36**,** No. 1**,** pp. 104-118.

Rashed, C. a. A., Azeem, A. & Halim, Z. (2013), "Effect of information and knowledge sharing on supply chain performance: A survey based approach", *Journal of Operations and Supply Chain Management,* Vol. 3**,** No. 2**,** pp. 61-77.

Rocco, T. S. & Plakhotnik, M. S. (2009), "Literature reviews, conceptual frameworks, and theoretical frameworks: Terms, functions, and distinctions", *Human Resource Development Review,* Vol. 8**,** No. 1**,** pp. 120-130.

Ruppel, C. (2004), "An information systems perspective of supply chain tool compatibility: The roles of technology fit and relationships", *Business Process Management Journal,* Vol. 10**,** No. 3**,** pp. 311-324.

Sahay, B. S. (2003), "Understanding trust in supply chain relationships", *Industrial Management & Data Systems,* Vol. 103**,** No. 8**,** pp. 553-563.

Sahin, F. & Robinson, E. P. (2002), "Flow coordination and information sharing in supply chains: Review, implications, and directions for future research", *Decision Sciences,* Vol. 33**,** No. 4**,** pp. 505-536.

Salant, P. & Dillman, D., A. (1994). *How To Conduct Your Own Survey,* John Wiley & Sons Inc., New York.

Samaddar, S., Nargundkar, S. & Daley, M. (2006), "Inter-organizational information sharing: The role of supply network configuration and partner goal congruence", *European Journal of Operational Research,* Vol. 174**,** No. 2**,** pp. 744-765.

Sanders, N. R., Autry, C. W. & Gligor, D. M. (2011), "The impact of buyer firm information connectivity enablers on supplier firm performance: A relational view", *The International Journal of Logistics Management,* Vol. 22**,** No. 2**,** pp. 179-201.

Sanders, N. R. & Premus, R. (2002), "IT applications in supply chain organizations: A link between competitive priorities and organizational benefits", *Journal of Business Logistics,* Vol. 23**,** No. 1**,** pp. 65-83.

Saunders, M., Lewis, P. & Thornhill, A. (2009). *Research Methods for Business Students,* Pearson Education Limited, England.

Schloetzer, J. D. (2012), "Process integration and information sharing in supply chains", *The Accounting Review,* Vol. 87**,** No. 3**,** pp. 1005-1032.

Schopler, J. H. (1987), "Interorganisational groups: Origins, structure and outcomes", *The Academy of Management Review,* Vol. 12**,** No. 4**,** pp. 702-713.

Schreiber, J. B., Nora, A., Stage, F. K., Barlow, E. A. & King, J. (2006), "Reporting structural equation modeling and confirmatory factor analysis results: A review", *The Journal of Educational Research,* Vol. 99**,** No. 6**,** pp. 323-338.

Seidmann, A. & Sundararajan, A. (1998), "Sharing logistics information across organizations: Technology, competition and contracting", *Information Technology and Industrial Competitiveness*, Springer, 107-136.

Sezen, B. (2008), "Relative effects of design, integration and information sharing on supply chain performance", *Supply Chain Management: An International Journal,* Vol. 13**,** No. 3**,** pp. 233-240.

Sezen, B. & Yilmaz, C. (2007), "Relative effects of dependence and trust on flexibility, information exchange, and solidarity in marketing channels", *Journal of Business & Industrial Marketing,* Vol. 22**,** No. 1**,** pp. 41-51.

Shaw, M. J. (2001), "Information-based manufacturing with the web", *Information-Based Manufacturing*, Springer, 7-21.

Shepherd, C. & Günter, H. (2006), "Measuring supply chain performance: Current research and future directions", *International Journal of Productivity and Performance Management,* Vol. 55**,** No. 3/4**,** pp. 242-258.

Sheu, C., Yen, H. R. & Chae, B. (2006), "Determinants of supplier-retailer collaboration: Evidence from an international study", *International Journal of Operations & Production Management,* Vol. 26**,** No. 1**,** pp. 24-49.

Shin, S. K., Ishman, M. & Sanders, G. L. (2007), "An empirical investigation of socio-cultural factors of information sharing in China", *Information & Management,* Vol. 44**,** No. 2**,** pp. 165-174.

Shore, B. (2001), "Information sharing in global supply chain systems", *Journal of Global Information Technology Management,* Vol. 4**,** No. 3**,** pp. 27-50.

Simatupang, T. M. & Sridharan, R. (2005), "An integrative framework for supply chain collaboration", *The International Journal of Logistics Management,* Vol. 16**,** No. 2**,** pp. 257-274.

Singh, R. K. (2011), "Developing the framework for coordination in supply chain of SMEs", *Business Process Management Journal,* Vol. 17**,** No. 4**,** pp. 619-638.

Slater, S. F. & Narver, J. C. (1995), "Market orientation and the learning organization", *The Journal of Marketing,* Vol. 59, No. 3, pp. 63-74.

Smith, J. B. & Barclay, D. W. (1997), "The effects of organizational differences and trust on the effectiveness of selling partner relationships", *The Journal of Marketing,* Vol. 61, No. 1, pp. 3-21.

Spekman, R. E., Kamauff Jr, J. W. & Myhr, N. (1998), "An empirical investigation into supply chain management: A perspective on partnerships", *Supply Chain Management: An International Journal,* Vol. 3, No. 2, pp. 53-67.

Stage, F. K., Carter, H. C. & Nora, A. (2004), "Path analysis: An introduction and analysis of a decade of research", *The Journal of Educational Research,* Vol. 98, No. 1, pp. 5-13.

Stank, T. P., Daugherty, P. J. & Ellinger, A. E. (1996), "Information exchange, responsiveness and logistics provider performance", *The International Journal of Logistics Management,* Vol. 7, No. 2, pp. 43-58.

Stank, T. P., Keller, S. B. & Daugherty, P. J. (2001), "Supply chain collaboration and logistical service performance", *Journal of Business logistics,* Vol. 22, No. 1, pp. 29-48.

Streiner, D. L. (2003), "Starting at the beginning: An introduction to coefficient alpha and internal consistency", *Journal of Personality Assessment,* Vol. 80, No. 1, pp. 99-103.

Stump, R. L. & Heide, J. B. (1996), "Controlling supplier opportunism in industrial relationships", *Journal of Marketing Research,* Vol. 33, No. 4, pp. 431-441.

Suhr, D. D. (2006), "Exploratory or confirmatory factor analysis?", *Statistics and Data Analysis*, SAS Institure Inc., Cary, 200-231.

Tabachnick, B. G. & Fidell, L. S. (2007). *Using Multivariate Statistics,* Pearson Education Inc., USA.

Tan, K.-C., Kannan, V. R., Handfield, R. B. & Ghosh, S. (1999), "Supply chain management: An empirical study of its impact on performance", *International Journal of Operations & Production Management,* Vol. 19, No. 10, pp. 1034-1052.

Tan, K. C., Kannan, V. R., Hsu, C.-C. & Leong, G. K. (2010), "Supply chain information and relational alignments: Mediators of EDI on firm performance", *International Journal of Physical Distribution & Logistics Management,* Vol. 40**,** No. 5**,** pp. 377-394.

Tashakkori, A. & Teddlie, C. (1998). *Mixed methodology: Combining qualitative and quantitative approaches,* Sage Publications Inc., Thousand Oaks, CA.

Tashakkori, A. & Teddlie, C. (2003), "Issues and dilemmas in teaching research methods courses in social and behavioural sciences: US perspective", *International Journal of Social Research Methodology,* Vol. 6**,** No. 1**,** pp. 61-77.

Teddlie, C. & Tashakkori, A. (2009). *Foundations of Mixed Methods Research: Integrating Quantitative and Qualitative Approaches in the Social and Behavioral Sciences,* Sage Publications Inc, Thousand Oaks, CA.

Teddlie, C. & Yu, F. (2007), "Mixed methods sampling: A typology with examples", *Journal of Mixed Methods Research,* Vol. 1**,** No. 1**,** pp. 77-100.

Thagurathi, R. K. (2007), "A study on procurement function of supply chain management in small and medium-sized enterprises in Pokhara Valley", *The Journal of Nepalese Business Studies,* Vol. 4**,** No. 1**,** pp. 88-95.

Thomas, S. P., Thomas, R. W., Manrodt, K. B. & Rutner, S. M. (2013), "An experimental test of negotiation strategy effects on knowledge sharing intentions in buyer–supplier relationships", *Journal of Supply Chain Management,* Vol. 49**,** No. 2**,** pp. 96-113.

Tranfield, D., Denyer, D. & Smart, P. (2003), "Towards a methodology for developing evidence‐informed management knowledge by means of systematic review", *British Journal of Management,* Vol. 14**,** No. 3**,** pp. 207-222.

Tsanos, C. S., Zografos, K. G. & Harrison, A. (2014), "Developing a conceptual model for examining the supply chain relationships between behavioural antecedents of collaboration, integration and performance", *The International Journal of Logistics Management,* Vol. 25**,** No. 3**,** pp. 418-462.

Varadarajan, P. R. & Cunningham, M. H. (1995), "Strategic alliances: A synthesis of conceptual foundations", *Journal of the Academy of Marketing Science,* Vol. 23**,** No. 4**,** pp. 282-296.

Wang, C.-S. & Chen, C.-Y. (2014), "Developing supply chain strategies model for Taiwanese manufacturing companies", *Journal of American Academy of Business, Cambridge,* Vol. 19**,** No. 2**,** pp. 217-226.

Wang, Z., Ye, F. & Tan, K. H. (2014), "Effects of managerial ties and trust on supply chain information sharing and supplier opportunism", *International Journal of Production Research,* Vol. 52**,** No. 23**,** pp. 7046-7061.

Wathne, K. H. & Heide, J. B. (2000), "Opportunism in interfirm relationships: Forms, outcomes, and solutions", *Journal of Marketing,* Vol. 64**,** No. 4**,** pp. 36-51.

