Achieving Excellence in Logistics through the appropriate style of information management.

Peter Franz

A research report submitted to the Faculty of Commerce, University of the Witwatersrand, Johannesburg, in partial fulfillment of the requirement for the degree of Master of Commerce.

Johannesburg 1997

Abstract

Logistics is a management discipline that has been spoken about for years and is yet to deliver the full potential that it purports to bring about. Excellence in logistics has been identified as one of the major challenges that products related organisations currently face to ensure continued success in an increasingly competitive, global market.

One of the key enablers to integration is the effective application of information technology. Most managers easily accept this as fact but few are clear in describing how this can be achieved.

Two prime works used as reference for this research are Bowersox's research into logistics, providing a reference framework on the role of logistics in organisations, and Cilliers's study of logistics at 150 South African companies, providing a South African reference point.

It is the combination of the Bowersox attributes and the Cilliers qualified sample of South African companies that provides the basis for an exciting research initiative establishing the role of information technology in achieving logistics excellence in South Africa.

Both successful and less successful organisations were measured against a set of attributes to determine which were most crucial in achieving logistics excellence.

It is clear from the survey that logistics excellent companies have a marked difference in their approach to information technology as compared to those who are not logistics excellent. This is mapped out in the paper in some detail and some of the detailed responses may be somewhat of a surprise to the reader as they challenge conventional wisdom.

The results of the survey were encapsulated into a simple model. This should act as a quick reference to IT professionals seeking to play a leading role in driving their company towards logistics excellence.

Information technology plays a vital role in achieving logistics excellence. This paper provides some insight into the factors that are critical in achieving this goal.

Declaration

I declare that this research report is my own unaided work except to the extent indicated by the acknowledgments, text and references. It is being submitted in partial fulfillment of the requirements for the degree of Master of Commerce (by course work) in the Faculty of Commerce at the University of the Witwatersrand, Johannesburg.

This work has not been submitted for any degree or examination in any other university.

Peter Franz

Signed on the 3 day of December 1997 in Johannesburg.

Contents

Appendices

1. Research Background

1.1. Introduction to the Research

Integrated supply chain management, also referred to as Logistics, is a management discipline that has been spoken about for at least thirty years (Sharman, 1984) and is yet to deliver the full potential that it purports to bring about. Excellence in logistics has been identified as one of the major challenges that products related organisations currently face to ensure continued success in an increasingly competitive, global market (Fuller, 1993) (Cilliers, 1994). The cornerstone to excellence in logistics is integration of the supply chain from raw material producer to end consumer.

Information technology is important to logistics and is claimed by many as one of the key enablers to integration across the supply chain. There is a large amount of material that describes the importance of logistics and its evolving role as a board level priority. Similarly, material describes the criticality of information technology in meeting this goal. A number of these have been used for this research. The three prime works used as reference for this research are Bowersox, (1994) Davenport, (1993) and Cilliers (1994). Bowersox, at the Michigan State University, has led a team doing deep research into logistics providing a good reference framework on the role of logistics in organisations. He identified a list of attributes that are critical to the successful implementation of integrated logistics. This is used as an ingredient to the theoretical conjecture used in this research.

Davenport, (1993) a leading figure in process re-engineering, has analysed the relationship between IT and processes with a view to achieving real economic benefit. Some of his thoughts are used to further develop the theory.

Cilliers, (1994) at the University of Pretoria, conducted a study of logistics at 150 South African companies. The study focused on what it meant to achieve logistics excellence and used a framework to determine the level of excellence that had been achieved by the organisations that were surveyed. This reference base is used to test the theoretical conjecture used in this research.

1.2. The Problem and Reason for Research

Most managers easily accept the fact that information technology is key to ensuring excellence in logistics, but few are clear in describing how this can be achieved. There is also little published research that supports information technology managers in their quest to put in place the information requirements to support logistics excellence. The net result, however, has been a very slow take-on of integrated management principles. The reasons for this are not clear and there is a need to provide information to support information technology (IT) managers in their quest to assist in achieving logistics excellence by providing some empirical reference on how this has been achieved in more successful companies.

It is the combination of the Bowersox (1994) attributes, the Davenport (1993) process models and the Cilliers (1994) qualified sample of South African companies that provides the basis for an exciting research initiative establishing the role of information technology in achieving logistics excellence in South Africa. Both successful and less successful organisations were measured against these attributes to determine which were most crucial in achieving logistics excellence.

This report documents the background, findings and conclusions of this research.

1.3. Research Objectives

The purpose of this research is therefore as follows:

1. To identify a set of issues of style that are critical in ensuring logistics excellence.
2. To test these against a selected group of IT managers.
3. To propose a model for applying IT to achieving logistics excellence.
4. To identify further research that can contribute to this subject and advance logistics in South Africa.

1.4. Structure of the Report

The report is structured as follows:

Chapter 1 introduces the background to the research. It describes the research objectives and highlights the limitations of the research and, by definition, starts to identify further areas for future research.

Chapter 2 reviews the current literature relevant to this subject. It firstly describes the generic subject of logistics excellence. This is then related to the current position in South Africa. Information technology and its bearing on logistics is then explored in more detail drawing on some of the theoretical relationship between process design and information technology.

Chapter 3 uses the summary material presented in the prior chapter to propose a theoretical conjecture. This formed the basis of the research and thus the later conclusions.

Chapter 3 describes the approach taken in preparing the research instrument, selecting the sample and conducting the research. The limitations of the research and some further thoughts on future research topics are also described.

Chapter 4 presents the evidence of the research, describing how the respondents answered the survey.

Chapter 5 presents an analysis of the research results and the authors interpretation of these results. Detailed quantitative findings are included in Appendix E.

Chapter 6 discusses the completeness of the research in meeting the research objectives, identifies its strategic importance to South African managers, and proposes further research topics.

Chapter 7 lists the multiple references used in this analysis.

Finally, the appendices include the more detailed supporting material. Here, the research instrument, research sample, quantitative and qualitative findings and other details are included.

2. Literature Review

Logistics is a very topical subject and much has thus been written about it. To focus the summary of the literature review, it was approached in layers as shown in figure 2.1 below.

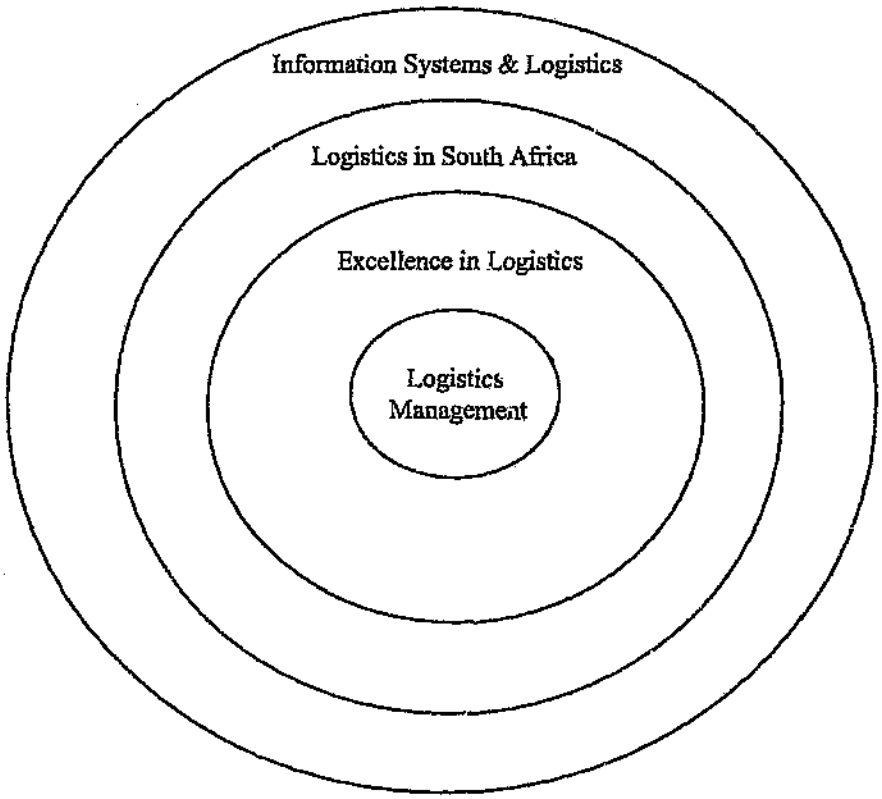

Figure 2.1 Layered approach to Literature Review

This started with a generic understanding of logistics management, establishing a common base to work from in a world where logistics is used to describe many different things.

The review focused on Excellence in Logistics and how this could be defined and measured. A useful model was found to assist in this process.

With the aim of making this relevant in South Africa, the scant material describing logistics and logistics excellence nationally was reviewed.

Finally, various pieces of information were strung together to establish a clearer link between integrated logistics and how it is supported by information technology.

Each following section in this chapter gradually moves from the generic to the specific.

2.1. Logistics Management

The word 'Logistics' is used to describe many different things, both in a military and management context. Logistics has many definitions. For the purposes of this research, the definition recognised by the Council of Logistics Management, derived from Ittman (1994) will be used:

> "Logistics Management is the process of planning, implementing, and controlling the efficient, cost effective flow of storage of raw materials, in process inventory, finished goods and related information from point of origin to point of consumption for the purposes of conforming to customer requirements. This definition includes inbound, outbound, internal and external movements." (Ittman, 1994)

A similar and very concise definition is that of the Institute of Logistics in the United Kingdom.

> "Logistics is the management of the entire supply chain."
> (Ittman, 1994).

This emphasises the importance of a holistic and integrated view of the supply chain from raw material producer through to the end consumer. It is the optimisation of this whole that is key to success. It has been found that optimising parts of the chain may lead to sub-optimisation of the chain overall. Conversely, optimisation of the end-to-end supply chain may require the sub-optimisation of components of the supply chain. Heron (1988) criticises the piecemeal planning and management of international logistics as it leads to needlessly high costs because it neglects the important tradeoffs among the various logistics functions.

For the past decade many writers have identified the importance of logistics management. Most claiming that in their near future (which differs vastly for each author) logistics management will shape the strategic thinking of companies. In each case they have described the critical importance of managing inventory out of the supply chain and improving customer service as being the only ways of achieving significant cost reduction and differentiated service.

Sharman believes that original publication of material on the need for integrated logistics goes back to the 1960's (Sharman, 1984). At this time (more than a decade ago) he claims that there will be a "rediscovery of logistics" as a management priority. More recently, Fuller (1993) highlights logistics as being "the next governing element of strategy ". He believes that logistics will take up its place at most boardroom tables.

The complexity of implementing a true integrated logistics management process is large. This is probably one of the prime reasons for the slow take-on of effective logistics management even though many writers have highlighted its importance.

There are two factors which now add reason to the quest for change. These are Globalisation and Communication.

Globalisation

At an ever increasing pace, the world economy is turning into a "global village". Trade barriers are being removed with the introduction of a number of free trade agreements. The IMF has issued a series of economic standards which drive countries to adopt more open policies. Countries that have a history of very tight trade barriers and exchange controls are opening in an endeavor to be more acceptable to global investors and as a prerequisite to selling their products on global markets. This is particularly relevant in South Africa where, after decades of political turmoil, the country now enjoys a period of political stability. The liberation struggle, which many believed would end in violent confrontation has revealed a flare for negotiated settlement and seems to signal the start of increased openness.

The new macro-economic strategy (GEAR) announced by the government in June 1996 embodies many aspects of international best practice for economic policy. Job creation is a key objective and this is achieved through stimulating growth and a much greater level of openness in dealing with the rest of the world.

Europe as an Example

In Europe this change in "openness" is driving a reshaping of logistics in cross border cooperation never seen before. Primarily it is a result of the optimisation and rationalisation of expensive manufacturing facilities with organisations opting to move goods effectively to where they are required, rather than manufacturing them close to point of consumption.

This has particularly been the case with the unification of Europe where, in the past, a manufacturing facility would have been located in each of the national markets. These facilities would have the capability to produce a complete spectrum of products. Through optimisation and rationalisation process, focused manufacturing facilities were created in certain countries which served the needs of customers across Europe. Each of these revised manufacturing facilities would produce a more focused set products based on their core capabilities.

As can be expected, this would significantly improve and optimise the manufacturing capability of these plants. As would be expected, it poses a significant burden on the logistics function. Goods now cross Europe where in the past they were simply moved from a single manufacturing facility to multiple points of usage and these points of usage were typically relatively close to the manufacturer. Pragmatism has driven a cumbersome manufacturing problem into a more flexible, logistics management problem. The challenge is to improve logistics management at a pace that will compensate soon enough to switch in focus. Across the globe there are examples like this that will escalate the importance of logistics taking place now

Communication

Communication is both a major enabler to integration and a driver of globalisation. The cost of telecommunication is reducing each year. In the past, the major cost of communication was in international linkages because of the high costs associated with trans-continental, under water, fibre-optic cables (BMI, 1997) Domestic communications were relatively inexpensive. As the volume of traffic increases, the relative cost of international communications is reducing to a forecast position where the cost in about 5 years will be negligible. Already, there is a significant shake-up in the telecommunications industry as companies try and adapt to this changing reality.

The cost of international calls in Europe reduced over a ten year period from in excess of two dollars a minutes to between fifty and ninety cents a minute in today's value of money. This is as shown in figure 2.2 below.

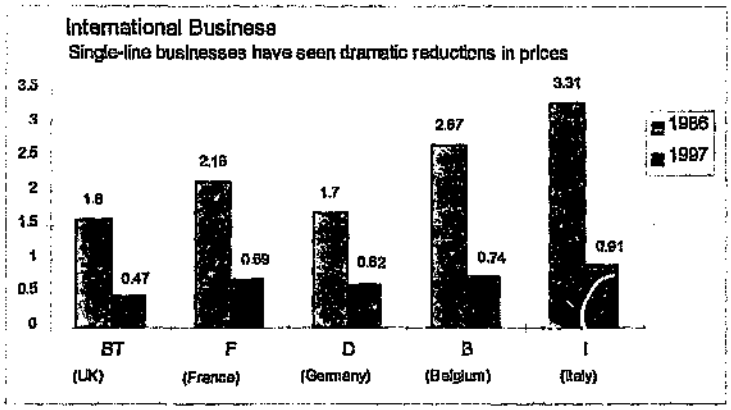

Figure 2.2 Reduction in Price of European International Calls

This trend is even more marked in the United States where greater competition has driven down costs. This is described in the technology communication handbook (BMI, 1997) in some detail with the various reasons for the increase in tension in the telecommunication industry. It further speculates that international communication costs could reduce to close to zero during the next five years. This is because of the increasing capacity that is created through the launching of satellites. Europe has been slow to follow the United States trend in reducing costs, but the increasing global competition is likely to force this on to European telecommunications companies.

Communication is the most important enabler in inter-company integration. Electronic Data Interchange (EDI) was never seen as successful as it could have been because it took time and required the use of very sophisticated and cumbersome standards. The internet is driving a new wave of interconnectivity that is shaping commerce into the future.

When seen together, these trends in communication are likely to give rise to a level of interconnectivity between companies that has never been seen before.

The importance of cost

One of the critical issues in management towards logistics excellence is a keen appreciation of the total costs associated with logistics and effective management of these costs.

> "The foundation of the integrated logistics management concept is total cost analysis, which we have defined as minimising the cost of transportation, warehousing, inventory, order processing and information systems, and lot quantity cost, while achieving a desired customer service level." (Stock & Lambert, 1987)

La Londe has been advocating this concept for more than 20 years (La Londe, 1970). The extent of the global need for sound logistics management is highlighted in an article by Henkoff (1994). A vast amount of the cost of products is consumed in the delivery of the product to the shelf. Henkoff (1994) claims that American companies spent $670 billion – a gaping 10,5% of GDP – to wrap, bundle, load, unload, sort, reload, and transport goods in 1994. The United States gross national pipeline is so clogged with unnecessary steps and redundant stockpiles that the grocery industry alone believes it can take $30 billion, or nearly 10% of its annual operating costs, out of the system. (Henkoff, 1994) This is an example of the immense power of optimising the supply chain across the industry and reducing the costs associated with inefficiency compounded throughout the chain.

Summary

Logistics management has been identified as a priority for over thirty years. Take-on of sound practices has been slow but the pace of change is increasing as organisations across the globe start to improve their supply chains. These organisations are trading in markets where they typically would not have been increasing the imperative for even more isolated economies to meet the challenges of change. The next decade will see logistics management as one of the key board level priorities and across the globe, organisations see logistics as one of the major priorities to significantly reduce the cost of product and to improve the availability of product to end consumers.

2.2. Excellence in Logistics

If we agree that logistics management is important to organisations in the future, then it is important to identify those attributed that constitute good practice in ensuring a well integrated supply chain.

Bowersox (1994) identifies four competencies that need to be in place for logistics excellence. These are shown in figure 2.3 below:

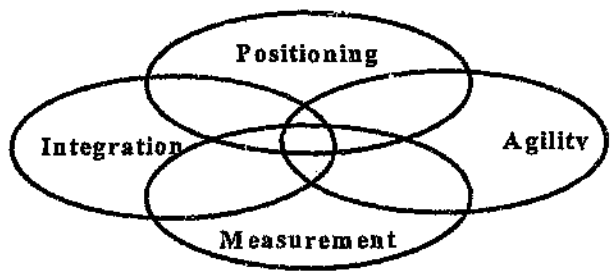

Figure 2.3 Logistics competency Model (Global Logistics Research Team, 1995)

He describes these in some detail and concludes that it is only through the simultaneous occurrence of all of these that logistics excellence can result.

The research done by Cilliers at the University of Pretoria (Cilliers et al,1994) describes a framework for measuring logistical excellence on two dimensions:

- Individual excellence - The logistics practice of the individual company; and
- Value Chain excellence - The level of logistics excellence within the extended value chain.

A measurement tool had been developed by the University of Pretoria which identified attributes that indicated the level internal logistics excellence and further attributes that indicated the degree of external logistics excellence. A copy of this measurement tool is included in Appendix B.

A comparison between these two research initiatives indicate a relatively good correlation of attribute. There is approximately an 83% overlap between attributes while all four areas in the competency model are covered in some way by the attributes described by Cilliers. The comparison between these models at a high level is shown in Appendix C.

La Londe, (1994) describes companies moving towards a philosophy of integrated logistics management as moving through stages of development:

> "Companies have pursued three general stages in their evolution into integrated logistics management: physical distribution focus, internal linkages, and external linkages." (La Londe, 1994)

He then continues to describe a series of material flow loops as shown in figure 2.4 below:

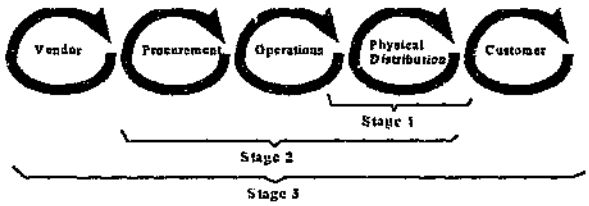

Figure 2.4 Evolution of the Integrated Logistics concept (La Londe, 1994)

He describes the progression as moving from the basic stage of simply managing the physical distribution through to the stage of integrated supply chain management. This staging theory is aligned with the thinking of Cilliers who found that the migration to "logistics excellence" (top right position on the matrix below) required an initial focus on internal excellence followed by a focus on extending this excellence to the rest of the logistics chain. Improvement needed to take place along the path shown in figure 2.5 below. He continued to describe a few companies that were exceptions to this and believed they could achieve supply chain excellence without getting their own operation in order but stated that this was short lived and that the outcome was not achieved.

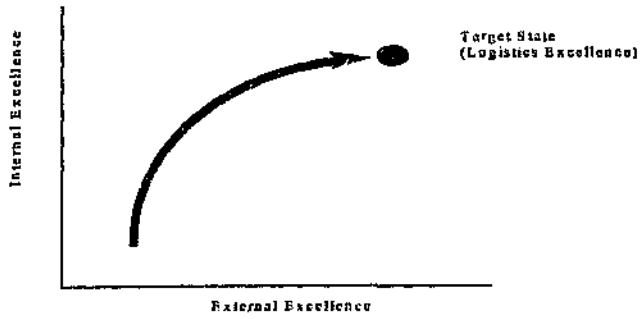

Figure 2.5 Path to Logistics Excellence (Cilliers, 1994)

In summary, logistics excellence can be measured both internally (within the organisation) and externally (across the supply chain). Excellence requires the close attention to Positioning, Agility, Integration and Measurement.

2.3. Logistics in South Africa

Logistics is seen as a management priority across the globe and excellence is the answer to competitiveness into the future. As we relate this to South Africa, it is of interest to understand why we should take this as being important and how South African companies stack up to the attributes of excellence.

South Africa has, in many ways, enjoyed the benefits of isolation in that competition what largely national rather than truly global. As we reenter the global market companies are suddenly faced with global competition and need to take on world class practices in order to survive. Fourie (1994) describes the path to re-enter the international markets, as requiring a realisation that it is a changed situation. He continues to say that for South African companies to succeed they will have to adapt or die.

This impetus for change is heightened by the fact that our competitors internationally have been focusing on distribution improvements for some time already and have made significant progress in this quest. The external and internal forces active in business organisations force continued changes in these organisations and in the role of the distribution executive. Masters (1994) claims that the most notable of these forces driving change were the increased cost of performing distribution processes and the deregulation of the transportation industry."

In South Africa we need to catch up this gap and then take a stride into a global leadership position – a major challenge. The Chair in Logistics at the School of Management, University of Pretoria and Andersen Consulting conducts an annual survey (Cilliers et al, 1994), as described earlier, titled: "Logistics Excellence in South Africa", with the expressed objective of establishing a point of reference that can be used by logistics practitioners in South Africa. Particular focus of the 1994 survey was given to: (1) establishing a benchmark of where companies are positioned in logistics at present, (2) identifying major issues facing companies today, (3) identifying major trends that are likely to emerge during the remainder of the decade, (4) comparing current status and trends against results of a similar survey conducted across Europe a year ago, and (5) providing a basis for this becoming a repeated event with effective monitoring of trends into the future.

> "The role of IT is considered all-important by the majority of large SA companies in the move towards effective logistics management" (Cilliers et al, 1994)

The results show that most organisations have not excelled on either of the two dimensions (internal and external excellence) and this is depicted in the matrix shown in figure 2.6 below.

