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**An assessment of information flow as an enabler to
Collaboration in the Supply Chain within a South African
context**

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This research proposal was submitted to the Gordon Institute of Business Science, University of Pretoria, in partial fulfilment of the requirements for the degree of Master of Business Administration

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Declaration

I declare that this research project is my own work. It is submitted in partial fulfillment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before any degree or examination in any other university.

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On this 14Th day November 2006

Abstract

Organisations need to know more in order to do more for customers. As demand for customer information grows, so to, do the archives in the back office and the servers at the central hub. It is estimated that the amount of data now captured and stored nearly doubles every 12-18 months. (Information Week)

The logistics industry is plagued by the very element of changing customer demands, customization thus resulting in the survival of the fittest. The informed customer demands an integrated product offering customised to their needs. This industry has evolved to one where companies need deep pockets to ensure an IT platform capable of meeting the increasing demands of the modern supply chain.

The objective of the report is to gain further insight and understanding of how stakeholders within South Africa assess the flow of information as an enabler to greater collaboration within the supply chain.

Information flow is one of the many elements that contribute toward greater collaboration, which is a recent trend in supply chain management that focuses on joint planning, coordination and process integration between stakeholders in the supply chain (Spekman et al 1998).

Globalisation and the advent of e-commerce Business 2 Business transactions and the Lean production philosophies that are being adopted by

more and more industries is demanding real time, data exchange and information flow in order to make the necessary and timely decisions which are required to meet ever changing customer demands.

Information is only one of the areas in which tremendous benefit can be derived, this paper considers a thorough literature review of aspects surrounding information flow from a global perspective and assesses the feedback of South African organisations in relation to this theme with the view to providing readers with greater insight to possible opportunities that may exist for improvement in their respective supply chain.

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CHAPTER 1

1.1 INTRODUCTION

Today's technology culture literally inundates us with masses of information in order to make decisions. The reliance upon the internet and e-mail has placed excessive reliance upon these mediums for information and the questions around accuracy and reliability (Barratt, 2004).

Research conducted by the Aberdeen group (2006) on the global supply chain benchmark of more than 150 companies; highlights the following points in regard to the changing area of supply chain management, namely:

- 79% of the companies surveyed in the research state that their top concern is the lack of supply chain process visibility.
- Three quarters of firms lack enterprise wide automation for global supply chain processes.
- Inadequate technology is inhibiting the finance departments from extracting the necessary information requirements.

(Aberdeen Group, 2006)

In today's competitive environment, the ability to respond rapidly to changing customer demand is one of the key attributes to success. In order to maximize this capability and derive the necessary competitive advantage, all

members within the supply chain should “seamlessly” work together to serve the end customer (Towill in spekman *et al* 1998).

As work contexts tend to be more and more complex, there is a resultant growth in the size and volumes of:

- document archives,
- guidelines and
- processes

The general perception is that inadequate software exists to extract the meaningful data required to make the necessary business decisions. Not only is the right information needed, but also required at the right place and at the right time.

The optimization of information flow can alleviate some of the constraints and reduce the costs of time spent retrieving the necessary information. Assessing the information and interpreting information from the various sources, absorbs considerable resources, something that smaller companies do just not have at their disposal.

Lundqvist (2004) states that smaller enterprises make use of typical information sources far less than larger organisations and do not necessarily share the strategic view on information and rely much more on the tacit knowledge that exists within the organisation to make the necessary decisions.

Mackenzie Owen 1995 in Lundqvist 2004 argues that the primary reasons for smaller enterprises lacking the awareness of information needs and the importance of fulfilling the needs are:

- Lack of knowledge regarding the value of information
- Subject matter interest with regard to strategic information is somewhat lacking.
- Focus is directed towards familiar and reliable information sources.
- Smaller enterprises want easy to understand and readily accessible information, that is condensed for ease of application, which is somewhat lacking in existing information services.

It is argued that the reason behind the above observations is due to the fact that many smaller businesses are started by entrepreneurs who possess a particular knowledge regarding the business rather than business management in general.

A report by the Delphi Group in Lundqvist (2004) highlights the fact that 70 percent of business professionals spend 25 percent of their day, searching, retrieving and processing information and in many cases not actually finding what they are looking for. The impact on productivity levels and the opportunity cost of these activities is massive.

A large amount of money is spent on hardware and software that does not necessarily efficiently facilitate the flow of information. Focussing on

information flow optimization, will allow organisations to reduce the expenditure on these items and reduce the concomitant “waste” in time in the search for meaningful data and information, where complex document archives, guidelines and processes exist (Lundqvist 2004).

Among the greatest challenges facing organisations today is the need to adapt to escalating unpredictability in demand (Christopher, 2004). Volatile markets are becoming the norm as product life cycles shorten and globalisation impacts on the competitive environment.

Within this context, slow-moving logistics pipe-lines have become unsustainable; and the paradigm of *agility* is the order of the day (van Hoek et al., 2001). Agility may be defined simply as “*The gracefulness of [an entity] that is quick and nimble*” (Merriam-Webster, 2006).

According to Christopher (2004), “an agile supply chain comprises four key characteristics:

- market sensitivity;
- virtuality (i.e. information rather than inventory-based);
- network-based; and
- process integration”.

Organisations have entered into an era of network competition, realising this, the organisations that have managed to leverage off the competencies of vendors and supply chain partners have been able to effectively co-ordinate and manage the relationships with their partners in a network committed to better, faster and closer relationships with their final customers (Christopher, 2000).

Agile businesses require supply chain relationships that will enable them to cope with fluctuating or constantly changing demand patterns. Organisations have started to reduce the number of suppliers they do business with by implementing vendor review programs that identify suppliers with operational excellence. A close buyer-supplier relationship is important because suppliers in such a relationship are easier to work with and provide better service (Spekman *et al.*, 1998).

Collaboration between stakeholders is understood as key to this process, one which relies heavily on information sharing between partners (Spekman *et al.*, 1998).

As Childerhouse *et al* (2003) comment, relationships such as partnerships or alliances are highly dependent on information support, partners within the supply chain need to have access to information on activities that do not necessarily fall within their direct control. The long-term, collaborative buyer-supplier relationships, i.e. partnerships, are enabled through the seamless integration and transfer of information up and down the chain. In reality,

there is always plenty of data about, but the real difficulty is finding the hidden information therein, which is capable of leveraging improved supply chain performance (Popp 2000).

It has been pointed out that Supply Chain Management (SCM) has been characterised by rapid changes, largely as a result of information changes in the global business environment. It has been pointed out, however, that “supply chain practice seldom resembles the theoretical ideal” (Fawcett & Magnan, 2002, p.339). Further, authors note the need for further research on emerging concepts such as process integration (Power *et al.*, 2001), collaboration (McLaren *et al.*, 2002) and agility (van Hoek *et al.*, 2001).

- Information flow is regarded as a key enabler of collaboration, but this is not always converted to practice or more carefully understood in relation to related emerging concepts.

Many organisations are attempting to gain competitive advantage by integrating their supply chain. This requires greater coordination between activities and cooperation between buyers and sellers. Collaboration is a very broad and encompassing term and when it is put in the context of the supply chain it needs yet further clarification. Many authors, when talking about collaboration, cite:

- mutuality of benefit,
- rewards and risk sharing together with the
- exchange of information as the foundation of collaboration

(Stank *et al* 1999 in Barratt 2004).

Research has been conducted over the past decade addressing this area of supply chain management (Spekman *et al.*, 1998) and which examines the current practices and their relations to the theoretical ideal (Fawcett & Magnan, 2002). There is also a research bias in the literature to studies conducted in the United States (USA) (van Hoek *et al* 2001).

The research proposes to assess the feedback of industry participants on their assessment of information and the impact thereof as an enabler to collaboration within the supply chain within a South African context.

In exploring the above, it is necessary to establish:

Research Question 1

- The state and significance of information flow in the supply chain

Research Question 2

- Information flow is only possible through the platform of Information Technology infrastructure

Research Question 3

- Process integration as a facilitator of information flow

Research Question 4

The research will allow us to attain the **Key Outcomes** of:

- agility within the supply chain and
- responsiveness to fluctuating customer demand

Research Question 5

In order to optimize these factors, a collaborative effort from all parties needs to take place.

- It is necessary to understand the extent to which people see collaboration as an important criterion for success

CHAPTER 2: LITERATURE REVIEW

2.1 THE IMPORTANCE OF INFORMATION FLOW IN THE SUPPLY CHAIN

Design decisions for the supply chain have been dominated by the physical flow of goods resulting in less than optimal solution for the flow of information. An increasing number of firms are subscribing to the idea that developing long term co-ordination and cooperation can significantly improve efficiency in the supply chain (Fiala 2004).

A recent study conducted by Stanford University and Accenture looked at 100 manufacturers and retailers assessing whether information sharing was worth the risk and effort. The analysis revealed that higher than average returns and profits were experienced with the firms that engaged in higher levels of information integration. (Hau, L and Whang, S 2001)

The reasons that uncertainties exist within the supply chain are due to the fact that

- Supply chain partners understand their information within the system but do not have the perfect information about the partners in the supply chain;
- The flow of accurate data within the system; and
- The lack of willingness of the partners to share information

Addressing the above issues will improve the performance of the system whereby information sharing between partners

- Will promote greater efficiencies throughout the chain processes.
- Will reduce uncertainties with the supply chain.
- Will promote a trust amongst partners in the ultimate best interest of the end user and themselves.

One of the significant contributors to the inefficiency in the supply chain is termed the **Bull-Whip** effect defined as:

- *“Demand order variability’s in the supply chain are amplified as they moved up the supply chain. Distorted information from one end of the supply chain to the other can lead to tremendous inefficiencies”* (Lee, Padmanabhan and Whang 1997).

By increasing the vertical information sharing between partners, limits the impact of the Bull-Whip effect and greatly improves the performance of the system. (Zhenxin *et al* 2001).

The degree or level of information can fall into two very simple categories as highlighted by Li *et al* (2005):

- Partial information
 - where a supplier obtains information from retailers regarding demand distribution and inventory related strategies.
- Complete Information
 - is comprised of more detailed and daily fluctuations in demand and inventory status. It is implied that the deeper the level of information, the greater the benefit as well as the associated risk.

(Li *et al* 2005).

Different quantitative and analytical tools have been developed to assess the value of the flow of information under varied circumstances, influences and assumptions.

It is meaningless to say that information adds value to the supply chain – the various assumptions need to be considered as is the case with the “Graves model” the objective of which is stage inventory cost minimization, considers the sharing of demand information between retailer and supplier where the end demand process is an integrated moving average process – under these conditions the forecast method applied provides an optimal estimation for future demand, thus information sharing has no impact on the cost of the supply chain - Graves in Li *et al* 2005 argues that information sharing has no value for supply chain management.

The research paper by Li *et al* (2005) considers 12 information sharing models, the assumptions and conditions for each of the models discussed are clearly different from each other. It is this difference that ultimately yields varied results between the respective models but the conclusion is that except for the “Graves model” – information sharing is indeed valuable, but may not be the only way to obtain optimal performance and simpler ways to achieve the optimal performance can be adopted.

In traditional supply chains, orders move upstream whilst the flow of goods moves downstream, Based on information, each party in the supply chain attempts to minimize the inventory on hand and the costs associated with holding of stock whilst trying to respond to customer demands. (Lee in McAdam and McCormack 2001).

According to Lee in McAdam and McCormack 2001, the semi-conductor industry in 1995 resulting experienced suppliers scrambling to meet perceived demand only to find out that poor information had left them with high stock levels, thus illustrating that the communication of customer demand through the supply chain can be exaggerated at each linkage and distorted until supply is greater than the actual demand.

The effect is commonly termed the “Bull-Whip effect” or the “Forrester effect” as defined earlier which leads to demand order variability’s ultimately leading to inefficiencies being experienced as follows: (McAdam and McCormack 2001)

- significant inventory builds up across the whole network,
- poor customer service and
- misguided capacity plans.

Hau *et al* (1997) identified the following major causes of the Bull-Whip effect:

- Demand Forecast updating
- The batching of orders along the supply chain
- Price fluctuation
- Rationing and shortage gaming.

The above mentioned aspects, along with the managers' rational decision making, create the resultant Bull-Whip effect.

With the increase in complexity of supply chains and the number of linkages and participants, the dependency of members becomes greater and common goals become more difficult to achieve. An integrated supply chain allows for large virtual organisations to be more agile and gain competitive advantage in a fast moving market place.

The report Global supply chain benchmark (Aberdeen group, 2006) details that the second highest concern after visibility is the concern surrounding the uncoordinated nature of multi-tier supply chain processes resulting in imbalance between supply and demand and the inability of the supply chain to meet the more agile needs of its customers.

Larger companies are faced with even greater challenges in that they need to manage a greater number of multi tiered suppliers in a coordinated manner in order to meet the time definite requirements of the supply chain. This uncoordinated management together with poor visibility across the supply chain results in excessive buffer stock being held thus resulting in unnecessary expenses incurred. In order to improve bottom line results, greater supply chain visibility is required allowing for more accurate forecasting.

Research has shown that there are important inhibitors to information exchange that prevent firms from participating in collaborative efforts. Markus and Christiaanse (2003) argue that without proper management of both goods movement and information movement up and down the supply chain, the responsiveness to customer demands and flexibility in the supply chain would not be achieved.

An opposing view is that sophisticated information technology can create problems as well as gains in inter-firm collaboration. Experimental evidence points to the fact that information sharing between firms is not necessarily beneficial (Steckel *et al* 2004).

Information sharing may also create power struggles between different parties as competitive advantage can be gained through information asymmetry. Alternatively, fears of losing competitive advantage may

compromise the potential advantages that information sharing may offer (Mason-Jones and Towill, 1997).

To state that information adds value to the supply chain is too simplistic a statement and one needs to consider the various influencing factors affecting the value of the information.

As highlighted in the research document of Li *et al* (2005) the following three phases need to be considered.

1. In situations where the capacity of the supplier is low, it makes it difficult for the supplier to meet demand, the number of choices are restricted and the value of information can allow the supplier to make priority decisions – the converse however is the fact that lower capacity leaves no room for the supplier to manoeuvre and thus the existence of information is yielded non beneficial.
2. Factors that mutually restrict each other would be the inventory costs and shortage cost when one is fixed the stakeholders have a greater opportunity of deviating from the norm and the availability of information allows for greater opportunity for better decision making, but when the factors both change the value of the information is dependent upon the rate at which these factors change.

3. Factors have different impacts on the traditional supply chain and information chain – the increase in variability of demand will increase the costs of both systems but the rate of these increases is different, thus the cost savings are dependent upon the different rates of change.

2.2 INFORMATION TECHNOLOGY INFRASTRUCTURE AND THE SUPPLY CHAIN

2.2.1 The Impact Of Information Technology In The Supply Chain

The extent to which IT flows across the organisation, forms the backbone of commerce in the world today (Carr, 2003). IT expenditure is currently estimated at around US\$ 900Billion and expected to grow annually at a rate of 5.4% into 2007 (Van Heerden 2004).

Businesses in South Africa continue to be early adopters of new technology and the usage of information technology is on the increase. A Case in point is of the 3.7 Million Internet users, 545 of them are within the business environment and as such the business environment is the play ground for technology. (Goldstuck 2004). Information Technology (IT) is instrumental in the daily running of business which supports the strategic initiatives of the organisation (Lewis and Talalayevsky 2004).

The performance of the supply chain relies very much on the infrastructure of the information system which provide the necessary functional support.

Information technology influences how the coordination between activities takes place by:

- substituting IT for human coordination,
- increasing the amount of coordination used,
- substituting information and knowledge for actual inventory

(Ward *et al.* 1999).

The pace at which technological advancement is taking place, branding is becoming increasingly important in the purchasing decision i.e. an important differentiation process.