Welker, G. A., Van Der Vaart, T. & Pieter Van Donk, D. (2008), "The influence of business conditions on supply chain information-sharing mechanisms: A study among supply chain links of SMEs", *International Journal of Production Economics,* Vol. 113**,** No. 2**,** pp. 706-720.

Wernerfelt, B. (1984), "A resource‐based view of the firm", *Strategic Management Journal,* Vol. 5**,** No. 2**,** pp. 171-180.

Wiengarten, F., Humphreys, P., Cao, G., Fynes, B. & Mckittrick, A. (2010), "Collaborative supply chain practices and performance: exploring the key role of information quality", *Supply Chain Management: An International Journal,* Vol. 15**,** No. 6**,** pp. 463-473.

Williamson, O. E. (1975). *Markets and hierarchies: Analysis and antitrust implications,* The Free Press, New York.

Williamson, O. E. (1981), "The economics of organization: The transaction cost approach", *American Journal of Sociology,* Vol. 87**,** No. 3**,** pp. 548-577.

Wilson, D. T. (1995), "An integrated model of buyer-seller relationships", *Journal of the Academy of Marketing Science,* Vol. 23**,** No. 4**,** pp. 335-345.

Wong, C., Skipworth, H., Godsell, J. & Achimugu, N. (2012), "Towards a theory of supply chain alignment enablers: A systematic literature review", *Supply Chain Management: An International Journal,* Vol. 17**,** No. 4**,** pp. 419-437.

Wong, C. Y., Boon-Itt, S. & Wong, C. W. (2011), "The contingency effects of environmental uncertainty on the relationship between supply chain integration and operational performance", *Journal of Operations Management,* Vol. 29**,** No. 6**,** pp. 604-615.

Wu, F., Yeniyurt, S., Kim, D. & Cavusgil, S. T. (2006), "The impact of information technology on supply chain capabilities and firm performance: A resource-based view", *Industrial Marketing Management,* Vol. 35**,** No. 4**,** pp. 493-504.

Wu, I.-L., Chuang, C.-H. & Hsu, C.-H. (2014), "Information sharing and collaborative behaviors in enabling supply chain performance: A social exchange perspective", *International Journal of Production Economics,* Vol. 148**,** No.**,** pp. 122-132.

Xu, D., Huo, B. & Sun, L. (2014), "Relationships between intra-organizational resources, supply chain integration and business performance: An extended resource-based view", *Industrial Management & Data Systems,* Vol. 114**,** No. 8**,** pp. 1186-1206.

Yaibuathet, K., Enkawa, T. & Suzuki, S. (2008), "Influences of institutional environment toward the development of supply chain management", *International Journal of Production Economics,* Vol. 115**,** No. 2**,** pp. 262-271.

Yang, T.-M. & Maxwell, T. A. (2011), "Information-sharing in public organizations: A literature review of interpersonal, intra-organizational and inter-organizational success factors", *Government Information Quarterly,* Vol. 28**,** No. 2**,** pp. 164-175.

Ye, F. & Wang, Z. (2013), "Effects of information technology alignment and information sharing on supply chain operational performance", *Computers & Industrial Engineering,* Vol. 65**,** No. 3**,** pp. 370-377.

Yigitbasioglu, O. M. (2010), "Information sharing with key suppliers: A transaction cost theory perspective", *International Journal of Physical Distribution & Logistics Management,* Vol. 40**,** No. 7**,** pp. 550-578.

Youn, S., Hong, P. & Nahm, A. (2008), "Supply chain partnerships and supply chain integration: The mediating role of information quality and sharing", *International Journal of Logistics Systems and Management,* Vol. 4**,** No. 4**,** pp. 437-456.

Yu, J. & Cooper, H. (1983), "A quantitative review of research design effects on response rates to questionnaires", *Journal of Marketing Research,* Vol. 20**,** No. 1**,** pp. 36-44.

Yu, Z., Yan, H. & Cheng, T. E. (2001), "Benefits of information sharing with supply chain partnerships", *Industrial Management & Data Systems,* Vol. 101**,** No. 3**,** pp. 114-121.

Zaheer, N. & Trkman, P. (2017), "An information sharing theory perspective on willingness to share information in supply chains", *International Journal of Logistics Management, The,* Vol. 28**,** No. 2**,** pp. 417-443.

Zelbst, P. J., Green Jr, K. W., Sower, V. E. & Baker, G. (2010), "RFID utilization and information sharing: The impact on supply chain performance", *Journal of Business & Industrial Marketing,* Vol. 25**,** No. 8**,** pp. 582-589.

Zhang, J. & Chen, J. (2013), "Coordination of information sharing in a supply chain", *International Journal of Production Economics,* Vol. 143**,** No. 1**,** pp. 178-187.

Zhou, H. & Benton Jr, W. (2007), "Supply chain practice and information sharing", *Journal of Operations Management,* Vol. 25**,** No. 6**,** pp. 1348-1365.

Zikmund, W. G., Babin, B. J., Carr, J. C. & Griffin, M. (2010). *Business Research Methods,* CENGAGE Learning, USA.

Zikmund, W. G., Babin, B. J., Carr, J. C. & Griffin, M. (2014). *Business Research Methods,* CENGAGE Learning, USA.

APPENDICES

APPENDIX I: COVERING LETTER (SURVEY)

UNIVERSITY of TASMANIA | AMC Australian Maritime College

Identifying the Factors Affecting Information Sharing in Supply Chains and the Effect of Information Sharing on Supply Chain Performance – A Context of Nepal

Dear Sir/Madam,

You are invited to participate in a survey which is the major part of a PhD research focusing on **information sharing in supply chains** in Nepal. The main aims of this research are to:

1. Identify the factors that affect information sharing in supply chains;
2. Examine how these factors affect operational and strategic information sharing among supply chain participants; and
3. Evaluate how information sharing affects supply chain performance.

You will be asked to answer questions regarding your business, your business relationships with your suppliers/customers/service providers and your supply chain performance. All individual responses collected through this survey, including the results, will be treated as **strictly confidential** and the **anonymity** of companies and individuals is assured. They will only be used for research purposes and reported in a statistical form. For your assurance, this survey has been approved by the **Tasmanian Social Science Human Research Ethics Committee (HREC)**. The ethics reference number is **H0015234**.

The survey will take approximately **30 minutes** of your time to complete. Your participation in this study is entirely voluntary and you have the right to withdraw from it at any time without any effect. If you have any questions or would like further information, please do not hesitate to call or email Ms. Reenu Maskey at the contact details provided below.

Your participation will make a great contribution towards a better understanding of information sharing between supply chain partners and its effect on supply chain performance in Nepal.

If you agree to participate, please tick the box and continue with the survey. ☐

Thank you for your help.

Yours faithfully,
Reenu Maskey
Locked Bag 1397
Launceston, Tasmania, 7250 Australia
Email: reenu.maskey@utas.edu.au
Tel: +61 452 554 275

UNIVERSITY of TASMANIA | AMC Australian Maritime College

CRICOS 00586B

APPENDIX II: EMAIL INVITATION TO PARTICIPATE IN THE SURVEY

UNIVERSITY of TASMANIA | AMC Australian Maritime College

Invitation to Participate in the Survey about Information Sharing in Supply Chains in Nepal

Dear Sir/Madam,

My name is Reenu Maskey and I am a doctoral candidate at the Australian Maritime College, University of Tasmania, Australia. As your insights are expected to be highly relevant to this research, I would like to invite you to participate in a survey which is the major part of my research focusing on information sharing in supply chains in Nepal.

Your participation is very important for this study. The results of this survey aim to assist the companies in Nepal as follows:

1. Understand why and under what circumstances supply chain participants in Nepal are willing to share information with each other;
2. Evaluate how information sharing will affect supply chain performance of the companies.
3. Explore potential areas of improvement to enhance information sharing and supply chain performance.

It will take approximately 30 minutes of your precious time to complete the survey.

If you wish, you can request a hard copy or an electronic version of the survey by replying to this email or calling me on the number provided below.

All individual responses collected through the survey, including the results, will be treated as **strictly confidential** and the **anonymity** of companies and individuals is assured. Your participation is entirely voluntary and you are free to withdraw at any time without providing an explanation.

If you have any queries, please do not hesitate to email me at reenu.maskey@utas.edu.au or call me on +61 452 554 275.

Yours Faithfully,

Reenu Maskey
PhD Candidate
Department of Maritime and Logistics Management
Australian Maritime College | University of Tasmania
T: +61 452 554 275
Email: reenu.maskey@utas.edu.au
www.amc.edu.au

APPENDIX III: SURVEY INSTRUMENT

UNIVERSITY of TASMANIA | AMC Australian Maritime College

Identifying the Factors Affecting Information Sharing in Supply Chain and the Effect of Information Sharing on Supply Chain Performance – A Context of Nepal

A. Company/Respondent Profile

A.1. Please indicate your position in the company.

☐ CEO/President/Owner ☐ Managing Director

☐ General Manager ☐ Other, please specify _____

A.2. Please indicate the number of years you have been in this position.

☐ Less than 5 years ☐ 5-10 years ☐ 11-20 years ☐ More than 20 years

A.3. Please indicate the number of years your company has been established.

☐ Less than 5 years ☐ 5 - 10 years ☐ 11 - 20 years ☐ More than 20 years

A.4. Please indicate your company's main business/businesses (Tick more than one if applicable).

☐ Supplier ☐ Producer/Grower ☐ Manufacturer ☐ Distributor

☐ Dealer ☐ Wholesaler ☐ Retailer ☐ Transport/Logistics Provider

A.5. Please indicate your industry type.