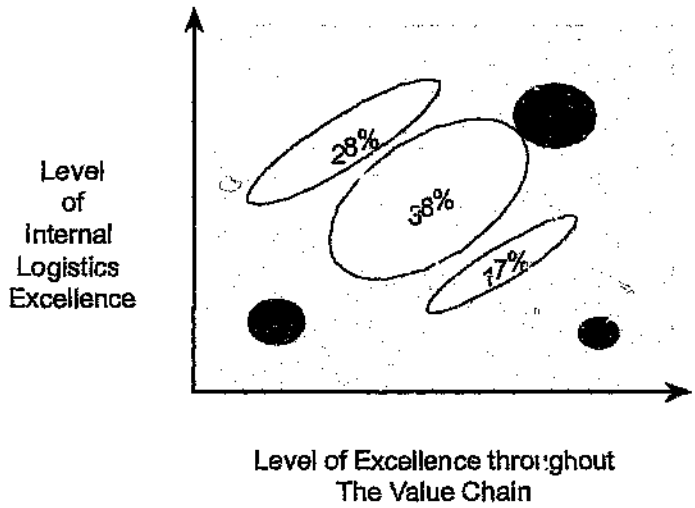

Figure 2.6 Level of Logistics Excellence (Cilliers , 1994)

This figure shows a small number of organisations (11%) that have achieved both a high level of internal excellence and a high level of external value chain excellence. Most organisations (83%) fit into a mediocre category with 28% that have favoured achieving internal logistics excellence before exploiting the value chain. A smaller number (17%) have attempted to improve integration through the value chain before achieving a high level of internal excellence. There are 5% that were non-excellent on both categories.

The results of this survey were published in a report which is referenced in the bibliography in the University of Pretoria. In summary, it showed that the bulk of South African organisations achieved a level of mediocrity in logistics. There was a small percentage of organisations that identified as being logistically excellent and a similar percentage which were identified as being very weak at

logistics. As a result of this survey, it was possible to identify a list of good business practices that showed a marked difference between those organisations that succeeded versus those that were performing less well.

2.4. Information Systems and Logistics

In achieving good logistics integration, information technology plays a pivotal role. The reason for this is best described in the introduction to the logistics research report produced by Fuller.

> "The principle here is one borrowed from just-in-time management: when information precedes the flow of physical stock, that is, when the arrivals and departures of products can be made to coincide with unprecedented precision, companies can achieve more and more consistent throughput." (Fuller et al, 1993).

This is reinforced by La Londe (La Londe, 1994), who identifies Information technology as one of the four major factors as shaping the development of integrated logistics management thinking. He continues to describe how Information Technology will be a major contributor to logistics problem solving into the future. He also lists four primary factors that have shaped the development of distribution thinking: scientific management, data processing technology, a customer focus, and profit leverage."

The Bowersox team identified the importance of information systems in meeting the objective of logistics excellence and furthermore concluded that work on related information systems will be a major management priority in the next few years.

This was borne out by a question that was asked in their survey:

> "Among world class firms, managers report their firm's plan substantial development or replacement of logistics operating systems within the next three to five years.".

Respondents to the Bowersox (1994) survey indicated that 81,9% strongly agreed or agreed with this statement. A mere 7,8% strongly disagreed or disagreed. This is another indication of the importance of logistics in the upcoming years.

Masters and Pohlen (1994) reinforce these various views in some work done by them in describing the evolution of logistics. They also relate logistics management and Information Technology back to the importance of total cost management as described earlier. They describe "Computers as providing the means to address the most compelling reasons for integrating materials and distribution functions – the dollars involved."

In understanding integration, it is important to recognise the optimisation of the whole distribution channel rather than the efficiency of any part of this. Gustin (1994) describes this well and again highlights the importance of information in this quest. He describes the importance of a central co-ordination of diverse functional objectives to effectively assess relevant trade-offs properly He further concludes that adequate co-ordination can only be achieved when sufficient information support is available.

Many organisations have a fanatical approach to identifying, testing and using the latest technologies. It is a pragmatic balance between innovation and stability that will ensure logistics success. This question will test the speed of technology take-on as a function of logistics excellence.

Writers agree that information is important to achieving excellence in logistics:

> "Total supply chain management requires high levels of computer-based information support; thus firms should dedicate more resources to automating logistics data in the future" (Gustin et al, 1994)

It is also interesting to note that for the past ten years, Andersen Consulting in conjunction with the Council of Logistics Management, has compiled a list of available logistics software. (CLM, 1996) In the logistics field alone there are in excess of a thousand logistics software packages compared with sixty-seven, ten years ago. Technology is obviously an area where there has been significant investment in driving solutions that support logistics excellence.

This is further supported by Bowersox who says that a decision to postpone the acquisition of new technology can have catastrophic long term implications. (Bowersox, et al, 1992).

In summary information is critical to logistics and organisational success is dependent on it. This is nicely encapsulated in the following quote from Mesher.

> "In today's knowledge-driven economy, a manufacturer's future is based on an updated version of Darwin original theory: 'survival of the fittest information system'..." (Mesher et al, 1994)

This is equally important in South Africa as demonstrated in the results from the 1994 survey (Cilliers et al, 1994) which highlight: (1) information systems as key to achieving an integrated logistics capability, (2) information systems are old and will require replacement, and (3) the advantages of information technology (IT) is not fully realised.

In this survey, 65 percent of the respondents viewed IT as critically important and 95 percent viewed it as important. (Cilliers et al, 1994) For those organisations that were embracing a comprehensive logistics strategy, (information) technology was found to be a key enabler in achieving the required levels of internal and external integration"

2.5. Integrated Approach to Process and Systems

As has been eluded to in earlier parts of this paper, logistics is a process that covers a wide range of functions across an organisation. In order to integrate this, it is said to be essential that a process view is taken of all of the functions that support the logistics process. This is re-enforced by a wide range of writers in logistics theory and in particular supported by Bowersox, (1992) who claims that a careful analysis should be conducted of the specific functions that are accountable to the logistics organisation and to the degree to which their performance and measurement are integrated. He sees this as being one of the prime indicators of the level of logistics excellence in an organisation. This view is supported by Cilliers, (1994) who claims that a balanced optimisation across all functions is more important than individual excellence in any one of the materials and distribution activities.

It therefore seems that process change is an absolute pre-requisite to effective logistics integration. This has a major impact on the approach to implementing information systems. A number of leading thinkers describe the importance of simultaneously focusing on systems and processes. This is not specific to logistics and relates to any successful implementation of change.

For many years, Andersen Consulting (Magee, 1985) have focused on the importance of addressing strategy, process, technology and people simultaneously. This is as documented in their business integration model shown in figure 2.7 below.

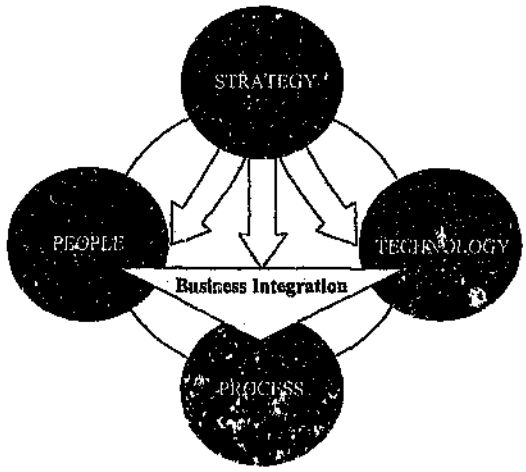

Figure 2.7 Andersen consulting Business Integration Model (Magee et al, 1985)

They contend that it is only though the successful simultaneous attention to all of these that a strategy of change is going to show lasting benefit within the organisation. There experience they have demonstrated that addressing one of these without taking the others into account, forces the one chosen to revert back to prior practice, or to be ignored completely. For example making changes to a system without the adequate attention to new processes and the job descriptions of the people involved, would cause the new system to be undermined to support existing practices. They conclude that it is only through simultaneous attention to all of these areas that a strategy of change can be implemented.

It is this style of implementing information systems that the author has chosen to explore further. In implementing information systems, there are a number of traditional good practices that will ensure the quality of the information system, but it is the style of linking process to information technology that the author felt warranted further attention.

Davenport (1993) identifies the close link between these two areas - process and IT to be critical.

He describes at some lengths the importance of a process view of an organisation describing process improvement and innovation as being the best hope for creating greater value out of the vast investment in information technology. He further describes how organisations have tried at length to identify measurable productivity benefits that are derived out of IT investments. The combination of these two factors drives him to conclude that it is a virtual necessity to make use of IT to achieve process innovation.

Davenport (1993) attempts to identify empirical research that proves the connection between process change, IT and economic benefit. He states that this does not exist although there are examples where this is clearly the necessity. His conjecture is that the following model applies:

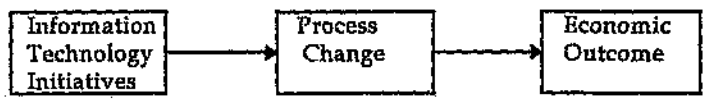

Figure 2.8 The IT-Process-Productivity Relationship (Davenport, 1993)

Davenport (1993) then analyses various categories of IT opportunity for achieving process innovation. The one most relevant here is the "Integrative" category. (Davenport, 1993) More and more, companies that are finding it difficult to radically improve process performance for highly segmented tasks split across many jobs are moving to a "case management" approach. In this type of process, an individual or team completes, or at least manages, all aspects of a product or service delivery process. IT is used to support this integration.

This is clearly the case in logistics where components of the supply chain split across different functions in a company.

The second area of relevance is "Disintermediation" where technology allows the removal of some of the players in the supply chain. It is becoming increasingly clear in many industries that human intermediaries are inefficient for passing information between parties. IT is invariably useful in connecting buyers and sellers and helping them exchange information about purchase transactions."

This link between process and technology has been described in a number of different contexts, not specific to logistics. It is, however, re-enforced by Dawe (1994) who describes the reduction in costs and optimisation of the logistics channel as requiring process and management improvements that are inextricably linked to the changes in technology. This is further borne out by an analysis performed by Halverson (1995) where he analysed a classic example of where information technology was being used to transform a logistics organisation. He described at length the retailers innovative use of technology to transform not only the business itself, but also to improve the quality of life of the employees. He described this organisation as being a worthy role model as re-inventors of the entire logistics process. (Halverson,1995)

It therefore seems as if the link between process and technology is paramount in ensuring that the results are achieved out of any systems related project.

This concept of process and IT is then applied more specifically to the logistics excellence where Copacino (Magee et al, 1985) identifies the hierarchical approach of moving from the high level strategic intent in the form of customer service down to the four major physical components, which include infrastructure, people, systems and the processes. This is as described by and shown in the logistics strategy implementation framework in figure 2.9 below:

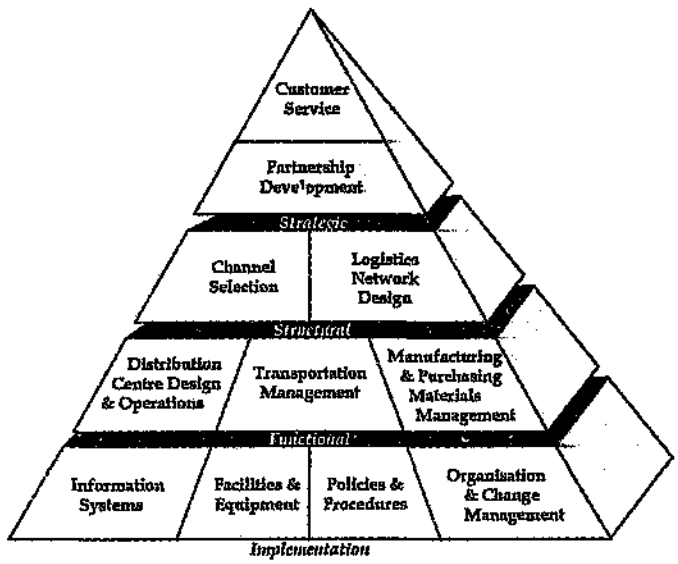

Figure 2.9 Logistics Strategy Framework (Magee et al, 1985)

It is not the authors intent to demonstrate that this model works, but it does appear to be born out by experience and which been well documented in the book by Copacino. He describes the importance of understanding logistics strategy and then gradually translating this into an integrated set of actions addressing the four areas at the base of the pyramid of which IT and process and two of the more important. It is therefore fair to conclude that the Davenport (1993) theory that has been shown to be applicable at a generic level is equally relevant in the areas of logistics management.

2.6. Summary Theoretical Conjecture

The Thread of logic that flows through this literature review can be summarised as follows:

1. Integrated Logistics Management is a critical component of strategy into the future
2. Logistics excellence requires a migration of performance from simple physical distribution through to and integrated management of the distribution channel.
3. In South Africa logistics management is far from ideal and we have a major challenge to overcome a backlog in improvement caused by isolation
4. A key enabler to good, integrated logistics management is information and the systems to support this.
5. Success in implementing logistics systems requires the simultaneous attention to processes reengineering.

This thread is drawn from a number of separate and non-related works. It is the purpose of this paper to analyse these statements in a single context and establish whether they hold true. If not they will be rewarded into what is found to be a more accurate set of guiding principles. The author summarised the various statements into a single statement of theoretical conjecture. This was as follows:

> "Logistical excellent companies in South Africa differ from their lesser counterparts in the way they apply IT to optimise the logistical performance in the style of enabling IT solutions".

The methodology to test this is described in the next chapter.

3. Research Methodology

The author made use of a broader questionnaire which was sent to a number of IT managers. The information gathered was then analysed and follow-up interviews conducted to verify results and to collect qualitative support for findings. Establishing a suitable measuring instrument and the gathering of data were the two most time consuming activities. This chapter discusses how the measuring instrument was established. It then describes how a representative sample was selected to ensure alignment with earlier research completed by the University of Pretoria to facilitate leverage against prior research.

Finally this chapter describes the approach used to research and the analysis that followed.

3.1. Questionnaire

Following the review of material, described in chapter 2, the theoretical conjecture was established. From this conjecture, a number of indicators were identified that would prove or disprove the conjecture.

The following is a list of indicators required to establish the validity or otherwise of the theoretical conjecture.

Indicator
Integrated systems environment The level of integration in the systems environment may indicate the extent to which systems play
Cost savings in implementing integrated systems
Are total logistics costs measured and managed?
The extent to which systems contribute to a value added logistics service.
Availability of end-to-end definition of the logistics processes
Use of the integrated logistics process in systems design
Are systems and new processes implemented concurrently
Latest technology implemented
Use of an integrated architecture
Establish the architecture prior to systems development
Methodology used in implementing systems?
Simultaneous comprehensive change management strategy
Independent implementation of systems (stores, purchasing, transport management, production, etc.)

These indicators were then translated into a number of questions. The measuring instrument was being shared with three other students so the results of the three analyses were consolidated into a single questionnaire.

This questionnaire was then given to a professional research organisation to verify the method, level of detail of question and to avoid ambiguity. Once through this scrutiny, a draft was given to five IT managers for their review. They were requested to comment on the level of detail and on any questions where the meaning was not well understood. Their feedback was invaluable in coming to a final questionnaire that could be distributed.

3.2. Selecting the sample

The research sample was that used in the survey conducted by the University of Pretoria. It was essential for the hypotheses to be tested against the same sample base to maximise the correlative value between the two bodies of research.

Having been involved in the earlier research, the author assisted in selecting the original sample base. This was done by identifying a selection of companies across the different consumer industries groups. The aim was to ensure a representation of different sized companies across most of the supply chains of consumer goods. Care was also taken to identify companies in different stages of the supply chain from primary producers through various intermediaries to the retailers.

The list chosen for this survey consisted of 145 organisations that had responded to the earlier research. A list of these organisations is included in attachment D.

3.3. Collecting responses

In the earlier research the team had aimed to identify the logistics manager as the key respondent. For the purposes of this survey the research was aimed at their IT counterparts. Initially questionnaires were addressed to "The IT Manager" as the names of these individuals were not known.

The initial response was poor. Thirteen responses were received in the first two weeks. A concerted effort was then made to gain the names of the IT managers through phone calls to the remaining organisations. During this process it was identified that 4 of the businesses no longer existed and three managers were not interested in responding. The rest claimed not to have received the material.

A second mailing was therefore arranged directed to identified people. From this second mailing a number of additional responses were received. This was biased towards Logistics Innocent companies as is representative of the expected average sample. In ensuring that there was a representative sample of both areas those whom were known to be logistical excellent were further chased until a good reference base was attained. The 30 respondents are highlighted on the list in attachment D.

3.4. Data Capture and Analysis

Even with a sample size of 30 there is a vast amount of data that needs to be processed. Without access to a statistical modelling software tool, this was done using an Excel workbook. Raw data was captured on one of the worksheets and various forms of analysis were done in a number of further worksheets with reference to the original worksheet. This allowed for a good level of integrity of data across the base of various analyses with minimal duplication. This Excell workbook is available to anyone doing further research in this area.

The data captured was graphed in various ways and initial findings were documented. Based on the Literature Review and the interpretation of these results, a draft model was developed to facilitate further discussion.

3.5. Qualitative Confirmation

Armed with the graphical representation of results and the draft model described above, five follow-up interviews were conducted with IT managers in different industries across different points in the supply chain. These provided excellent context to the quantitative results and resolved areas of apparent difference.

The model proved to be a good way of focusing the discussions and was further refined in the process.

The findings of the quantitative and qualitative material were then summarised in Chapter 4. From this conclusions were drawn as described in Chapter 5 and Chapter 6.

4. Presentation of the Evidence

This chapter presents the results of the survey and the follow-up interviews. The presentation of the data is described in the following three areas:

1. General research observations are described in section 4.1.
2. The findings from the quantitative analysis are described in section 4.2.
3. Feedback from the qualitative follow-up is included in section 4.3.

These follow below:

4.1. General Research Observations

4.1.1 Demographics

As described in section 2.2, Bowersox (1989) identified a number of attributes that need to be in place and thus measured for organisations. He further stated that:

These attributes are very similar across organisations regardless of their position in the supply chain. In his research, Bowersox (1989) suggested that regardless of the type of company, similar management practices are used to implement logistics excellence:

> "The practices of leading edge firms are nearly identical independent of the channel position." (Bowersox, 1989)

These findings make it clear that the leading edge firm can be expected to place a premium on specific managerial behavior regardless if they are manufacturing, wholesale, retail, or hybrid organisations.

The aim was, however, to get a good spread of responses from a number of different industries and a cross-section of the supply chain. This was successful as depicted in Figure 4.1 and Figure 4.2 below:

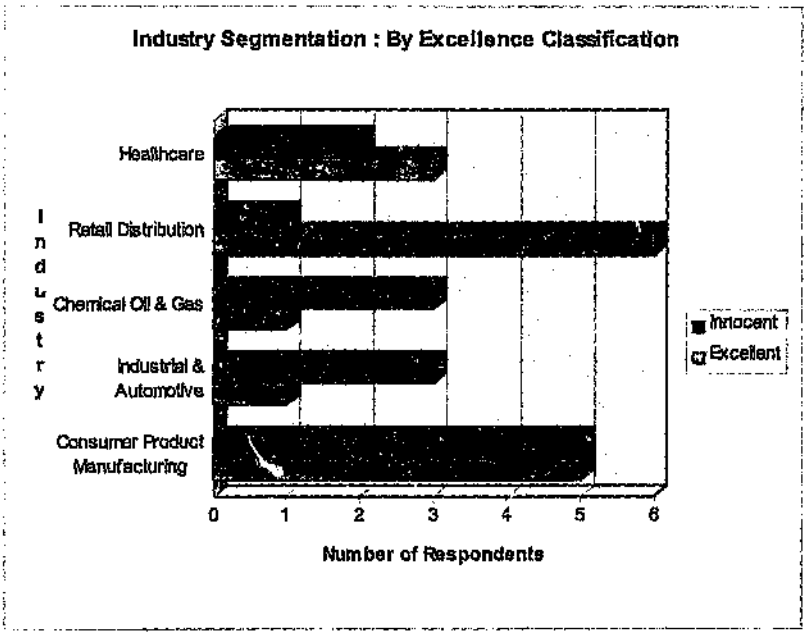

Figure 4.1 - Demographics of sample by industry and level of excellence

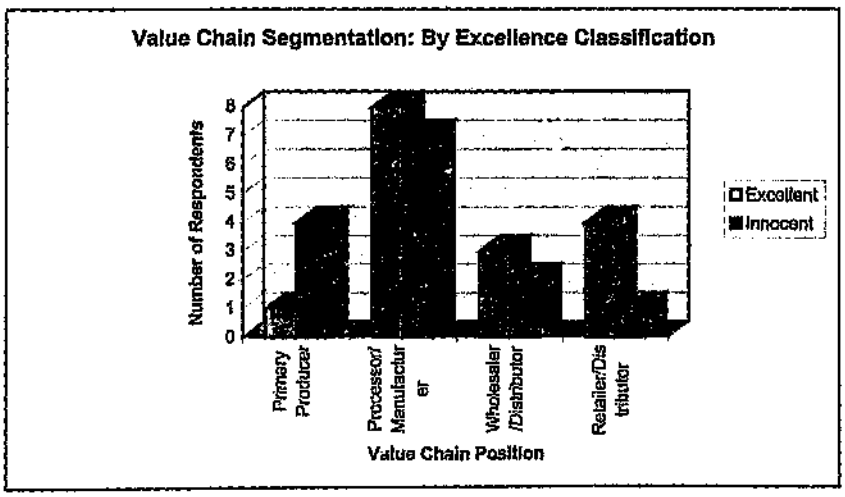

Figure 4.2 - Demographics of sample by position in supply chain and level of excellence

It is important to recognise that the level of logistics excellence was based on the perceptions developed during the prior Cilliers survey after interviews with the logistics managers in each organisation. To ensure that this basis was valid, one of the questions asked in the survey questionnaire sent out for this research was for the IT managers to rate their organisations logistics performance.

4.1.2 Correlation between surveys

The two surveys (original Cilliers research and this research) were conducted using very different approaches and about fourteen months apart. Adding to the complexity, the surveys were answered by different members of the target organisations. Cilliers interviewed the logistics managers (or equivalent) and these questionnaires were sent to the Information Technology (IT) manager (or equivalent).

One of the questions asked in the IT survey was the rating of logistics excellence. The responses by the IT managers matched the original analysis 100% providing a level of comfort that linking these two sets of results provided a valid basis for further analysis.