Value is derived by the benefits received by the product or service and should exceed the cost of owning it (Knox, 2004), this includes the opportunity cost involved in seeking the product and purchasing.

Today it is about added value through the application of IT to the business environment, in other words, the cost of ownership must be less than the benefits derived from the product or service, in order for it to yield the necessary competitive advantage (Quartero, 2004).

2.2.2 Information and The Supply Chain

The ability of IT to reduce coordination and transaction costs and risks suggests a trend toward more tightly coupled relationships such as those found in supply chains.

Benjamin and Wigand (1995) suggest that trends, within IT, would restructure the distribution of profits along the supply chain and essentially lead to the evolution of electronic markets from the more conventional single source channels.

Each element in the supply chain is affected by inaccurate demand information owing to various reasons including the number of decision points where information is centred, time lags and non-value adding processes along with decision rules for order replenishment and inventory levels (Evans *et al.* 1993).

An analysis conducted by Lewis and Talalayevsky (2004) formalizes the proposition that by reshaping chains to optimize information flows, the number of decision points can be reduced while the quality of decisions can be improved. In this event the infusion of IT into the coordination structures increases the reliance of the structures on a few information nodes.

The true advantage to IT is that it has a different failure rate to that of humans and is able to recover from more failures at a lower cost and with the least amount of disruption and quicker recovery from failure owing primarily to the back up and replication processes inherent to IT. (Lewis *et al* 2004).

An opposing view to the use of IT is that of Ireland and Bruce (2000) whereby it is stated that supply chain collaboration does not need to be

based on technology, the obsession with technology in many respects is seen as a barrier to collaboration.

Mclaren *et al* (2002) make reference to the fact that many organisations have undertaken information technology supported initiatives to enable greater collaborative efforts between partners and the use of IT has made it possible, evident through the use of more effective, significantly less expensive, alternative software offerings in the initial stages of collaboration aligned for real time data exchange.

Even though technology provides the ability to share information easily, firms may not share information for various business reasons. Businesses thrive and make money on information asymmetry. Therefore, there are strong disincentives to share information. Unless there is positive proof that sharing information is equally beneficial to all members of the supply chain, it will be difficult to convince all members to share information (Premkumar 2000).

Information technology and in particular, the Internet, play a key role in furthering the goals of supply chain integration. It is likely that the internet will have a more profound impact on Business to Business interaction into the future.

This essentially leads us to the notion surrounding e-business which is accelerating the integration within the supply chain, e-business specifically refers to “the planning and execution of the front end and back-end

operations in a supply chain using the Internet.” The internet has now emerged as perhaps the most compelling enabler of supply chain integration, it allows for the effective means of counteracting distortion downstream in the supply chain and allows for visibility across extended networks across the globe. (Lee and Whang, 2001).

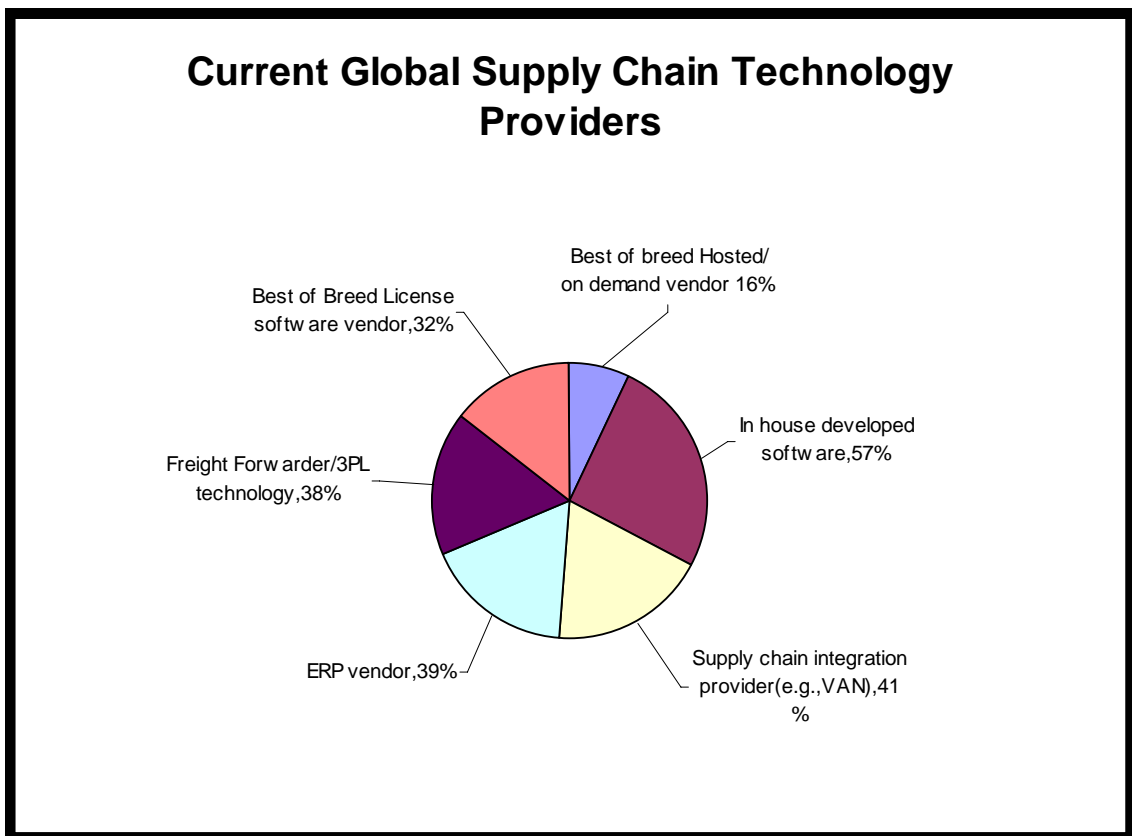
2.2.3 Technology Sources

Research by Aberdeen (2006) suggests that existing enterprise systems are one of the challenges that need to be overcome. Most companies use a combination of technology sources and a CIO respondent stated “seamless collaboration between islands of automation is one of the critical issues not well addressed by today’s technologies.”

The sources of technology adopted by companies surveyed in the research conducted by the Aberdeen Group (2006) are represented in Graph 1. It is interesting to note that the majority of the source technology is developed in-house representing 57%, further analysis reveals the plans of sourcing additional supply chain technology the preference towards in-house developed software drops to 18% (Aberdeen 2006). The results beg the question whether in-house developed systems applications are the way forward.

It is clearly evident by the shift in preferences that this is indeed not the case with an increase in the best of breed license software representing 27%.

Graph 1: Current Global Supply Chain Technology Providers



Source: Aberdeen Group 2006.

“In house developed technology ranks first in usage today but is last in companies’ future adoption intentions”, Aberdeen Group 2006.

Information integration refers to the sharing of information amongst supply chain partners that is generally freely accessible with ease of access and in real time and includes any kind of data that could affect the decisions of supply chain partners (Aberdeen Group 2006).

Generally speaking, as organisations begin to demand more out of their computer systems to manage their everyday operations, they begin suffering from restrictive connectivity and integration constraints.

2.3 PROCESS INTEGRATION /COORDINATION BETWEEN BUYERS AND SELLERS

Morell and Phelps in White *et al* (2004) define interoperability as the “*flow of information from one system to another without the need for human intervention*”

It is considered as one of the most important factors in the supply chain and needs to be precise and timely in order to be beneficial to the supply chain.

In multilateral relationships, difficulties in integration and interoperability are greater than simple one on one relationship as the business models have to proliferate communication pathways across a spectrum of stakeholders.

Parunak, Savit and Riolo in white *et al* (2004) make reference to the “butterfly effect” similarly explained by the Bull-Whip effect which occurs as a result of communication delays and inaccurate information, which can be overcome by prioritising the interoperability between systems in the respective organisations.

The impact of networks, globalisation and the proliferation of product variety has compelled organisations to address their supply chain strategies. E-commerce and the advent of the internet has re-invented the way the supply chain operates today. The impact of e-business can be can be found in the following four dimensions as discussed by Lee and Whang (2001).

1. The integration of information between supply chain partners
2. Planning Synchronisation which defines what is to be done with the information.
3. The workflow co ordination which entails the automation of activities in the supply chain
4. Future business models i.e. new ways of doing business (redefining the way in which we conduct business).

Information integration refers to the sharing of information between members of the supply chain and includes the type of data that can influence decisions and performance of members of the supply chain. The e-business or internet computing model has emerged as the single most compelling enabler of supply chain integration. This has allowed businesses to gain global access and visibility to products and markets around the world and allows for quick response to changing demands (Lee and Whang 2001).

The internet has accelerated the goal of supply chain integration and redefined the back end operations. The coordination of business processes is highly dependent on the ability of firms to coordinate the flow of goods and information.

The fact that information can flow independently of goods has tremendous implications for the transactions: sharing of information is a principle component in supply chain integration, which focuses on improving the information flow between links in the chain. Apart from being costly, the one-

one coordination through Electronic Data Interchange (EDI) requires significant investment and is not necessarily being taken up by smaller parties in the supply chain. (Christiaanse 2005).

White *et al* (2004) regard information logistics as the provision of the right information at the right time and place comprising three key aspects namely:

1. Content: Information relevant to the end user – providing the right content,
2. Time: Provision of the information at the time that the end user requires it.
3. Location: the system needs to consider how the information will be disseminated and the location of the end user.

2.3.1 Collaborative Planning, Forecasting and Replenishment

The 1980's saw the introduction of Supply Chain Management (SCM) and following that in 1992, the introduction of Efficient Customer Response (ECR).

Since 1995, new forms of collaboration have been adopted, taking information sharing relations one step further, representing a more proactive approach, through common planning and the synchronization of activities known as Collaborative Planning, Forecasting and Replenishment (CPFR).

The integration is stronger as a result of more information being exchanged and the coordinating meetings become more frequent. CPFR is defined by the organisation Voluntary Inter-Industry Commerce Standards (VICS (1998) in Skjoett-Larsen *et al* 2003) as:

“A collection of new business practices that leverage the Internet and electronic data interchange in order to radically reduce inventories and expenses while improving customer service.”

The efficient customer response movement (ECR in Skjoett-Larsen *et al* 2003) definition focuses less on technological aspects as defined below:

“A cross industry initiative designed to improve the supplier / manufacturer / retailer relationship through co-managed planning processes and shared information.

Noekkentved in Skjoett *et al* (2003) argues that whilst SCOR tells us what processes to include in collaboration, the VICS guideline tells us how to do it.

A report recently published by ECR (2002) and mentioned in Skjoett *et al* (2003) suggests the following:

“the use of collaborative practices will certainly accelerate and the next few years will, without doubt, present a wave of scaled implementations that fully endorse CPFR’s status as a supply chain

best practice for retail and consumer goods business across the globe”.

Considering the strategic development role, firms must develop together as a unit with a high degree of synchronization to survive. The exchange of data and adaptation processes meet the joint collaboration objective to create new knowledge and competence.

Collaborative planning (CPFR) should be viewed as a general approach to coordination of processes between participants in the supply chain and involves deeper analysis of both integration depth and scope of collaboration forms.

2.3.2 Integrations Hub and B2B Market Places

Christiaanse (2005) makes reference to the high costs of coordination required in dyadic relationships in order to facilitate the transfer of information via EDI. Through Enterprise Resource Planning (ERP) connectivity, integration hubs are set up with the purpose of connecting parties – an example is Elemica which is an e-business initiative in the chemical industry in the US, comprising 22 companies in the chemical industry. The biggest customer of Elemica is the chemical industry itself.

Buyers and suppliers enter the forecasts and material requirements respectively which allow them to collaborate on forecasting a demand

stream. The system or integration hub consolidates various sources of in-transit status messages to one place.

Companies cannot realise the true benefits of on-line trading or collaboration until the back-end systems are integrated, and are expensive without a hub.

Network Inhibitors include the following as discussed by Lundqvist (2004):

- The lack of scalability: the ability to deploy process integration systems to many business partners is what keeps costs down and adds value to the network optimization solution.
- Inter-Company process standards: Business processes need to be aligned along with interoperability of the IT infrastructure in order to align for collaborative efforts.
- Back-end integration: the lack of integration of back-end legacy systems with middle ware systems inhibit companies to scale up to multiple supply chain partners.

The relevance of information at the location required varies depending on the timing of the information – all three aspects are interdependent and from an information flow optimization and demand driven information supply chain point of view. Information logistics is regarded as one of the most important concepts surrounding this (Lundqvist 2004).

Coordination involves the management of dependencies between activities in the supply chain; it focuses on making decisions that reduce the

information asymmetry in the supply chain (Mclaren *et al* 2002). Information can become systematically distorted as it is passed along the supply chain due to imperfect coordination between buyers and sellers. In the absence of credible commitments and trust between the respective parties, the sharing of information can impact negatively on the supply chain (Lee *et al* 1997).

2.3.3 Process Integration

Shared information between buyers and sellers can be fully leveraged through “process integration”. This may at times be challenging. Childerhouse *et al* (2003) make reference to external factors that potentially contribute to the difficulty of extracting meaningful information/data, one need only consider the adversarial attitudinal problem frequently met in practice where a customer washes his hands by saying "over to you – you sort it out if you want the orders!"

This was also evident at IBM where effective relationships with suppliers were hampered because IBM did not want suppliers to know what product its parts were going to be used in. This example raises the further difficulty that process integration involves the collaborative working between parties in the joint development of systems and integration to allow for shared information. Strategy determination accompanies process integration and the transparency of information and open book policies (Christopher, 2004).

Ho *et al.* (2002) argue that process integration is best achieved through meaningful collaboration. This presents a challenge for all stakeholders in that considerable trust and commitment is required for meaningful levels of process integration (Spekman *et al.*, 1998).

Integration requires a great deal of data input from both automated sources as well as manual inputs, high frequency data flows should be automated and in standard format.

White *et al* (2004) highlight in a report document titled: “*Describing ideal and suboptimal supply chain integration*”, ideal information flow is not evolving within the supply chain industry, for a number of reasons as stated below:

- The Manual input of data which is widespread and that takes place at many points within the supply chain.
- The Interventions that are required to maintain data integrity and the quality of output.
- The use of translators to convert data from one format to another is prevalent.
- Organisations are making use of informed data as apposed to actual data to make decisions – lends itself to the Bull-Whip effect.
- Large firms operate without essential data (White *et al* 2004).

2.3.4 Coordination Failures

Highlighted by White *et al* (2004), coordination failures arise due to asymmetries in incentives between market participants, self interest and mistrust. These failures can be attributed to the following.

- Standards adopted by organisation that are not optimal to the industry.
- Incompatible systems created by dominant players collaborating with each other focussing on the private optimum e.g. Computer aided design /manufacturing and engineering.
- Size and technical capabilities of various firms differ – financial resources and technical capabilities become obstacles.
- The perception that investments may not pay out over the required time horizon.

(White *et al* 2004)

White *et al* (2004) explain Inefficient integration as the automation of information inputs and flows, the problem is the lack of suitable standards infrastructure leading to excessive capital investment with concomitant duplication of staffing efforts.

Incomplete integration refers to the deployments of systems enhancements to only subsets of the supply chain – ultimately certain key elements of a comprehensive system are missing.

The goal of supply chain integration would be to extend the concepts to inter firm transactions across the entire chain of industries where information is entered in at source and available to all stakeholders in the chain with standard protocols obviating the need for translation without manual intervention – Enterprise resource planning and internal networks have come close to providing this within the boundaries of a multidivisional firm.

Lee and Whang (2001) argue that Integration cannot be complete without strong linkage of the relationships between organisations, this entails the following:

- Channels of communication must be open and well defined,
- Key performance indicators need to be established and aligned,
- Supply chain partners are not mutually exclusive in respect of the performance of the supply chain – there needs to be joint accountability for performance measures of other members within the supply chain.
- The sharing of incentives by stakeholders (Mutual benefit).