☐ Food, Beverage, Tobacco ☐ Textile, Clothing, Footwear, Leather ☐ Soap, Detergent, Chemical, Paint

☐ Wood, Paper, Jute ☐ Brick, Cement, Marble, Tiles ☐ Pharmaceutical, Herbal Medicine

☐ Iron, Steel, Pipes, Aluminium ☐ Plastic, Foam, Polythene, Rubber ☐ Electric, Electronics, Battery

☐ Other, please specify _____

A.6. Please indicate the number of employees in your company.

☐ Less than 50 ☐ 50-99 ☐ 100-199 ☐ More than 200

A.7. Does your company engage in international trade?

☐ Yes ☐ No

B. Factors

To what extent do you agree or disagree with the following statements where: **5-Strongly agree | 4-Agree | 3-Neither agree nor disagree | 2-Disagree | 1-Strongly disagree | 0-Not applicable|**							
1	Our partners have always helped us in need.	☐5	☐4	☐3	☐2	☐1	☐0
2	The information provided by our partners is reliable.	☐5	☐4	☐3	☐2	☐1	☐0
3	Our partners are honest with us in business dealings.	☐5	☐4	☐3	☐2	☐1	☐0
4	We intend to continue the relationship with our partners for a long term.	☐5	☐4	☐3	☐2	☐1	☐0
5	We intend to strengthen our relationship with our partners.	☐5	☐4	☐3	☐2	☐1	☐0
6	Both sides in the relationship make decisions that are mutually beneficial.	☐5	☐4	☐3	☐2	☐1	☐0
7	Our partners can influence our company's decision making.	☐5	☐4	☐3	☐2	☐1	☐0
8	Our dependence on our partners has made them more powerful than us.	☐5	☐4	☐3	☐2	☐1	☐0
9	The owner/manager of our company attends the social functions organised by the owner/manager of our partner companies.	☐5	☐4	☐3	☐2	☐1	☐0
10	Personal connections with our partner companies are an added advantage in business decision making.	☐5	☐4	☐3	☐2	☐1	☐0
11	Personal connections play an important role in our business.	☐5	☐4	☐3	☐2	☐1	☐0
12	Our company and our partners have *similar goals and objectives.*	☐5	☐4	☐3	☐2	☐1	☐0
13	Our company and our partners have *similar views towards information sharing.*	☐5	☐4	☐3	☐2	☐1	☐0
14	Our company and our partners have *similar views towards inter-organisational relationship.*	☐5	☐4	☐3	☐2	☐1	☐0
15	Our top management team considers *relationships with trading partners* to be important to enhance supply chain performance.	☐5	☐4	☐3	☐2	☐1	☐0
16	Our top management team considers *information sharing with trading partners* to be important to enhance supply chain performance.	☐5	☐4	☐3	☐2	☐1	☐0
17	Our top management team considers *managerial ties with the top executives of our partner companies* to be important to enhance supply chain performance.	☐5	☐4	☐3	☐2	☐1	☐0
18	Our company is concerned about *competitors' market position.*	☐5	☐4	☐3	☐2	☐1	☐0
19	Our company is concerned about *competitors' strength.*	☐5	☐4	☐3	☐2	☐1	☐0
20	Our partners have a good overall reputation in the market.	☐5	☐4	☐3	☐2	☐1	☐0
21	Our partners do not change their partners very often.	☐5	☐4	☐3	☐2	☐1	☐0

22	Our company will invest in information sharing with our partners if *the costs are high but the outcome is valuable.*	☐5	☐4	☐3	☐2	☐1	☐0
23	Our company will invest in information sharing with our partners if *the outcome is immediate.*	☐5	☐4	☐3	☐2	☐1	☐0
24	Our company will invest in information sharing with our partners if *the costs and benefits are shared between both companies.*	☐5	☐4	☐3	☐2	☐1	☐0
25	Our company monitors our partners to detect whether they comply with established agreements.	☐5	☐4	☐3	☐2	☐1	☐0
26	Our company monitors our partners to detect whether they have provided any incorrect information.	☐5	☐4	☐3	☐2	☐1	☐0
27	Our company monitors our partners to detect their wrongful actions for personal benefits.	☐5	☐4	☐3	☐2	☐1	☐0
28	We offer *incentives* to our partners to provide improved products/service.	☐5	☐4	☐3	☐2	☐1	☐0
29	We offer *incentives* to our partners to provide us with useful information.	☐5	☐4	☐3	☐2	☐1	☐0
30	We offer *incentives* to our partners to contribute to increasing our profits.	☐5	☐4	☐3	☐2	☐1	☐0
31	We share information with our partners via *online marketing*.	☐5	☐4	☐3	☐2	☐1	☐0
32	We share information with our partners via *electronic catalogues*.	☐5	☐4	☐3	☐2	☐1	☐0
33	We share information with our partners via *bar coding/automatic identification system*.	☐5	☐4	☐3	☐2	☐1	☐0
34	Our partners provide us with useful information.	☐5	☐4	☐3	☐2	☐1	☐0
35	Our partners provide us with timely information.	☐5	☐4	☐3	☐2	☐1	☐0
36	Our partners provide us with easy-to-understand information.	☐5	☐4	☐3	☐2	☐1	☐0
37	We share a long-term relationship with our partners.	☐5	☐4	☐3	☐2	☐1	☐0
38	We gain mutual benefits from the relationship with our partners.	☐5	☐4	☐3	☐2	☐1	☐0
39	Our company and our partners are always cooperative in problem solving.	☐5	☐4	☐3	☐2	☐1	☐0
40	There is no need of contracts in our relationship with our partners.	☐5	☐4	☐3	☐2	☐1	☐0
41	Contracts will hinder the development of a good business relationship.	☐5	☐4	☐3	☐2	☐1	☐0
42	Contracts will limit the communication and information-based operations between our company and our partners.	☐5	☐4	☐3	☐2	☐1	☐0
43	We communicate with our immediate supply chain partners only.	☐5	☐4	☐3	☐2	☐1	☐0
44	We never deal with our indirect supply chain partners.	☐5	☐4	☐3	☐2	☐1	☐0

45	Our indirect supply chain partners are of no concern to us.	☐5	☐4	☐3	☐2	☐1	☐0
46	Our company and our partners meet regularly to discuss *mutual goals and objectives.*	☐5	☐4	☐3	☐2	☐1	☐0
47	Our company and our partners meet regularly to discuss *market condition.*	☐5	☐4	☐3	☐2	☐1	☐0
48	Our company and our partners meet regularly to discuss *quality improvement.*	☐5	☐4	☐3	☐2	☐1	☐0
49	Our company makes joint plans with our partners.	☐5	☐4	☐3	☐2	☐1	☐0
50	We have collaborative relationship with our partners.	☐5	☐4	☐3	☐2	☐1	☐0
51	We face uncertainties due to changing customer demands.	☐5	☐4	☐3	☐2	☐1	☐0
52	We face difficult situations due to supply uncertainties.	☐5	☐4	☐3	☐2	☐1	☐0
53.	The government has enforced laws/regulations that provide stable and reliable conditions for business operations.	☐5	☐4	☐3	☐2	☐1	☐0
54	Government policies have increased our confidence to establish collaborative relationships with our partners.	☐5	☐4	☐3	☐2	☐1	☐0
55	Government policies support the development of information technology.	☐5	☐4	☐3	☐2	☐1	☐0
56	National culture has affected the way we communicate with our partners.	☐5	☐4	☐3	☐2	☐1	☐0
57	National culture has affected the amount of information we share with our partners.	☐5	☐4	☐3	☐2	☐1	☐0
58	National culture has affected our relationships with our international business partners.	☐5	☐4	☐3	☐2	☐1	☐0

C. Information Sharing

F.1.To what extent do your company and your partners share the following *operational information* where: **5-Very great extent | 4-Great extent | 3-Some extent | 2-Little extent | 1-Very little extent | 0-Not applicable**|							
IS1	Changing customer demand	☐5	☐4	☐3	☐2	☐1	☐0
IS2	Order status	☐5	☐4	☐3	☐2	☐1	☐0
IS3	Delivery schedule	☐5	☐4	☐3	☐2	☐1	☐0
IS4	Production schedule	☐5	☐4	☐3	☐2	☐1	☐0
IS5	Inventory level	☐5	☐4	☐3	☐2	☐1	☐0
F.2. To what extent do your company and your partners share the following *strategic information* where: **5-Very great extent | 4-Great extent | 3-Some extent | 2-Little extent | 1-Very little extent | 0-Not applicable**|							
IS6	Pricing	☐5	☐4	☐3	☐2	☐1	☐0

IS7	New product development	☐5	☐4	☐3	☐2	☐1	☐0
IS8	Distribution plans	☐5	☐4	☐3	☐2	☐1	☐0
IS9	Upcoming promotions	☐5	☐4	☐3	☐2	☐1	☐0

D. Supply Chain Performance

To what extent do you agree or disagree with the following statements where: **5-Strongly agree | 4-Agree | 3-Neither agree nor disagree | 2-Disagree | 1-Strongly disagree | 0-Not applicable|**							
P1	Our *logistics costs* are kept at a minimum level.	☐5	☐4	☐3	☐2	☐1	☐0
P2	Our *inventory costs* are kept at a minimum level.	☐5	☐4	☐3	☐2	☐1	☐0
P3	Our *operations costs* are kept at a minimum level.	☐5	☐4	☐3	☐2	☐1	☐0
P4	Our partners' products have *good quality.*	☐5	☐4	☐3	☐2	☐1	☐0
P5	Our partners' products have *low defect rate.*	☐5	☐4	☐3	☐2	☐1	☐0
P6	Our partners' product *damages/loss* on arrival is very low.	☐5	☐4	☐3	☐2	☐1	☐0
P7	Our partners deliver orders at our *preferred time*.	☐5	☐4	☐3	☐2	☐1	☐0
P8	Our partners' deliveries are *reliable*.	☐5	☐4	☐3	☐2	☐1	☐0
P9	Our partners' deliveries are always *accurate.*	☐5	☐4	☐3	☐2	☐1	☐0
P10	We cope well with *uncertain customer demand.*	☐5	☐4	☐3	☐2	☐1	☐0
P11	We cope well with *changing product specification.*	☐5	☐4	☐3	☐2	☐1	☐0
P12	We cope well with our *capacity* to meet customer needs.	☐5	☐4	☐3	☐2	☐1	☐0
P13	We cope well with *delivery requirements.*	☐5	☐4	☐3	☐2	☐1	☐0
P14	We cope well with *storage/warehousing* facility.	☐5	☐4	☐3	☐2	☐1	☐0

Thank you for your time in completing this questionnaire!