4.1.3 Quality of Results

The Cilliers analysis was done by preparing a structured questionnaire and personally interviewing the respondents. This was a labour intensive activity that ensured a high degree of accuracy of logistics reference information.

The questionnaire sent to the IT managers was well structured and tested for ambiguity and simplicity with a number of IT professionals. Most responses were detailed showing a high level of commitment to accuracy.

Some of the critical questions in the survey were asked in two different ways allowing for comparison of results.

Finally, selected interviews were conducted to verify the findings and to discuss the implications of these on the IT professional.

Any analysis is subject to misinterpretation and error, but the above points emphasize that this material provides a relatively reliable source of information.

4.2. Quantitative Findings

In this section findings as they relate to the theoretical conjecture in Chapter 3 are described. This provided extremely interesting and yielded reasonable but not predicted results. Some areas posed as more obvious questions were answered in the reverse of expectation supported by comments that clearly explained the initial incorrect perception. A number of areas are described - one point to a section - and these are then drawn into the draft model in section 4.3 for further qualitative follow-up.

4.2.1 Logistics Excellence

As described in the overview of research material, one of the important reference points was the level of logistics excellence. One of the first points of clarity was the assurance that there was a good split of organisations into these two categories.

Of the 30 respondents there were 16 that were classified, as per the Cilliers (1994) model, as "logistics excellent" and 14 classified as "logistics innocent".

Logistics excellence is a key determinant in the rest of the survey so it was important to ensure that there was a sound reference base to be used for the rest of the analysis. As described in section 4.2.2, there was a large correlation between the two different sets of questions and it was ensured that there was a good mix of responses of "excellent" and "innocent" companies. Referring back to the breakdown of demographics in figure 4.1, it can be clearly seen that there is also a mix of "innocent" and "excellent" companies cross-industry. With reference to figure 4.2, it is also clear that there was a mix of "innocent" and "excellent" companies cross the supply chain.

During the rest of this analysis, reference will be made to "innocent" and "excellent" companies. This is to allow for a good split between the two groups within the sample. As evidenced by the distribution of organisations in figure 4.3 below, this is simply to identify those strategies and practices that are used by "excellent" companies over those that are not achieving as great performance. For the purposes of analysis, all those that achieved 51% and greater on the Cilliers analysis scale were classified as being excellent while all those that were 50% and below were classified as being "innocent". It is recognised that the organisations that fit close to this boundary line have very similar performance but for the purposes of analysis, it was necessary to draw the line at some point.

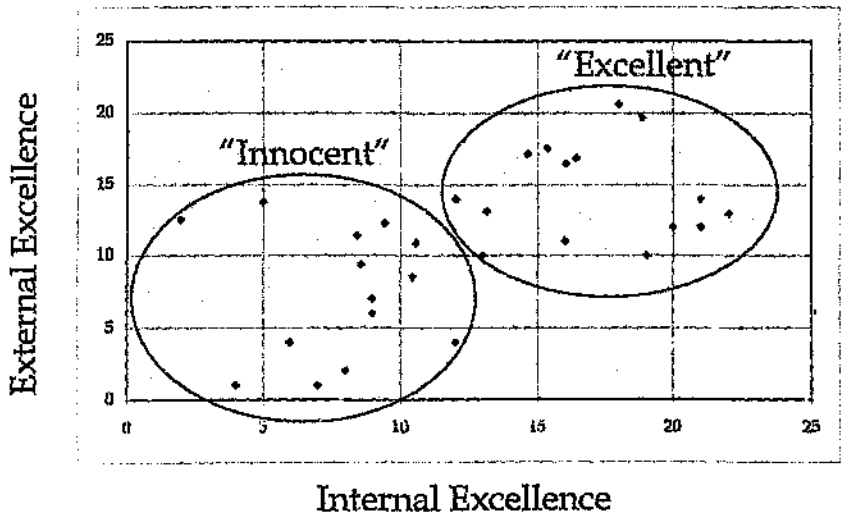

Figure 4.3 - Distribution of sample companies by their relative logistics excellence

For the remainder of section 4.2, reference will be made to "innocent" and "excellent" companies as per the analysis above.

4.2.2 Information Technology and Logistics

As would be expected, all organisations that were spoken to, identified information technology as being critically important to achieving logistics excellence. The reason for this was that as the integration of the supply chain between organisations started taking place, it was critically important to share information in this channel. One of the organisations polled, identified a inventory saving of in excess of 25% that resulted after an agreed improved sharing of information between all of the players in a specific supply chain. This was initially done at great expense through manual exchange of the information via telefax. This additional effort and cost was easily offset by the inventory savings but was onerous to sustain. So, in parallel with the manual implementation, a technology project identified the critical information and shared this through electronic data interchange (EDI). The Paretto principle was used in identifying the most critical information that needed to be exchanged first. This was given the highest priority with the implementation project. Others followed as time would permit.

The respondent company identified that the most critical barrier that needed to be overcome in getting this flow of information working, was establishing the necessary trust to enable the information to be made available. It appears that South African companies still have the belief that information is power. The respondent company had the following words of wisdom for them:

"It is not information that gives power, the power lies in shared information."

Other qualitative feedback identified during the course of the survey further highlighted the importance of information technology in achieving logistics excellence.

> "Logistics is dependent on an information rich environment." (survey Respondent, 1996)

> "Information Technology enables supply chain transparency and visibility." (survey Respondent, 1996)

4.2.3 Importance of Methodology

As described in the theoretical conjecture, it was important to identify how relevant a methodology was in driving the approach to achieving logistics excellence. To this end, the following question was asked:

"Do you believe a formal methodology is required to develop both the logistical process and the supporting information technology?"

As can be seen in figure 4.4 below, the converse of what might have been expected was the result.

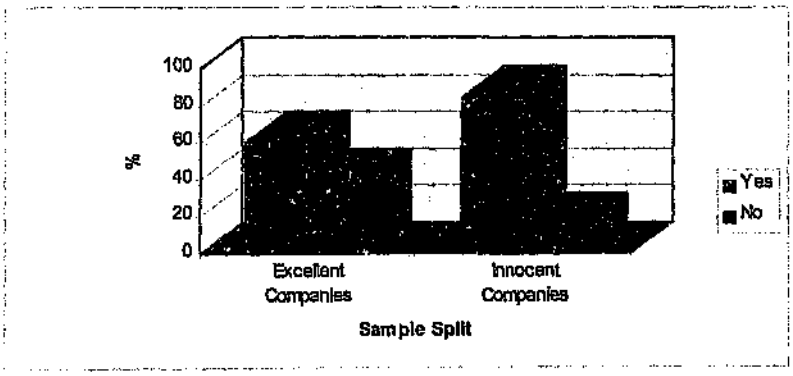

Figure 4.4 - Importance of Methodology to Logistics Excellence

Those companies that were "excellent" in logistics seemed to indicate that methodology was not the most critical success factor to achieving logistics excellence. The key ingredient was identified by them as being an integrated approach. In subsequent discussion, respondents indicated the importance of taking a top level view of the integration requirements and translating that into an integrated programme of change. Then, through the appropriate use of selected methodologies or techniques could be pulled together to support the programme.

"Innocent" companies be contrast, identified the importance of an integrated methodology in achieving logistics excellence. In discussion, this was identified as being a "holy grail" that they hoped to find. They were looking for a simply laid out instruction booklet that could direct their efforts in achieving logistics excellence. A clear message to those companies is that an integrated methodology, that provides for the requirements of all organisations, is clearly not available.

There were a number of qualitative quotations that added substance to the quantitative feedback given above. There are two that summed up the general sentiment of logistics excellent companies:

> "Logistics excellence will only become a reality if an integrated approach is followed"; and
> "an integrated methodology will help but is not essential".

4.2.4 Investment in IT

Having established in section 4.2.2 that information technology is important in the strive towards logistics excellence, it was now necessary to establish the extent of

investment required in information technology. To this end the following question was asked looking for the level of agreement with the following statement of a scale of 1 to 7:

"A significant investment in IT and related technology is a pre-requisite for logistical excellence."

As shown in figure 4.5, "excellent" companies answered this question with an average of 5.7. As can be seen, there were two organisations that answered a level 3. Further probing identified that these two organisations had pursued an integrated systems technology strategy for some time. They therefore had an integrated systems environment across all aspects of their company already. They did not feel that an additional significant investment in information systems was required to achieve logistical excellence and with subsequent probing said that, had they not gone through the prior integration, that it would require a significant further investment to achieve the results that they had achieved. If these two responses are even an average weighting, the response to this question by "excellent" companies is 6.1.

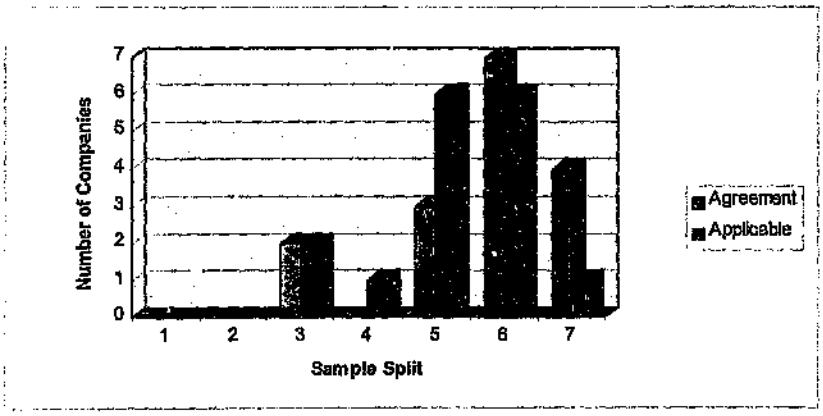

Figure 4.5 - Level of Agreement Significant Investment being Required in IT and Related Technology (Excellent Companies)

In terms of the applicability of significant investment in IT being required for success within the "excellent" companies surveyed, this average is 5.2. Most of the "excellent" companies had already achieved a high level of integration and therefore, were less convinced about their need to future invest in information technology. For cont' ous improvement purposes, they still felt that a relatively high level of investme would still be required. With "innocent" companies, the responses were in the reverse of "excellent" companies. They generally identified that an investment of IT was important but an average score of 5.5 as shown in figure 4.6 below. This seems to indicate that they have followed a strategy of lower investment than "excellent" companies and were feeling the results. Most of the "innocent" companies, however, identified that they needed a greater level of investment than was typically required and answered 5.9 on average to the question of applicability of IT spend in their environment.

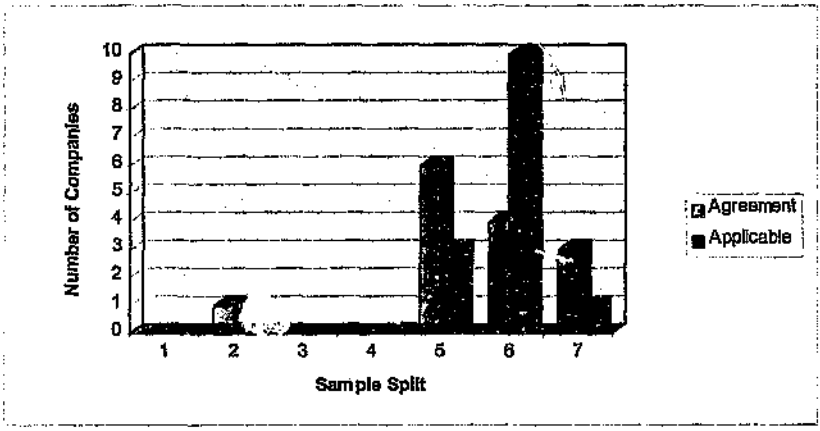

Figure 4.6 - Level of Agreement to a Significant Investment being Required in IT and Related Technology (Innocent Companies)

In summary, an investment in information technology and related technology is seen as being important. For those organisations that have a sound integrated systems environment, the investment in achieving logistical integration is likely to be lower. For those that have a fragmented systems environment, significant investments are going to be required to achieve the levels of integration that are necessary for logistical excellence.

4.2.5 Process vs Functional View

The conjecture, identified in chapter 3, was that logistical excellence could only be achieved if an organisation took a cross-functional view of the logistical processes and supported these by good information technology. Integration of the material supply chain clearly requires that all physical and logical functions are integrated in a streamlined end to end process allowing for the clear visibility of inefficiencies. This view was supported through a question asked in the survey which again required a level of agreement from 1 to 7 on the statement.

"A process rather than a functional view is taken in system applications."

As can be seen in figures 4.7 and 4.8, there is a high degree of support for the fact that a process view is important. Both "excellent" and "innocent" companies were in general agreement with this statement with an average response of 5.5.

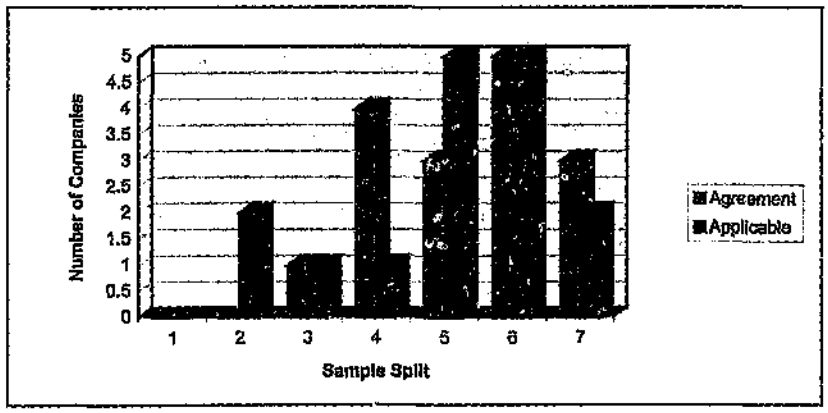

Figure 4.7 - Level of Agreement to the need for Process rather than functional view of systems (Excellent Companies)

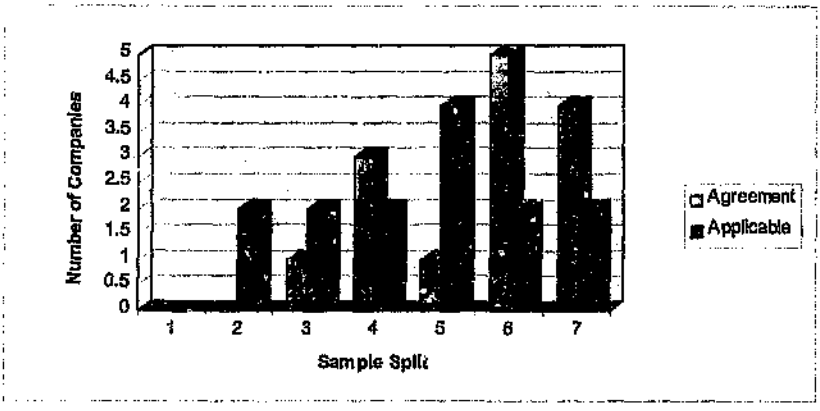

Figure 4.8 - Level of Agreement to the need for a Process rather than functional view of Systems (Innocent Companies)

Also clearly identifiable in the above two graphs is the fact that "excellent" companies are applying process integration a great deal more than "innocent" companies. "Excellent" companies rated application at an average of 5.1. "Innocent" companies rated the same at an average of 4.5.

In summary, a strong support for the process view of systems as compared to a functional view.

4.2.6 IT Implementation and Process Change

As described earlier, Davenport (1993) describes a relationship between information technology initiatives and the economic outcome. He states that in various categories of IT, process innovation can only be achieved if the information technology initiative is followed by a sound approach to process change. He illustrates this in two particular categories of IT change:
integrative change or where disintermediation is required.
In attempting to verify this, respondents were asked for their level of agreement on a scale of 1 to 7 to the following statement:
"It is important that IT implementation is always accompanied by process change".

The answer to this had a wide range of values which did not seem to provide support for the Davenport (1993) hypothesis. As can be seen in both figure 4.9 and figure 4.10, responses were largely divergent with respondents either being strongly for or strongly against the statement. This indicated that the question was ambiguous with the potential of being answered in different ways.

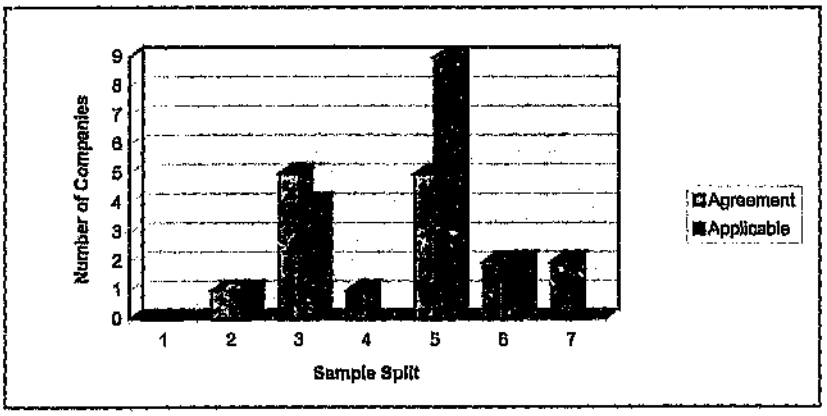

Figure 4.9 - Level of Agreement to the Need for IT Implementation to be accompanied with process change (Excellent companies)

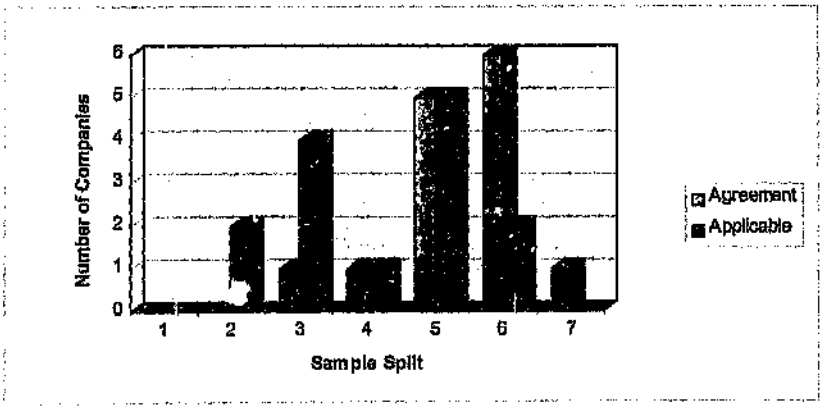

Figure 4.10 - Level of Agreement to the Need for IT Implementation to be accompanied with process change (Innocent companies)

It was, therefore, necessary to probe this in more detail through follow-up questions from selected respondents. During the course of this follow-up, the nature of the ambiguity became apparent as did the reinforcement of the Davenport (1993) hypothesis.

There are a number of information technology initiatives which take some effort to implement but are primarily focused on substituting elements of process with a more efficient automated method. In these situations, the process stays constant but time is saved. As has been described earlier, savings in time have a significant impact in reductions in inventory and improvements in customer service when dealing with logistics.

Therefore, in answer to the question in the survey, those organisations that identified this, answered with a low level of agreement because of the word "always" in the question.

In situations where information technology is being used as a lever to integrate the supply chain or disintermediate, the respondents fully supported the hypothesis raised as part of the theoretical conjecture in chapter 2. In other words, where a move was being taken away from a functional view to a more integrated process view, the mere implementation of information technology would not achieve the expected economic benefits without a significant process re-engineering effort.

4.2.7 IT role in Internal Process integration

The next significant question was the level of agreement to the following statement:

"Firms can achieve a high level of internal process integration required for logistical excellence without striving for a similar level of internal information systems integration."

This question had a marked unambiguous response. The "excellent" companies had a average response of 2.75 as shown in figure 4.11 below. It, therefore, clearly showed that the converse of the statement was true. This indicated that a high level of internal process integration is dependent on a similar level of internal information system integration. Companies, therefore, with well integrated, cross functional systems could expect a higher level of performance when striving for process integration.

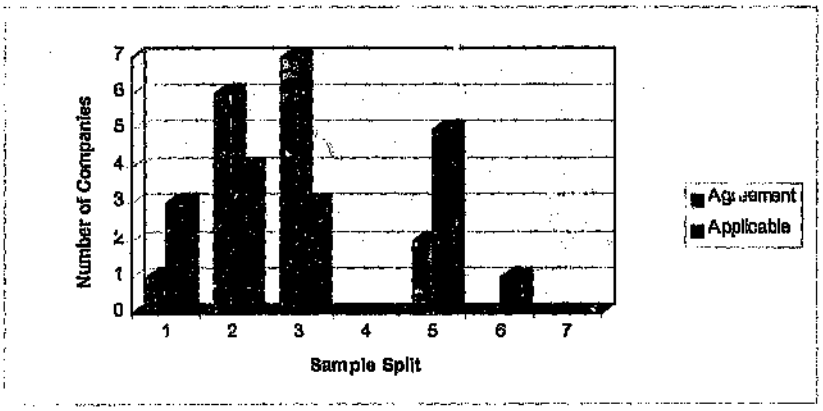

Figure 4.11 - Level of Agreement to the Achievement of Internal Process Integration without IT (Excellent companies)

An interesting result was obtained to the question on applicability of process and IT integration in the "excellent" companies. The expectation would have been to find a similar response to the level of agreement as you would expect the "excellent" companies to be following the trend that would yield excellence. This was not the case as is highlighted by the five respondents who gave a weighting of 5 to their level of agreement. These five were therefore saying that there was not a clear dependency in their organisation between the process integration and the IT integration.

It was again necessary to probe respondents directly to identify the reason for this discrepancy. The responses to this follow-up fell into two categories. Two of the respondents (the same two whom answered 5 to the agreement part of the question) had extremely focused their operation to deliver a unique niche service to the supply chain. Their entire business was serving that niche and doing so very effectively. They had a number of independent technical systems that supported the different parts of their business and did not feel that there was a high level of dependence between the ability to achieve process integration in the absence of good integrated systems.

The second category of respondents identified that they believed that the dependence of information technology integration and process integration was as described earlier. In their respective organisations they had not achieved the level of information technology integration internally that they would like. They had, however, achieved a high level of process integration through manual methods as described earlier. They were currently initiating projects to improve the efficiency of these processes through information technology. They therefore were not as strong on the immediate need in their organisation for a close dependence between process and information technology although they agreed that the best result was achieved when this did in fact happen. Market pressures did not always allow the time required to achieve both of these simultaneously.