Evident in mature industries, as highlighted by White *et al* (2004), is the important aspect around the way in which industries are dominated by single firms which create the standards and set the benchmark for the industry to follow. Within the automotive sector – dominant OEM's have developed their own systems and insisted that their suppliers adopt the same as has been the case with Daimler Chrysler, Ford and General Motors.

2.4 AGILITY AND RESPONSIVENESS TO CUSTOMER DEMAND

The importance of time as an element of competitive advantage has been recognised for some time. The ability of firms to respond to customer demands in increasingly shorter periods of time together with the ability to synchronize with the variability in demand is of critical importance in the modern supply chain. The concept of “Agility” is one of the upcoming challenges facing supply chains in the international business world Christopher (2000).

Given the volatility and increasing dynamic performance requirements, this emerging concept challenges many well established paradigms i.e. lean production schedules. (Chandra and Kumar, 2000; and van Hoek *et al.*, 2001).

Van Hoek *et al.* (2001, p.146) argue that agility centres on "responsiveness to dynamic and turbulent markets and customer demand". Mass production vs. mass customization is the challenge that faces many supply chains.

Agility is the response of the supply chain to the ever increasing flexibility requirements and the fast paced requirements of end users in the supply chain.

Many organisations are forecast driven and not demand driven, the information at the point of sale is not available, or the direct feed from the market place in the form of data on actual customer requirements is lacking.

An agile supply chain is capable of reading and disseminating this information upstream in order to be able to respond to the requirements commonly termed as Efficient Customer Response (ECR) which has been a break through since the early '90's with the use of information technology to capture data on demand direct from point of sale, this has fundamentally changed the market place in allowing organisations to accurately assess in real time, the customer demands downstream thus relating this into meaningful data upstream (Christopher 2000).

The Agile supply chain is market sensitive, it responds to real demand which ultimately means making forecasts based on past sales and then converting this into inventory a redundant process (Christopher 2000).

Different views exist regarding the core characteristics of agility. For example, van Hoek (2000, p.195) presents a definition which focuses on information flow and integration. He defines agility as being “tuned along the lines” of

- market responsiveness,
- information,
- process integration and
- network integration.

In contrast, Goldman *et al* (1995) define agility as more closely aligned with principles of collaboration with the following dimensions: enriching the customer; enhanced competitiveness through cooperation; the mastering of

change and uncertainty; and leveraging the impact of people and information.

The concept of agility is therefore, linked to both information flow involving integration along with collaboration between supply chain partners

2.4.1 Leagility

The concept of agility has been debated, particularly because of its potential conflict with dominant paradigms of the lean organization (Towill and Christopher, 2002). Leanness implies efficiency and elimination of waste while agility implies quick responsiveness and flexibility.

Piszczalski (2000 in Bruun and Mefford, 2003) argue that there is an inherent conflict between the lean principles of operation and that of IT which requires greater flexibility. It is argued that lean production emphasises reducing variety and flexibility to achieve greater efficiency whereas IT emphasises more flexibility and product variety.

It has however, been argued that both can co-exist, provided that sufficient robustness as well as smooth demand and level scheduling.

Naylor *et al.* (1999) introduce the concept of "leagility", arguing that both leanness and agility can co-exist. They explain that good market knowledge and information facilitates agility as well as lean planning. Leagility also

relates to responsiveness to the 'customer' being the next receiver of goods and not necessarily the end-user. This is related to the positioning of the decoupling point.

The decoupling point separates front office from the back office, where the front office is responding to customer demands/orders and the back office is based on the planning and forecasting. Information decoupling centres around the flow of information rather than that of the goods movement, there are various points along the supply chain where information is disconnected between the functions and the companies involved (Remko and Van Hoek 2000).

It is important to distinguish between the material decoupling point and the information decoupling point whereby the former involves the strategic inventory being held in its generic form as far downstream as possible to the end user and the latter where the information should lie as far upstream as possible (Christopher, 2000). Optimal agility and leanness is determined by the positioning of the decoupling point through postponement which allows for greater differentiation closer to the customer. This reduces risk in the supply chain and allows for greater flexibility (Naylor *et al.*, 1999).

Agile companies seek to rationalise their customer base in order for them to create long-term relationships through process integration with multiple suppliers.

Christopher (2000) argues that whilst inherent dangers exist with single sourcing, the advantages to having a network of key suppliers whereby production distribution and the like can be synchronized, yields considerable benefits to the supply chain - Furthermore, opportunities for establishing paper-less, information based systems through vendor managed inventory are greater when the participants are able to see each other as vital links in the competitive supply chain.

The legitimacy of the concept of leagility is, however, controversial (e.g. Power *et al.*, 2001) and Van Hoek (2000), for example, have argued that a possible flaw with the leagility concept is, while it may work operationally to a certain extent, lean thinking is not going to allow sufficient agility for a true move towards a strategically agile organization. In this way, leagility can only be a compromise position because it does not sufficiently challenge lean thinking.

2.4.2 Virtuality

A virtual supply chain is created by sharing information between participants in the supply chain, this, in effect is the premise of the virtual supply chain, being information based as apposed to inventory based.

Developments over the past decade in communication and technology have led to an increased need to coordinate activities irrespective of geographical

constraints this has led to virtual teaming requiring coordinated development of people, processes and technology (Gundry in Bal *et al* 1999).

The members of the team are committed to the strategy of mastering change. The strategy is designed to help reduce supply chain turbulence and this is done by fast-track, synchronous group messaging systems such as computer conferencing and shared applications in order to manage change and exceptions.

Virtual teaming has been recognised by major automotive manufacturers as the answer to agility which is unconstrained by geography whereby knowledge is quickly applied as corrective and preventative measures. Virtual teaming is probably one of the most appropriate frameworks that can be applied across a distributed supply chain and if implemented correctly can be a significant innovation in effective management of the agile supply chain (Bal *et al* 1999).

2.5 INFORMATION FLOW AS AN ENABLER TO COLLABORATION

According to Barrat (2004), collaboration takes place both internally and externally within an organisation and can be divided into two main categories namely

- vertical integration and
- horizontal integration

The former would include collaboration with customers as well as internally across functional silos within the organisation and the latter with competitors as well as non-competitors.

For the purposes of this paper, the focus will remain on external collaboration which is supported by the internal collaboration with the view to establishing closer relationships and integrating processes and the sharing of information between supply chain partners (Barrat, 2004).

Newman in Spekman *et al* 1998 argues that we are beyond the point whether close ties between buyers and sellers carry inherent risks, the relevant question is how effectively organisations are better able to manage and leverage of the capabilities of their supply chain partners. The procurement manager is no longer regarded as a transaction manager but rather seen as a broker of information (Spekman *et al* 1998).

A critical question on how much information can be shared between supply chain partners is not a technology question but rather a business question. Businesses thrive on information asymmetry. Unless positive proof exists that the sharing of information be mutually beneficial to supply chain participants, then the likelihood of them sharing information will be less.

Organisations deliberately try to establish goodwill towards each other by building trusting relationships, this is done in the attempt to avoid participants from benefiting from opportunistic behaviour, it is characterised

by the voluntary reciprocal engagement and operates on a model of shared power contrarily, compliance is ensured by inequities in power, and non voluntary participation, weaker parties are forced to cooperate under the dominance of the larger parties – the terms and conditions are mutually determined in collaboration but enforced by the dominant party.(Hardy *et al* 1998)

Collaboration has become a popular topic as an integral facet of supply chain management sourcing strategies. The movement of co-ordination to collaboration requires levels of trust and commitment and share a common vision of the future and are beyond those typically found in Just in Time (JIT) and EDI relationships. (Spekman *et al* 1998)

Many studies have shown that the sharing of information between parties in the supply chain improves the performance of the supply chain. The largest obstacle however, is the aspect regarding confidentiality. It is regarded as both a legal and an economic issue (Mason-Jones and Towill 1997).

One need only consider the sharing of information between retailer and manufacturer and the risk of the leaking of this information to competing retailers who in turn can respond to the information.

The power of information can be harnessed to help supply chain members establish partnerships for better supply chain system performance. Although many companies through the implementation of IT are swimming in

information, it is the management thereof that is problematic for most and the greatest challenge that lies ahead, if any of the organisations are going to make any meaningful decisions of it. It is not so much the technology but rather the information that is transferred that makes the difference. (Mason-Jones and Towill 1997).

Whilst information asymmetry may cause greater uncertainty between partners, it allows for the one to possibly exploit the other – even if it is technically feasible to integrate systems and share the required information, organisationally, it may not be feasible due to the fact that this may cause upheavals in the power structure.

Dearden (1972) in Premkumar (2000) claimed in a Harvard review, ignoring these organisational realities and going forward with implementation would possibly result in there being a high probability of implementation failure.

The advent of Enterprise Resource Planning (ERP) systems is one way in which information systems engineers and organisations are coping with this dilemma and allowing for increasing level of public information thus slowly increasing the level of information for increased performance.

The supply chain partnerships can mitigate deficiencies associated with decentralized control and reduce the “Bull-Whip effect” – uncertainties arise due to lack of perfect information about other members and hence the

reason for the importance around gaining more information and the sharing of information of other members within the supply chain (Lee *et al* 1997).

Many Original Equipment Manufacturers (OEMs) have invested heavily in IT infrastructure to make important information visible to their suppliers and customers that is viewed as being essential to maintaining a firm's competitive advantage. Forging ties between the respective stakeholders in the supply chain allows the companies to work together to refine the components and parts and easily respond to variances of shifts in customer demand. (White *et al* 2004)

Companies participating in alliances deepen their relationship beyond the contractual level and develop common business strategies and goals and allowing them to become more comfortable with the sharing of information between them (Tilson 2001).

Simatupang and Sridharan (2004) argue that the concept of collaboration can be categorised into three interrelated dimensions:

- 1) information sharing,
- 2) decision synchronisation and
- 3) incentive alignment.

The authors believe that collaboration needs to take place on all three fronts in order for there to be optimization of operational performance within the supply chain.

Christopher (2004) argues that one of the keys to achieving agile response to fast changing markets lies upstream of the organisation in the quality of supplier relationships. Many companies have not recognised the competitive advantage that can be derived from closer relationships with key suppliers.

One way in which a company can build agility into the supply chain is to provide data on changes in supply and demand continuously to the supply chain partners so that they are able to respond quickly. For instance, Cisco recently created an e-hub, which connects suppliers and the company via the internet. This allows all the firms to have the same demand and supply data at the same time, to spot changes in demand or supply problems immediately and to respond in a concerted fashion. Ensuring that there are no information delays is the first step in creating an agile supply chain (Lee 2004).

According to (Spekman *et al* 1998) collaboration as a concept on its own cannot be fully understood without including the other concepts discussed in this literature review, essentially collaboration centrally implicates the following:

- information flow,
- IT infrastructure,
- process integration, agility and
- responsiveness to fluctuating customer demand.

A central notion to supply chain management is the degree to which each member in the chain views the other as essential and that members in the chain are not acting in their own best interests to the detriment of the supply chain – this is commonly known as criticality and based on the notion of the highly recognised interdependence of each member. (Spekman *et al* 1998)

CHAPTER 3: RESEARCH QUESTIONS

3.1 RESEARCH AIM

The aim of the research is to assess how partners in the supply chain view information as an enabler to collaboration in the South African environment. More specifically to gain a deeper understanding of the potential of information flow as an enabler of

- agility,
- customer responsiveness and
- collaboration

As assessed by supply chain partners. It is hoped that this will contribute to a better understanding of current practice and that recommendations stemming from this research can in turn contribute towards improving practice.

The following research questions are proposed:

1. What is the state and significance of information flow in each organisation?
2. What role does IT infrastructure play in facilitating the flow of information between supply chain partners?
3. How is process integration viewed in each company and what are the possible barriers to successful integration?
4. How do stakeholders assess information flow as an enabler of agility which allows for greater responsiveness to fluctuating customer demand?
5. How do stakeholders assess information flow as an enabler to collaboration?

CHAPTER 4: RESEARCH METHODOLOGY

Research Method

This chapter will discuss the methodology that was used, the unit of analysis and how the data was collected and the process of data analysis. The chapter will also cover limitations of the research.

4.1 RESEARCH DESIGN

This research proposes to assess information flow as an enabler to supply chain collaboration in a South African context, as such, it is not specific to a

particular organization or industry but addresses issues shared across a number of organizations.

A survey design was therefore most appropriate given the ability of surveys to gather a large number of responses from a heterogeneous sample. Surveys are useful in establishing a sense of the overall state of a particular issue (Leedy, 1985). The structured nature of the survey design requires large numbers of respondents who all answer a standard set of questions (Neuman, 1991).

In this case, the survey was directed towards Logistics/Supply Chain executives based in different organizations. It was used to assess their understanding of information flow and its relationship to supply chain collaboration from a more global perspective than would be possible through a study based in one organization.

The Surveys may also potentially allow for exploration of the relations between different variables (Rosenthal & Rosnow, 1991).

The current study aims to assess the possible relationships between information flow,

- IT infrastructure,
- process integration,
- agility and customer responsiveness and
- collaboration.

With the range of variables being investigated, the structured nature of the survey design is particularly useful.

It will form the basis of a “real world” analysis on the different factors all related to the research questions posed above. It should be noted, however, that survey research aims primarily to provide a description and explore relationships between different responses. It cannot establish causality, as can experimental research and does not provide more in-depth, qualitative understandings of the opinions and practices of stakeholders.

It is appropriate to this research because it can provide a clearer understanding of information flow as an enabler of collaboration through the eyes of the respective stakeholders in the supply chain.

4.2 SAMPLING

Survey research requires a large and representative sample (Leedy, 1985). The theoretical population for this study comprises any organization involved in supply chain management.

It is not, however, pragmatic to define the population this broadly. For the purposes of this study, the population was defined as all companies serviced by UTi South Africa (International Division). UTi’s primary activity is to offer supply chain solutions to a broad range of organizations and industries involved in the importing and exporting of goods.

The researcher was employed by UTi (International Division) and had ready access to the diverse client base. Because of its positioning as a supply chain solution expert, UTi's client base is sufficiently representative of the business environment to address the current research question, and sufficiently globalized to necessitate complex and critical supply chains and partnerships. This is however seen as a possible limitation and discussed later in this chapter.

The researcher had access to almost 600 customers across the respective industry silos. UTi makes use of its existing customer service department, focused on the existing customer base.

Rather than randomly selecting from this customer base, purposive sampling was chosen for this study. The sampling criterion is logistics spend. This is based on the assumption that supply chain activity drives billings and essentially the revenues earned.

It was assumed that high logistics spend is likely to co-occur with increased information flow and increased need for collaboration. The purpose of this sampling method was therefore to specifically target those companies who were likely to have most at stake concerning information flow and collaboration in the supply chain.

UTi service profilers regularly visit all customers, and make frequent visits to "A" customers (spend greater than R200k net revenue for UTi per annum).

Access to the sample was deemed relatively simple and therefore it was envisaged that it would be possible to administer questionnaires to a total sample size of 100 companies, representing those with the top logistics spend with UTi.

The survey proved to not be as simple as initially anticipated, with the reluctance of many potential participants to apportion their time to complete the survey questionnaire. A total of 140 Questionnaires were issued to the service profilers of which, 48 responses were received back from willing participants, indicating a response rate of 34% which is regarded as a significant response rate to allow for assessment.

The questionnaire was targeted towards logistics managers or senior executives who were strategically or predominantly involved in supply chain management. They were considered to be best suited to respond to questions about their particular company.

4.3 METHOD OF DATA COLLECTION

A structured questionnaire was designed in order to address the research questions. No existing questionnaires have been found that are able to assess the particular combination of factors addressed in this study. (See Appendix A for the questionnaire).

The items in the questionnaire measure different degrees of attitude towards the attitudinal object. Questions have been designed through a combination of areas identified in the literature and the researcher's knowledge of the research field. The selection of the correct dimensions was imperative to insure that the profile was concise and sharp.