APPENDIX IV: REMINDER EMAIL

Gentle Reminder to be sent to the Sample Population

RE: Survey about Information Sharing in Supply Chains in Nepal

Dear Sir/Madam,

You must have received an email two weeks ago inviting you to participate in a survey focusing on supply chain information sharing in Nepal. I would like to take the opportunity to thank you if you have already completed the survey. I am writing to you today to remind you about the survey just in case you have forgotten. If you wish to complete the survey online, you can simply click here and follow the instructions. If you wish, you can also request a hard copy or an electronic version of the survey by replying to this email or calling me on +61 452 554 275.

The survey will take approximately **30 minutes** of your time to complete. I can understand that you are a busy person, but your help will make a difference to my study as your insights are expected to be highly relevant to this research. However, your participation is completely voluntary and you have the right to decline or withdraw. All individual responses collected through the survey, including the results, will be treated as **strictly confidential** and the **anonymity** of companies and individuals is assured.

If you have any queries, please do not hesitate to email me at reenu.maskey@utas.edu.au or call me on +61 452 554 275.

Thanking you in advance.

Yours faithfully,
Reenu Maskey
PhD Candidate
Department of Maritime and Logistics Management
Australian Maritime College | University of Tasmania
T: +61 452 554 275
Email: reenu.maskey@utas.edu.au
www.amc.edu.au

CRICOS 00586B

APPENDIX V: INVITATION TO PARTICIPATE IN AN INTERVIEW

UNIVERSITY of TASMANIA | AMC Australian Maritime College

Invitation to Participate in an Interview about Information Sharing in Supply Chains in Nepal

Dear Sir/Madam,

My name is Reenu Maskey and this research is carried out as a partial fulfilment of my Doctor of Philosophy Degree at the Australian Maritime College, University of Tasmania, Australia. The main focus of this research is to identify the influential factors in supply chain information sharing in Nepal and to examine the effect of information sharing on supply chain performance.

As your insights are expected to be highly relevant to this research, I kindly request you to participate in an interview that will help me to gain a deep understanding of the current status of supply chain information sharing in Nepal.

It will take between 45-60 minutes of your precious time to complete the interview. All individual responses collected through the interview, including the results, will be treated as **strictly confidential** and the **anonymity** of companies and individuals is assured. If you agree to participate, please sign the attached consent form and let me know the best time and venue to conduct the interview by replying to this email. While your participation is very important for this study, we will respect your decision to decline or withdraw. Your participation is entirely voluntary and you are free to withdraw at any time without providing an explanation.

If you have any queries, please do not hesitate to email me at reenu.maskey@utas.edu.au or call me on +61 452 554 275.

Yours faithfully,

Reenu Maskey

PhD Candidate
Department of Maritime and Logistics Management
Australian Maritime College | University of Tasmania
T: +61 452 554 275
Email: reenu.maskey@utas.edu.au
www.amc.edu.au

APPENDIX VI: PARTICIPANT CONSENT FORM

UNIVERSITY of TASMANIA | AMC Australian Maritime College

PARTICIPANT CONSENT FORM

Identifying the Factors Affecting Information Sharing in Supply Chains and the Effect of Information Sharing on Supply Chain Performance – A Context of Nepal

This consent form is for interview participants from supply chains members in manufacturing and agricultural sectors in Nepal including suppliers, manufacturers/producers, distributors, transport companies and retailers.

Participants can withdraw within 28 days after the interview.

1. I agree to take part in the research study named above.
2. I have read and understood the Information Sheet for this study.
3. The nature and possible effects of the study has been explained to me.
4. I understand that the study involves me participating in a face-to-face interview for approximately 45-60 minutes which will be recorded with my consent for future reference.

   I agree to have the interview voice recorded. Yes ☐ No ☐
5. I understand that there are no specific risks anticipated with my participation in this study.
6. I understand that all research data and information will be stored safely in a locked cabinet at the University of Tasmania premises for five years from the publication of the study results and will then be destroyed.
7. Any questions that I have asked have been answered to my satisfaction.
8. I understand that the researcher(s) will maintain confidentiality and that any information that I supply to the researcher(s) will be used only for the purposes of the research.
9. I understand that the results of the study will be published so that I cannot be identified as a participant.

10. I understand that my participation is voluntary and that I may withdraw at any time without any effect.
11. I understand that I will be able to withdraw any data that I have supplied within 28 days after the interview/survey.

Participant's Name: _____

Participant's Signature: _____

Date: _____

Statement by Investigator

☐ I have explained the project and the implications of participation to this participant and I believe that he/she understands the implications of participations.

If the investigator has not had an opportunity to talk to the participants prior to them participating, the following must be ticked.

☐ The participant has received the Information Sheet which includes the contact details of the investigator so that they can contact the investigator before giving his/her consent for participation.

Investigator's Name: _____

Investigator's Signature: _____

Date: _____

APPENDIX VII: INTERVIEW INSTRUMENT

Interview Questions

Study Title: Factors Affecting Information Sharing in Supply Chains and the effect of Information Sharing on Supply Chain Performance – A Context of Nepal

Code number:

Date of interview:

Time interview started & ended:

Total length of interview:

Part A: Company Profile

1. What is your main business and how long have you been doing it?
2. What is your position in the company and how long have you been in this position?
3. How many employees do you have?
4. Does your company engage in international trade?

Part B: Supply Chain and Supply Chain Partner

1. Who do you do business with (suppliers/customers/logistics service providers) and how many business partners do you have? Do you know other members in your supply chain?
2. Who are your most important trading partners and why?
3. How do you maintain strong relationships with these partners?
4. Do you have any contractual agreements with these partners? Why?

Part C: Information Sharing

1. Are you aware of the importance of information sharing in supply chains? What is your opinion on supply chain information sharing in Nepal?
2. What kind of information does your company share and with which partners (suppliers, customer and logistics provider)? What kind of information do you feel uncomfortable to share and why?
3. What factors do you think have influenced your company's information sharing decision with your partners? How do you think factors such as uncertainty, competition, government support and national culture affect information sharing?
4. What communication tools are used to get the information you need? What do you think about the role of information technology in improving information sharing? What IT arrangements have you made to enhance information sharing?

Part D: Effect of Information Sharing

1. What kind of information do you need for your: a) day-to-day operations; and b) long-term business plans?
2. How do you think information sharing affects your supply chain performance?

3. What efforts has your firm made to improve information sharing with your trading partners?
4. Can you suggest some measures to improve information sharing between supply chain partners in Nepal?

APPENDIX VIII: SAMPLE LIST

S. No.	Company Name	Role in Supply Chain
1	Gorkha Brewery Pvt. Ltd.	Manufacturing (FMCG)
2	Him Ganga Beverage Pvt. Ltd.	Manufacturing
3	United Spirits Nepal Pvt. Ltd	Manufacturing/Wholesale/Retail
4	Himalayas Spring Water Pvt. Ltd.	Manufacturing (FMCG)
5	The Nepal Distilleries (P) Ltd.	Supplier/Manufacturing
6	Bottlers Nepal Limited	Manufacturing/Retail
7	Highland Beverages Pvt. Ltd.	Manufacturing (FMCG)
8	Himalayan Distillery Limited	Manufacturing/Retail
9	Tiger Breweries Industries Pvt. Ltd.	Manufacturing (FMCG)
10	Shree Distillery (P) Ltd.	Manufacturing (FMCG)/Distributor
11	Asian Pharmaceuticals Pvt. Ltd.	Manufacturing
12	Deurali Janta Pharmaceuticals	Manufacturing
13	Dabur Nepal Pvt. Ltd.	Manufacturing (FMCG)
14	Qmed Formulation Pvt. Ltd	Manufacturing
15	Quest Pharmaceuticals Pvt. Ltd.	Manufacturing
16	Nepal Oriend Magnesite (P) Ltd.	Manufacturing/Retail
17	Nepal Pashmina Industry	Manufacturing/Wholesale/Dealer/Retail
18	Reliance Spinning Mills Ltd.	Manufacturing
19	Yeti Fabric Ltd.	Manufacturing
20	Harisiddhi Brick &Tile Factory Ltd.	Manufacturing
21	Godawari Marble Industries (P) Ltd.	Manufacturing
22	Agni Cement Industries Pvt. Ltd.	Manufacturing/Wholesale
23	Ashoka Carbon & Allied Industries Pvt. Ltd.	Manufacturing
24	Fujima Oil Company Pvt. Ltd.	Manufacturing/Dealer
25	Ambe Cement Pvt. Ltd	Manufacturing
26	Janakpur Cigarette Factory Ltd.	Manufacturing
27	Jagdamba Cement Industries Pvt. Ltd.	Manufacturing/Wholesale
28	Bhaktapur Ita Tatha Tayal Udyog Pvt. Ltd.	Manufacturing
29	Bishal Cement Industries Pvt. Ltd.	Manufacturing/Wholesale/Dealer
30	Rijalco Fenolex Polypark Industries Pvt Ltd.	Manufacturing/Dealer
31	Kalpana Craft	Manufacturing
32	Logo Industries Nepal (P) Ltd.	Manufacturing/Dealer/Distributor
33	Sumy Pharmaceuticals Pvt. Ltd.	Manufacturing/Retail
34	Nature Knit Pvt. Ltd.	Manufacturing
35	Nepal Oil Corporation Ltd	Supplier/Distributor
36	Brij Cement Industries Pvt. Ltd.	Manufacturing/Retail
37	Pashupati Iron & Steel (P) Ltd.	Manufacturing/Dealer/Distributor
38	Ghorahi Cement Industry Pvt. Ltd	Manufacturing
39	Hetauda Cement Industries Ltd.	Manufacturing/Distributor