With "innocent" companies, as shown in figure 4.12 below, there was not a high level of consensus on either of these questions. This may be one of the reasons that these organisations fit into the "innocent" category.

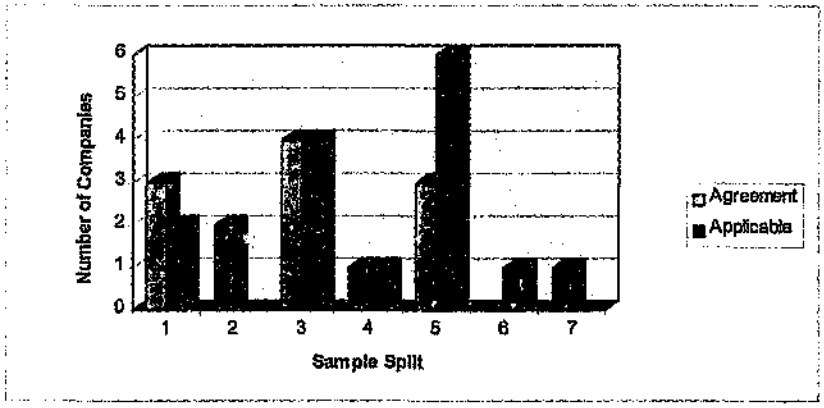

Figure 4.12 - Level of Agreement to the Achievement of Internal Process Integration without IT (Innocent companies)

In summary, information technology is important in achieving internal process integration. The more integrated the systems are cross function, the easier it is to achieve internal process integration. "Excellent" companies have achieved this level of integration or have alternatively compensated for it through less efficient manual methods.

4.2.8 IT role in External Process integration

The next area of focus was on external integration. Here the responses were very similar, in ways, to the question on internal integration. In the survey, respondents were asked to give their level of agreement to the following statement:
"A high level of external process integration with partners requires a high level of IT support".

The response to this question from both "excellent" and "innocent" companies was unambiguous agreement as demonstrated in figure 4.13 and 4.14 below. "Excellent" companies answered this with an average of 5.9 and "innocent" companies gave it an average of 5.5.

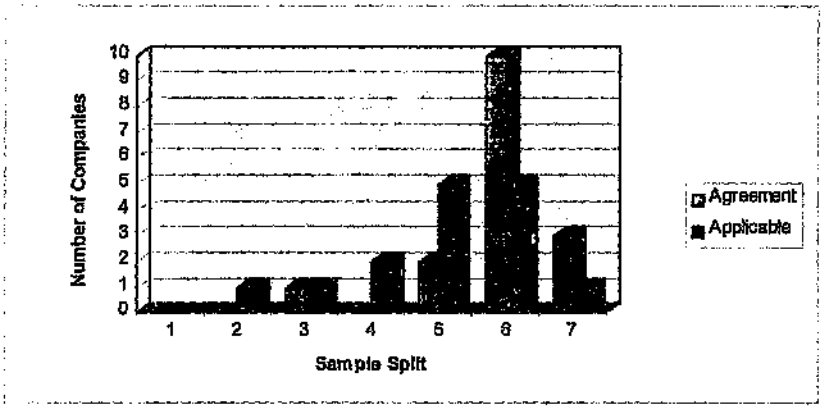

Figure 4.13 - Level of Agreement that External Process Integration required with IT Integration (Excellent companies)

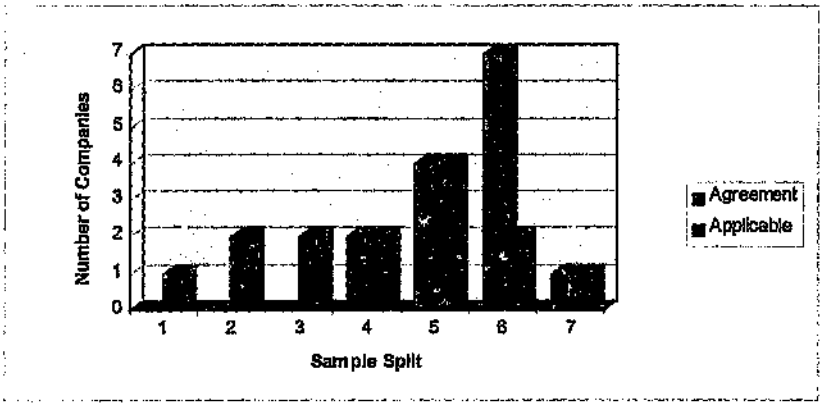

Figure 4.14 - Level of Agreement that External Process Integration required with IT (Innocent companies)

It is on this measure that the difference between "excellent" and "innocent" companies was most marked. "Excellent" companies answered the applicability question giving an average of 5.1. This was as compared to the applicability amongst "innocent" companies of about 4.1 - a full point behind. The response to this question intrigued the author who prompted him to discuss it in a bit more detail amongst the respondents. In the same follow-up discussions he identified the reason for this marked difference.

"Excellent" companies felt that one of the prime reasons for the pressure on their achievement of logistics excellence came through the additional pressure that was provided by the other partners in the supply chain once the intent had been agreed to achieve a greater level of supply chain integration amongst the various partners in the chain. This teaming gave rise to a heightened need for integration. Integration could only be achieved through a focus on information technology and, once the information technology was in place, a great focus on achieving the desired level of performance. The access to information by teaming partners gave visibility and focus to the weak areas of performance.

It therefore seems as if this is one of the most significant contributors to achieving logistical excellence. Those companies that are embarking on a programme of improving logistical excellence should take heed from this and look to involving as many of the partners in the supply chain as early as possible in the process.

4.2.9 Early adoption of new technologies

Is it necessary to be on the bleeding edge of information technology to achieve logistical excellence? This is the question that was aimed to be answered through the request for a level of agreement on the following statement:
"Early adoption of new technologies is a prerequisite for logistical excellence."

The answer to this question was inconclusive. For both and "excellent" and "innocent" companies the average response was 4.5. This is only marginally above the mid-point of the 1 to 7 range which would be 4. The responses to this, as shown in figure 4.15 and in figure 4.16, were also very erratic without any clear preference for any specific trend.

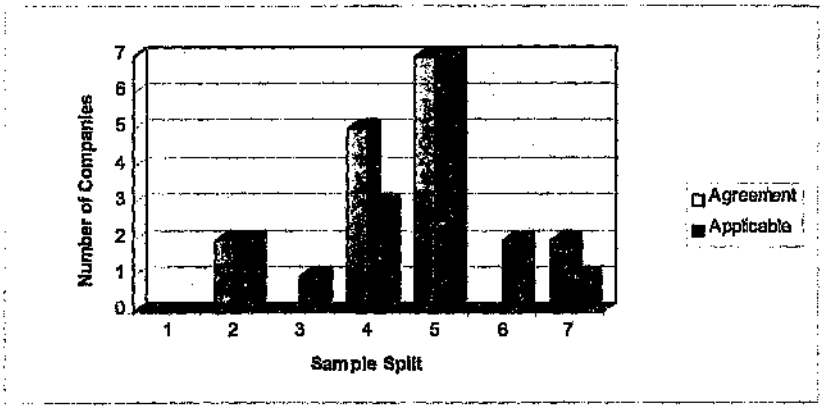

Figure 4.15 - Level of Agreement that Early adoption of New Technologies is important for Logistical Excellence (Excellent companies)

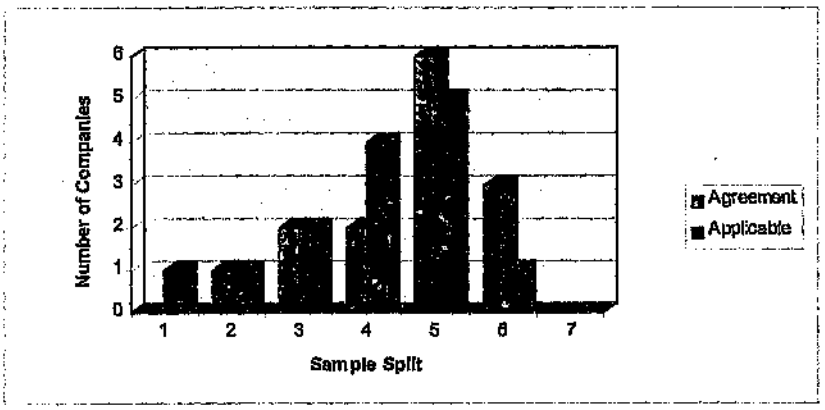

Figure 4.16 - Level of Agreement that Early adoption of new Technologies is important for Logistical Excellence (Innocent companies)

The conclusion to be drawn from this is that the early adoption of new technologies can be of assistance in some circumstances but it is not an absolute pre-requisite for achieving logistical excellence. The prime focus in achieving logistical excellence is on integration both internal and external. A large amount can be achieved by focusing relatively average technologies on the internal and external IT integration.

4.2.10 Integrated change package

The last question in this section asked for the level of agreement to the following statement:

"Deployment of an integrated change package, created through the concurrent design of process, systems and change management interventions, is critical for successful IT deployment in logistics processes."

This was an all encompassing question that included a number of different concepts but that focused on the need for a good business integration approach to implementing logistical solutions. Both "excellent" and "innocent" companies identified this as being important with an average response from both of 5.6. This is as shown in figure 4.17 and figure 4.18 below.

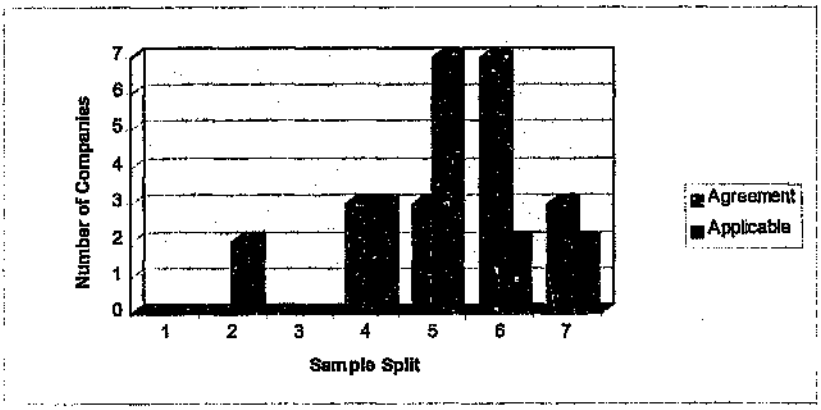

Figure 4.17 - Integrated change package (Excellent companies)

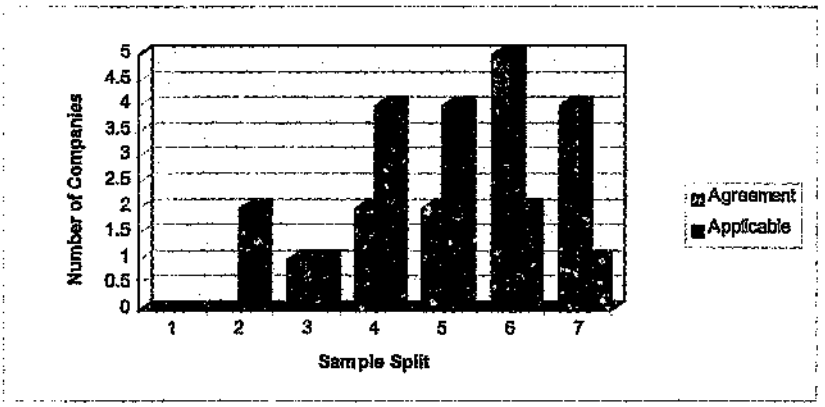

Figure 4.18 - Integrated change package (Innocent companies)

"Excellent" companies were marginally better than "innocent" companies in achieving the level of integrated change that they required. During the subsequent follow-up discussions, respondents identified that they were ill-equipped to take and adequate and concurrent view of processes, technologies and the impact on people simultaneously. This had caused the failure of some of the initiatives and, those that succeeded only did this with a great level of post-conversion determination from the project sponsor. It was this drive that ensured that the necessary changes to process and people were retro-fitted during the course of the implementation effort. This took longer and was highly immotive at times.

In summary, good support for a greater level of business integration applied to change initiatives.

4.3. Proposed Model

In reviewing the summary results as identified above, a number of trends, critical success factors and guide lines were identified as being very relevant in the search for logistical excellence. These findings were summarised into a draft model as shown in figure 4.19. In this model, the aim was to simply encapsulate the best practice thinking of the survey respondents in a form that could be easily

communicated and easily followed without detailed reference back to the findings described above.

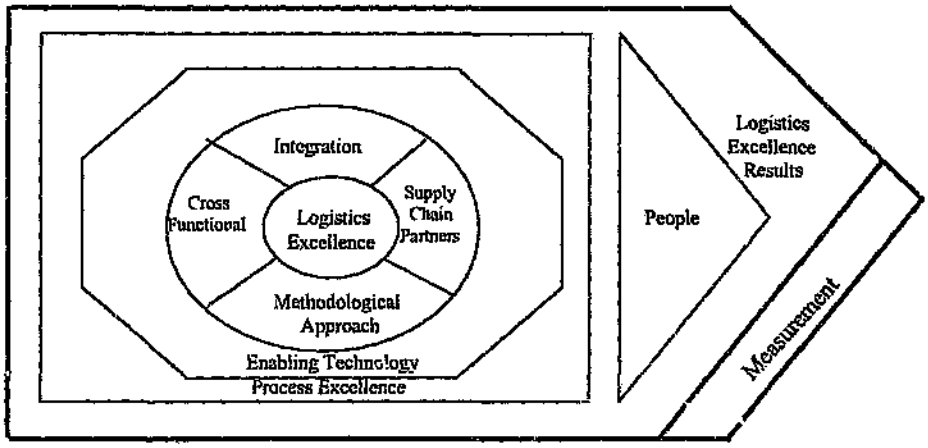

Figure 4.19 Summary Key Issues in the Style of Logistics Excellence though IT

This model assumes that the goal is to achieve a strategy of logistics excellence. This needs to be properly defined and will adhere to and drive out the principles of integration, cross functional process orientation, including supply change partners, and a sound methodological approach. Using these principles the strategy will then be implemented using a concurrent approach of enhancing the logistics processes and implementing the correct enabling technologies. This package of change is then enabled through behavioural change in people and is used to leverage that change ultimately achieving the logistics excellence results. These results need to be properly measured and made visible.

This was the draft model that was taken to a number of IT managers. Discussions with them were documented in the form shown in Appendix F. Results of these discussions are summarised in Section 4.4 below.

4.4. Qualitative Feedback

Using the model described in section 4.3, the author arranged interviews with five IT managers in logistics related companies. The purpose of these interviews was to get their feedback on the model as a useful tool in assisting in achieving logistics excellence. Their comments were documented in the form shown in attachment F. For purposes of anonymity, these forms have been excluded from this report. Their comments were useful in validating the model and adding further refinement to it. Their comments are included in the following sections and these are then used to shape a revised model shown and described in section 5.3.

4.4.1 Excellence Principles

While there was general agreement that the points raised in the second band of the model were key principles in achieving logistics excellence, it was clear that this was not an inclusive list. There were other key principles that had been identified by Bowersox (1994) and Cilliers (1994) that had been excluded from this model. I discussed this at some length with two of the respondents who felt that it was important to establish these principles but that this would differ from company to company and could best be achieved by reference to the original works. They saw the value in this model as driving the IT professional to get a clear grasp on the overall logistics excellence objectives and then the underlying principles that would be critical in their environment.

In discussion with them, the author therefore revised that band to be more generic.

4.4.2 People

All of the respondents emphasised the absolute importance of people in achieving logistics excellence. The other aspects highlighted to the left of the people triangle provided a solid foundation on which excellence could be built. This foundation also helped lift people to achieve greater performance. It was, however, the change in people behaviour that achieved the required level of excellence.

This change in people behaviour required a very strong leadership focus and an enabling environment that encouraged high performance.

It was not the author's purpose to dwell on the importance of behavioural change as this has been done by many authors in behavioural sciences. The IT professional who is looking at transforming an organisation through the use of information technology, needs to ensure though that adequate attention is given to this behavioural change.

4.4.3 Measurement

The respondents again concurred that measurement was a very effective tool in making any programme of change focus on the outcome rather than just on the process of getting there.

Many examples were given by the respondents of how this had worked. The respondents were all in the logistics "excellent" category and this could thus be expected. One of these examples was particularly striking and therefore bears mentioning in this report.

A large South African retail group aimed at a logistics excellence target of three days delivery from supplier to the retail store at a significantly reduced cost. Their performance to date had averaged at around four to five weeks for the same event.

Starting with this outcome in mind, they decomposed this into a series of key performance measures which were made visible at the outset of the programme and then monitored throughout the development effort. They became the centre of focus driving the design decisions in the various enabling technologies and in the significant process changes. Once the implementation started to take place, these measures provided the basis for ensuring that the correct outcomes were realised. The particular respondent spent a large amount of the interview reinforcing the model as a whole and, in particular, focusing on measurement as being the backbone to success. It is at his insistence that the author has extended the measurement process to cover the entire programme life cycle.

4.4.4 Process Excellence

Each of the respondents confirmed the importance of sound principles, good enabling technology, process excellence and delivery through people. With many of them, the author got into significant debate around the sequence of these. Some felt that enabling technology was a starting point as indicated in the diagram, while others felt that the importance of process was the cornerstone on which enabling technology was built.

During the course of the debate, it became evident that many of the examples they chose to demonstrate that the enabling technology sometimes came first, had little bearing on achieving logistics excellence. There was also a very strong argument which supported process excellence being more important. As has been described earlier, achieving logistics excellence is a move towards process integration. It is therefore very evident that a clear understanding of the integrated processes is a prerequisite foundation to any changes in technology for the people.

It is therefore the conviction of the author that there may be many situations in the implementation of information technology where the sequence could be different. However, in achieving logistics excellence it is imperative to get the process view aligned and clearly entrenched prior to choosing the enabling technology. Detailed procedures that link the process and the technology should be agreed as part of the addressing the behavioural change of people.

The author therefore changed the sequence of these two headings on the model.

4.4.5 Summary Feedback

Overall, the respondents were very supportive of this model and said that it provided a very good basis for shaping an prioritising change in a programme to achieve logistics excellence. The results of these discussions are included in a description of the revised model in section 5.3.

5. Analysis of Results

In the results, there is large amount of information as summarised out of the survey. It is important to relate this back to the theoretical conjecture. In doing this, the section below first looks at the extent to which the five statements in section 2.6 were supported through the results and then secondly, looks at the statement of theoretical conjecture included in the same section establishing whether this truly holds. Section 5.1 below analyses each of the five statements and section 5.2 analyses the statement of theoretical conjecture.

5.1. Analysis of Literature Review Summary

At the end of the literature review in section 2.6 the author summarised a thread of logic that included the following five statements :

1. Integrated Logistics Management is a critical component of strategy into the future.
2. Logistics excellence requires a migration of performance from simple physical distribution through to and integrated management of the distribution channel.
3. In South Africa logistics management is far from ideal and we have a major challenge to overcome a backlog in improvement caused by isolation.
4. A key enabler to good, integrated logistics management is information and the systems to support this.
5. Success in implementing logistics systems requires the simultaneous attention to processes reengineering.

Each of these statements will be analysed in more detail in the following sub-sections 5.1.1 through 5.1.5.

5.1.1 Integrated logistics management

Literature review seemed to indicate the importance of integrated logistics management and that this would become an increasingly critical component of strategy into the future. This has been borne out by a number of research initiatives and writers that have been quoted in chapter 2.

The purpose of this survey was not to establish whether this fact held. It was taken as an assumption as this had been shown through the survey by Cilliers (1994). It had the prime focus of identifying how organisations viewed logistics. In that survey, it was clear that organisations sought logistics excellence although many were not meeting the excellence mark. The lack of logistics achievement was again identified as described in section 4.2.1.

In summary, logistics excellence is important and was seen important by the selected group of companies who were chosen out of the sample that was used for the Cilliers (1994) survey.

5.1.2 Integrated management of the distribution channel

The theory identified the absolute importance of moving away from a very functional focus of the different components of the logistics chain into an integrated management of all processes throughout the distribution channel. This, again, is a fact that was established as part of prior surveys. Bowersox (1993) describes this relationship in some detail and this was re-enforced through the sample that was surveyed by Cilliers (1994). This survey being a selection of the respondents in the Cilliers (1994) survey, it can be assumed that this is a view held by them.

In particular, when they were asked whether a process versus functional view was important in achieving logistics excellence, there was an overwhelming response that this was important as identified in section 4.2.5. It can therefore be assumed that this group of companies re-affirmed the thinking in the literature and felt that cross function integration was paramount in achieving logistics excellence.

5.1.3 South African logistics backlog

The summary thread out of the literature was a clear indication that South Africa was far behind many of its competitors in the field of logistics management. A results on logistics excellence described in section 4.2.1 clearly re-enforce this view. There is a relatively small proportion of organisations that achieved a greater than fifty percent on this measure and even those were grouped with a average of seventy-two percent. The average for the sample as a whole was sixty percent.

5.1.4 Information systems and enabler

The hypothesis put forward in chapter 2 describes information systems as a key enabler to achieving logistics excellence. This was founded on the basis that logistics required the optimisation of a wide range of activities across a supply chain. For this to take place effectively it requires an intensive amount of information and it was real time and current. It is one of the key linkages on which this thesis is based.

The result presented in the previous chapter supported this linkage in a number of different ways. This linkage is described in some detail in section 4.2.2, the essence of which is encapsulated in the following quote from one of the respondents:

"Logistics is dependent on an information rich environment"

The interesting responses about investment in IT in section 4.2.4 give a great deal of insight into this linkage. In summary, those organisations that were "logistic excellent", did not feel that they needed further significant investment in IT. Those, however, who were "logistic innocent", identified investment in IT as being one of their top priorities. An average of 6.1 out of a possible 7 points is a very convincing argument for the importance of IT in supporting logistics excellence.

The importance in the investment in IT was focused around integration. There was little support for always attempting to be at the "leading" edge of technology. As described in section 4.2.9, early adoption of new technologies was not seen to be critical to success in logistics. The success came through the linkages and this came through integration.

In summary, IT is a key enabler in that it drives out the linkages and assists in managing the large volumes of information required to successfully optimise a logistics supply chain.

5.1.5 Simultaneous attention to process and IT

The final key component of the thread of logic described in section 2.6 related to the association between implementation of systems and implementation of process. This was based on the work put forward by Davenport (1993) where he described the economic outcome as being dependent on the information technology initiative and associated process change. He said that in the field of IT the only way of achieving the economic outcome was through the correct attention to process change.