The likert scale is easier to compile than other attitudinal scales and is used for multi-dimensional attitudes, which is not necessarily possible with other types of attitudinal scales. (Welman and Kruger, 2001).

The research questions were based on the problem that had been identified. The documentary review via grounded theory assisted in the development of the questionnaire and the questionnaire addressed the following areas relating to the problem Pekman *et al* (1998) make reference to the fact that collaboration implicates the following criteria: information flow, IT infrastructure, process integration, agility and responsiveness to fluctuating customer demand, hence the focus on these specific criteria.

- *The state and significance of information flow in each organization.*
- *The role of IT infrastructure in facilitating the flow of information.*
- *Perceptions of process integration in each organization.*
- *An assessment of information flow as an enabler of agility and as enabling responsiveness to fluctuating customer demand.*
- *An assessment of information flow as an enabler to collaboration.*

The intention was not to elicit details or specific information, but to obtain a more holistic or “global” assessment of the role of information flow as an enabler to collaboration. Within the research questions addressed above, the idea was to gain an understanding of the respective philosophies and approaches that the parties have adopted with respect to supply chain partnering.

The survey design required that all respondents answer the same questions in the same way. The questionnaire was structured around closed-ended, likert-type questions.

To enable all respondents to have a common understanding of the questions, all items were defined in the questionnaire. Responses would be quantifiable and comparable. Respondents would be asked to indicate the importance of the listed questions on a five point likert scale. On this scale, 1 and 5 correspond to “Strongly Agree” and “Strongly Disagree” respectively. A single open ended question with subsections was included to allow for unexpected data to emerge and this addressed possible limitations of the structured survey design.

The questionnaire was administered through participants in the servicing team of UTi Worldwide Inc. (International Division- South Africa) the role of the team is to conduct field service calls to existing customers of the international division. The relationships management and the role of client retention forms the basis of their portfolio. A group of Key Account Managers

(KAM's) to which these service executives report through, were addressed and advised of the intention behind the survey and the intended outcomes of the research.

The possible benefits of which, could be filtered through to the customers through enhancements to technology and information flow allowing for greater service delivery. The various industry silos overseen by the KAM's are as follows: Fast Moving Consumer Goods (FMCG), Pharmaceuticals, Chemicals, Automotive, Mining, Textiles/ Apparel and the Technology vertical.

The questionnaire was administered through the servicing team and accompanied by a letter outlining the reason for the research.

The following was conducted in order to encourage maximum response rates:

A draft questionnaire was sent out to fifteen individuals both within UTi International along with respondents from Sister Companies falling under the umbrella of UTi worldwide Inc. These individuals represented various areas of business and were encouraged to provide feedback in terms of their understanding of the questionnaire, structure, and recommendations regarding any possible changes and improvements to the questionnaire design format and content. The responses to the questions were validated and explained where necessary.

The final questionnaire was drawn up, based upon the feedback received from the respondents who reviewed the initial draft questionnaire.

The questionnaire was clearly structured and not time consuming to complete.

- A covering letter advising the reason for the research along with the assessment of the questionnaire and the intended outcome may be of benefit to the particular organization since it could possibly improve UTi's service delivery.

The ideal would have been a one on one interview whereby the service executive could walk through the survey with the respondent, however cognizance was given of the fact that many respondents were constrained by time pressures and preferred the questionnaire to be filled out in their own time and picked up at a later stage.

The risk was the likelihood of the survey not being completed at all – in essence, tremendous reliance was placed on the respective service executives to drive the process with their clients.

- Pre-existing relationships exist between executives and UTi servicing team members. This is likely to result in good motivation to fill out the questionnaire.

The research instrument is focused around examining in greater detail aspects of supply chain management that address the transition from co-

operation to collaboration and gaining insight into issues affecting workflow and information flow among levels of the supply chain.

Throughout the study, the primary goal is to gain a better understanding of the thoughts and insights into respective supply chain participants on their view surrounding the flow of information as an enabler to collaboration in the supply chain.

A significant response was expected through this methodology, the limitations of which are discussed later in the chapter. It is also believed that the correct people will be targeted as it is encouraged that triple deck verification takes place on all accounts.

4.4 METHOD OF ANALYSIS

The primary method of data analysis was quantitative. This involved computing descriptive statistics on individual questionnaire items and running comparative statistics across questionnaire items. It was also possible to examine the relationships between the different aspects of the research questions.

It should be noted, however, that the research question will not be primarily answered through a statistical analysis of the relationship between information flow and collaboration. Instead, it will present the results of the assessments of key stakeholders regarding their experiences and opinions.

The open-ended questions do not form a core area of data analysis, but would be useful to explicate the quantitative results found. Thematic content analysis will be conducted on these open-ended questions. This will involve repeated readings of individual responses followed by identification of relevant themes.

Open-ended responses will then be quantified into these themes. Individual quotations will also be used, where appropriate, to ground quantitative results in more detailed and unstructured responses.

4.5 LIMITATIONS TO RESEARCH

The limitations of this particular research are as presented below.

4.5.1 Sample Size

- The sample size is of a population serviced by The UTi International Division of UTi worldwide Inc.
- The sample for this research comprised a total of 140 survey questionnaires which were distributed amongst the servicing team – it was hoped that in the time permitted a response rate with at least 30%-40% - which is a small sample of the entire population – considering point number one above.

4.5.2 Sample Formation

- Convenience of industry silos as serviced by the existing service team representing UTi International - the risk is the oversight of other types of industry.
- Feedback is restricted by those respondents that were prepared to set aside the time to complete the questionnaire, ultimately a question of access and time availability of the service executive along with the respondent.
- Tremendous reliance was placed in the hands of the service executives to get the required feedback in a short space of time.
- The assumption that activity drives logistics spends and ultimately the criterion upon which the company was chosen to be surveyed.

CHAPTER 5: ANALYSIS OF RESULTS

5.1 INTRODUCTION

The data was assessed in terms of the industry silos as listed below. For purposes of analysis, the results were consolidated to reflect an overall assessment.

Due to the limited number of responses per industry silo, the results cannot be interpreted per industry silo. Where appropriate, the data has been reflected and interpreted to add meaning to the overall results obtained.

A total number of 140 survey questionnaires were distributed amongst existing customers of UTi (International Division) of which 48 were returned reflecting a response rate of 34%.

- Mining
- Automotive
- Information Technology / Hi Tec
- Chemicals
- General

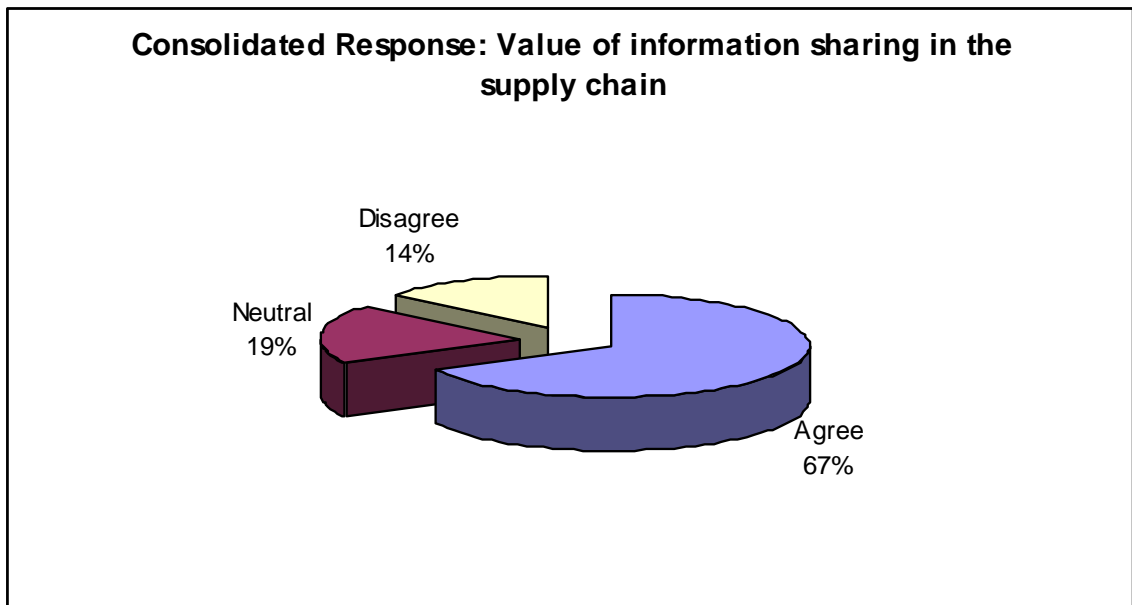
The survey was structured with the view to gaining responses covering the following five questions:

1. What is the state and significance of information flow in each organisation?
2. What role does IT infrastructure play in facilitating the flow of information between supply chain partners?
3. How is process integration viewed in each company and what are the possible barriers to successful integration?
4. How do stakeholders assess information flow as an enabler of agility which allows for greater responsiveness to fluctuating customer demand?
5. How do stakeholders assess information flow as an enabler to collaboration?

5.2 VALUE IN INFORMATION SHARING

Graph 2 illustrates industry response in respect of the value of information sharing in the supply chain.

Graph 2: Value in information sharing



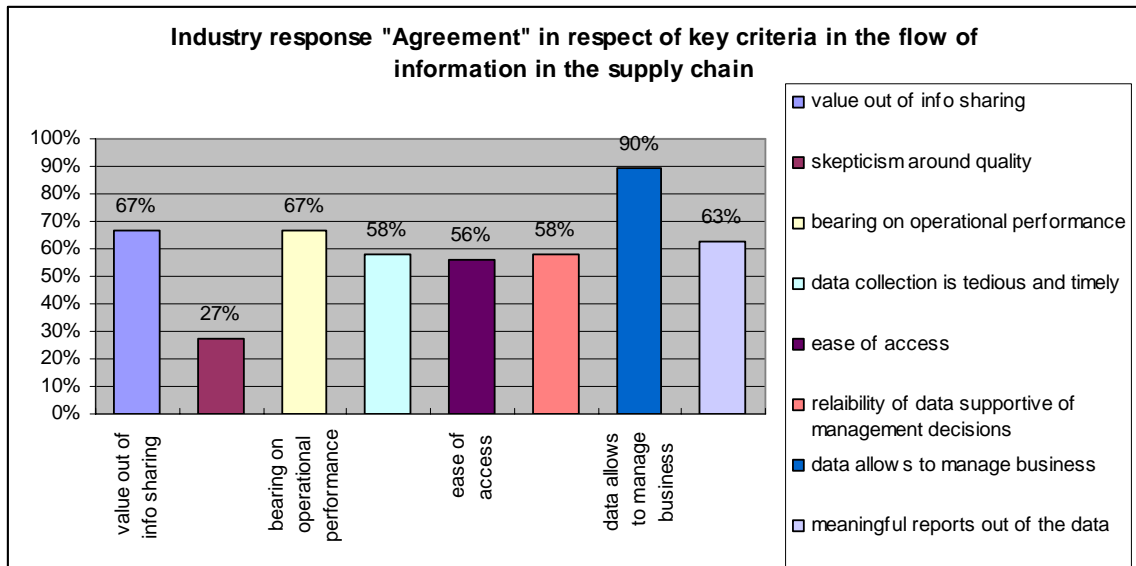
Graph 2 illustrates the apportionment of response in respect of agreement or disagreement in the value of information sharing in the supply chain.

Note: The portion of respondents that “Agree” comprises responses in respect of “Strongly Agree” and “Agree” combined totalling 67%.

5.2.1 Criteria Enabling The Flow Of Information

Graph 3 provides an illustration of the key criteria in respect of the flow of information in the supply chain.

Graph 3: Key criteria in the flow of information



Graph 3 summarizes the research results related to the key criteria listed in the survey questionnaire (Appendix A). There is clear consensus in regard to the value of information sharing in the supply chain as indicated in Graph 2. The analysis reveals that 90% of respondents agree to data being used in the management of their business.

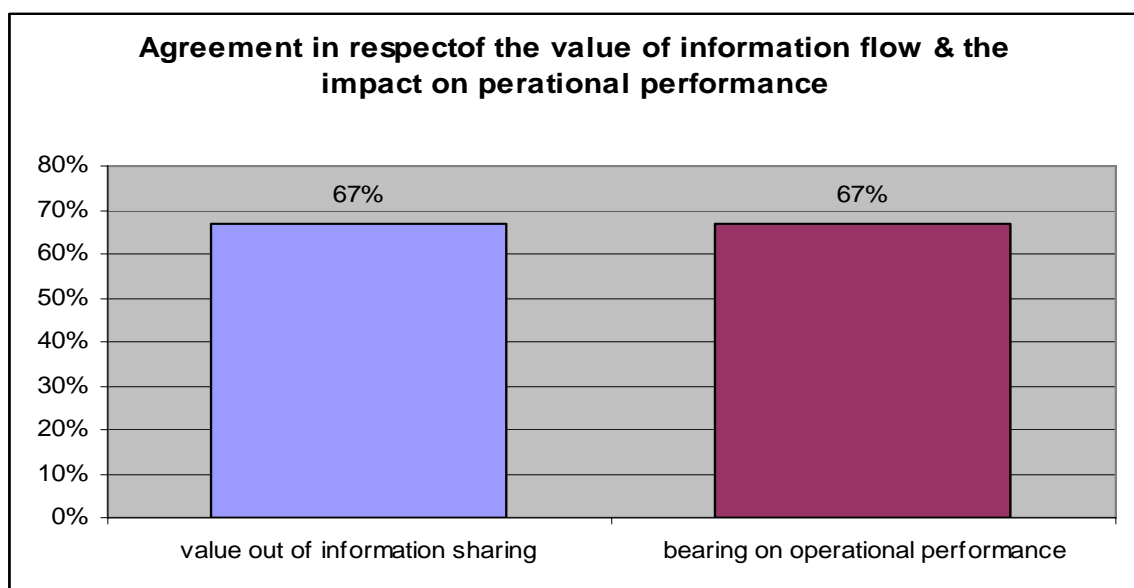
There is a high reliance placed upon the use of data in decision making, however a significantly lower confidence in the reliability of the data along with the ability to generate meaningful (add value) reports which enable effective decision making.

5.2.2 Impact On Operational Performance

Operational performance is defined as having an impact on *cost, quality, reliability, flexibility and speed* within the organisation or along the supply chain.

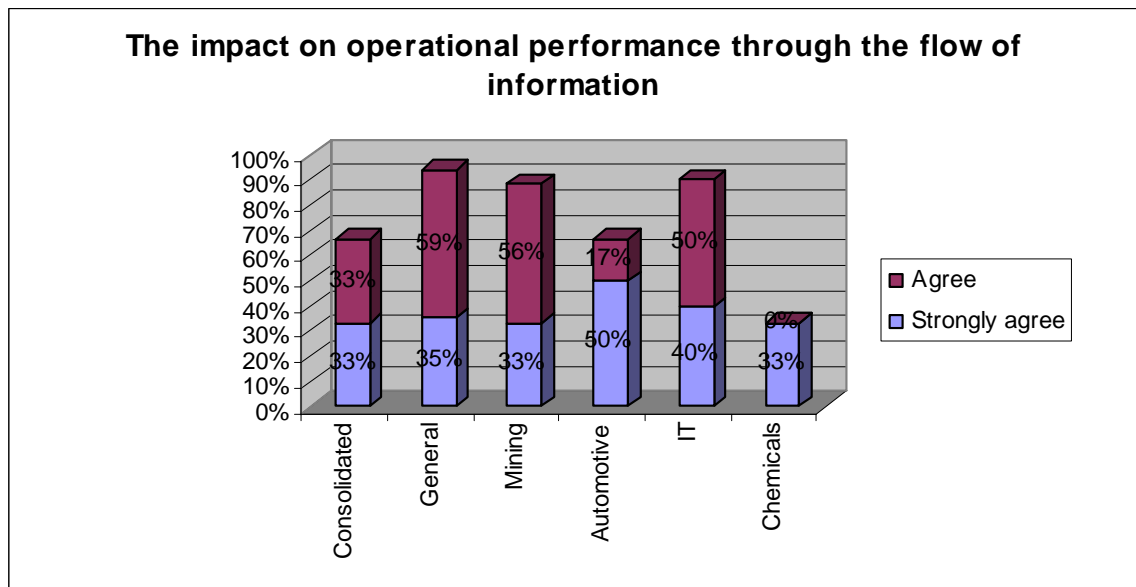
Responses indicate that 67% of respondents agree that information flows between supply chain partners have an impact on operational performance as reflected in Graph 4 below. 20% of respondents were neutral in their response and the remaining 13% of the respondents believe the flow of information to have no impact on operational performance. Results in respect of the agreement in terms of these two criteria are represented below.