S. No.	Company Name	Role in Supply Chain
40	Sarbottam Cement Pvt. Ltd	Manufacturing
41	Bhudeo Khadya Udyog	Manufacturing/Grower
42	Siddhartha Flour Mills Pvt. Ltd	Manufacturing
43	Asian Thai Foods (P) Ltd.	Distributor/Wholesale/Retail
44	Shree Shiva Shakti Ghee Udyog Pvt. Ltd.	Manufacturing
45	CG Foods (Nepal) Ltd.	Manufacturing/Retail
46	Sitaram Gokul Milks Kathmandu Ltd.	Manufacturing
47	Ganapati Vanaspati Pvt. Ltd.	Manufacturing (FMCG)
48	Gandaki Oil Mills	Manufacturing (FMCG)
49	Shree Pashupati Biscuit Industries (P) Ltd.	Manufacturing (FMCG)
50	Everest Sugar & Chemical Industries (P) Ltd.	Manufacturing/Grower
51	Sujal Foods	Manufacturing (FMCG)
52	Himalayan Snax & Noodles (P) Ltd.	Manufacturing/Retail/Wholesale
53	Jagdamba Foods Pvt. Ltd	Manufacturing (FMCG)/Wholesale
54	Nandan Ghee and Oil Industries (P) Ltd.	Manufacturing (FMCG)
55	NEBICO Private Limited	Manufacturing (FMCG)/Wholesale
56	Sujal Dairy Pvt. Ltd.	Manufacturing (FMCG)
57	Closure Systems International Nepal Pvt. Ltd.	Manufacturing
58	AL-TECH (P) Ltd.	Manufacturing
59	Gorakhkali Rubber Udyog Ltd.	Manufacturing
60	TSN Plastcare Industries Pvt. Ltd.	Manufacturing/Dealer/Distributor
61	Gorkha Lahari Pvt. Ltd.	Manufacturing
62	Siddhartha Group	Manufacturing/Dealer/Distributor
63	Surya Nepal (P) Ltd.	Manufacturing
64	CG Electronics Pvt. Ltd.	Manufacturing/Wholesale
65	Him Electronics Private Limited	Manufacturing/Distributor/Retailer
66	Janta Cable Industries Pvt. Ltd.	Manufacturing
67	Nepali Paper Products Pvt. Ltd.	Manufacturing/Supplier
68	Lumbini Vidyut Udyog Pvt. Ltd.	Manufacturing/Supplier/Wholesale
69	Nepal Bitumen & Barrel Udyog Ltd.	Manufacturing
70	Nepal Bayern Electric Pvt. Ltd.	Manufacturing
71	Nepal Hydro & Electric Limited	Manufacturing
72	Sipradi Energy Pvt. Ltd.	Manufacturing/Wholesale
73	Trishakti Cable Industries (P) Ltd.	Manufacturing
74	Transweld Nepal Pvt. Ltd.	Manufacturing/Distributor
75	Furniture Land Store Pvt. Ltd.	Distributor/Dealer/Wholesale/Retail
76	Homely Furniture (P) Ltd.	Distributors/Wholesale
77	Aarati Soap & Chemical Industries Pvt. Ltd.	Manufacturing
78	Mahashakti Soap & Chemical Industries	Manufacturing
79	Ambe Steels Pvt. Ltd.	Manufacturing
80	Jagdamba Steels Pvt. Ltd.	Manufacturing

S. No.	Company Name	Role in Supply Chain
81	Reliance Paper Mills Pvt. Ltd.	Manufacturing/Grower
82	Kiran Shoes Manufacturers	Manufacturing
83	Ashok Steel Industries Pvt. Ltd.	Manufacturing
84	Hama Iron and Steel Industries (P) Ltd.	Manufacturing
85	Hulas Steel Industries (P) Ltd.	Manufacturing
86	Kamala Rolling Mills Pvt. Ltd.	Manufacturing
87	Laxmi Steels Pvt. Ltd.	Manufacturing
88	Panchakanya Steel (P) Ltd.	Manufacturing
89	Saakha Steel Industries (P) Ltd.	Manufacturing/Dealer/Distributor
90	Arihant Multifibers Ltd.	Manufacturing
91	Himal Iron & Steel (P) Ltd.	Manufacturing
92	Nepal Jute Industries	Manufacturing/Wholesale
93	Berger Jenson & Nicholson (Nepal) Pvt. Ltd.	Manufacturing
94	Pashupati Paints (P) Ltd.	Manufacturing
95	Jyoti Spinning Mills Ltd.	Manufacturing
96	Gorkha Ayurved Company (P) Ltd.	Manufacturing
97	Dugar Spices & Food Products (Pvt.) Ltd.	Manufacturing
98	Unilever Nepal Limited	Manufacturing
99	MB Petrolube Industries Pvt. Ltd.	Manufacturing
100	Vinod Metal Industries Pvt. Ltd.	Manufacturing
101	AVCO International Pvt. Ltd.	Dealer/Distributor
102	Vishal Group	Supplier/Manufacturer/Distributor
103	The Nepal Distilleries (P) Ltd.	Manufacturing
104	Logo Industries Nepal (P) Ltd.	Manufacturing/Supplier
105	Exotic Oriental Crafts Pvt. Ltd.	Manufacturing/Supplier/Wholesale
106	Chachan Group	Manufacturing/Supplier
107	Kirti Carpet Industries	Manufacturing/Supplier
108	Golyan Group	Manufacturing/Supplier
109	YASH International	Manufacturing/Supplier
110	Panchakanya Plastic Industries (P) Ltd.	Manufacturing
111	Himalayan Feeds (P) Ltd.	Manufacturing/Supplier
112	Nepal Wellhope Agri-Tech Pvt. Ltd.	Manufacturing/Supplier
113	Bhajuratna Engineering & Sales (P) Ltd.	Supplier/Dealer/Distributor
114	Probiotech Industries Pvt. Ltd.	Grower/Supplier/Manufacturing
115	Ganpati Rosin & Turpentine Industries Pvt. Ltd.	Grower/Supplier/Manufacturing
116	Hightension Switchgears P. Ltd.	Supplier
117	Himal Refrigeration and Electrical Industries Pvt. Ltd.	Supplier
118	Samsher and Ganga Devi Tea Estate Pvt. Ltd.	Grower
119	Padam Tea Estate	Grower
120	Guranse Tea Estate Pvt. Ltd.	Grower
121	Himalayan Ontop Organic Coffee Estate (P) Ltd.	Grower/Dealer/Distributor

S. No.	Company Name	Role in Supply Chain
122	Giri Bandhu Tea Estatet Pvt. Ltd.	Grower
123	Agri Breeders Pvt. Ltd.	Grower
124	DRN Overseas Pvt. Ltd.	Dealer/Distributor
125	Civil Group Pvt. Ltd.	Manufacturing/Dealer/Distributor
126	Laxmi Intercontinental Pvt. Ltd.	Dealer/Distributor
127	Trithunga Trading Concern	Dealer/Distributor
128	CAS Trading House Pvt. Ltd.	Dealer/Distributor
129	Allied Trade Link International Pvt. Ltd.	Dealer/Distributor
130	ICTC (P) Ltd.	Dealer/Distributor
131	Ishan Infosys Pvt. Ltd.	Distributor/Retailer
132	IMS Teletime Nepal Pvt. Ltd.	Dealer/Distributor
133	United Distributors	Distributors
134	Classic Diamond Jewellers Pvt. Ltd.	Retailer/Distributor
135	IME Mart Pvt. Ltd.	Retailer
136	Bhatbhateni Supermarket	Retailer
137	Rajesh Sanatery Wares	Supplier/wholesale/distributor/dealer/ Retailer/
138	Saleways Supermarket	Retailer
139	Allied Food Industry	Retailer
140	Goshali Departmental Store	Retailer
141	Pragati Group	Manufacturing/Dealer/Distributor
142	CG Mart	Retailer
143	Ridhi Sidhi Enterprises Pvt. Ltd.	Supplier
144	Prime International (P) Ltd.	Dealer/Distributor
145	Integrated Mobility Solutions Pvt. Ltd.	Supplier/Dealer/Distributor/Retail
146	Universal Wings Marketing Centre Pvt. Ltd.	Supplier/Dealer/Distributor/Wholesale
147	IME Group	Supplier/Dealer/Distributor
148	Paramount Carpet Industry	Manufacturing/Supplier
149	Momento Apparels (P) Ltd.	Manufacturing/Supplier
150	Saurabh Photo International	Supplier
151	Agni Incorporated Pvt. Ltd	Dealer/Distributor
152	M.A.W. Enterprises Pvt. Ltd.	Dealer/Distributor
153	Navin Distributors Pvt. Ltd.	Distributors
154	Tele Talk Nepal	Distributors
155	Ekta Book Distributors	Grower/Manufacturing/Distributors/ Dealer/Wholesaler/Retailer
156	Sipradi Autoparts Private Ltd. (SAPL)	Distributors
157	Syakar Co. (P) Ltd.	Dealer/Distributor
158	Sipradi Trading Pvt. Ltd	Dealer/Distributor
159	United Traders Syndicate (P) Ltd.	Dealer
160	Trade Link Global Pvt. Ltd.	Dealer/Distributor
161	CM Trading	Distributors