There seem to be a lot of support for this theory and the question is whether or not it was demonstrated in logistics systems.

Unfortunately, as described in section 4.2.6, the prime question that was asked yielded an ambiguous response. It took the follow-up qualitative questions to establish why this was the case. This is described in some detail in section 4.2.6. In summary, where a move was being taken away from a functional view to a more integrated process view, the mere implementation of technology would not achieve the expected economic benefits without significant process re-engineering effort. However, in situations where technology was simply replacing components of the chain with the aim to automate an existing part of the process, significant process change was not required.

Therefore there seems to be a lot of support for the solid attention to both IT and to process in situations where the organisation is driving towards a significant behavioral change as is the case when aiming to move towards a state of logistics excellence and a move from the current sixty percent average to something much more significant in the case of South Africa.

The linkage between process and IT was further described in sections 4.2.7 and 4.2.8. In both of these, there was unambiguous agreement that to achieve the level of internal or external process integration required for logistical excellence demanded a similar level of information systems integration - internally and externally.

5.2. Analysis of Theoretical Conjecture

As described in Section 2.6, the theoretical conjecture that the author set out to prove or disprove was as follows:

"Logistical excellent companies in South Africa differ from their lesser counterparts in the way they apply IT to optimise the logistical performance in the style of enabling IT solutions".

As described in each of the preceding sections, there is a clear thread of differences between logistical "excellent" companies and logistical "innocent" companies. These differences are listed in table 5.1 below.

Area of Difference	Refer to Section
Share information across the supply chain	4.2.2
Use a methodological approach to implementing change adapting it as required.	4.2.3
Have an information rich environment	4.2.2
Are flexible in their use of methodology	4.2.3
Have an integrated approach to implementing system and process change	4.2.3
Invest wisely in IT aiming at integration rather than state of the art change	4.2.4
Have integrated information systems	4.2.4
Have a process versus functional view of logistics	4.2.5
Implement IT and process change simultaneously	4.2.6
Use IT as a lever to achieve internal logistics excellence	4.2.7
Use IT as a lever to achieve external process integration	4.2.8
Are not at the forefront of technological development	4.2.9
Have an integrated approach to change	4.2.10

Figure 5.1 Differentiators of Logistics Excellent Companies

As described in Chapter 4, the differences between logistical excellent companies and logistical innocent companies are significant and the gaps, with some, as large as a point or a point and a half on a seven point scale.

5.3. Revised Style of Logistics Excellence Model

What started as a series of loose concepts has therefore been pulled together into a model which provides a conceptual reference point for IT managers. This can be used to identify the various critical components of a programme and to articulate their priority in a logistics organisation.

This refined model is shown below in figure 5.2.

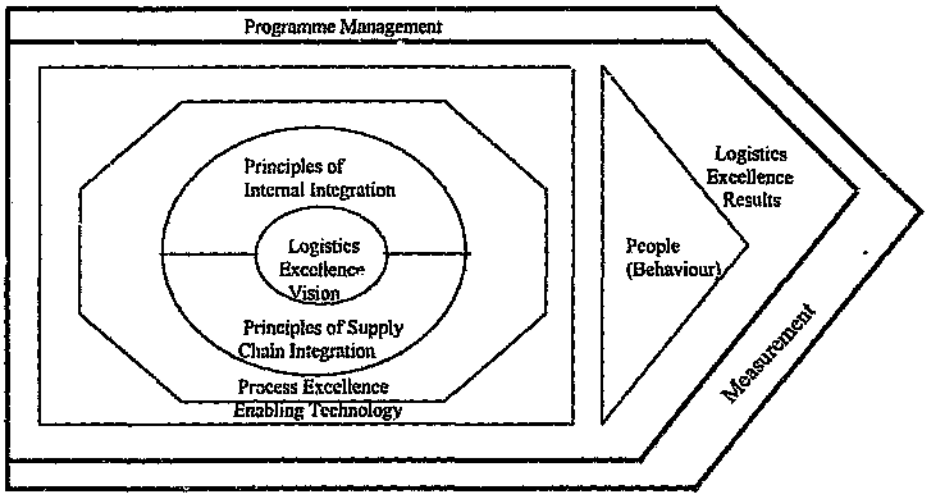

Figure 5.2 Summary Key Issues in the Style of Logistics Excellence though

The sequence of this model runs from inside to out and from left to right. At the core to achieving logistics excellence is a shared vision by the top management of an organisation on the outcome they need to achieve. This vision positions them as delivering the required customer service to the different segments of the market that they choose to support. This vision must be clear and concise and must be

easily translated into a set of key measures to be referred to during the course of the implementation programme.

Under-pinning this vision are a series of customised principles that describe how the organisation intends achieving that vision. These principles would include the major operating intent of the organisation as it relates to logistics. In consumer organisations, the internal integration principles would cover most departments across the spectrum of the organisation. It is therefore often the case that the logistics excellence vision is given a subtly different name and becomes the vision for the organisation at large. For those organisations that truly achieve logistics excellence, this is definitely the case.

Principles described to cover the internal organisation are then extended to cover all major stakeholders in the extended supply chain. It is this combination of a high level vision under-pinned by the principles of internal integration and external supply chain integration that form the foundation for achieving a sound logistics excellence.

The next important aspect is the process view of the organisation. This, at first glance, appears to be the simplest layer. It is, however, the most complex. This requires the breakdown of barriers that are entrenched for years as the functional orientation of an organisation has become embedded in a political and hierarchical structure. A good understanding of the processes and how they will support the underlying principles is a further absolute prerequisite to achieving logistics excellence. This, as described earlier, is as a result of the necessity for integration that is brought about by integrated logistics. It can only be achieved by a process orientation and a focus on process integration.

It is then the task of the IT professional to ensure that any implementation of information technology to achieve logistics excellence is preceded by these first four steps. If not properly addressed, these four areas will be addressed as part of the implementation of the technology which will slow its progress and sometimes

give rise to suspending a mission critical programme of change. Enabling technologies are critical to achieving the level of integration that is required to achieve logistics excellence. Technologies must be chosen primarily for their ability to achieve the level of process integration rather than their state of the art nature.

Ultimately, it is the people that will make the difference between logistics excellence and failure in a programme of change. Involvement of those people in achieving that outcome is a key ingredient to the process that is followed by the IT professional. It is through this process that excellence in logistics will result. This process must be properly managed with an effective methodology. This is not necessarily a single ideal methodology but could also be a series of related approaches and techniques that are carefully crafted into a programme of change that has clear outcomes and a good understanding of the path to achieve them. This programme must take cognisance of all of the different aspects mentioned above. It needs a clear focus on the vision, the principles, the process excellence, the enabling technology and a focus on the people. Any one of these would be disregarded at the peril of the entire programme.

Finally, a focus on measurement established as early as possible in the programme will focus the overall programme on the outcome and drive it to achieving the excellence vision. These measures must be very visible and must provide the point of reference to make ongoing changes to the overall programme where necessary.

This model, establishes a clear basis for the IT professional to help shape a programme of change to achieve logistics excellence. It is recommended that this be used a framework for a dedicated workshop at the outset of such a change programme to shape the thinking of all stakeholders and ensure that they all are focused around the same end goal. The author believes that experience will show this to have a significant impact on the level of success achieved in a logistics excellence programme.

6. Conclusions

6.1. Background

This research project started out with a series of independent research findings written about information technology in general, logistics excellence in general and the relationship between process and information technology. The key theme of this research initiative was to analyse the relationship between information technology and logistics clearly focusing on the style that is used to implement information technology towards the goal of achieving logistics excellence.

Work done by Bowersox (1994) was used to establish some fundamental principles of logistics excellence. These principles were shown to be supported by the respondents in this survey.

This logistics framework was used as part of a survey conducted by the University of Pretoria by Cilliers (1994). Cilliers also established a reference framework for identifying logistical excellent companies. He did this against two major variables each having a number of measures. These two major variables were the level of internal logistics excellence and supply chain logistics excellence (the external focus). Cilliers (1994) conducted a survey of 120 companies and was able to establish the level of logistics excellence for most of these. There was a clear correlation between the measures identified by Cilliers (1994) and the excellence principles identified by Bowersox (1994).

The combination of Bowersox (1994) and Cilliers (1994) clearly therefore provided sound research basis that provided both a measuring instrument of logistics excellence and a sample set of logistics companies that had already been measured against this set of criteria.

6.2. Differences in Style

In the course of the research conducted in this survey, the author was then able to send a questionnaire to the same sample set used by Cilliers (1994). A quarter of these organisations responded which provided a good analysis base to be used by the author to look at the relationship between logistics excellence and the style of implementing information technology.

The results of this survey are described in detail in the earlier chapters. Overall, they demonstrate significant differences in the approaches used by logistical excellent companies and those that do not portray the same level of logistics excellence. The following are some of the critical differentiators identified within logistical excellent companies:

- they share information across the supply chain;
- they use a methodological approach to implementing change adapting this as is required to suit their own environment;
- they have an information rich environment;
- they are flexible in their use of methodology;
- they follow an integrated approach to implementing system and process change simultaneously;
- they invest wisely in IT aiming at integration rather than state of the art change;
- they have integrated information systems;
- they have a process versus functional view of the logistics organisation;
- they implement information technology and process change simultaneously;
- they use IT as a lever to achieve internal logistics excellence and integration;
- they also use IT as a lever to achieve integration and excellence across the supply chain;
- they are not at the forefront of technological development; and
- they have an integrated approach to change.

6.3. Recommended Style of Implementing Logistics Change

As part of the research initiative, a framework was developed which describes the interrelationship between information technology and the programme of change needed to implement logistics excellence. The model below was developed during the course of this research and was validated against five major IT managers.

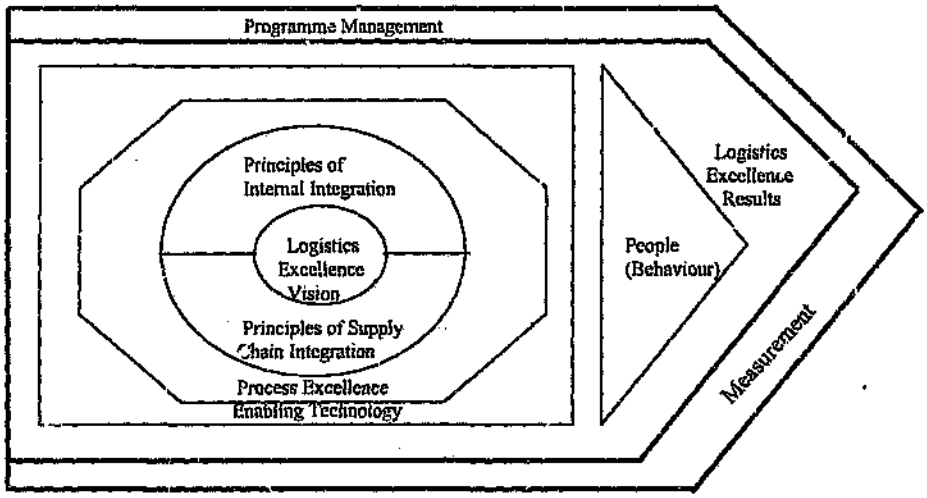

Figure 6.1 Summary Key Issues in the Style of Logistics Excellence though

This model is described in section 5.3 in some detail and in summary suggests that the achievement of logistics excellence starts with a clear vision established by the organisation. This vision is under-pinned by an operational intent describing the principles for achieving internal logistics excellence and excellence throughout the supply chain. This operational vision is enabled through a clear understanding of the processes that are required to achieve this vision.

The IT professional then translates this clear foundation into the IT enablement that is required to support it. This IT must focus on achieving integration rather than being the absolute state of the art. A programme of change is then put together taking into account all of these aspects and the people behavioural change

all focusing on a clear achievement of a set of measures that collectively will ensure that the vision is achieved.

This framework should provide the IT professional with a good starting point at the outset of a programme of change. This can be used to provide the basis of a workshop including the major stakeholders to help ensure that all aspects of the programme are thought about and included in the overall planning. Those IT professionals whom have seen it embraced it with some enthusiasm.

6.4. Research Limitations and Key Assumptions

Early in the review of this subject, it was identified that there are many components of information technology that have an influence on the ability to achieve logistics excellence. Some of these include:

1. The alignment on the IT strategy with the logistics strategy.
2. The scope of information technology deployed.
3. The level of technical integration.
4. The decentralised or centralised nature of the application architecture.
5. The maturity of the organisation in its use of technology.

The aim of this research was focus on the methods and approaches used in achieving logistics excellence (the style) and not to comprehensively look at IT and logistics. Industry could gain from further research that covers many of these related topics.

The chosen sample is a small subset of South African products companies. Reference was made to practices currently used internationally but the practices were only tested in South Africa. The results provide a good reference point for South African practitioners but should not necessarily be seen as a global benchmark.

The author believes that most of the findings could be applied universally and would be a useful reference point for IT professionals across the globe. Priorities may vary elsewhere and this research could provide the basis for further research elsewhere in the world.

Much comment was raised during this research on the relationship between IT, process/change and the leverage it has on behavioural change in people. The author has made reference to some of these implications but further research would be beneficial in analysing this in more detail.

Finally, these guidelines and the resulting framework have been put together based on a number of disconnected bits of experience from many leaders in delivering information technology solutions to South African companies. The results appear to hold a theoretical basis for taking forward. The next logical step would be to apply this in a practical environment and to test its relevance, end to end, in a real life situation. Such a pilot project would be a good way of further adding to this research and putting a practical reference base around this theoretical construct.

7. References

1. Basson D. Bullard D., Farlanger D. and Hagelburst E., *A World of Difference beyond Exchange Controls*, Financial Mail p62-84, July 18, 1997.
2. Bowersox D.J., Clinton S.R., Closs D.J., Cooper M.B., Fawcett S.E., Frayer D.J., Morash E.A., Rinehart L.M., et al, *Global Logistics Best Practice: An Intermediate Research Perspective*, Annual Conference Proceedings, Council of Logistics Management Press, Ohio, 1994.
3. Bowersox D.J., Daugherty P., Dröge C.L., Germain R.N., Rogers D.S., *Logistical Excellence: Its not business as usual*, Digital Press, Burlington, 1992.
4. Bowersox D.J., et al, *Leading Edge Logistics - Competitive Positioning for the 1990s*, Digital Press, Burlington, 1992.
5. Bowersox D.J., *Making the leading edge*, Logistics World, p151-156, September 1989.
6. Bowersox D.J., *The strategic benefits of logistics alliances*, Harvard Business Review, p36-45, July-August 1990.
7. Branegan J., *Making Talk Cheaper* Time, p44-46, August 25, 1997.
8. Bruns, W.J. Jr, McFarlan F.W., *"Information Technology puts Power in Control Systems"*, Harvard Business Review Vol. 65 No. 5, Harvard Business Press, Boston, 1987.
9. Cilliers W., Franz P., Andrews D., *Logistics Excellence in South Africa*, Unpublished report on a syndicated study by the Chair in Logistics, School of Management, University of Pretoria and Andersen Consulting, Pretoria, 1994.
10. Davenport T.H., *Process Innovation - Reengineering Work through Information Technology*, Harvard Business School Press, Boston, Massachusetts, p44-55, 1993.
11. Dawe R.L., *We can't afford to pit cost against service.* Transportation & Distribution, Vol. 35, Iss. 7, p 70, July 1994.
12. Delaney R.V., *Fourth Annual State of Logistics Report*, Cass Logistics Inc, St Louis, 1993.

13. Ettlie J.E., *New links in the supply chain.*, Production, Vol. 107, Iss. 2, p14-15, February 1995.

14. Fahy J., Taguchi F., *Reassessing the Japanese Distribution System*, Sloan Management Review, MIT School of Management, Boston, 1995.

15. Fourie A., *The decade of logistics*, Logistics News, p3, 18 September 1991.

16. Fuller J.B., O'Connor J., Rawlinson R., *Tailored Logistics: The next Advantage*, Harvard Business Review, p87-98, May-June 1993.

17. Global Logistics Research Team, *World Class Logistics*, 1995.

18. Grant I., *Communication Technologies Handbook 1997*, BMI-TechKnowledge Group©, 1997.

19. Gustin C. M., Stank T.P., Daugherty P.J., *Computerization: Support Integration*, International Journal of Physical Distribution & Logistics Management Vol. 24. No. 1, MCB University Press ,1994.

20. Gustin C.M., cited in Distribution, Vol. 87, No 2, p14, Feb 1988 Survey of firms demonstration complete logistics management.

21. Halverson R., *Retooling retailing via information technology*, Discount Store News, Vol 34, Iss 10, p73-77, May 15, 1995.

22. Hamal G., Prahalad C.K., *Competing for the future.*, Harvard Business School Press, 1994.

23. Henkoff R., *Delivering the Goods*, Fortune, p35-47, 28 November, 1994.

24. Herron D., *Integrated World Logistics*, Logistics World, Vol 1, No 2, p90-96, June 1988.

25. Ittman H.W., *The Impact of Technology on the Practice of Logistics Management*, Unpublished First Follow-up Report, CSIR Decision Support Services, Pretoria, 1994.

26. Ittman H.W., *The Impact of Technology on the Practice of Logistics Management*, Unpublished Second Follow-up Report, CSIR Decision Support Services, Pretoria, 1994.

27. Keen P.G.W., *Shaping the Future: Business Design through Information Technology.*, Harvard Business School Press, 1991.

28. La Londe, B.J., *Evolution of the Integrated Logistics Concept*, Logistics Handbook, The Free Press, p3-12, 1994.

29. La Londe, B.J., Masters J.M., *Emerging Logistics Strategies: Blueprints for the Next Century*, International Journal of Physical Distribution & Logistics Management Vol. 24 No.7, MCB University Press, Bradford, 1994.
30. La Londe, B.J., Grabner J.R. & Robeson, J.F., *Integrated Distribution Systems: A Management Perspective*, International Journal of Physical Distribution, 1970 Very old reference to integrated logistics.
31. Lieb R.C., *New study tracks response to third-party logistics*, Traffic Management, p38-45, February 1992.
32. Magee J.F., Copacino W.C., Rosenfield D.B., *Modern Logistics Management*, p5-7, John Wiley, New York, 1985.
33. Masters, J.M., Pohlen, T.L., *Evolution of the Logistics Profession*, Logistics Handbook, The Free Press, p13-34, 1994.
34. Mesher A., Rybeck T., *A Manufacturers Guide to COMS*, Annual Conference Proceedings, Council of Logistics Management Press, Ohio, 1994.
35. Porter M.E., Miller V.E., *"How Information Gives You Competitive Advantage"*, Harvard Business Review Vol. 66 No. 4, Harvard Business Press, Boston, 1988.
36. Remenyi S J, Money A, Twite A, *A Guide to Measuring and Managing IT Benefits*, Blackwell,1993 .
37. Shah S.K., "Designing an Integrated Distribution System", Journal of Systems Management Vol. 40 No.9, USA, 1989.
38. Sharman G., *The rediscovery of logistics*, Harvard Business Review, p71-79, September-October 1984.
39. Stabenau H., *Logistics and Information Technologies*, Conference paper, Deutsche Aussenhandels und Verkehrschule, Bremen, 1987.
40. Stalk, G. Jr and Hout, T.M., *Competing against Time*, The Free Press, New York, 1990.
41. Stalk, G. Jr, *"Time - The Next Source of Competitive Advantage"*, Harvard Business Review Vol. 65 No. 5, Harvard Business Press, Boston, 1987.
42. Stock J.R. & Lambert D.M., *Strategic Logistics Management* (2nd Edition), Irwin, Homewood, 1987.
43. Venkatraman N., *IT-enabled Business transformation : From Automation to Business Scope Redefinition.*, Sloan Management Review, p73-87, Winter 1994.

44. Willersdorf R.G., *Adding Value through Logistics Management,* International Journal of Physical Distribution & Logistics Management, p6-8, Vol. 21, No. 4, December 1991.

45. Willesdorf, R. G., *Adding Value through Logistics Management*, International Journal of Physical Distribution & Logistics Management Vol 24. No. 1, MCB University Press , 1992.

Appendix A - Research Questionnaire

On the following pages is a copy of the questionnaire used in the research. Notice that this include questions not referred to in this report. These were used by three other students who made use of the same research instrument.

Information Technology and Logistics in South African Business

Department of Information Systems

University of the Witwatersrand

Dear Sir/Madam,

Four masters students from the Department of Information Systems at WITS are currently conducting research into the role of Information Technology in the Logistics process of business in South Africa . The research is conducted among IT managers, or their senior reports answering on their behalf.

Please help us by filling in this form honestly and openly. Your response will be treated with utmost confidence, and your identity will not be divulged to anyone.

Please feel free to phone any of the students during office hours. They will be happy to assist you with any queries that you may have.:

Francis Callard	(011)-774-4654
Peter Franz	(011)-328-3000
Herman Evert	(011)-774-4600
Jaap van der Merwe	(011)-773-5700

Thank you for taking part in this survey.

DAN REMENYI : PROFESSOR IN INFORMATION SYSTEMS

Please remember that the success of this survey depends on you!

When you have filled in your form, please put it in the enclosed envelope, seal it and return it by post to:

IT and Logistics Survey
Department of Information Systems
Private
Bag 3
WITS
Johannesburg, 2050

before July 30, 1996 or ASAP thereafter.

GUIDELINES ON HOW TO FILL IN THE QUESTIONNAIRE

A. Please answer all questions.

B. Please do not circle or tick any numbers in the shaded areas - they are for office use only.

C. Please complete all questions exactly in the sequence as indicated in the questionnaire.

D. In this questionnaire the abbreviation "IT" refers to both Information Technology and Information Systems.

Definition of Logistics:

Logistics is the process of planning, implementing and controlling the efficient flow and storage of raw materials, in-process inventory, finished goods, services and related information, from point of origin, to point of consumption (including inbound, outbound, internal and external movements) for the purpose of conforming to customer requirements.

COMPANY PROFILE?

Company Name: _____

Responded Name: _____

Position: _____

Telephone Number: _____

Please circle the number which tells us where you fit in. Please circle only one box in each section.