Graph 4: The Value of Information and the Impact on operational Performance



Analysis was conducted in respect of each Industry Silo, results of which are reflected below, albeit that there is not a significant response per industry Silo, the results obtained from each Industry silo are reflected in Graph 5 below – the purpose of which, is to add further insight into the responses obtained and illustrate the comparative assessment between the respective industry responses.

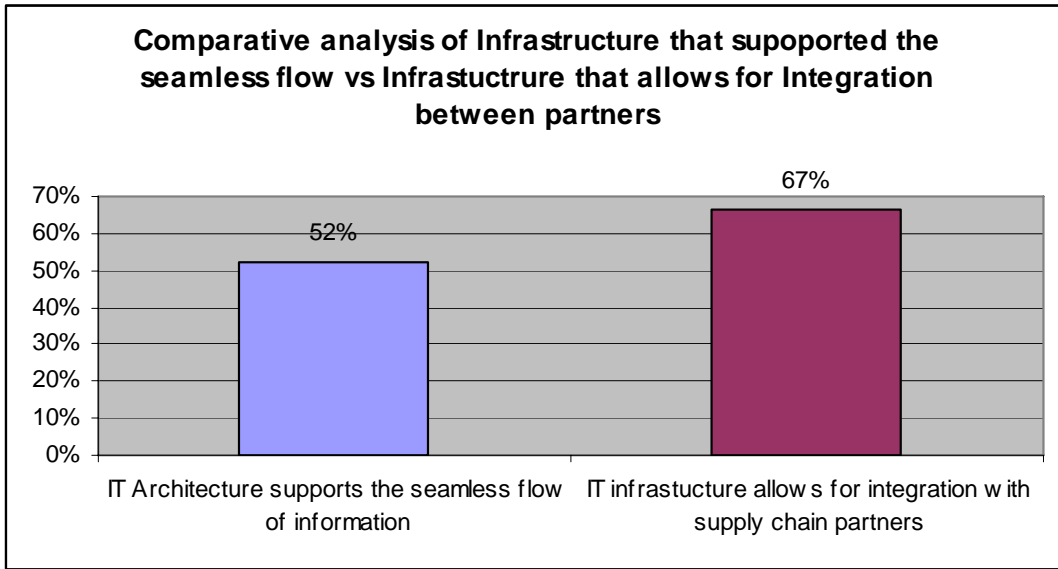
Graph 5: The impact on operational Performance



5.3 IT INFRASTRUCTURE

IT infrastructure facilitating the flow of information between supply chain partners was assessed, reflected in Graph 6, revealing a comparative analysis of IT infrastructure and information flows between supply chain partners

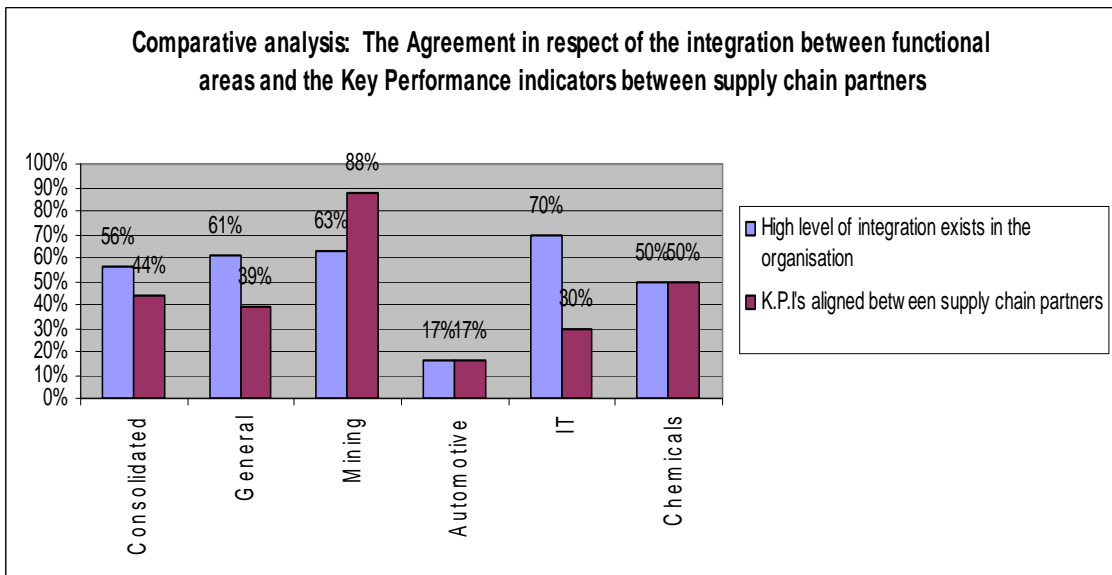
Graph 6: Infrastructure and Integration



Graph 6 illustrates that 67% of respondents agree that IT infrastructure allows for integration between supply chain partners. 52% of the respondents agree that IT architecture within their respective organisations supports the seamless flow of information.

5.4 INTEGRATION AND THE ALIGNMENT OF GOALS AND OBJECTIVES

Graph 7: Levels of integration and KPI Alignment



Graph 7 illustrates the comparative analysis between industry silos in regard to the level of supply chain integration that exists within the organisations accompanied by the assessment of respondents in regard to the Key performance indicators being aligned between the respective functional areas in the business.

Table 1: Levels of integration and KPI Alignment

Criteria	Response	Comment
High Levels of supply chain Integration	56% of Respondents agree to high levels of integration. 16% of the respondents were Neutral in response.	Integration inhibited by Security measures - response = 46% (Driver of lower Integration levels)
Alignment of Key performance indicators.	44% agreed to Alignment - 29% of respondents were Neutral	Very low alignment and high "Neutral" sentiment

Graph 8: Inhibitors to integration

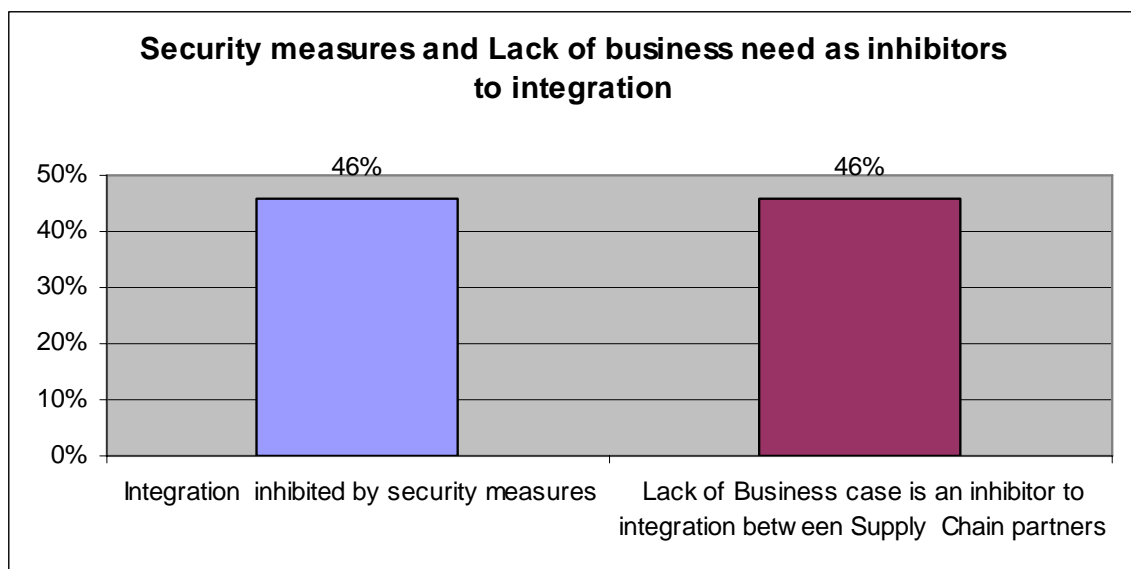


Table 2: Integration inhibitors

Criteria	Response	Comment
Integration between supply chain partners inhibited by security parameters.	46% Agree and 20% of respondents are “Neutral in response	Security – the element of trust and sharing of critical information is an inhibitor and the reason for security measures in the systems.
Lack of business need or recognition of the need.	83% of respondents Agree to lack of business case as an inhibitor to integration.	Significant response expected. Organisations are driven by profit, however in the “IT” and “General” silo the responses are 40% and 33% respectively.

5.5 CUSTOMER RESPONSIVENESS AND AGILITY

Graph 9 reflects the results of responsiveness and agility and illustrates the various criteria that impact on the organisations being able to respond quickly to changing customer demands.

The listed criteria indicate the impact of information flows on upstream activity and the important aspect of information flows as triggers of activity within the supply chain. The Graph illustrates the assessment of the impact of changing customer demands and the resultant unpredictability of the system and the ability of the organisations to respond to changing customer demands, commonly termed, the ‘Bull-Whip’ effect, represented by the unpredictability and variance in upstream activity through changing customer demands (Lee *et al* 1997).

Graph 9 illustrates “Total Agreement” which is the summation of responses “Strongly Agree” and “Agree” in order to provide an overall assessment of the variable.

The extent to which respondents agree or strongly agree are highlighted as such allowing for further insight into the variables concerned

Graph 9: Responsiveness and Agility

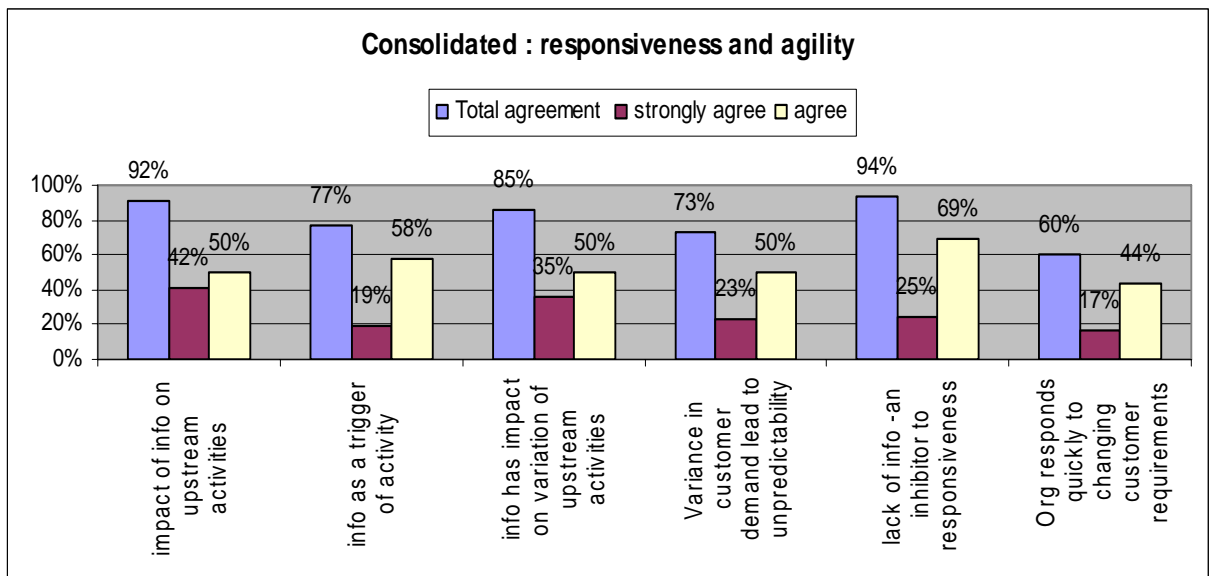
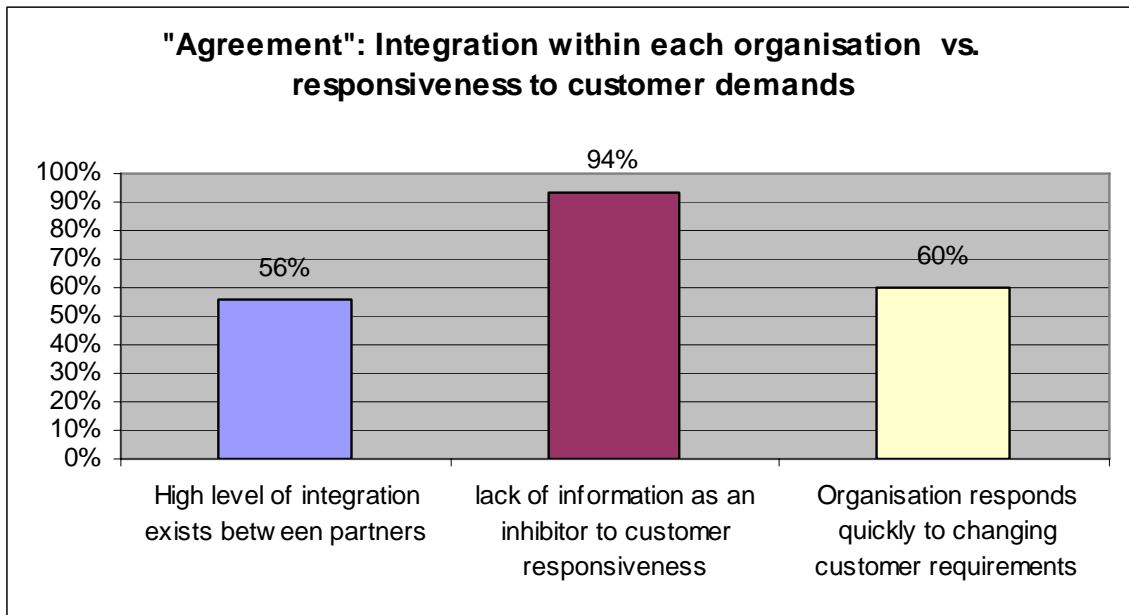


Table 3: Information impact on upstream activity and customer responsiveness

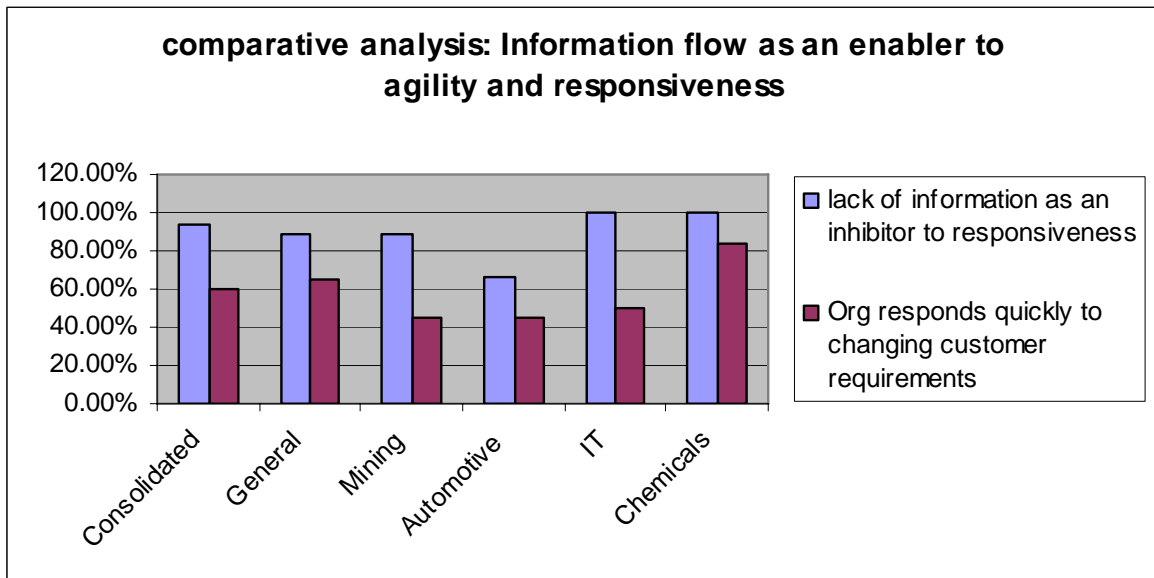
Criteria	Information impacts on upstream activities	Information flow is seen as a trigger of activity in the organisation	Information sharing has an impact on the variation of upstream activities	The variance in customer demand leads to unpredictability in upstream activity	The lack of information as an inhibitor to responsiveness to changing customer demands	The organisation responds quickly to changing customer requirements
Response	4% = Neutral 4% = Disagree	19% = Neutral	15% = Neutral	10.5% = Neutral 14.5% = Disagree	4% = Neutral	23% = Neutral 17% = Disagree
Comment	Very high % agreement in respect to the impact	High percentage of Neutral responses. Respondents unaware of this – may not have the level of exposure or understanding	High neutral response-correlates with the first criteria.	Bull-Whip effect is common and agreed to by large % of respondents.	High positive response has a direct impact on the speed at which the organisation responds to customer demands.	Impacted by the lack of information as illustrated.