S. No.	Company Name	Role in Supply Chain
162	Interstate Multi-modal Transport (P) Ltd.	LSP
163	Shangri-la Freight Pvt. Ltd.	LSP
164	Speedway Cargo Pvt. Ltd.	LSP
165	Swift Air Cargo Services O. Ltd.	LSP
166	PFL Logistics Pvt. Ltd.	LSP
167	Quality Freight Service Pvt. Ltd.	LSP
168	Royal Express Cargo (P) Ltd.	LSP
169	Aramex Corporate	LSP
170	Skynet Worldwide Express Nepal Pvt. Ltd.	LSP
171	Mass Global Freight Pvt. Ltd.	LSP
172	Aero-Ship Logistics Nepal Pvt. Ltd.	LSP
173	Nepal Shipping & Air Logistics Pvt. Ltd.	LSP
174	Sufficient Cargo Pvt. Ltd.	LSP
175	Shangrila Tours Pvt. Ltd.	LSP
176	Smooth Cargo Movers (P) Ltd.	LSP
177	Atlas De Cargo P. Ltd	LSP
178	Muktinath De Cargo (P.) Ltd.	LSP
179	Bridges of Travel (Pvt) Ltd	LSP
180	Total Transport Systems Pvt. Ltd	LSP
181	United World Logistics (P) Ltd.	LSP
182	Trans Global Services Pvt. Ltd.	LSP
183	Highland Air and Ocean Logistics Pvt. Ltd.	LSP
184	Gandaki Freight International P. Ltd.	LSP
185	Mount Pumori Air Cargo (P) Ltd.	LSP
186	Das World Wide Freight International	LSP
187	Air Link Nepal Pvt. Ltd.	LSP
188	Bhawani Freight & Forwarding Agency P. L	LSP
189	Dynamic Freight Pvt. Ltd.	LSP
190	Eastern Clearing & Forwarding Agency Pvt.Ltd.	LSP
191	Global Merchants & Logistics P.Ltd.	LSP
192	Himalayan Freight International (Pvt.) Ltd.	LSP
193	Inter-Continental Logistics Pvt. Ltd.	LSP
194	Laxmi Shipping & Air Logistics Pvt. Ltd.	LSP
195	Mount Everest Freight International P. Ltd.	LSP
196	Nepa Agency & Co. (P) Ltd.	LSP
197	Mass Nepal Logistics Pvt. Ltd.	LSP
198	Reliance Logistics Pvt. Ltd.	LSP
199	Royal Express Cargo (P) Ltd.	LSP
200	Star Light Express Pvt. Ltd.	LSP
201	Trans Global Services Pvt. Ltd.	LSP
202	Victoria Cargo Pvt. Ltd.	LSP

S. No.	Company Name	Role in Supply Chain
203	Blue Moon Logistics Pvt. Ltd.	LSP
204	Bridge Logistics Pvt. Ltd.	LSP
205	Everest Express Tours and Travels (P) Ltd.	LSP
206	Flash Freight Logistics Pvt. Ltd.	LSP
207	Himali International Cargo (P.) Ltd.	LSP
208	Jet Express Tours and World Transportation Pvt. Ltd.	LSP
209	Legend Cargo (P.) Ltd.	LSP
210	Multi Freight (P) Ltd.	LSP
211	Nine Star Cargo Pvt. Ltd.	LSP
212	Nepal Air Courier & Cargo Service Pvt. Ltd.	LSP
213	Multi Freight (P) Ltd.	LSP
214	Oriental Cargo Service P. Ltd.	LSP
215	S&S Logistics P. Ltd.	LSP

APPENDIX IX: ETHICS APPROVAL LETTER

Social Science Ethics Officer
Private Bag 01 Hobart
Tasmania 7001 Australia
Tel: (03) 6226 2763
Fax: (03) 6226 7148
Katherine.Shaw@utas.edu.au

HUMAN RESEARCH ETHICS COMMITTEE (TASMANIA) NETWORK

UTAS

24 September 2015

Dr Jiangang Fei
National Centre for Ports and Shipping
Australian Maritime College

Student Researcher: Reenu Maskey

Sent via email

Dear Dr Fei

Re: MINIMAL RISK ETHICS APPLICATION APPROVAL
Ethics Ref: **H0015234 - Identifying the Factors Affecting Information Sharing in Supply Chains and the Effect of Information Sharing on Supply Chain Performance**

We are pleased to advise that acting on a mandate from the Tasmania Social Sciences HREC, the Chair of the committee considered and approved the above project on 7 September 2015.

This approval constitutes ethical clearance by the Tasmania Social Sciences Human Research Ethics Committee. The decision and authority to commence the associated research may be dependent on factors beyond the remit of the ethics review process. For example, your research may need ethics clearance from other organisations or review by your research governance coordinator or Head of Department. It is your responsibility to find out if the approval of other bodies or authorities is required. It is recommended that the proposed research should not commence until you have satisfied these requirements.

Please note that this approval is for four years and is conditional upon receipt of an annual Progress Report. Ethics approval for this project will lapse if a Progress Report is not submitted.

The following conditions apply to this approval. Failure to abide by these conditions may result in suspension or discontinuation of approval.

1. It is the responsibility of the Chief Investigator to ensure that all investigators are aware of the terms of approval, to ensure the project is conducted as approved by the Ethics Committee, and to notify the Committee if any investigators are added to, or cease involvement with, the project.

A PARTNERSHIP PROGRAM IN CONJUNCTION WITH THE DEPARTMENT OF HEALTH AND HUMAN SERVICES

2. Complaints: If any complaints are received or ethical issues arise during the course of the project, investigators should advise the Executive Officer of the Ethics Committee on 03 6226 7479 or human.ethics@utas.edu.au.

3. Incidents or adverse effects: Investigators should notify the Ethics Committee immediately of any serious or unexpected adverse effects on participants or unforeseen events affecting the ethical acceptability of the project.

4. Amendments to Project: Modifications to the project must not proceed until approval is obtained from the Ethics Committee. Please submit an Amendment Form (available on our website) to notify the Ethics Committee of the proposed modifications.

5. Annual Report: Continued approval for this project is dependent on the submission of a Progress Report by the anniversary date of your approval. You will be sent a courtesy reminder closer to this date. **Failure to submit a Progress Report will mean that ethics approval for this project will lapse.**

6. Final Report: A Final Report and a copy of any published material arising from the project, either in full or abstract, must be provided at the end of the project.

Katherine Shaw
Executive Officer
Tasmania Social Sciences HREC

A PARTNERSHIP PROGRAM IN CONJUNCTION WITH THE DEPARTMENT OF HEALTH AND HUMAN SERVICES

APPENDIX X: EFA OUTPUT (EFA 9 - FINAL)