1. Please provide information only about the company or organisation where you are functioning, excluding any parent or sister company? (Circle one box only)

Consumer Product Manufacturing	1.	Int. Use
Industrial and Automotive	2.	2
Chemical / Oil and Gas	3.	
Retail Distribution	4.	
Healthcare	5.	
Utilities	6.	
Central or Local Government	7.	

2. Where are you positioned in your industry supply chain? (Circle one box only)

Primary Producer	1.	Int. Use
Processor / Manufacturer	2.	3
Wholesaler / Distributor	3.	
Retailer / Distributor	4.	

3. Logistics classification (To be post coded - for internal use only)

		Int. Use
Category 2		4

QUESTIONS

1. Thinking about your organisation, on a scale of 1 to 7, how will you rate the level of logistical performance. Use the following rating scale and circle one box only :

Excellent	7	Int. Use
Very Good	6	10
Good	5	
Average	4	
Not Very Good	3	
Poor	2	
Totally Useless	1	

2. We want to assess the relative importance and performance of various criteria for the role of information technology in your organisation. Do Step 1 before you do Step 2.

STEP ONE	STEP TWO
Please indicate in the first column of the tables below, on a scale of 1 to 7, the **importance of** the following criteria for the role of **information technology in your organisation.** Use the following rating scale to indicate your response: 7 = Critically Important 6 = Very Important 5 = Important 4 = Of Average Importance 3 = Not Very Important 2 = Not Important 1 = Not Important at All 0 = Not Applicable to your organisation	Please indicate in the second column of the tables below, on a scale of 1 to 7, **how well you perceive your organisation to be performing** currently on each of the criteria. Use the following rating scale to indicate your response: 7 = Excellent 6 = Very Good 5 = Good 4 = Average 3 = Not Very Good 2 = Poor 1 = Totally Useless 0 = Not Applicable to your organisation

	Information Systems support for the following Business Processes in your organisation.	**Importance**	**Int. Use**	**Performance**	**Int. Use**
1.	Purchasing		11.		24.
2.	Inventory Control		12.		25.
3.	Order Processing		13.		26.
4.	Freight and Audit Payment		14.		27.
5.	Sales Forecasting		15.		28.
6.	Warehouse Management		16.		29.
7.	Vehicle Routing and Scheduling		17.		30.
8.	Freight Consolidation		18.		31.
9.	Distribution Modeling		19.		32.
10.	Supply Chain Management		20.		33.

11.	Alternate Logistics Supply Route Selection		21.		34.
12.	Track and Trace of Goods in Transit		22		35.
13.	ETA Prediction of Goods in Transit		23.		36.

	Required Processing Frequency for Logistics support in your Organisation	**Importance**	**Int. Use**	**Performance**	**Int. Use**
1.	Real-time Tracking of Goods		37.		44.
2.	On-line Processing of Logistics Transactions		38.		45.
3.	Batch Processing of Logistics Transactions		39.		46.
4.	On-line Supply Chain Management		40.		47.
5.	Off-line Decision Support		41.		48.
6.	On-line Updates of your Logistics State		42.		49.
7.	Daily Updates of your Logistics State		43.		50.

3. We want to assess the relative importance and usage of various technologies in the logistics processes within your organisation. Do Step 1 before you do Step 2.

STEP ONE:

Please indicate in the first column of the table below, on a scale of 1 to 7, the **importance of** the following **technologies for the logistics processes in your organisation.** Use the following rating scale to indicate your response:

7 = Critically Important
6 = Very Important
5 = Important
4 = Of Average Importance
3 = Not Very Important
2 = Not Important
1 = Not Important at All
0 = Not Applicable to your organisation

STEP TWO

Please indicate in the second column of the table below **whether your organisation utilises the specific technology** in your logistics process. Please tick the box in the Usage column with a ✓if your organisation uses the technology.

	The application of Technologies to the Logistical Processes in your Organisation.	Importance	Int. Use	Usage	Int. Use
1.	Bar Coding		51.		70.
2.	Automated Storage and Retrieval Systems		52.		71.
3.	Automated Material Handling Equipment		53.		72.
4.	Computers On-board Delivery Vehicles		54.		73.
5.	Local Area Networks		55.		74.
6.	TCP-IP Wide Area Network		56.		75.
7.	Hand-held Data Entry Devices		57.		76.
8.	80386 Based Personal Computers		58.		77.
9.	80486/ Pentium Based Personal Computers		59.		78.
10.	Document Scanning Systems		60.		79.
11.	Client/Server Technology		61.		80.
12.	Mainframes		62.		81.
13.	UNIX Servers		63.		82.
14.	Microsoft Windows Operating System family		64.		83.
15.	IBM OS/2 Operating System family		65.		84.
16.	SAP Software		66.		85.
17.	Upstream EDI with Suppliers		67.		86.
18.	Downstream EDI with Customers		68.		87.
19.	Electronic Funds Transfer (POS/EFTPOS)		69.		88.

4. We want to assess the relative importance and usage of IT at various places of logistical significance within your organisation. Do Step 1 before you do Step 2.

STEP ONE:

Please indicate in the first column of the table below, on a scale of 1 to 7, the **importance of IT** at the following **places of logistical significance within your organisation**. Use the following rating scale to indicate your response:

7 = Critically Important
6 = Very Important
5 = Important
4 = Of Average Importance
3 = Not Very Important
2 = Not Important
1 = Not Important at All
0 = Not Applicable to your organisation

STEP TWO

Please indicate in the second column of the table below **whether your organisation has IT usage at the following places** in your logistics process. Use the following rating scale to indicate your response:

3 = Strong Information Technology Usage
2 = Medium Information Technology Usage
1 = Low Information Technology Usage
0 = Do not Use Information Technology at all

	Places of Deployment for Logistics Related Information Technology	**Importance**	**Int. Use**	**Usage**	**Int. Use**
1.	At the Front-line / On the Shop Floor		89.		97.
2.	In Delivery / Collection Vehicles		90.		98.
3.	Hand-held Units for Warehouse Staff		91.		99.
4.	At Goods Receiving / Dispatch		92.		100.
5.	At Customer Service Centres		93.		101.
6.	Portable IT for the Roving Sales Force		94.		102.
7.	At the Enterprise Data Processing Centre		95.		103.
8.	At the Client		96.		104.

5. We want to assess the extent of your personal agreement with specific statements on logistics and IT and how applicable these statements are to your organisation. Do Step 1 before you do Step 2.

STEP ONE	STEP TWO
Please indicate in the first column **to what extent you agree or disagree** with the following statements. Use the following rating scale to indicate your response: 7 = Totally Agree 6 = Strongly Agree 5 = Somewhat Agree 4 = Neither Agree nor Disagree 3 = Somewhat Disagree 2 = Strongly Disagree 1 = Totally Disagree	Indicate in the second column of the table above **the extent of which these statements apply to your organisation.** Use the following rating scale to indicate your response: 7 = Applies to a Great Extent 6 = Strongly Applies 5 = Partially Applies 4 = Not sure whether it Applies 3 = Sometimes does not Apply 2 = Seldom Applies 1 = Does not Apply at All

		Agreement	Int. Use	Applicable	Int. Use
1.	Firms striving for logistical excellence will often out-source logistics services based on the IT capabilities of the logistics provider.		105.		128.
2.	Firms striving for logistical excellence need to operate within a culture of information sharing.		106.		129.
3.	Individual firms can optimise Logistical performance without considering the IT competencies of all players within their value chain.		107.		130.
4.	A significant investment in IT and related technology is a pr equisite for logistical excellence.		108.		131.
5.	A process rather than a functional view is taken in system applications.		109.		132.
6.	It is important that IT implementation is always accompanied by process change.		110.		133.

7.	The quality of IT at the front-line staff is a key differentiator for logistical excellence.		111.		134.
8.	Firms can achieve a high level of internal process integration required for logistical excellence without striving for a similar level of internal information systems integration.		112.		135.
9.	IT enables the reduction of order cycle times		113.		136.
10.	IT assists in improving the order fill rate		114.		137.
11.	IT is a good tool to assist with pressures to shrink overall cycle times and reduce inventory carrying costs		115.		138.
12.	IT assists in increasing the speed by which products get to market		116.		139.
13.	IT simplifies problems associated with the geographic nature of logistics.		117.		140.
14.	IT is key to using distribution as a competitive weapon		118.		141.
15.	IT assists in the mass customisation process required for improved customer satisfaction		119.		142.
16.	IT improves decision making to enable the lowering of inventory carrying costs		120.		143.
17.	IT is required for Integrated Supply Chain Performance Management.		121.		144.
18.	A high level of external process integration with partners requires a high level of IT support.		122.		145.
19.	Travel time associated with both finished goods and work in progress goods can be shortened through the use of IT.		123.		146.
20.	The Quality of IT has Strategic Value.		124.		147.
21.	The Quality of IT Implementation Enhances its Value.		125.		148.
22.	Early Adoption of new Technologies is a prerequisite for Logistical Excellence.		126.		149.

23.	Deployment of an Integrated Change Package, created through the concurrent design of Process, Systems and Change Management Interventions, is critical for successful IT deployment in Logistics processes		127.		150.

6. Please indicate in the column below **whom in your organisation are the main users of IT** in your logistics process. Use the following rating scale to indicate your response:

3 = Strong Users of Information Technology
2 = Medium Users of Information Technology
1 = Low Users of Information Technology
0 = Do not Use Information Technology at all

	The Main Users of IT in the Logistics Process are:	**Usage**	**Int. Use**
81.	Front-line Till Operators / Sales Staff		151.
82.	Telephone Sales Staff		152.
83.	Warehouse Shelving and Racking Staff		153.
84.	Goods Receiving and Dispatch Staff		154.
85.	Collection and Delivery Staff		155.
86.	Customer Service Personnel		156.
87.	Front Line Managers		157.
88.	Traveling Sales Representatives		158.
89.	Logistics Managers		159.
90.	Executive Management		160.
91.	Key Account Managers / On Site Client Liaison Personnel		161.

The following questions are open-ended and designed for your personal input. Please answer them as complete as possible:

7. Is there explicit integration between the logistics strategy of your organisation and your IT strategy? Please circle a 1 for Yes or a 2 for No.

		Int. Use
Yes	1	162
No	2	

Please explain your answer:

Explanation:		163.
		164.
		165.
		166.
		167.
		168.
		169.
		170.
		171.

8. Please elaborate on the role, involvement and key focus areas of your Information System Division (ISD) in enabling competitive logistics advantage?

Role:		172.
		173.
		174.
		175.

Involvement:		176.
		177.
		178.
		179.
		180.
Key Focus Areas:		181.
		182.
		183.
		184.
		185.

9. How does information technology support the external integration with partners in your value chain?

		186.
		187.
		188.
		189.
		190.
		191.
		192.
		193.
		194.

10. What is the IT planning to facilitate logistics success in your organisation? Please elaborate.

Near Term (1996-1997):		195.
		196.
		197.
		198.
		199.
		200.
Medium Term (1998-2000):		201.
		202.
		203.
		204.
		205.
		206.
Long Term (beyond 2000):		20..
		208.
		209.
		210.
		211.
		212.

11. What do you consider as the Critical Success Factors for achieving Logistics Excellence in your company as it relates to Information Technology?

		213.
		214.
		215.

		216.
		217.
		218.
		219.
		220.
		221.

12. Do you believe a formal methodology is required to develop both the logistical process and the supporting Information Technology? Please circle a 1 for Yes or a 2 for No.

		Int. Use
Yes	1	222
No	2	

Please explain your answer:

Explanation:		223.
		224.
		225.
		226.
		227.
		228.
		229.
		230.
		231.

Appendix B - Logistics Excellence Research Questionnaire

The logistics research conducted by University of Pretoria included a measuring instrument to determine the level of logistics excellence. On the following pages is a copy of those pages of the questionnaire used in the Cilliers research to determine logistics excellence. See the comparison to the Bowersox definition of excellence in the next Appendix.

Application of Logistics	*Relative Importance*
The following statements may describe the logistics practice of your company, indicate to what extent you agree or disagree	*1 - Totally disagree* *3 - Neutral* *5 - Totally agree*
Logistics got more attention recently, than in the past	1 2 3 4 5
Understanding for the concept of integrated logistics has increased, but the practice of logistics still lags behind	1 2 3 4 5
Logistics is seen as a value-added process and is managed to create competitive advantage for the company	1 2 3 4 5
Formal organizational structures make more provision for logistics than in the past	1 2 3 4 5
More time is spent on planning for logistics compared to the past	1 2 3 4 5
A manager from logistics is involved in strategic planning on business-unit level	1 2 3 4 5
Management treat logistics as equally important to other business functions such as marketing and finance	1 2 3 4 5
Logistics is managed with sophisticated information systems and computer models	1 2 3 4 5
Logistic costs are managed according to the philosophy of total-cost	1 2 3 4 5
Logistics performance is managed with a comprehensive model of performance measures such as costs and customer service	1 2 3 4 5
All activities related to logistics are managed as part of the same department or are totally integrated	1 2 3 4 5
Logistics activities are managed according to a process-orientated approach, rather than a functionally orientated approach	1 2 3 4 5
Logistics management is totally integrated with the other functional departments via sharing of information & joint planning	1 2 3 4 5
Suppliers form an integral part of the business and are managed as an extension of the business process	1 2 3 4 5
Integrated information systems (which form an integral part of logistics), are implemented	1 2 3 4 5
Service providers and third parties are used more and more to perform and manage logistics activities	1 2 3 4 5
EDI (electronic data interchange) is used to transfer information between the different participants in logistics channels	1 2 3 4 5
Distributors and Dealers are seen as partners in managing logistics channels and management of activities are shared	1 2 3 4 5

Application of Logistics	*Relative Importance*
The following statements may describe the logistics practice of your company, indicate to what extent you agree or disagree	1 - *Totally disagree* 3 - *Neutral* 5 - *Totally agree*
Information systems integrate not only within organizational boundaries, but also across to other channel participants	1 2 3 4 5
The philosophy for managing logistics has moved from that of managing a single business to managing the total supply chain	1 2 3 4 5
Training in logistics will play an important role in the improvement of logistics practice in South Africa	1 2 3 4 5
Logistics will play a key role in the international competitiveness of South Africa in future	1 2 3 4 5

Appendix C - Bowersox Cross Reference to Cilliers

The table below gives an indication of how the questions posed by Cilliers compare to the components of logistics excellence as defined by Bowersox.

Num	Cilliers Question	Internal/ External	Bowersox Criteria
1	*... more attention recently, than in the past*	Internal	Positioning
2	*Understanding ... has increased, but the practice ... lags*	Internal	Positioning
3	*Logistics is seen as a value-added process*	Internal	Positioning
4	*Formal organizational structures*	Internal	Integration
5	*More time is spent on planning*	Internal	Positioning
6	*Logistics manager involved in strategic planning*	Internal	Agility
7	*Management treat logistics as equally important*	Internal	Positioning
8	*Sophisticated information systems and computer models*	Internal	Integration
9	*Logistic costs are managed*	Internal	Measurement
10	*Logistics performance is managed*	Internal	Measurement
11	*Managed as part of the same department*	Internal	Measurement
12	*Process-orientated approach*	Internal	Agility
13	*Totally integrated with the other functional departments*	Internal	Integration
14	*Suppliers form an integral part of the business*	External	Positioning
15	*Integrated information systems*	External	Integration
16	*Third parties are used to perform and manage activities*	External	Agility
17	*EDI is used between participants in logistics channels*	External	Integration
18	*Distributors and Dealers are seen as partners*	External	Integration
19	*Systems integrate across channel participants*	External	Integration
20	*Philosophy for managing the total supply chain*	External	Measurement
21	*Training in logistics will play an important role*	General	Positioning
22	*Logistics ... key role in the international competitiveness*	General	Positioning

Appendix D - Research Sample

The table below lists the 145 organisations that were sent survey questionnaires. The 30 highlighted in bold are those that responded. The author wishes to thank them for the effort in furthering this research.

Number	Company
1.	Adcock Ingram Critical Care
2.	**Adcock Ingram Pharmaceuticals**
3.	**Alpha Pharmaceuticals**
4.	Aerotek : CSIR
5.	Afrox Ltd
6.	Albany Bakery
7.	Alcatel Altech
8.	Altech Instruments
9.	American Swiss Jewellers
10.	Anglo Alpha
11.	Anikem (Pty) Ltd
12.	Aquachlor
13.	Autoflug
14.	Bayer (Pty) Ltd
15.	BB Cereals
16.	Bergers Group
17.	Blendcor (Pty) Ltd
18.	BMW SA (Engine Plant)
19.	**Boots Pharmaceuticals**
20.	Brick 'n Tile
21.	Broadlans Holstein
22.	Bull Brand Foods
23.	Cadbury
24.	Caltex
25.	Capital Cement Distributor

26.	**Castrol SA (Pty) Ltd**
27.	Central News Agency Ltd
28.	Challenger Auto Parts
29.	Chem Services (Pty) Ltd Metal Sciences
30.	Chemico
31.	Chemserve Systems
32.	**Clover SA**
33.	Cold Chain
34.	Consol Limited
35.	Consol Paper
36.	Contracts Logistics Equipment (Pty) Ltd
37.	**Dairymaid Nestle**
38.	Distillers Corp (SA) Ltd
39.	**Dulux**
40.	Earlybird
41.	Edgars Stores
42.	Elida Ponds
43.	Empisal
44.	Engen Petroleum
45.	Engen Petroleum
46.	Epol (Pty) Ltd
47.	Eskom Durban Distributor
48.	Fedics Foods
49.	Femo Auto Parts (Pty) Ltd
50.	Ferodo
51.	Foschini Stores (Pty) Ltd
52.	Fosroc (Pty) Ltd
53.	FreightPack (Pty) Ltd
54.	Game Discount
55.	Genuine Parts
56.	Gilbeys Distillers & Vinthers (Pty) Ltd

57.	Glastam (Pty) Ltd
58.	Grinel
59.	Hickson Performance Chemicals
60.	**Highveld Steel & Vanaduim Corp**
61.	Hoechst
62.	**Hudson & Knight**
63.	ICI SA (Pty) Ltd
64.	Iscor
65.	J.A.B.
66.	Janssen Pharmaceutical
67.	JD Group
68.	**Jet Stores - Edgars Group**
69.	JL du Plessis Vervoer
70.	**Johnson & Johnson**
71.	Kanhym Fresh Meat
72.	**Lever Bros**
73.	Lion
74.	**Luk Africa**
75.	Mageu Number One
76.	Maize Board
77.	Markhams Stores
78.	Mass Stores (Dions & Makro)
79.	Meadowfeed
80.	**Merck**
81.	Midas
82.	Milady's Division of Specialty Stores Ltd
83.	Mondi Forests
84.	Mondy Paper
85.	Motor Component Industry (Pty) Ltd
86.	**Nampak Corrigated Containers**
87.	NCP

88.	Nestlé (SA) (PTY) (LTD)
89.	Nissan
90.	Nissan SA Manufacturing
91.	**Nola (Pty) Ltd**
92.	OK Bazaars
93.	**Outspan**
94.	NSB - Phelidaba Div
95.	Page Electronic Co. (Pty) Ltd
96.	**Pepcor (Smart Centre Holdings Ltd)**
97.	PG Building Glass
98.	PG Autoglass
99.	**PG Bison**
100.	Premier Pharmaceuticals Consumer Division
101.	Premier Pharmaceuticals
102.	Renown Fresh Product
103.	**Royal Beech-Nut (Pty) Ltd**
104.	Patrick Daniel
105.	Penny Pinchers
106.	Pharmarama
107.	Pick 'n Pay - Northern Tvl
108.	Premier Foods
109.	Prilla Mills
110.	Rex Trueform
111.	Robert Bosch
112.	**Ruto Mills (Pty) Ltd**
113.	Sappi
114.	Sasol Phenolics
115.	SAB
116.	Samancor Ltd

117.	Samancor Lyttleton Quarries
118.	Samcor Marketing (Pty) Ltd Parts & Accessories
119.	SANS
120.	**Sasko (Pty) Ltd**
121.	Score
122.	Scotts Retail
123.	Sea Harvest
124.	**Shell SA (Pty) Ltd**
125.	Shoprite Checkers Meat Markets
126.	SIMBA LTD
127.	Silverton Fitment Centre (PG Autoglass)
128.	**Smith & Nephew Ltd**
129.	Smithkline Beecham
130.	Suncrush Ltd
131.	Surgikem (Pty) Ltd
132.	Tedelex
133.	Toyota
134.	**Toyota SA Manufacturing**
135.	**Travellers Retail**
136.	Trident Steel
137.	Tru Foods & Dairy Products
138.	**Truworths**
139.	**Unifruco**
140.	Unispares
141.	United Pharmaceutical Distributors (UPD)
142.	Vivo
143.	Volkswagen SA
144.	W P Kelders
145.	**Woolworths SA**

Appendix E - Detailed Quantitative Results

On the following pages is a summary of the detailed quantitative results. This excludes the detailed responses by respondent for purposes of anonymity. This appendix is divided into 3 sections as follows:

E.1 Total Sample

E.2 Responses of Logistics "innocent" companies

E.3 Responses of Logistics "excellent" companies

These are included on the following pages.