Note: “Bull-Whip Effect”: Unpredictability in upstream activity due to changing customer demand.

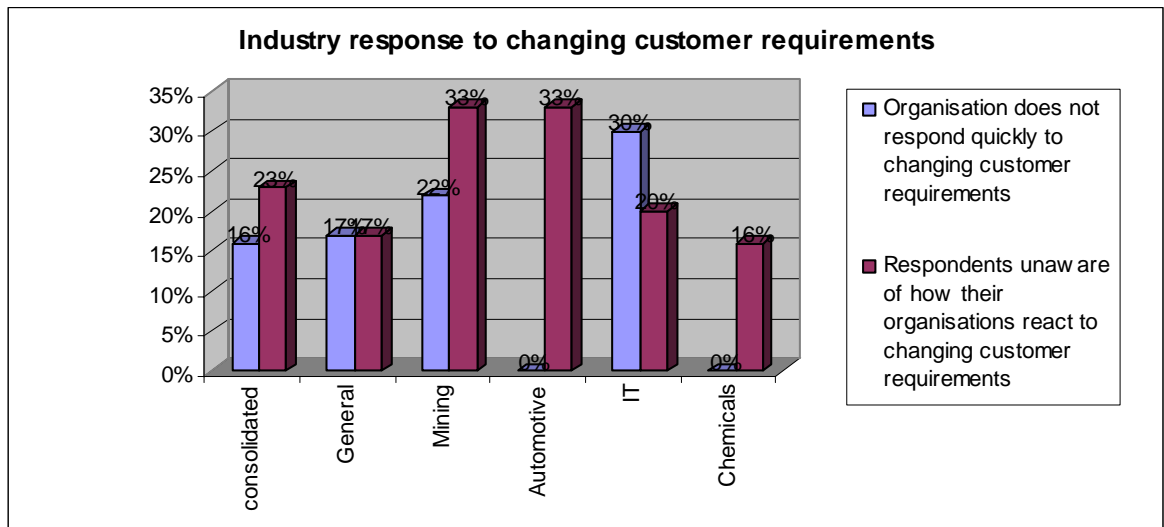
Graph 10: Levels of Integration v.s Ability to respond to customer demands



Graph 11: Information flow as an enabler to agility and responsiveness



Graph 12: Industry response to changing customer requirements



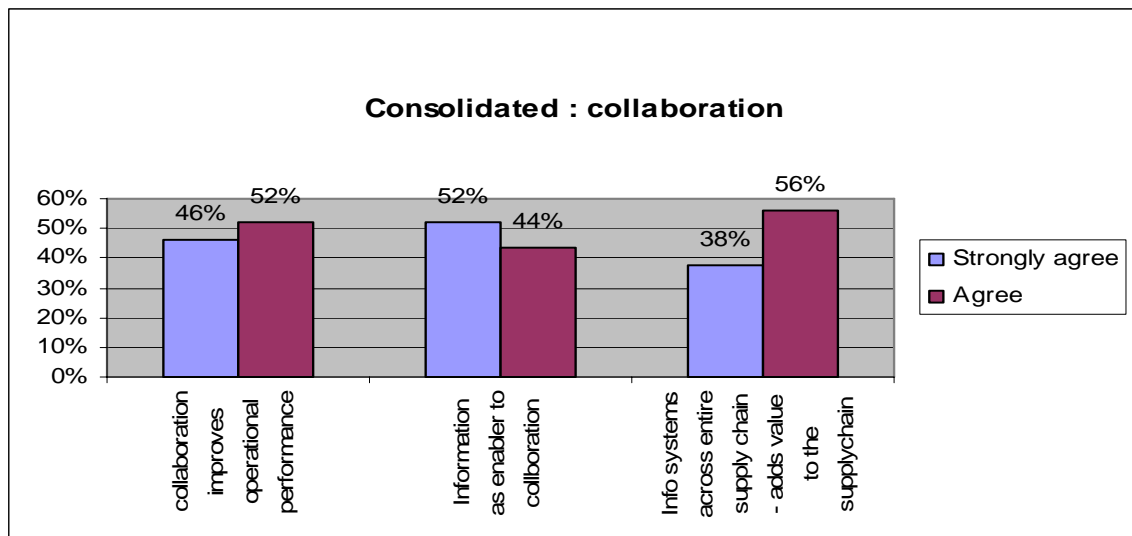
Graph 12 illustrates the consolidated response encompassing the respective industry silos targeted, the results indicate that 16% of respondents do not believe that their organisations respond quickly to changing customer demands, 23% of respondents were neutral in their response, thus being unaware of the speed at which their respective organisations respond to changing customer requirements.

5.6 INFORMATION: AN ENABLER TO COLLABORATION

Analysis reveals that 96% of these respondents believe information flow to be a critical enabler to collaboration within the supply chain. 98% of respondents agree that collaboration through information sharing will have a positive impact on operational performance. As reflected in graph 13.

94% of respondents agree that the sharing of information across the entire supply chain will add value.

Graph 13: Industry response: Information flow as enabler to collaboration within the supply chain



5.7 CONSOLIDATED ASSESSMENT: WHERE AND WHY IS INFORMATION USED AND THE IMPACT ON THE BOTTOM LINE

Three open ended questions were posed to all participants in respect of the following:

1. Where is information used in the business?
2. Why is information necessary within the organisation?
3. Does the use of information and the application thereof add value to their bottom line?

The summation of results has been consolidated into a diagram illustrating the general consensus and common themes as highlighted by the responses obtained as reflected in the Figure 4 (Chapter 6).

CHAPTER 6: RESEARCH FINDINGS

The purpose of the research is to provide the reader with a “snap shot” of the assessment of Supply Chain participants in respect to information flows and the impact thereof, as an enabler to collaboration in the supply chain, within a South African context.

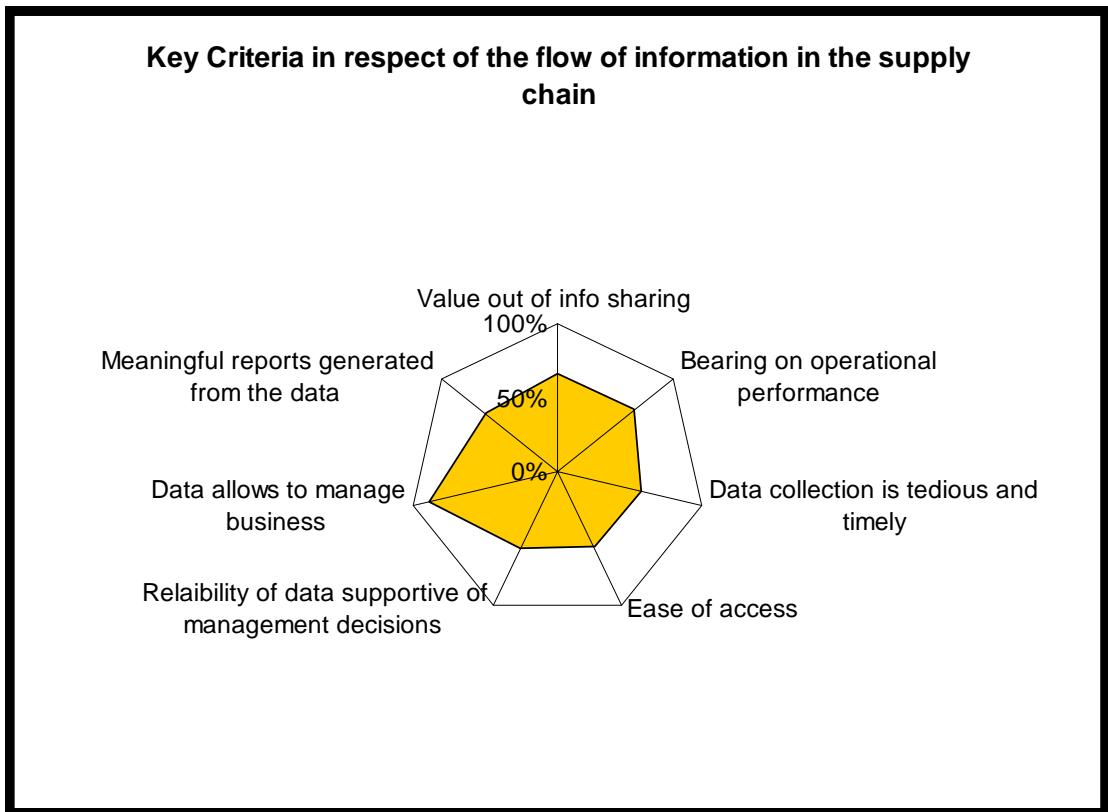
6.1 THE VALUE OF INFORMATION

The responses and feedback received, indicate significant agreement in respect of the flow of information being of value in the supply chain within the respective organisations as is reflected in Graph 2.

Discussed earlier, the Bull-Whip effect, which arises due to lack of perfect information about other members and hence the reason for the importance around gaining more information and the sharing of information of other members within the supply chain is imperative, to the efficient and effective functioning of the supply chain.(Lee *et al* 1997).

Analysis of the responses are related to the flows of information, reflected in Figure 1 below, which illustrates the shortfall or shortcomings (Reflected by the white area) of specific criteria that allow for the facilitation or enable the flow of information within the supply chain, an alternative graphical representation is illustrated by Graph 3 in Chapter 5.

Figure 1: Key criteria measurement in respect of information flows.



White *et al* (2004) highlight the reasons for suboptimal supply integration, as discussed in chapter 2.

Figure 1 highlights the responses to the examined criteria related to efficient and effective flows of information, providing insight into possible reasons as to why information is not evolving within the supply chain within the organisations assessed.

Evident in figure 1, is the significant “pull” towards the use of data by respondents in managing their business. The white shaded area in the diagram reflects the area for improvement or the shortcomings of related criteria and possible opportunity for improvements or enhancements that can

be considered in order to facilitate the more efficient and effective flows of information within the organisations.

A reasonable assumption would be that, in order for managers to make meaningful (educated) decisions, reliable data, along with meaningful reports, should be easily accessible. It is evident that vast improvements in data accessibility can be made, as reflected above.

Almost a third of respondents are sceptical of the quality of data provided by their systems, reflected in Graph 3.

Improving the accuracy and reliability of the data will in turn increase the value of information that is shared and in essence provide decision makers with the confidence to make business decisions.

Where scepticism exists regarding the quality and reliability of data, the application thereof comes under question and ultimately results in the inability of individuals to make informed decisions, thus ultimately resulting in a positive or negative impact on operational performance.

It is assumed that with more reliable data, improved access and the ability to generate useful and informative reports will lead to more educated decisions being made.

The research assessment indicates that this will have a direct impact on operational performance and further improve the value of information sharing within the supply chain.

To support this finding, Susarla *et al* (2004) in their research detailed, “*Operational Impact of information sharing between firms*”, reveals that information sharing on a number of dimensions has a significant impact on operational performance when combined with the coordination of supply chain partners.

It should be the prerogative of each organisation to improve on the above listed criteria. This will allow for far more effective and efficient flows of information, thus further enhancing the supply chain capability.

6.2 INFRASTRUCTURAL AND OBJECTIVES ANALYSIS

The effective flow of information is reliant upon infrastructural hardware and system capabilities of the supply chain partners.

Information technology (IT) is instrumental in the daily running of business and therefore supports the strategic initiatives of the organisation. The extensiveness and robustness of IT infrastructure across the organisation thus forms the backbone of commerce in the world today (Carr, 2003).

With regard to improving the capabilities between supply chain partners, integrative capabilities were assessed and the results reveal that 67% of respondents agree that their systems allow for integration between supply chain partners. The need for the “Seamless” flow of information, was supported by fewer respondents.

The analysis reflects a “gap” between the required and actual capabilities of the respective systems within the organisations, While 67% of respondents agree to integrative capability between supply chain partners, fewer respondents (52%) agree that there is seamless flow within their supply chain, this can be attributed to some of the criteria listed in figure1, which relate to the ease of access, reliability and relative time taken to access data and the ability to generate “meaningful” reports out of the systems, furthermore, as supported by Lundqvist (2004), who states that the lack of integration of back-end legacy systems with middle ware limit companies in networking with multiple supply chain partners.

The analysis reveals the need for organisations to investigate and enhance the capabilities of their respective systems and integration linkages, in order to allow for the seamless flow of information between supply chain partners, supported by Lewis and Talalayevsky (2004) who argue that the reshaping of supply chains optimizes information flows and with the introduction of IT into the coordination structures results in an increase in the reliance of the structures on a fewer information nodes, thus resulting in a far more efficient supply chain.

6.3 INTEGRATION BETWEEN FUNCTIONAL AREAS AND ALIGNMENT OF KEY PERFORMANCE INDICATORS

Lundqvist (2004). States that in order for successful collaboration to occur between supply chain partners, there should be alignment of inter-company process standards.

There is a significant response (56%) in regard to high levels of integration between functional areas of the organisations, highlighted by Parunak, Savit and Riolo in white *et al* (2004) interoperability should be one of the highest priorities when it gets to supply chain optimization, as this could reduce the impact of the Bull-Whip effect on the supply chain.

6.3.1 Key Performance Indicators

A prerequisite for successful collaboration would require the alignment of Key performance indicators as discussed by Lee and Whang (2001).

44% of respondents agreed that alignment between supply chain partners exists within their supply chain. This presents a major opportunity for organisations to further enable supply chain effectiveness by simply aligning their goals and requirements with supply chain partners.

The high percentage of “Neutral “responses indicate the lack of awareness or understanding regarding alignment within the respective supply chains.

Once the fundamentals of infrastructural hardware and information flows and other key enablers to collaboration have been established, the alignment of KPIs should form the platform from which partners can establish common ground through the alignment of goals.

6.3.2 Integration Capabilities

Security issues and lack of integration between systems can be related to the “trust’ factor that exists between supply chain partners. This notion is supported by Ho *et al* (2002) who argue that process integration is best achieved through meaningful collaboration

46% of respondents regard security issues as inhibitors to integration. This notion is supported by Lee *et al* (1997) who argue that credible commitments and trust between parties is required in order for integration to take place.