	Component															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Item 47	.803	-.023	.100	-.009	.115	.112	.227	.042	.034	.026	.002	-.033	.037	.188	-.018	.180
Item 46	.801	-.043	.212	.047	.068	.013	.035	.119	-.060	.008	-.022	-.007	-.020	.156	-.061	-.016
Item 48	.765	.022	-.155	.188	.020	-.024	.031	.182	.147	.213	.015	.003	-.047	.033	-.010	.168
Item 50	.655	.039	.318	.087	.054	-.004	.186	.078	.036	-.072	.143	-.014	.146	-.042	.107	-.042
Item 49	.579	.027	.397	.117	.080	.087	-.005	-.042	.020	-.064	.160	.116	.150	.065	.198	.067
Item 57	.006	.921	-.062	.014	.001	.040	.118	-.024	.149	.102	.043	.098	.012	-.012	.007	.045
Item 56	.038	.912	-.038	.038	.083	.103	-.025	-.048	.135	.106	.039	.114	.041	.023	-.015	.010
Item 58	-.046	.844	.059	-.022	.106	.000	-.055	.072	-.059	.065	.130	-.035	.081	.120	.032	.088
Item 14	.183	.091	.703	.217	.045	-.002	.050	.088	.042	.034	.170	.092	.244	.001	-.046	.076
Item 13	.167	.006	.703	.308	.158	-.151	-.009	.030	-.079	-.033	.012	.098	.038	.000	.207	.184
Item 38	.157	-.032	.688	.082	.012	.143	.228	.129	.018	.000	.040	-.079	.091	-.082	-.058	-.153
Item 12	.118	-.197	.661	.020	.172	.151	-.048	.159	.144	.190	-.053	.045	-.084	.299	.003	.201
Item 35	.124	.013	.202	.850	.099	.031	.046	.110	-.040	-.011	.085	.017	.004	.078	.060	.025
Item 36	.005	-.083	.216	.844	.075	.111	-.018	.057	.041	.097	.026	.005	.124	-.023	.001	-.024
Item 34	.164	.101	.025	.826	.093	.092	.112	.055	.016	.119	-.004	-.118	.013	-.006	.137	.094
Item 53	.064	.069	.079	.041	.905	.032	.042	.034	.040	.002	-.006	.126	.026	.006	.022	.086
Item 54	.100	.150	.035	.082	.884	-.034	.024	-.010	.054	.092	.133	.040	-.069	-.057	.013	.054
Item 55	.084	-.034	.156	.173	.738	.026	-.008	.041	.042	.109	.232	.029	.126	.022	.082	.141
Item 28	.041	.057	.065	.009	.010	.852	.124	.109	.122	.174	-.016	.095	.027	.025	.107	.071
Item 30	.000	.037	.071	.095	.018	.835	.237	.055	.242	-.072	.079	-.099	.014	.011	-.050	-.018
Item 29	.115	.077	-.019	.197	-.003	.716	.228	-.135	.055	.155	.135	.223	.071	.043	.027	.179
Item 24	.027	.082	.063	.028	-.035	.182	.777	-.014	.118	.136	.060	-.052	-.033	.063	.221	.022
Item 23	.145	-.027	.006	.091	-.013	.167	.747	.078	.213	.193	.068	-.002	-.090	.042	.143	.046
Item 22	.240	-.011	.156	.020	.108	.203	.695	.019	-.011	.019	.061	-.042	.139	-.129	.048	-.010
Item 5	.044	.033	.077	.057	-.059	.049	-.039	.861	-.012	.035	-.039	-.133	.152	-.013	.184	-.049
Item 4	.181	-.009	.105	.026	.107	.129	-.033	.816	-.054	-.096	.070	-.066	.090	.078	.074	-.001
Item 6	.112	-.032	.116	.175	.005	-.136	.170	.701	-.068	.097	-.097	.196	.081	.117	-.025	.046
Item 10	.086	-.003	.016	-.077	.057	.024	.197	.004	.824	-.031	.070	.003	.159	.119	.024	-.092
Item 11	-.120	.175	.067	.011	-.015	.212	.130	-.036	.759	.068	-.052	-.039	-.030	.122	.092	.039
Item 9	.189	.098	-.003	.109	.128	.210	-.036	-.135	.685	-.098	-.015	.121	.032	.205	.107	.079
Item 26	-.035	.102	.051	.254	.055	-.040	.159	.025	.047	.802	.063	.087	.113	.010	.034	-.044
Item 27	.035	.100	-.003	-.023	-.025	.155	.142	.054	.054	.783	.058	-.027	.099	.131	-.021	.146
Item 25	.127	.126	.061	.002	.260	.129	.011	-.086	-.216	.705	-.029	-.044	-.067	.195	.028	-.170
Item 31	.082	.025	.002	-.005	.145	.122	.022	-.034	.046	.049	.826	.125	.123	-.050	.024	.053
Item 32	.014	.076	-.013	.112	.071	.007	.207	-.075	.043	.062	.810	-.087	-.010	.006	.119	.085
Item 33	.043	.099	.150	.002	.070	.008	-.043	.056	-.069	-.015	.682	-.041	-.100	.048	-.125	.009
Item 41	.080	.063	.053	-.081	.088	.063	-.088	-.077	.064	.059	.047	.870	-.039	-.024	.045	.006
Item 42	.061	.139	.091	.021	.142	.218	.025	-.049	-.068	-.002	-.041	.754	.275	.028	.055	-.031
Item 40	-.174	-.006	-.041	-.013	-.018	-.123	-.029	.109	.047	-.053	-.029	.713	-.020	.047	-.205	.296
Item 20	-.077	.041	.040	.038	-.206	.045	-.069	.118	.171	.115	-.009	.080	.735	-.144	.164	.001
Item 1	.087	.027	.023	-.001	.139	.011	.123	.303	.069	.045	.179	.102	.698	.073	-.141	.060
Item 21	.222	.100	.286	.125	.111	.134	-.094	.066	.017	.102	-.091	-.019	.656	-.025	.056	.031
Item 52	.047	-.011	-.064	-.062	-.130	.267	-.163	.134	.256	.211	.223	-.034	-.519	-.265	.258	-.100
Item 19	.140	.064	.018	.023	-.024	.007	.015	.098	.170	.150	.008	.053	-.012	.855	.102	-.036
Item 18	.164	.084	.045	.008	-.033	.058	-.033	.066	.211	.125	.010	-.016	-.008	.851	.164	-.028
Item 16	.030	.087	.146	.119	-.039	.010	.090	.116	-.034	-.023	.096	.018	-.009	.249	.791	.084
Item 15	-.029	-.018	-.014	.028	.073	.100	.182	.127	.197	.048	-.092	-.040	.031	-.047	.762	.047
Item 17	.160	-.092	-.109	.124	.178	-.071	.334	-.024	.076	.002	-.005	-.076	-.020	.315	.534	.105
Item 45	.084	.037	.118	.065	.134	.049	-.022	-.021	-.030	.080	.095	.093	.056	-.009	.038	.852
Item 44	.168	.110	.022	.023	.116	.119	.085	.006	.027	-.097	.050	.077	.037	-.038	.134	.837

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 8 iterations.

APPENDIX XI: EFA 1

Rotated Component Matrix[a]

	Component																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Item 47	.821																
Item 46	.787																
Item 48	.748																
Item 50	.635																
Item 49	.544	.465															
Item 38		.744															
Item 14		.695															
Item 13		.614															
Item 12		.558															
Item 37		.512		.484													
Item 39		.478															
Item 35			.835														
Item 34			.827														
Item 36			.817														
Item 5				.848													
Item 4				.829													
Item 6				.646													
Item 57					.914												
Item 56					.913												
Item 58					.831												
Item 53						.901											
Item 54						.883											
Item 55						.741											
Item 28							.823										
Item 30							.816										
Item 29							.717										
Item 20								.756									
Item 21								.683									
Item 1								.607									
Item 2								.603									-.424
Item 10									.815								
Item 11									.722								
Item 9									.701								
Item 24										.755							
Item 22										.727							
Item 23										.704							
Item 16											.734						
Item 17											.573						
Item 15											.570						
Item 8											.545						
Item 27												.810					
Item 26												.758					
Item 25												.712					
Item 31													.801				
Item 32													.786				
Item 33													.710				
Item 41														.856			
Item 42														.749			
Item 40														.711			
Item 44															.836		
Item 45															.819		
Item 43											.505				.522		
Item 19																.861	
Item 18																.814	
Item 51																	.755
Item 52																	.502
Item 3																	-.439
Item 7																	

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 15 iterations.

APPENDIX XII: EFA 2

Rotated Component Matrix[a]

	Component																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Item 47	.821																
Item 46	.789																
Item 48	.746																
Item 50	.641																
Item 49	.550	.458															
Item 38		.740															
Item 14		.706															
Item 13		.619															
Item 12		.575															
Item 37		.509		.485													
Item 39		.474															
Item 35			.843														
Item 36			.831														
Item 34			.822														
Item 5				.848													
Item 4				.833													
Item 6				.648													
Item 56					.915												
Item 57					.915												
Item 58					.829												
Item 53						.902											
Item 54						.883											
Item 55						.740											
Item 28							.828										
Item 30							.816										
Item 29							.717										
Item 10								.816									
Item 11								.724									
Item 9								.703									
Item 20									.766								
Item 21									.715								
Item 1									.580								-.414
Item 2									.534								-.506
Item 24										.751							
Item 22										.729							
Item 23										.701							
Item 16											.757						
Item 17											.589						
Item 15											.586						
Item 8											.516						
Item 31												.809					
Item 32												.787					
Item 33												.706					
Item 27													.813				
Item 26													.760				
Item 25													.706				
Item 41														.866			
Item 42														.747			
Item 40														.709			
Item 44															.841		
Item 45															.822		
Item 43											.492				.526		
Item 19																.858	
Item 18																.812	
Item 51																	.733
Item 52																	.559
Item 3																	-.473

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 14 iterations.

APPENDIX XIII: EFA 3

Rotated Component Matrix[a]

	Component																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Item 47	.822																
Item 46	.788																
Item 48	.747																
Item 50	.639																
Item 49	.547	.461															
Item 38		.741															
Item 14		.706															
Item 13		.617															
Item 12		.579															
Item 37		.510				.483											
Item 39		.477															
Item 35			.840														
Item 36			.836														
Item 34			.823														
Item 57				.915													
Item 56				.914													
Item 58				.832													
Item 53					.902												
Item 54					.883												
Item 55					.741												
Item 5						.845											
Item 4						.831											
Item 6						.659											
Item 28							.826										
Item 30							.818										
Item 29							.718										
Item 10								.817									
Item 11								.724									
Item 9								.702									
Item 20									.767								
Item 21									.715								
Item 1									.598								
Item 2									.558								-.468
Item 24										.750							
Item 22										.733							
Item 23										.699							
Item 16											.754						
Item 17											.590						
Item 15											.587						
Item 8											.518						
Item 27												.812					
Item 26												.762					
Item 25												.705					
Item 31													.808				
Item 32													.791				
Item 33													.702				
Item 41														.869			
Item 42														.746			
Item 40														.710			
Item 44															.841		
Item 45															.822		
Item 43											.492				.526		
Item 19																.857	
Item 18																.811	
Item 51																	.770
Item 52																	.577

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 13 iterations.

APPENDIX XIV: EFA 4

Rotated Component Matrix[a]

	Component																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Item 47	.818																
Item 46	.789																
Item 48	.739																
Item 50	.657																
Item 49	.566	.421															
Item 38		.739															
Item 14		.698															
Item 13		.633															
Item 12		.618															
Item 37		.488				.487											
Item 39		.451															
Item 35			.842														
Item 36			.840														
Item 34			.823														
Item 57				.917													
Item 56				.912													
Item 58				.838													
Item 53					.900												
Item 54					.882												
Item 55					.745												
Item 5						.852											
Item 4						.832											
Item 6						.660											
Item 30							.828										
Item 28							.824										
Item 29							.729										
Item 10								.817									
Item 11								.724									
Item 9								.701									
Item 24									.764								
Item 22									.732								
Item 23									.712								
Item 16										.755							
Item 15										.589							
Item 17										.575							
Item 8										.516							
Item 27											.811						
Item 26											.760						
Item 25											.706						
Item 31												.814					
Item 32												.804					
Item 33												.677					
Item 41													.871				
Item 42													.746				
Item 40													.710				
Item 44														.836			
Item 45														.829			
Item 43										.503				.506			
Item 20															.771		
Item 21															.729		
Item 1															.579		
Item 19																.864	
Item 18																.816	
Item 51																	.774
Item 52																	.609

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 10 iterations.