E 1 - Total Sample

Ser	Question	Code	Total	Avg Score	Score %
10	IS view of logistical performance	10	138	4.60	60
11	Importance of IT's role in Purchasing	11	178	5.93	82
12	Performance of IT's role in Purchasing	24	142	4.73	62
13	Importance of IT's role in Inventory Control	12	191	6.37	89
14	Performance of IT's role in Inventory Control	25	131	4.37	56
15	Importance of IT's role in Order Processing	13	195	6.50	92
16	Performance of IT's role in Order Processing	26	150	5.00	67
17	Importance of IT's role in Freight and Audit Payment	14	141	4.70	62
18	Performance of IT's role in Freight and Audit Payment	27	124	4.13	52
19	Importance of IT's role in Sales Forecasting	15	165	5.50	75
20	Performance of IT's role in Sales Forecasting	28	111	3.70	45
21	Importance of IT's role in Warehouse Management	16	176	5.87	81
22	Performance of IT's role in Warehouse Management	29	131	4.37	56
23	Importance of IT's role in Vehicle Routing and Scheduling	17	124	4.13	52

Ser	Question	Code	Total	Avg Score	Score %
24	Performance of IT's role in Vehicle Routing and Scheduling	30	101	3.37	39
25	Importance of IT's role in Freight Consolidation	18	117	3.90	48
26	Performance of IT's role in Freight Consolidation	31	111	3.70	45
27	Importance of IT's role in Distribution Modeling	19	119	3.97	49
28	Performance of IT's role in Distribution Modeling	32	90	3.00	33
29	Importance of IT's role in Supply Chain Management	20	163	5.43	74
30	Performance of IT's role in Supply Chain Management	33	111	3.70	45
31	Importance of IT's role in Alternate Logistics Supply Route Selection	21	112	3.73	46
32	Performance of IT's role in Alternate Logistics Supply Route Selection	34	88	2.93	32
33	Importance of IT's role in Track and Trace of Goods in Transit	22	132	4.40	57
34	Performance of IT's role in Track and Trace of Goods in Transit	35	102	3.40	40
35	Importance of IT's role in ETA Prediction of Goods in Transit	23	126	4.20	53

Ser	Question	Code	Total	Avg Score	Score %
36	Performance of IT's role in ETA Prediction of Goods in Transit	36	96	3.20	37
37	Importance of Real-time Tracking of Goods	37	136	4.53	59
38	Performance of Real-time Tracking of Goods	44	95	3.17	36
39	Importance of On-line Processing of Logistics Transactions	38	161	5.37	73
40	Performance of On-line Processing of Logistics Transactions	45	116	3.87	48
41	Importance of Batch Processing of Logistics Transactions	39	138	4.60	60
42	Performance of Batch Processing of Logistics Transactions	46	126	4.20	53
43	Importance of On-line Supply Chain Management	40	154	5.13	69
44	Performance of On-line Supply Chain Management	47	97	3.23	37
45	Importance of Off-line Decision Support	41	149	4.97	66
46	Performance of Off-line Decision Support	48	114	3.80	47
47	Importance of On-line Updates of your Logistics State	42	150	5.00	67

Ser	Question	Code	Total	Avg Score	Score %
48	Performance of On-line Updates of your Logistics State	49	109	3.63	44
49	Importance of Daily Updates of your Logistics State	43	168	5.60	77
50	Performance of Daily Updates of your Logistics State	50	128	4.27	54
51	Importance of Bar Coding	51	166	5.53	76
52	Usage of Bar Coding	70	22	0.73	73
53	Importance of Automated Storage and Retrieval Systems	52	88	2.93	32
54	Usage of Automated Storage and Retrieval Systems	71	4	0.13	13
55	Importance of Automated Material Handling Equipment	53	73	2.43	24
56	Usage of Automated Material Handling Equipment	72	7	0.23	23
57	Importance of Computers On-board Delivery Vehicles	54	69	2.30	22
58	Usage of Computers On-board Delivery Vehicles	73	2	0.07	7
59	Importance of Local Area Networks	55	183	6.10	85
60	Usage of Local Area Networks	74	29	0.97	97
61	Importance of TCP-IP Wide Area Network	56	154	5.13	69
62	Usage of TCP-IP Wide Area Network	75	21	0.70	70
63	Importance of Hand-held Data Entry Devices	57	130	4.33	56

Ser	Question	Code	Total	Avg Score	Score %
64	Usage of Hand-held Data Entry Devices	76	12	0.40	40
65	Importance of 80386 Based Personal Computers	58	91	3.03	.34
66	Usage of 80386 Based Personal Computers	77	22	0.73	73
67	Importance of 80486/ Pentium Based Personal Computers	59	180	6.00	83
68	Usage of 80486/ Pentium Based Personal Computers	78	30	1.00	100
69	Importance of Document Scanning Systems	60	112	3.73	46
70	Usage of Document Scanning Systems	79	9	0.30	30
71	Importance of Client/Server Technology	61	164	5.47	74
72	Usage of Client/Server Technology	80	25	0.83	83
73	Importance of Mainframes	62	117	3.90	48
74	Usage of Mainframes	81	20	0.67	67
75	Importance of UNIX Servers	63	142	4.73	62
76	Usage of UNIX Servers	82	25	0.83	83
77	Importance of Microsoft Windows Operating System family	64	169	5.63	77
78	Usage of Microsoft Windows Operating System family	83	30	1.00	100
79	Importance of IBM OS/2 Operating System family	65	52	1.73	12

Ser	Question	Code	Total	Avg Score	Score %
80	Usage of IBM OS/2 Operating System family	84	7	0.23	23
81	Importance of SAP Software	66	64	2.13	19
82	Usage of SAP Software	85	5	0.17	17
83	Importance of Upstream EDI with Suppliers	67	136	4.53	59
84	Usage of Upstream EDI with Suppliers	86	13	0.43	43
85	Importance of Downstream EDI with Customers	68	136	4.53	59
86	Usage of Downstream EDI with Customers	87	15	0.50	50
87	Importance of Electronic Funds Transfer (POS/EFTPOS)	69	137	4.57	59
88	Usage of Electronic Funds Transfer (POS/EFTPOS)	88	20	0.67	67
89	Importance of logistics IT at the Front-line / on the Shop Floor	89	169	5.63	77
90	Usage of logistics IT at the Front-line / on the Shop Floor	97	59	1.97	32
91	Importance of logistics IT in Delivery / Collection Vehicles	90	87	2.90	32
92	Usage of logistics IT in Delivery / Collection Vehicles	98	16	0.53	(16)
93	Importance of logistics IT hand-held Units for Warehouse Staff	91	123	4.10	52
94	Usage of logistics IT hand-held Units for Warehouse Staff	99	29	0.97	(1)

Ser	Question	Code	Total	Avg Score	Score %
95	Importance of logistics IT at Goods Receiving / Dispatch	92	183	6.10	85
96	Usage of logistics IT at Goods Receiving / Dispatch	100	66	2.20	40
97	Importance of logistics IT at Customer Service Centres	93	141	4.70	62
98	Usage of logistics IT at Customer Service Centres	101	49	1.63	21
99	Importance of logistics Portable IT for the Roving Sales Force	94	111	3.70	45
100	Usage of logistics Portable IT for the Roving Sales Force	102	17	0.57	(14)
101	Importance of logistics IT at the Enterprise Data Processing Centre	95	179	5.97	83
102	Usage of logistics IT at the Enterprise Data Processing Centre	103	78	2.60	53
103	Importance of logistics IT at the Client	96	104	3.47	41
104	Usage of logistics IT at the Client	104	29	0.97	(1)
105	We agree that firms striving for logistical excellence will often out-source logistics services based on the IT capabilities of the logistics provider.	105	142	4.73	62

Ser	Question	Code	Total	Avg Score	Score %
106	It applies here that firms striving for logistical excellence will often out-source logistics services based on the IT capabilities of the logistics provider.	128	107	3.57	43
107	We agree that firms striving for logistical excellence need to operate within a culture of information sharing.	106	199	6.63	94
108	It applies here that firms striving for logistical excellence need to operate within a culture of information sharing.	129	143	4.77	63
109	We agree that individual firms can optimise Logistical performance without considering the IT competencies of all players within their value chain.	107	80	2.67	28
110	It applies here that individual firms can optimise Logistical performance without considering the IT competencies of all players within their value chain.	130	103	3.43	41
111	We agree that a significant investment in IT and related technology is a prerequisite for logistical excellence.	108	168	5.60	77

Ser	Question	Code	Total	Avg Score	Score %
112	It applies here that a significant investment in IT and related technology is a prerequisite for logistical excellence.	131	165	5.50	75
113	We agree that a process rather than a functional view is taken in system applications.	109	163	5.43	74
114	It applies here that a process rather than a functional view is taken in system applications.	132	144	4.80	63
115	We agree that it is important that IT implementation is always accompanied by process change.	110	147	4.90	65
116	It applies here that it is important that IT implementation is always accompanied by process change.	133	128	4.27	54
117	We agree that the quality of IT at the front-line staff is a key differentiator for logistical excellence.	111	167	5.57	76
118	It applies here that the quality of IT at the front-line staff is a key differentiator for logistical excellence.	134	139	4.63	61

Ser	Question	Code	Total	Avg Score	Score %
119	We agree that firms can achieve a high level of internal process integration required for logistical excellence without striving for a similar level of internal information systems integration.	112	89	2.97	33
120	It applies here that firms can achieve a high level of internal process integration required for logistical excellence without striving for a similar level of internal information systems integration.	135	105	3.50	42
121	We agree that IT enables the reduction of order cycle times	113	173	5.77	79
122	It applies here that IT enables the reduction of order cycle times	136	139	4.63	61
123	We agree that IT assists in improving the order fill rate	114	173	5.77	79
124	It applies here that IT assists in improving the order fill rate	137	146	4.87	64
125	We agree that IT is a good tool to assist with pressures to shrink overall cycle times and reduce inventory carrying costs	115	189	6.30	88

Ser	Question	Code	Total	Avg Score	Score %
126	It applies here that IT is a good tool to assist with pressures to shrink overall cycle times and reduce inventory carrying costs	138	152	5.07	68
127	We agree that IT assists in increasing the speed by which products get to market	116	170	5.67	78
128	It applies here that IT assists in increasing the speed by which products get to market	139	141	4.70	62
129	We agree that IT simplifies problems associated with the geographic nature of logistics.	117	165	5.50	75
130	It applies here that IT simplifies problems associated with the geographic nature of logistics.	140	126	4.20	53
131	We agree that IT is key to using distribution as a competitive weapon	118	177	5.90	82
132	It applies here that IT is key to using distribution as a competitive weapon	141	129	4.30	55
133	We agree that IT assists in the mass customisation process required for improved customer satisfaction	119	168	5.60	77

Ser	Question	Code	Total	Avg Score	Score %
134	It applies here that IT assists in the mass customisation process required for improved customer satisfaction	142	136	4.53	59
135	We agree that IT improves decision making to enable the lowering of inventory carrying costs	120	185	6.17	86
136	It applies here that IT improves decision making to enable the lowering of inventory carrying costs	143	156	5.20	70
137	We agree that IT is required for Inegrated Supply Chain Performance Management.	121	136	6.20	87
138	It applies here that IT is required for Integrated Supply Chain Performance Management.	144	145	4.83	64
139	We agree that a high level of external process integration with partners requires a high level of IT support.	122	171	5.70	78
140	It applies here that a high level of external process integration with partners requires a high level of IT support.	145	133	4.43	57

Ser	Question	Code	Total	Avg Score	Score %
141	We agree that travel time associated with both finished goods and work in progress goods can be shortened through the use of IT. We agree that	123	163	5.43	74
142	It applies here that travel time associated with both finished goods and work in progress goods can be shorter through the use of IT.	146	117	3.90	48
143	We agree that the Quality of IT has Strategic Value.	124	193	6.43	91
144	It applies here that the Quality of IT has Strategic Value.	147	154	5.13	69
145	We agree that the Quality of IT Implementation Enhances its Value.	125	194	6.47	91
146	It applies here that the Quality of IT Implementation Enhances its Value.	148	161	5.37	73
147	We agree that early Adoption of new Technologies is a prerequisite for Logistical Excellence.	126	137	4.57	59
148	It applies here that early Adoption of new Technologies is a prerequisite for Logistical Excellence.	149	129	4.30	55

Ser	Question	Code	Total	Avg Score	Score %
149	We agree that deployment of an Integrated Change Package, created through the concurrent design of Process, Systems and Change Management Interventions, is critical for successful IT deployment in Logistics processes	127	169	5.63	77
150	It applies here that deployment of an Integrated Change Package, created through the concurrent design of Process, Systems and Change Management Interventions, is critical for successful IT deployment in Logistics processes	150	139	4.63	61
151	Front-line Till Operators / Sales Staff are Users of IT	151	58	1.93	31
152	Telephone Sales Staff are Users of IT	152	51	1.70	23
153	Warehouse Shelving and Racking Staff are Users of IT	153	49	1.63	21
154	Goods Receiving and Dispatch Staff are Users of IT	154	76	2.53	51
155	Collection and Deliver Staff are Users of IT	155	36	1.20	7

Ser	Question	Code	Total	Avg Score	Score %
156	Customer Service Personnel are Users of IT	156	61	2.01	34
157	Front Line Managers are Users of IT	157	54	1.80	27
158	Traveling Sales Representatives are Users of IT	158	24	0.80	(7)
159	Logistics Managers are Users of IT	159	72	2.40	47
160	Executive Management are Users of IT	160	59	1.97	32
161	Key Account Managers / On Site Client Liaison Personnel are Users of IT	161	56	1.87	29

E2 - Response of Logistics "innocent" companies

Ser	Question	Code	Total	Count	Avg Score	Score %
10	IS view of logistical performance level	10	53	14	3.79	46
11	Importance of IT's role in Purchasing	11	78	14	5.57	76
13	Importance of IT's role in Inventory Control	12	88	14	6.29	88
15	Importance of IT's role in Order Processing	13	91	14	6.50	92
17	Importance of IT's role in Freight and Audit Payment	14	59	13	4.54	59
19	Importance of IT's role in Sales Forecasting	15	76	14	5.43	74
21	Importance of IT's role in Warehouse Management	16	85	14	6.07	85
23	Importance of IT's role in Vehicle Routing and Scheduling	17	57	13	4.38	56
25	Importance of IT's role in Freight Consolidation	18	57	13	4.38	56
27	Importance of IT's role in Distribution Modeling	19	59	14	4.21	54
29	Importance of IT's role in Supply Chain Management	20	78	14	5.57	76
31	Importance of IT's role in Alternate Logistics Supply Route Selection	21	58	13	4.46	58
33	Importance of IT's role in Track and Trace of Goods in Transit	22	67	14	4.79	63

Ser	Question	Code	Total	Count	Avg Score	Score %
35	Importance of IT's role in ETA Prediction of Goods in Transit	23	61	14	4.36	56
12	Performance of IT's role in Purchasing	24	62	14	4.43	57
14	Performance of IT's role in Inventory Control	25	53	14	3.79	46
16	Performance of IT's role in Order Processing	26	67	14	4.79	63
18	Performance of IT's role in Freight and Audit Payment	27	49	12	4.08	51
20	Performance of IT's role in Sales Forecasting	28	45	14	3.21	37
22	Performance of IT's role in Warehouse Management	29	54	14	3.86	48
24	Performance of IT's role in Vehicle Routing and Scheduling	30	37	11	3.36	39
26	Performance of IT's role in Freight Consolidation	31	44	13	3.38	40
28	Performance of IT's role in Distribution Modeling	32	33	11	3.00	33
30	Performance of IT's role in Supply Chain Management	33	44	14	3.14	36

Ser	Question	Code	Total	Count	Avg Score	Score %
32	Performance of IT's role in Alternate Logistics Supply Route Selection	34	41	12	3.42	40
34	Performance of IT's role in Track and Trace of Goods in Transit	35	47	14	3.36	39
36	Performance of IT's role in ETA Prediction of Goods in Transit	36	40	13	3.08	35
37	Importance of Real-time Tracking of Goods	37	64	14	4.57	60
39	Importance of On-line Processing of Logistics Transactions	38	77	14	5.50	75
41	Importance of Batch Processing of Logistics Transactions	39	54	14	3.86	48
43	Importance of On-line Supply Chain Management	40	75	14	5.36	73
45	Importance of Off-line Decision Support	41	70	14	5.00	67
47	Importance of On-line Updates of your Logistics State	42	73	14	5.21	70
49	Importance of Daily Updates of your Logistics State	43	74	14	5.29	71
38	Performance of Real-time Tracking of Goods	44	36	11	3.27	38

Ser	Question	Code	Total	Count	Avg Score	Score %
40	Performance of On-line Processing of Logistics Transaction	45	47	13	3.62	44
42	Performance of Batch Processing of Logistics Transactions	46	47	12	3.92	49
44	Performance of On-line Supply Chain Management	47	35	12	2.92	32
46	Performance of Off-line Decision Support	48	47	14	3.36	39
48	Performance of On-line Updates of your Logistics State	49	45	13	3.46	41
50	Performance of Daily Updates of your Logistics State	50	47	13	3.62	44
51	Importance of Bar Coding	51	66	13	5.08	68
53	Importance of Automated Storage and Retrieval Systems	52	30	10	3.00	33
55	Importance of Automated Material Handling Equipment	53	33	11	3.00	33
57	Importance of Computers On-board Delivery Vehicles	54	34	10	3.40	40
59	Importance of Local Area Networks	55	86	14	6.14	86
61	Importance of TCP-IP Wide Area Network	56	70	12	5.83	81

Ser	Question	Code	Total	Count	Avg Score	Score %
63	Importance of Hand-held Data Entry Devices	57	59	14	4.21	54
65	Importance of 80386 Based Personal Computers	58	41	13	3.15	36
67	Importance of 80486/ Pentium Based Personal Computers	59	82	14	5.86	81
69	Importance of Document Scanning Systems	60	47	12	3.92	49
71	Importance of Client/Server Technology	61	74	13	5.69	78
73	Importance of Mainframes	62	43	12	3.58	43
75	Importance of UNIX Servers	63	65	11	5.91	82
77	Importance of Microsoft Windows Operating System family	64	80	14	5.71	79
79	Importance of IBM OS/2 Operating System family	65	24	8	3.00	33
81	Importance of SAP Software	66	28	6	4.67	61
83	Importance of Upstream EDI with Suppliers	67	60	12	5.00	67
85	Importance of Downstream EDI with Customers	68	66	14	4.71	62
87	Importance of Electronic Funds Transfer (POS/EFTPOS)	69	66	13	5.08	68
52	Usage of Bar Coding	70	7	7	1.00	100

Ser	Question	Code	Total	Count	Avg Score	Score %
54	Usage of Automated Storage and Retrieval Systems	71	1	1	1.00	100
56	Usage of Automated Material Handling Equipment	72	5	5	1.00	100
58	Usage of Computers On-board Delivery Vehicles	73	1	1	1.00	100
60	age of Local Area Networks	74	14	14	1.00	100
62	Usage of TCP-IP Wide Area Network	75	9	9	1.00	100
64	Usage of Hand-held Data Entry Devices	76	5	5	1.00	100
66	Usage of 80386 Based Personal Computers	77	11	11	1.00	100
68	Usage of 80486/ Pentium Based Personal Computers	78	14	14	1.00	100
70	Usage of Document Scanning Systems	79	4	4	1.00	100
72	Usage of Client/Server Technology	80	10	10	1.00	100
74	Usage of Mainframes	81	8	8	1.00	100
76	Usage of UNIX Servers	82	9	9	1.00	100
78	Usage of Microsoft Windows Operating System family	83	14	14	1.00	100
80	Usage of IBM OS/2 Operating System family	84	3	3	1.00	100

Ser	Question	Code	Total	Count	Avg Score	Score %
82	Usage of SAP Software	85	3	3	1.00	100
84	Usage of Upstream EDI with Suppliers	86	4	4	1.00	100
86	Usage of Downstream EDI with Customers	87	5	5	1.00	100
88	Usage of Electronic Funds Transfer (POS/EFTPOS)	88	9	9	1.00	100
89	Importance of logistics IT at the Front-line / on the Shop Floor	89	81	14	5.79	80
91	Importance of logistics IT in Delivery / Collection Vehicles	90	38	12	3.17	36
93	Importance of logistics IT hand-held Units for Warehouse Staff	91	51	14	3.64	44
95	Importance of logistics IT at Goods Receiving / Dispatch	92	82	14	5.86	81
97	Importance of logistics IT at Customer Service Centres	93	76	13	5.85	81
99	Importance of logistics Portable IT for the Roving Sales Force	94	67	14	4.79	63
101	Importance of logistics IT at the Enterprise Data Processing Centre	95	76	12	6.33	89
103	Importance of logistics IT at the Client	96	46	11	4.18	53

Ser	Question	Code	Total	Count	Avg Score	Score %
90	Usage of logistics IT at the Front-line / on the Shop Floor	97	25	14	1.79	26
92	Usage of logistics IT in Delivery / Collection Vehicles	98	6	5	1.20	7
94	Usage of logistics IT hand-held Units for Warehouse Staff	99	7	5	1.40	13
96	Usage of logistics IT at Goods Receiving / Dispatch	100	29	14	2.07	36
98	Usage of logistics IT at Customer Service Centres	101	26	12	2.17	39
100	Usage of logistics Portable IT for the Roving Sales Force	102	8	5	1.60	20
102	Usage of logistics IT at the Enterprise Data Processing Centre	103	34	13	2.62	54
104	Usage of logistics IT at the Client	104	8	5	1.60	20
105	We agree that firms striving for logistical excellence will often out-source logistics services based on the IT capabilities of the logistics provider.	105	65	14	4.64	61

Ser	Question	Code	Total	Count	Avg Score	Score %
107	We agree that firms striving for logistical excellence need to operate within a culture of information sharing.	106	93	14	6.64	94
109	We agree that individual firms can optimise Logistical performance without considering the IT competencies of all players within their value chain.	107	38	14	2.71	29
111	We agree that a significant investment in IT and related technology is a prerequisite for logistical excellence.	108	77	14	5.50	75
113	We agree that a process rather than a functional view is taken in system applications.	109	78	14	5.57	76
115	We agree that it is important that IT implementation is always accompanied by process change.	110	75	14	5.36	73
117	We agree that the quality of IT at the front-line staff is a key differentiator for logistical excellence.	111	80	14	5.71	79

Ser	Question	Code	Total	Count	Avg Score	Score %
119	We agree that firms can achieve a high level of internal process integration required for logistical excellence without striving for a similar level of internal information systems integration.	112	45	14	3.21	37
121	We agree that IT enables the reduction of order cycle times	113	82	14	5.86	81
123	We agree that IT assists in improving the order fill rate	114	83	14	5.93	82
125	We agree that IT is a good tool to assist with pressures to shrink overall cycle times and reduce inventory carrying costs	115	87	14	6.21	87
127	We agree that IT assists in increasing the speed by which products get to market	116	83	14	5.93	82
129	We agree that IT simplifies problems associated with the geographic nature of logistics.	117	80	14	5.71	79
131	We agree that IT is key to using distribution as a competitive weapon	118	82	14	5.86	81

Ser	Question	Code	Total	Count	Avg Score	Score %
133	We agree that IT assists in the mass customisation process required for improved customer satisfaction	119	78	14	5.57	76
135	We agree that IT improves decision making to enable the lowering of inventory carrying costs	120	86	14	6.14	86
137	We agree that IT is required for Integrated Supply Chain Performance Management.	121	86	14	6.14	86
139	We agree that a high level of external process integration with partners requires a high level of IT support.	122	77	14	5.50	75
141	We agree that travel time associated with both finished goods and work in progress goods can be shortened through the use of IT.We agree that	123	80	14	5.71	79
143	We agree that the Quality of IT has Strategic Value.	124	91	14	6.50	92
145	We agree that the Quality of IT Implementation Enhances its Value.	125	91	14	6.50	92