80% of the respondents agree that Integration between supply chain partners will not take place without a justified business case or business need for integration.

Considering the above factors, provided a sound business case along with the need for integration exists, then it is safe to conclude that integration will indeed take place. The obstacle or challenge for stakeholders however, is the commitment by the respective parties and their ability to overcome the

“trust” element, as stated by Christiaanse (2005), companies cannot realise the true benefits of collaboration until the back-end systems are integrated.

6.4 AGILITY AND CUSTOMER RESPONSIVENESS

As previously discussed, increasing volatility and dynamic performance requirements of the international business world, centre around agility and the ability of organisations to adapt and respond to changing customer demands. Christopher (2000) argues that an agile supply chain is market-sensitive, which means it is capable of reading and responding to real demand.

Towill and Christopher, 2002 introduced the conception of Leagility. This implies a combination of responsiveness and flexibility in organisations responding to changing customer demands.

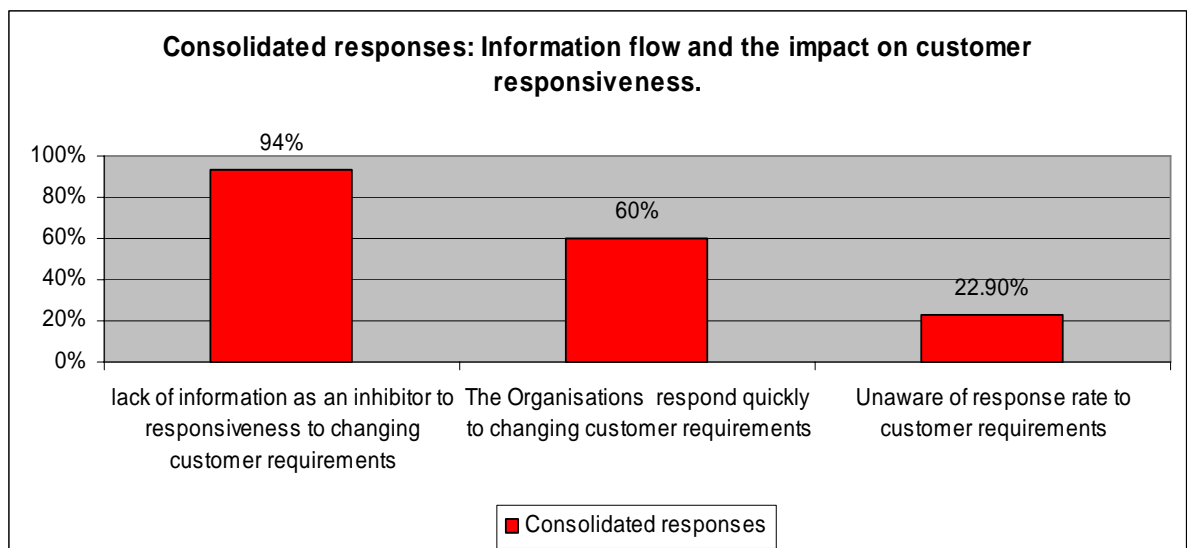
One way in which a company can build agility into the supply chain is to continuously provide real-time data on changes in customer requirements to the supply chain partners. In this way, supply chain partners are able to respond quickly to such changes (Lee, 2004).

Evident by the results obtained is that 94% of respondents view the lack of information as a major reason for organisations not being able to respond quickly to changing customer requirements.

The results show that more accurate and reliable information enables supply chain partners to respond better to customer demands / requirements.

Information evidently triggers activity in the respective organisations. An accompanying factor to unpredictability is the variance in customer demand supported by the high / significant response. These two factors play a major role in upstream activities and the ability of the organisations to respond timeously to changing customer demands.

Graph 14: Information flow and impact on customer responsiveness



60% of respondents agree that their organisations respond quickly to changing customer requirements and view the lack of information flow as an inhibitor to responsiveness, a large percentage of respondents were unaware of the speed or rate at which their organisations respond to changing customer demands.

Whilst respondents regard the lack of information as an inhibitor to customer responsiveness, there is no mutually exclusive direct causal relationship between these factors, consideration of additional variables affecting the ability of firms to respond need to be taken into account, namely: operational capabilities, scheduling and overall design of the business to name just a few.

These aspects are beyond the scope of this research report, however, the results indicate the significant reliance and the value attached to information flows and the impact it has in the organisations' ability respond timeously to changing customer demands.

The fact that 22.9% of respondents were unaware of the status of the speed at which their organisations respond to customer demands, clearly illustrates that they are not necessarily in a position to provide reasonable input as to the reasons for the lack of responsiveness.

The "unawareness" (Neutral response) of the respondents concerned, highlights the need for investigation by these individuals, into the flows of information and their impact thereof on customer responsiveness and whether in fact the inability of the organisation to respond timeously is due to the lack of information within the supply chain.

In regard to the impact of information on upstream activity, which is seen as a determinant of the ability to respond to downstream demands, strong

agreement (92%) exists that information sharing has an impact on upstream supply chain activity, strongly supported by the correlation of the responses.

This highlights the fact that respondents view the impact of information having a bearing on upstream activities and that it influences the predictability of stock and information flows, as discussed earlier with regard to the Bull-Whip effect.

The research indicates that the respondents support the fact that information impacts on both upstream and downstream activities and ultimately determines the efficiency and effectiveness of the systems and the capability of the organisations to respond to changing downstream demands.

6.5 SUPPLY CHAIN COLLABORATION

There is a significant correlation in the assessment by the respondents with respect to the following criteria:

- Value is added by the sharing of information across the entire supply chain .i.e. with all supply chain partners.
- Information is an enabler to collaboration- viewed as a vehicle to achieving synergies and collaboration between respective parties
- Collaboration improves Operational performance.

Figure 2 illustrates the flow of information as an enabler to collaboration in the supply chain and is representative of the agreement of the interaction of

these aspects around information flow and it being an enabler to collaboration as depicted by the high positive correlation as illustrated in Chapter 5.

Figure 2: Information Flow: An enabler to collaboration in the Supply Chain.

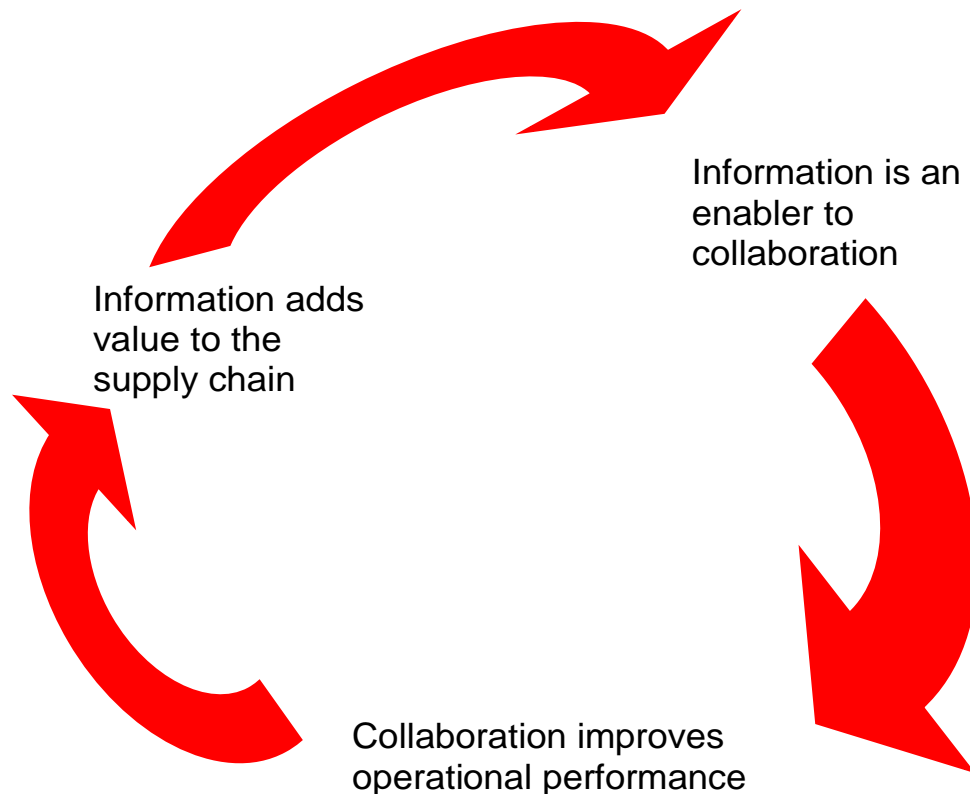


Figure 2 illustrates the interaction of information along the supply chain as assessed by the respondents who regard information flows as value adding to the supply chain which enables collaboration, ultimately impacting on the operational performance of the supply chain

All the above factors relating to the flows of information are elements that need to be considered and coordinated in order to enable greater collaboration between respective supply chain partners.

The factors contributing to supply chain collaboration are represented by the “*Collaboration Integration Triangle*” (Figure 3). In deriving the model, the researcher considered the various aspects highlighted in the study that allow for the facilitation of the flows of information along with the various enabling criteria supporting collaboration within the supply chain. The entire model is driven by the flows of information between partners as illustrated by figure 2.

The Diagram (Figure 3) is comprised of two parts, the “**Outer Core**” and the “**Inner Mechanics**”, which represents feedback from respondents regarding the role that information plays as an enabler to collaboration and its impact on operational performance. This information flow may be seen as the so called “Holy Grail” of the research topic (Figure 2).

The outer core is driven by the second part represented by the “Inner Mechanics”, represented by the integration triangle. This is supported by literature from Van Hoek (2000), whereby the characteristics of agility are related to Information; Process Integration and Network integration.

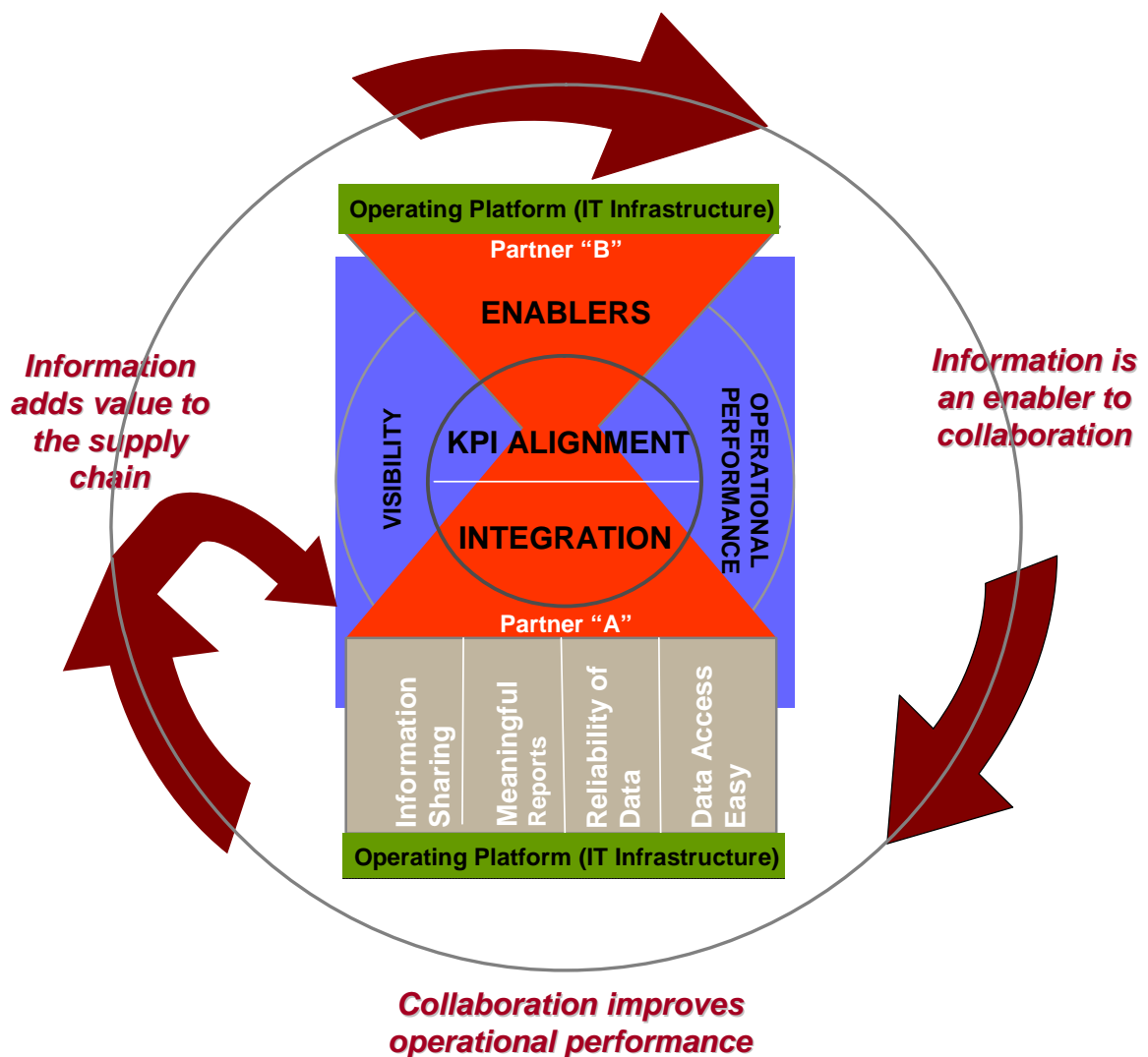
The research findings highlights the following factors as being imperative to the workings of the model, comprised of the following:

1. IT infrastructure (Foundation level criteria)
2. Enablers(access and transfer and availability of data) and
3. The integration (KPI's, People, Processes and systems)

These factors entail cooperation between parties, thus creating, a platform for collaboration between parties.

The resultant impact is the visibility among respective parties across the supply chain and the consequent information flow which in turn impacts upon operational performance.

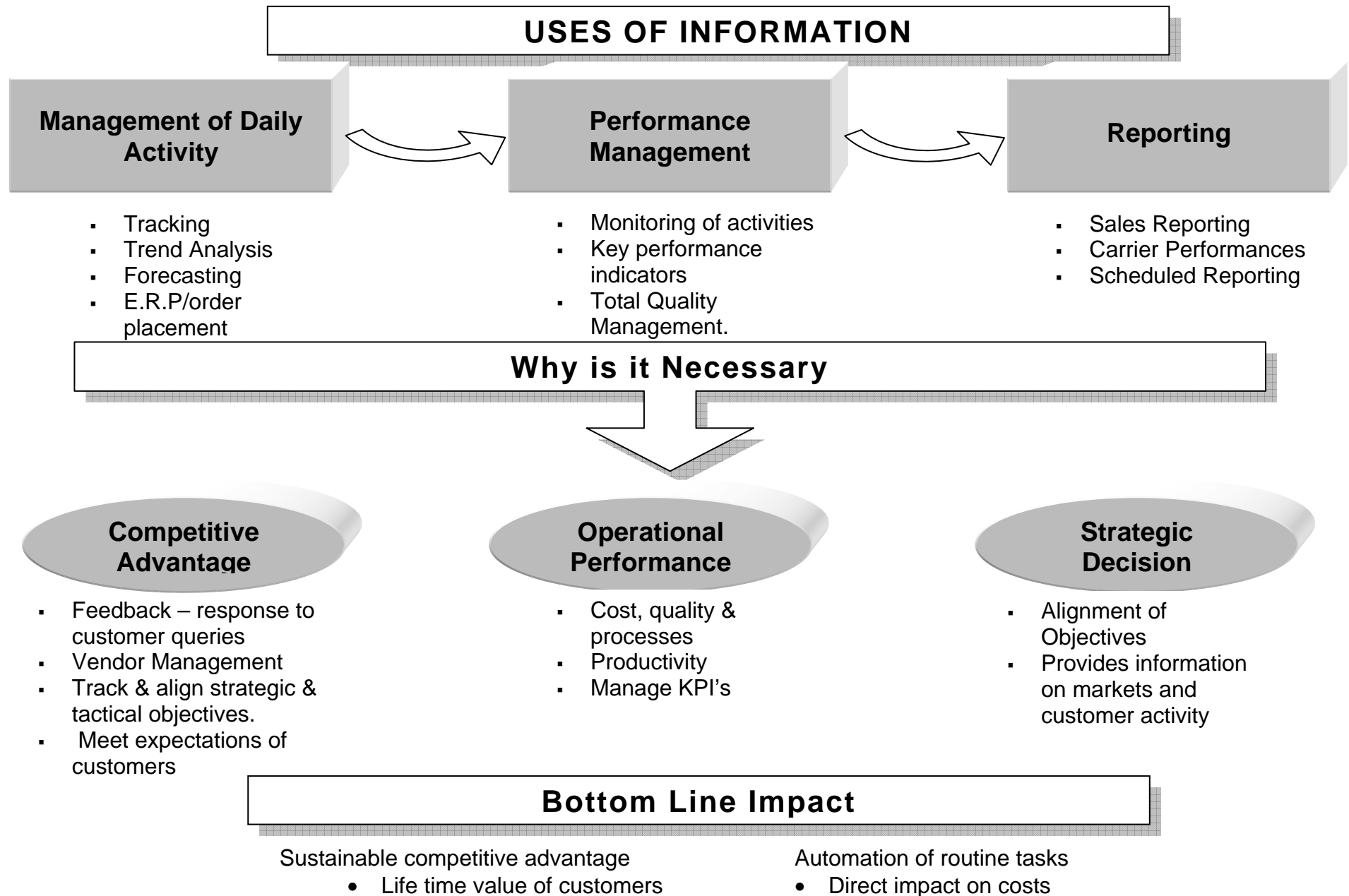
Figure 3: Collaboration Integration Triangle



Factors supporting Information Flow as an enabler to collaboration across the supply chain.