APPENDIX XV: EFA 5

Rotated Component Matrix[a]																	
	Component																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Item 47	.817																
Item 46	.790																
Item 48	.738																
Item 50	.664																
Item 49	.575		.415														
Item 35		.844															
Item 36		.842															
Item 34		.823															
Item 38			.710														
Item 14			.709														
Item 13			.656														
Item 12			.646														
Item 39			.426														
Item 57				.917													
Item 56				.911													
Item 58				.838													
Item 53					.901												
Item 54					.883												
Item 55					.743												
Item 30						.828											
Item 28						.821											
Item 29						.728											
Item 5							.860										
Item 4							.833										
Item 6							.675										
Item 10								.811									
Item 11								.732									
Item 9								.717									
Item 24									.764								
Item 22									.758								
Item 23									.702								
Item 16										.765							
Item 15										.605							
Item 17										.594							
Item 8										.487							
Item 31											.812						
Item 32											.805						
Item 33											.674						
Item 41												.870					
Item 42												.746					
Item 40												.712					
Item 27													.824				
Item 26													.770				
Item 25													.706				
Item 44														.834			
Item 45														.832			
Item 43										.490				.500			
Item 20															.779		
Item 21															.722		
Item 1															.562		
Item 19																.876	
Item 18																.835	
Item 51																	.771
Item 52																	.631

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 10 iterations.

APPENDIX XVI: EFA 6

Rotated Component Matrix[a]

	Component																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Item 47	.815																
Item 46	.791																
Item 48	.740																
Item 50	.660																
Item 49	.567	.427															
Item 38		.714															
Item 14		.708															
Item 13		.659															
Item 12		.648															
Item 39		.424	.406														
Item 35			.850														
Item 36			.835														
Item 34			.823														
Item 57				.917													
Item 56				.911													
Item 58				.839													
Item 53					.903												
Item 54					.886												
Item 55					.743												
Item 30						.830											
Item 28						.822											
Item 29						.729											
Item 5							.862										
Item 4							.833										
Item 6							.674										
Item 10								.820									
Item 11								.729									
Item 9								.705									
Item 22									.757								
Item 24									.754								
Item 23									.694								
Item 31										.816							
Item 32										.811							
Item 33										.670							
Item 41											.870						
Item 42											.748						
Item 40											.713						
Item 27												.829					
Item 26												.772					
Item 25												.697					
Item 16													.762				
Item 17													.615				
Item 15													.600				
Item 8													.518				
Item 19														.876			
Item 18														.837			
Item 20															.780		
Item 21															.726		
Item 1															.538		-.400
Item 45																.856	
Item 44																.822	
Item 51																	.771
Item 52																	.633

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 10 iterations.

APPENDIX XVII: EFA 7

Rotated Component Matrix[a]

	Component															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Item 47	.828															
Item 46	.812															
Item 48	.730															
Item 50	.652															
Item 49	.574															
Item 57		.918														
Item 56		.911														
Item 58		.838														
Item 13			.710													
Item 14			.704													
Item 12			.657													
Item 38			.655													
Item 10				.773												
Item 9				.709												
Item 11				.692												
Item 18				.585												
Item 19				.555												
Item 35					.844											
Item 36					.842											
Item 34					.829											
Item 53						.897										
Item 54						.884										
Item 55						.747										
Item 30							.832									
Item 28							.812									
Item 29							.730									
Item 24								.763								
Item 23								.744								
Item 22								.695								
Item 5									.856							
Item 4									.830							
Item 6									.687							
Item 27										.765						
Item 26										.760						
Item 25										.758						
Item 16											.812					
Item 17											.601					
Item 15											.556					
Item 8											.496					
Item 31												.809				
Item 32												.808				
Item 33												.672				
Item 41													.870			
Item 42													.749			
Item 40													.719			
Item 20														.786		
Item 21														.653		
Item 1														.617		
Item 45															.854	
Item 44															.829	
Item 51																.738
Item 52																.721

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 21 iterations.

APPENDIX XVIII: EFA 8

Rotated Component Matrix[a]																
	Component															
	0	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Item 47	.819															
Item 46	.806															
Item 48	.741															
Item 50	.645															
Item 49	.569															
Item 57		.923														
Item 56		.915														
Item 58		.840														
Item 13			.702													
Item 14			.696													
Item 38			.689													
Item 12			.657													
Item 35				.846												
Item 36				.840												
Item 34				.829												
Item 53					.898											
Item 54					.885											
Item 55					.748											
Item 28						.844										
Item 30						.842										
Item 29						.735										
Item 24							.773									
Item 23							.762									
Item 22							.620									
Item 10								.798								
Item 9								.684								
Item 11								.650								
Item 51								.541								
Item 5									.863							
Item 4									.817							
Item 6									.698							
Item 31										.827						
Item 32										.798						
Item 33										.686						
Item 26											.801					
Item 25											.735					
Item 27											.718					
Item 41												.871				
Item 42												.751				
Item 40												.715				
Item 18													.814			
Item 19													.803			
Item 20														.742		
Item 1														.706		
Item 21														.632		
Item 52														-.505		
Item 16															.760	
Item 15															.760	
Item 17															.540	
Item 45																.856
Item 44																.830

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 14 iterations.

APPENDIX XIX: INFORMATION SHARING – EFA 1

Rotated Component Matrix[a]

	Component	
	1	2
Information Sharing 8	.850	
Information Sharing 7	.827	
Information Sharing 9	.702	
Information Sharing 6	.490	
Information Sharing 3		.861
Information Sharing 2		.778
Information Sharing 5		.578
Information Sharing 4	.437	.569
Information Sharing 1		.456

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]
a. Rotation converged in 3 iterations.

APPENDIX XX: INFORMATION SHARING (FINAL) – EFA 2

Rotated Component Matrix[a]

	Component	
	Strategic IS	Operational IS
Information Sharing 8	.851	.168
Information Sharing 7	.833	.093
Information Sharing 9	.711	-.061
Information Sharing 6	.504	.334
Information Sharing 3	-.027	.876
Information Sharing 2	-.002	.805
Information Sharing 5	.374	.517
Information Sharing 1	.390	.506
Eigenvalue	3.016	1.544
Total Variance Explained (%)	37.694	19.301
Cumm. Variance Explained (%)	37.694	56.995
Cronbach's Alpha	0.75	0.66

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]
a. Rotation converged in 3 iterations.

APPENDIX XXI: SUPPLY CHAIN PERFORMANCE – EFA 1

Rotated Component Matrix[a]

	Component			
	1	2	3	4
Performance 12	.832			
Performance 10	.780			
Performance 13	.773			
Performance 14	.674			
Performance 11	.455			
Performance 7		.813		
Performance 8		.804		
Performance 9		.786		
Performance 3			.838	
Performance 1			.804	
Performance 2			.610	
Performance 5				.871
Performance 6				.810
Performance 4		.515		.573

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]
a. Rotation converged in 5 iterations.

APPENDIX XXII: SUPPLY CHAIN PERFORMANCE – EFA 2

Rotated Component Matrix[a]

	Component			
	1	2	3	4
Performance 12	.836			
Performance 13	.777			
Performance 10	.763			
Performance 14	.694			
Performance 7		.819		
Performance 8		.812		
Performance 9		.791		
Performance 3			.833	
Performance 1			.819	
Performance 2			.605	
Performance 5				.886
Performance 6				.786
Performance 4		.506		.589

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]
a. Rotation converged in 5 iterations.

APPENDIX XXIII: SUPPLY CHAIN PERFORMANCE (FINAL) – EFA 3

Rotated Component Matrix[a]

	Component			
	Flexibility	Delivery	Cost	Quality
Performance 12	.842	.140	.059	.062
Performance 13	.780	.230	.216	.031
Performance 10	.778	.203	.003	-.004
Performance 14	.669	.152	.074	.205
Performance 8	.230	.830	.006	.134
Performance 7	.248	.827	.072	.015
Performance 9	.146	.805	.087	.097
Performance 3	-.111	.085	.845	.065
Performance 1	.173	.087	.814	.015
Performance 2	.218	-.021	.610	.213
Performance 5	.020	.066	.100	.895
Performance 6	.175	.139	.139	.829
Eigenvalue	3.963	1.758	1.333	1.226
Total Variance Explained (%)	33.029	14.647	11.109	10.219
Cumm. Variance Explained (%)	33.029	47.678	58.787	69.006
Cronbach's Alpha	0.80	0.80	0.66	0.73

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]
a. Rotation converged in 5 iterations.

APPENDIX XXIV: MODEL SUMMARY – REGRESSION MODELS 3, 4, 5 AND 6

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
3	.439	**.193**	.180	.90535360	.193	15.301	2	128	.000
4	.267	**.071**	.057	.97120045	.071	4.912	2	128	.009
5	.166	.028	.012	.99373806	.028	1.822	2	128	.166
6	.060	.004	-.012	1.00594177	.004	.234	2	128	.791

Model 3. Dependent Variable: FLEXIBILITY PERFORMANCE
Model 4. Dependent Variable: DELIVERY PERFORMANCE
Model 5. Dependent Variable: COST PERFORMANCE
Model 6. Dependent Variable: QUALITY PERFORMANCE
Predictors: (Constant), OPERATIONAL IS, STRATEGIC IS

APPENDIX XXV: ANOVA – REGRESSION MODELS 3, 4, 5 AND 6

Model		Sum of Squares	df	Mean Square	F	Sig.
3	Regression	25.083	2	12.541	15.301	**.000**
	Residual	104.917	128	.820		
	Total	130.000	130			
4	Regression	9.267	2	4.633	4.912	**.009**
	Residual	120.733	128	.943		
	Total	130.000	130			
5	Regression	3.598	2	1.799	1.822	.166
	Residual	126.402	128	.988		
	Total	130.000	130			
6	Regression	.474	2	.237	.234	.791
	Residual	129.526	128	1.012		
	Total	130.000	130			

Model 3. Dependent Variable: FLEXIBILITY PERFORMANCE
Model 4. Dependent Variable: DELIVERY PERFORMANCE
Model 5. Dependent Variable: COST PERFORMANCE
Model 6. Dependent Variable: QUALITY PERFORMANCE
Predictors: (Constant), OPERATIONAL IS, STRATEGIC IS