6.6 Figure 4 CONSOLIDATED USES OF INFORMATION IN THE ORGANISATION AND WHETHER THERE IS BOTTOM LINE IMPACT



6.6.1 Where Is Information Used?

The industry response to the above questions is self explanatory summarised in Figure 4.

The diagram highlights the key issues and general consensus regarding the necessity of use of information.

The different ways in which information is used may be categorised into the following themes, namely – as illustrated in Figure 4:

1. Management of daily activities,
2. Performance management and
3. Reporting.

The daily running of operations and the management of key performance criteria along with reporting back to business or stakeholders are the primary reasons for the information use by respondents. The responses received were very operational / tactical in nature involving transactional / daily and almost routine like activity.

6.6.2 The Use Of Information

Information requirements were viewed at a high level represented by the following:

1. **Competitive advantage:** differentiation and the alignment of strategic objectives.
2. **Operational performance,** cost, quality and overall productivity of the operation.
3. **Strategic decision making** – Responding to market activity through the understanding of customer needs.

It is evident that these criteria are more strategic / higher level requirements of the business and the necessity thereof, has been highlighted by the respondents.

A key driver of sustainability in today's competitive environment, is the ability to maintain competitive advantage, an aspect that relies upon an organisation being able to respond to changing market demands and differentiate its product and service offerings to provide unique and superior value to its end users. Critical to this is the access to data and trends and market conditions as highlighted by the respondents.

6.6.3 Bottom Line Impact

Industry response reveals that sustainable competitive advantage and the lifetime value of customers are key considerations when evaluating bottom line impact of information within the organisations.

Through automation of routine tasks, operational costs will be driven down, impacting on the bottom line, resulting in sustainable competitive advantage. Competitive strategy through low cost operations or differentiation are two ways in which organisations are able to overcome and exploit industry forces.

CHAPTER 7: CONCLUSION

The objective of the report is to gain insight and understanding as to how stakeholders within South Africa assess the flow of information as an enabler to collaboration in the supply chain.

The research investigated criteria as discussed by Spekman *et al* (1998) that formed the basis of investigation related to the flows of information.

The results of the research report have been summarised into a single model namely the “Collaboration Integration Triangle” which illustrates the general overview of the assessment of the survey respondents, which highlights the various criteria related to the flows of information which ultimately enables collaboration in the supply chain.

The research has established that the uses of information relate primarily to the daily management activities of the business, encompassing both performance management and the reporting requirements.

The necessity thereof relates to the fulfilment of the tactical and strategic objectives outlined by the respondents as that of: Competitive Advantage, Operational Performance and the key component of Strategic Decision Making, as illustrated by Figure 4.

The research supports the fact that information flows between supply chain participants is of fundamental importance and ultimately serves as a pipeline for data to travel, thus creating visibility between organisations and impacting on operational performance.

In order to derive the necessary benefit out of information sharing, the foundation criteria as illustrated in the “**Collaboration Integration Triangle**” need to be optimally enforced, thus allowing for the efficient and effective flows of information between parties, further enabling collaboration in the supply chain.

The research results reveal that whilst many organisations possess the necessary infrastructural capability allowing for integration between supply chain partners, they lack the ability to provide the “seamless” flow of information this is a precursor to further cooperation and directly impacts on the ability of the organisations to respond to lower level requirements i.e the reporting requirements, management of daily activities and the operational performance of the supply chain.

This is an area that many organisations can investigate to establish whether the efficient and effective information flows are taking place and to further investigate the integration and interoperability of the middle-ware between the operating systems and enhance the capability thereof to cater for the more efficient and effective flows of information between organisations.

Closely linked to the “seamless” flow of data and information exchange is the aspect regarding the quality or integrity of data. The research reveals significant scepticism by respondents relating to this issue, which in turn, has a direct impact on the “trust’ factor between supply chain partners and their overall commitment to cooperation in the supply chain.

Confidence in the supply chain is derived by the ability of the systems to provide the necessary quality output with relative ease, coupled with the completeness and accuracy of data, in turn allowing for greater confidence and further cooperation between partners.

The next level of cooperation evident in the “**Collaboration Integration Triangle**” is the alignment of Key Performance indicators or performance criteria together with the integration of people, processes and technology illustrated at the centre of the diagram.

It is evident that integration between partners and systems will take place provided a sound business case or need exists. A major inhibitor to the lack of integration is the aspect regarding the security of information related to

the trust factor between supply chain partners. It has been established that information is regarded as a competitive advantage and possible coordination failures arise due to asymmetries in incentives between market participants and the self interest and mis trust that exists between them.

This aspect coupled with the fact that organisations need to be committed to the integration initiatives and overcome the “trust’ factor inhibits many from being able to integrate completely and effectively with their partners.

The second aspect relating to integration is the alignment of key Performance Indicators or performance criteria, a criteria located at the core of the “Collaboration Integration Triangle”.

KPIs should form the platform from which partners can establish their common goals. Without common goals and objectives being established -it is much like flying in the dark or without an instrument panel – almost relying on good fortune and not insight.

The report indicates the shortcomings of many organisations to realise the importance of this criteria in driving operational performance in their supply chain. Alarming, is the extent of the number of respondents who were unaware of the status of their performance criteria and relating indicators with supply chain partners, thus illustrating the need for these organisations to focus their attention to this area of the business.

The research indicates that respondents understand the resultant impact of the provision of information and the role it plays within the supply chain as a trigger of activity. Respondents realise the impact that the flows of information have both upstream and downstream in the supply chain and the resultant impact that these flows have on the ability of organisations to effectively respond to changing market conditions. The major cause for organisations not being able to respond timeously to the dynamic performance requirements of the modern supply chain, is as a result of the lack of information with the system as viewed by respondents in the research.

The agility of organisations cannot be viewed exclusively as the reason for the lack of responsiveness but rather a major contributor towards it, one needs to take into cognisance the additional variables at play affecting delivery within the supply chain, as discussed in the report.

Research reveals that respondents agree strongly with the notion that variance in customer demand leads to unpredictability of the system, but through the sharing of information are able to manage the variation or unpredictability of upstream activity caused by changing customer demand, commonly termed the Bull-Whip effect.

The high value attached to the presence of information in the supply chain and the resultant impact of flows on the activities along the supply chain has

been recognized by the respondents as critical to delivery and responsiveness to customer demands.

The notion of Information flow as an enabler to collaboration in the supply chain is strongly supported by the research findings. This is highlighted by the fact that respondents regard the flow of information as imperative to the functioning of the supply chain. It has been established that the availability of data allows for the management of business and enhances supply chain capability.

The various factors that facilitate flows have been discussed. The Operational performance and visibility of the systems is enhanced by the alignment and integration of people processes and technology and the “life Blood” of the system is the flow of information itself.

Various factors discussed, can either enhance or impede these flows thus having a direct impact on the operational performance and related outcomes of the system.

The ultimate collaboration within the system is driven by the cooperation of supply chain partners. The sharing of information and the subsequent integration and alignment of KPI's and related criteria through the flows of information, allow for collaboration with the supply chain and ultimately drive it forward

Managers must follow the advice of Thomas Edison when he said, "If there is a better way, find it". The competitive environment driven by Globalisation and technological advancement is continuously driving the performance requirements of the supply chain upward. The end to end transparency along a supply chain needs to be understood.

Integrative practices need to be considered to enhance coordination between partners and it is through the growing of the volumes of information that will allow technology to move collaboration to a closer real-time basis facilitating the sharing thereof between organisations.

7.2 Recommendations For Further Research

The study considered the assessment of information flow as an enabler to collaboration in the supply chain as viewed by South African respondents.

The study did not consider the global assessment on the topic nor did it consider input from industry outside of South Africa. This suggests itself as an area for further research to examine the extent to which information is an enabler to global supply chain collaboration.

The shortcoming of the research was the lack of significant response from various industry silos. Further investigation and analysis thereof could yield some interesting results and allow for comparative analysis between the respective industry silos.

Considering elements that were covered in the research, further research can be conducted in regard to the following listed criteria;

- Investigating the elements of trust and commitment in collaboration.
- Industry silos analysis – further research and comparative analysis between respective industries in regard to information flow as an enabler to collaboration i.e. greater sample of respondents in order to gain further insight into various industries responses.
- Case study: impact of information flows on operational performance – comparatives between similar outcomes based organisations and an investigation into their mechanics, systems, procedures and ascertain the drivers or factors impacting on operational performance.
- Research into the responsiveness of organizations through in-depth analysis of the systems, procedures and practices existing within the respective organisations and the ability of the organisation to respond to changing customer demands.
- Investigation into the alignment of KPIs –which factors need to be considered and identification of value adding criteria.
- Assess the types of integration practices within and between organisations establishing a best practice or common ground for integration between supply chain partners.
- Assess the variability of demand and the impact thereof on upstream activity and the resultant responsiveness to end customer demand.
- Customer demand responsiveness vs. the level or extent of supply chain integration (Quantitative analysis)

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Survey Questionnaire

An assessment of
Information flow as an enabler to collaboration in the supply
chain

The questionnaire forms the basis of a research document titled: *The Assessment of information flow and enabler to collaboration in the supply chain*. The outcome of the research report will be available on request.

UTi is conducting a survey evaluation of the flow of information between stakeholders in the supply chain with the view that improved communication and the availability of accurate and discreet data surrounding the supply chain can add value to both your decision making capabilities and possibly allow for value added improvements to your supply chain. The closer, long-term, collaborative buyer-supplier relationships, i.e. partnerships, are enabled through the seamless integration and transfer of information up and down the chain. In reality, there is always plenty of data about, but the real difficulty is finding the hidden information therein, which is capable of leveraging improved supply chain performance

As a member of the industry that is actively involved in supply chain interaction, you have unique insights into the supply chain management issues. The information that you provide will assist us in assessing the perceptions and opinions of stakeholders and allow us to assess the benefits and gain a greater understanding of the capabilities and expectations of industry participants.

Consequently, UTi will be better prepared to channel future investments towards projects to meet the required needs.

The questionnaire is designed to provide insight into the following questions posed below.

6. *What is the state and significance of information flow in each organisation?*
7. *What role does IT infrastructure play in facilitating the flow of information between supply chain partners?*
8. *How is process integration viewed in each company and what are the possible barriers to successful integration?*
9. *How do stakeholders assess information flow as an enabler of agility which allows for greater responsiveness to fluctuating customer demand?*
10. *How do stakeholders assess information flow as an enabler to collaboration?*

Questionnaire

Please answer the questions in relation to your assessment of the below statements and questions related to your experience in your organisation. **The data you provide will be considered confidential and will only be used in the aggregate with other companies.**

If you have any questions about the purpose of the survey or how to answer any of the items herein, please feel free to contact Graham Oates at goates@uti.co.za or phone at (011) 923 4000.

Thank you participating in the survey.

Glossary of terms:

Agility: Is the basis for achieving competitive advantage in changing market conditions, it is the response to coping with uncertainty.

Collaboration: facilitates the cooperation of participating members along the supply chain to improve performance, in context of the supply chain cites mutuality of benefit, rewards and risk sharing made up of elements namely: trust ,mutuality, information exchange and openness and communication together with the exchange of information.

Integration: supply chain integration focuses on improving the information flow between links in the chain

Cooperation: whereby firms exchange bits of essential information and engage some suppliers/ customers in longer – term contracts. It is a starting point for supply chain management and has become a necessary but not sufficient condition.

Coordination: Supply chain coordination focuses on making decisions that reduce the information asymmetry and resulting excess inventory in the supply chain whereby both specified workflow and information is exchanged in a manner that permits Just in Time (JIT), Electronic data Interchange (EDI) and other mechanisms that attempt to make seamless many of the traditional linkages between and among trading partners.

Appendix A

Questionnaire

The responses below are relevant to your own organisation.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. I do not gain value out of information sharing between my customers and suppliers					
2. I am sceptical about the quality and integrity of the information I receive from my customers and suppliers.					
3. Top management in my organisation believe that we can achieve greater operational performance (cost, quality, reliability flexibility & speed) through the use of IT infrastructure.					
4. Planning, forecasting and manufacturing are examples of upstream activities, the variation of these activities is impacted by information flow between the respective functions					
5. The Flow of information between functional areas in my organisation has no bearing on operational performance.					
6. I believe that collaboration through information sharing between supply chain partners has a positive impact on operational performance which is defined by cost, quality, speed, reliability & flexibility.					
7. Retrieving data is a tedious and timely process in my organisation.					



	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
8. The IT architecture in my organisation does not support the seamless flow of information between supply chain partners.					
9. There is a high level of supply chain integration in my company?					
10. Reliable IT infrastructure exists in my company that is able to support effective information flow					
11. The Key performance indicators within functional areas between supply chain partners are not aligned.					
12. Successful integration between supply chain partners is inhibited by the perception of security issues of on-line information.					
13. reliable Data is easy to access in the company					
14. Data in my organisations systems is reliable and supports my management decisions.					
15. I believe that the provision of data assists me in my ability to manage my business					
16. I am able to generate meaningful reports out of the systems which allow me to manage my business					
17. I believe information flow to be a critical enabler of collaboration within the supply chain.					



	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
18. The lack of a significant business case and funding is seen as an inhibitor to integration between suppliers and customers in my organisation.					
19. My organisation has the necessary IT infrastructure to integrate with supply chain partners					
20. Information flow is seen as a trigger of activity in my organisation?					
21. I believe that information sharing has an impact on variation in upstream activities.					
22. I believe that an information system across “all” partners, would add value to my supply chain.					
23. Variance in customer demand leads to unpredictability in upstream activity.					
24. Lack of information flow is seen as an inhibitor to responsiveness to customer demands.					
25. I believe that our company responds quickly to changing customer requirements.					



<p>26. Where do you use information in your daily tasks?</p>	
<p>➤ Why is this information necessary?</p>	
<p>➤ Do you believe that the use of the information or application thereof adds value to your bottom line?</p>	