Ser	Question	Code	Total	Count	Avg Score	Score %
147	We agree that early Adoption of new Technologies is a prerequisite for Logistical Excellence.	126	64	14	4.57	60
149	We agree that deployment of an Integrated Change Package, created through the concurrent design of Process, Systems and Change Management Interventions, is critical for successful IT deployment in Logistics processes	127	79	14	5.64	77
106	It applies here that firms striving for logistical excellence will often out-source logistics services based on the IT capabilities of the logistics provider.	128	42	14	3.00	33
108	It applies here that firms striving for logistical excellence need to operate within a culture of information sharing.	129	61	14	4.36	56

Ser	Question	Code	Total	Count	Avg Score	Score %
110	It applies here that individual firms can optimise Logistical performance without considering the IT competencies of all players within their value chain.	130	56	14	4.00	50
112	It applies here that a significant investment in IT and related technology is a prerequisite for logistical excellence.	131	82	14	5.86	81
114	It applies here that a process rather than a functional view is taken in system applications.	132	64	14	4.57	60
116	It applies here that it is important that IT implementation is always accompanied by process change.	133	57	14	4.07	51
118	It applies here that the quality of IT at the front-line staff is a key differentiator for logistical excellence.	134	61	14	4.36	56

Ser	Question	Code	Total	Count	Avg Score	Score %
120	It applies here that firms can achieve a high level of internal process integration required for logistical excellence without striving for a similar level of internal information systems integration.	135	54	14	3.86	48
122	It applies here that IT enables the reduction of order cycle times	136	60	14	4.29	55
124	It applies here that IT assists in improving the order fill rate	137	67	14	4.79	63
126	It applies here that IT is a good tool to assist with pressures to shrink overall cycle times and reduce inventory carrying costs	138	64	14	4.57	60
128	It applies here that IT assists in increasing the speed by which products get to market	139	65	14	4.64	61
130	It applies here that IT simplifies problems associated with the geographic nature of logistics.	140	59	14	4.21	54

Ser	Question	Code	Total	Count	Avg Scor	Score %
132	It applies here that IT is key to using distribution as a competitive weapon	141	51	14	3.64	44
134	It applies here that IT assists in the mass customisation process required for improved customer satisfaction	142	57	14	4.07	51
136	It applies here that IT improves decision making to enable the lowering of inventory carrying costs	143	66	14	4.71	62
138	It applies here that IT is required for Integrated Supply Chain Performance Management.	144	66	14	4.71	62
140	It applies here that a high level of external process integration with partners requires a high level of IT support.	145	58	14	4.14	52
142	It applies here that travel time associated with both finished goods and work in progress goods can be shortened through the use of IT.	146	59	14	4.21	54

Se:	Question	Code	Total	Count	Avg Score	Score %
144	It applies here that the Quality of IT has Strategic Value.	147	65	14	4.64	61
146	It applies here that the Quality of IT Implementation Enhances its Value.	148	69	14	4.93	65
148	It applies here that early Adoption of new Technologies is a prerequisite for Logistical Excellence.	149	56	14	4.00	50
150	It applies here that deployment of an Integrated Change Package, created through the concurrent design of Process, Systems and Change Management Interventions, is critical for successful IT deployment in Logistics processes	150	62	14	4.43	57
151	Front-line Till Operators / Sales Staff are Users of IT	151	28	13	2.15	38
152	Telephone Sales Staff are Users of IT	152	28	12	2.33	44
153	Warehouse Shelving and Racking Staff are Users of IT	153	20	12	1.67	22

Ser	Question	Code	Total	Count	Avg Score	Score %
154	Goods Receiving and Dispatch Staff are Users of IT	154	34	14	2.43	48
155	Collection and Delivery Staff are Users of IT	155	11	8	1.38	13
156	Customer Service Personnel are Users of IT	156	33	13	2.54	51
157	Front Line Managers are Users of IT	157	23	13	1.77	26
158	Traveling Sales Representatives are Users of IT	158	12	8	1.50	17
159	Logistics Managers are Users of IT	159	33	13	2.54	51
160	Executive Management are Users of IT	160	25	14	1.79	26
161	Key Account Managers / On Site Client Liaison Personnel are Users of IT	161	26	14	1.86	29
162	Is there explicit integration between the logistics strategy of your organisation and your IT strategy? A 1 for Yes or a 2 for No.	162-1	9	9	0.64	64

Ser	Question	Code	Total	Count	Avg Score	Score %
162a	Is there explicit integration between the logistics strategy of your organisation and your IT strategy? A 1 for Yes or a 2 for No.	162-2	5	5	0.36	36
172	Do you believe a formal methodology is required to develop both the logistical process and the supporting Information Technology? A 1 for Yes or a 2 for No.	222-1	11	11	0.85	85
172a	Do you believe a formal methodology is required to develop both the logistical process and the supporting Information Technology? A 1 for Yes or a 2 for No.	222-2	2	2	0.15	15

E 3 - Responses of Logistics "excellent" companies

Ser	Question	Code	Total	Count	Avg Score	Score %
10	IS view of logistical performance level	10	85	16	5.31	72
11	Importance of IT's role in Purchasing	11	100	16	6.25	88
13	Importance of IT's role in Inventory Control	12	103	16	6.44	91
15	Importance of IT's role in Order Processing	13	104	16	6.50	92
17	Importance of IT's role in Freight and Audit Payment	14	82	16	5.13	69
19	Importance of IT's role in Sales Forecasting	15	89	16	5.56	76
21	Importance of IT's role in Warehouse Management	16	91	16	5.69	78
23	Importance of IT's role in Vehicle Routing and Scheduling	17	67	15	4.47	58
25	Importance of IT's role in Freight Consolidation	18	60	15	4.00	50
27	Importance of IT's role in Distribution Modeling	19	60	15	4.00	50
29	Importance of IT's role in Supply Chain Management	20	85	15	5.67	78
31	Importance of IT's role in Alternate Logistics Supply Route Selection	21	54	14	3.86	48

Ser	Question	Code	Total	Count	Avg Score	Score %
33	Importance of IT's role in Track and Trace of Goods in Transit	22	65	14	4.64	61
35	Importance of IT's role in ETA Prediction of Goods in Transit	23	65	15	4.33	56
12	Performance of IT's role in Purchasing	24	80	16	5.00	67
14	Performance of IT's role in Inventory Control	25	78	16	4.88	65
16	Performance of IT's role in Order Processing	26	83	16	5.19	70
18	Performance of IT's role in Freight and Audit Payment	27	75	16	4.69	61
20	Performance of IT's role in Sales Forecasting	28	66	16	4.13	52
22	Performance of IT's role in Warehouse Management	29	77	16	4.81	64
24	Performance of IT's role in Vehicle Routing and Scheduling	30	64	15	4.27	54
26	Performance of IT's role in Freight Consolidation	31	67	15	4.47	58
28	Performance of IT's role in Distribution Modeling	32	57	13	4.38	56
30	Performance of IT's role in Supply Chain Management	33	67	14	4.79	63

Ser	Question	Code	Total	Count	Avg Score	Score %
32	Performance of IT's role in Alternate Logistics Supply Route Selection	34	47	12	3.92	49
34	Performance of IT's role in Track and Trace of Goods in Transit	35	55	14	3.93	49
36	Performance of IT's role in ETA Prediction of Goods in Transit	36	56	14	4.00	50
37	Importance of Real-time Tracking of Goods	37	72	15	4.80	63
39	Importance of On-line Processing of Logistics Transactions	38	84	15	5.60	77
41	Importance of Batch Processing of Logistics Transactions	39	84	16	5.25	71
43	Importance of On-line Supply Chain Management	40	79	15	5.27	71
45	Importance of Off-line Decision Support	41	79	16	4.94	66
47	Importance of On-line Updates of your Logistics State	42	77	15	5.13	69
49	Importance of Daily Updates of your Logistics State	43	94	16	5.88	81

Ser	Question	Code	Total	Count	Avg Score	Score %
38	Performance of Real-time Tracking of Goods	44	59	14	4.21	54
40	Performance of On-line Processing of Logistics Transactions	45	69	15	4.60	60
42	Performance of Batch Processing of Logistics Transactions	46	79	16	4.94	66
44	Performance of On-line Supply Chain Management	47	62	14	4.43	57
46	Performance of Off-line Decision Support	48	67	15	4.47	58
48	Performance of On-line Updates of your Logistics State	49	64	14	4.57	60
50	Performance of Daily Updates of your Logistics State	50	81	16	5.06	68
51	Importance of Bar Coding	51	100	16	6.25	88
53	Importance of Automated Storage and Retrieval Systems	52	58	13	4.46	58
55	Importance of Automated Material Handling Equipment	53	40	12	3.33	39
57	Importance of Computers On-board Delivery Vehicles	54	35	10	3.50	42

Ser	Question	Code	Total	Count	Avg Score	Score %
59	Importance of Local Area Networks	55	97	15	6.47	91
61	Importance of TCP-IP Wide Area Network	56	84	14	6.00	83
63	Importance of Hand-held Data Entry Devices	57	71	14	5.07	68
65	Importance of 80386 Based Personal Computers	58	50	12	4.17	53
67	Importance of 80486/ Pentium Based Personal Computers	59	98	16	6.13	85
69	Importance of Document Scanning Systems	60	65	14	4.64	61
71	Importance of Client/Server Technology	61	90	16	5.63	77
73	Importance of Mainframes	62	74	13	5.69	78
75	Importance of UNIX Servers	63	77	14	5.50	75
77	Importance of Microsoft Windows Operating System family	64	89	16	5.56	76
79	Importance of IBM OS/2 Operating System family	65	28	7	4.00	50
81	Importance of SAP Software	66	36	7	5.14	69
83	Importance of Upstream EDI with Suppliers	67	76	14	5.43	74

Ser	Question	Code	Total	Count	Avg Score	Score %
85	Importance of Downstream EDI with Customers	68	70	13	5.38	73
87	Importance of Electronic Funds Transfer (POS/EFTPOS)	69	71	13	5.46	74
52	Usage of Bar Coding	70	15	15	1.00	100
54	Usage of Automated Storage and Retrieval Systems	71	3	3	1.00	100
56	Usage of Automated Material Handling Equipment	72	2	2	1.00	100
58	Usage of Computers On-board Delivery Vehicles	73	1	1	1.00	100
60	Usage of Local Area Networks	74	15	15	1.00	100
62	Usage of TCP-IP Wide Area Network	75	12	12	1.00	100
64	Usage of Hand-held Data Entry Devices	76	7	7	1.00	100
66	Usage of 80386 Based Personal Computers	77	11	11	1.00	100
68	Usage of 80486/ Pentium Based Personal Computers	78	16	16	1.00	100
70	Usage of Document Scanning Systems	79	5	5	1.00	100

Ser	Question	Code	Total	Count	Avg Score	Score %
72	Usage of Client/Server Technology	80	15	15	1.00	100
74	Usage of Mainframes	81	12	12	1.00	100
76	Usage of UNIX Servers	82	12	12	1.00	100
78	Usage of Microsoft Windows Operating System family	83	16	16	1.00	100
80	Usage of IBM OS/2 Operating System family	84	4	4	1.00	100
82	Usage of SAP Software	85	2	2	1.00	100
84	Usage of Upstream EDI with Suppliers	86	9	9	1.00	100
86	Usage of Downstream EDI with Customers	87	10	10	1.00	100
88	Usage of Electronic Funds Transfer (POS/EFTPOS)	88	11	11	1.00	100
89	Importance of logistics IT at the Front-line / on the Shop Floor	89	88	15	5.87	81
91	Importance of logistics IT in Delivery / Collection Vehicles	90	49	12	4.08	51
93	Importance of logistics IT hand-held Units for Warehouse Staff	91	72	15	4.80	63
95	Importance of logistics IT at Goods Receiving / Dispatch	92	101	16	6.31	89

Ser	Question	Code	Total	Count	Avg Score	Score %
97	Importance of logistics IT at Customer Service Centres	93	65	13	5.00	67
99	Importance of logistics Portable IT for the Roving Sales Force	94	44	10	4.40	57
101	Importance of logistics IT at the Enterprise Data Processing Centre	95	103	16	6.44	91
103	Importance of logistics IT at the Client	96	58	13	4.46	58
90	Usage of logistics IT at the Front-line / on the Shop Floor	97	34	13	2.62	54
92	Usage of logistics IT in Delivery / Collection Vehicles	98	10	6	1.67	22
94	Usage of logistics IT hand-held Units for Warehouse Staff	99	22	9	2.44	48
96	Usage of logistics IT at Goods Receiving / Dispatch	100	37	16	2.31	44
98	Usage of logistics IT at Customer Service Centres	101	23	9	2.56	52
100	Usage of logistics Portable IT for the Roving Sales Force	102	9	6	1.50	17

Ser	Question	Code	Total	Count	Avg Score	Score %
102	Usage of logistics IT at the Enterprise Data Processing Centre	103	44	16	2.75	58
104	Usage of logistics IT at the Client	104	21	9	2.33	44
105	We agree that firms striving for logistical excellence will often out-source logistics services based on the IT capabilities of the logistics provider.	105	77	16	4.81	64
107	We agree that firms striving for logistical excellence need to operate within a culture of information sharing.	106	106	16	6.63	94
109	We agree that individual firms can optimise Logistical performance without considering the IT competencies of all players within their value chain.	107	42	16	2.63	27
111	We agree that a significant investment in IT and related technology is a prerequisite for logistical excellence.	108	91	16	5.69	78

Ser	Question	Code	Total	Count	Avg Score	Score %
113	We agree that a process rather than a functional view is taken in system applications.	109	85	16	5.31	72
115	We agree that it is important that IT implementation is always accompanied by process change.	110	72	16	4.50	58
117	We agree that the quality of IT at the front-line staff is a key differentiator for logistical excellence.	111	87	16	5.44	74
119	We agree that firms can achieve a high level of internal process integration required for logistical excellence without striving for a similar level of internal information systems integration.	112	44	16	2.75	29
121	We agree that IT enables the reduction of order cycle times	113	91	16	5.69	78
123	We agree that IT assists in improving the order fill rate	114	90	16	5.63	77

Ser	Question	Code	Total	Count	Avg Score	Score %
125	We agree that IT is a good tool to assist with pressures to shrink overall cycle times and reduce inventory carrying costs	115	102	16	6.38	90
127	We agree that IT assists in increasing the speed by which products get to market	116	87	16	5.44	74
129	We agree that IT simplifies problems associated with the geographic nature of logistics.	117	85	16	5.31	72
131	We agree that IT is key to using distribution as a competitive weapon	118	95	16	5.94	82
133	We agree that IT assists in the mass customisation process required for improved customer satisfaction	119	90	16	5.63	77
135	We agree that IT improves decision making to enable the lowering of inventory carrying costs	120	99	16	6.19	86

Ser	Question	Code	Total	Count	Avg Score	Score %
137	We agree that IT is required for Integrated Supply Chain Performance Management.	121	100	16	6.25	88
139	We agree that a high level of external process integration with partners requires a high level of IT support.	122	94	16	5.88	81
141	We agree that travel time associated with both finished goods and work in progress goods can be shortened through the use of IT. We agree that	123	83	16	5.19	70
143	We agree that the Quality of IT has Strategic Value.	124	102	16	6.38	90
145	We agree that the Quality of IT Implementation Enhances its Value.	125	103	16	6.44	91
147	We agree that early Adoption of new Technologies is a prerequisite for Logistical Excellence.	126	73	16	4.56	59

Ser	Question	Code	Total	Count	Avg Score	Score %
149	We agree that deployment of an Integrated Change Package, created through the concurrent design of Process, Systems and Change Management Interventions, is critical for successful IT deployment in Logistics processes	127	90	16	5.63	77
106	It applies here that firms striving for logistical excellence will often out-source logistics services based on the IT capabilities of the logistics provider.	128	65	16	4.06	51
108	It applies here that firms striving for logistical excellence need to operate within a culture of information sharing.	129	82	16	5.13	69
110	It applies here that individual firms can optimise Logistical performance without considering the IT competencies of all players within their value chain.	130	47	16	2.94	32

Ser	Question	Code	Total	Count	Avg Score	Score %
112	It applies here that a significant investment in IT and related technology is a prerequisite for logistical excellence.	131	83	16	5.19	70
114	It applies here that a process rather than a functional view is taken in system applications.	132	80	16	5.00	67
116	It applies here that it is important that IT implementation is always accompanied by process change.	133	71	16	4.44	57
118	It applies here that the quality of IT at the front-line staff is a key differentiator for logistical excellence.	134	78	15	5.20	70
120	It applies here that firms can achieve a high level of internal process integration required for logistical excellence without striving for a similar level of internal information systems integration.	135	51	16	3.19	36

Ser	Question	Code	Total	Count	Avg Score	Score %
122	It applies here that IT enables the reduction of order cycle times	136	79	16	4.94	66
124	It applies here that IT assists in improving the order fill rate	137	79	16	4.94	66
126	It applies here that IT is a good tool to assist with pressures to shrink overall cycle times and reduce inventory carrying costs	138	88	16	5.50	75
128	It applies here that IT assists in increasing the speed by which products get to market	139	76	16	4.75	63
130	It applies here that IT simplifies problems associated with the geographic nature of logistics.	140	67	15	4.47	58
132	It applies here that IT is key to using distribution as a competitive weapon	141	78	15	5.20	70
134	It applies here that IT assists in the mass customisation process required for improved customer satisfaction	142	79	16	4.94	66

Ser	Question	Code	Total	Count	Avg Score	Score %
136	It applies here that IT improves decision making to enable the lowering of inventory carrying costs	143	90	16	5.63	77
138	It applies here that IT is required for Integrated Supply Chain Performance Management.	144	79	15	5.27	71
140	It applies here that a high level of external process integration with partners requires a high level of IT support.	145	75	15	5.00	67
142	It applies here that travel time associated with both finished goods and work in progress goods can be shortened through the use of IT	146	58	15	3.87	48
144	It applies here that the Quality of IT has Strategic Value.	147	89	16	5.56	76
146	It applies here that the Quality of IT Implementation Enhances Its Value.	148	92	16	5.75	79

Ser	Question	Code	Total	Count	Avg Score	Score %
148	It applies here that early Adoption of new Technologies is a prerequisite for Logistical Excellence.	149	73	16	4.56	59
150	It applies here that deployment of an Integrated Change Package, created through the concurrent design of Process, Systems and Change Management Interventions, is critical for successful IT deployment in Logistics processes	150	77	16	4.81	64
151	Front-line Till Operators / Sales Staff are Users of IT	151	30	13	2.31	44
152	Telephone Sales Staff are Users of IT	152	23	11	2.09	36
153	Warehouse Shelving and Racking Staff are Users of IT	153	29	15	1.93	31
154	Goods Receiving and Dispatch Staff are Users of IT	154	42	16	2.63	54
155	Collection and Delivery Staff are Users of IT	155	25	12	2.08	36
156	Customer Service Personnel are Users of IT	156	28	14	2.00	33

Ser	Question	Code	Total	Count	Avg Score	Score %
157	Front Line Managers are Users of IT	157	31	16	1.94	31
158	Traveling Sales Representatives are Users of IT	158	12	9	1.33	11
159	Logistics Managers are Users of IT	159	39	16	2.44	48
160	Executive Management are Users of IT	160	34	16	2.13	38
161	Key Account Managers / On Site Client Liaison Personnel are Users of IT	161	30	14	2.14	38
162	Is there explicit integration between the logistics strategy of your organisation and your IT strategy? A 1 for Yes or a 2 for No.	162-1	12	12	0.80	80
162a	Is there explicit integration between the logistics strategy of your organisation and your IT strategy? A 1 for Yes or a 2 for No.	162-2	3	3	0.20	20

Ser	Question	Code	Total	Count	Avg Score	Score %
172	Do you believe a formal methodology is required to develop both the logistical process and the supporting Information Technology? A 1 for Yes or a 2 for No.	222-1	9	9	0.60	60
172a	Do you believe a formal methodology is required to develop both the logistical process and the supporting Information Technology? A 1 for Yes or a 2 for No.	222-2	6	6	0.40	40

Appendix F - Sample Qualitative Feedback

Name .....

Position .....

Organisation .....

Date .....

Location .....

1. How would you describe the importance of IT in achieving logistics excellence?

.....

.....

.....

.....

2. Can the implementation of information systems in logistics be successful without simultaneous attention to process change?

.....

.....

.....

.....

3. Is it important to be at the bleeding edge of IT for success in logistics?

.....

.....

.....

.....

4. Describe your approach to implementing IT and process change to achieve logistics excellence.

.....

.....

.....

.....

.....

5. Attached is a draft model describing the initial findings from the survey on the relationship between logistics process and IT. Comment on its relevance.

.....

.....

.....

.....

.....

To: Kyle Nel
cc:
From: Craig Koetsier
Date: 97/12/02 05:10 PM
Subject: November Reserves

The net impact on the income statement is zero due to the reserve. We will need to carry forward the amount in the November I&R.

In future we can separate out the two procedures to avoid confusing client accounting.

Regards
Craig

To: Craig Koetsier
cc: Ron Stevens
From: Kevin Sumbler
Date: 97/12/02 04:17 PM
Subject: November Reserves

Craig,

The UPFA was on the same form as some auto transfer requests. However, as the request did not arrive until 28 November these could not be done as it was past the deadline and it was all held back for 15 December period. Therefore, I will reserve this period and reverse next month to offset the UPFA.

This situation is not ideal but because we had two types of request on the same form it was held back even though one could have been processed. I apologise for this but it would help if we could put them through on separate forms going forward.

Regards

Kevin

To: Kevin Sumbler
cc:
From: Craig Koetsier
Date: 02/12/97 12:21
Subject: November Reserves

Kevin,

To confirm our discussion: Both reserves to be reversed in November period and the UPFA for Intercontinental has been faxed through to yourself.

Please let me know if you have any issues.

Regards
Craig

To: Craig Koetsier
cc:
From: Kevin Sumbler
Date: 97/12/02 11:27 AM
Subject: November Reserves

Craig,

I checked the UPFA forms yesterday and I could only see a write off for SAS of $17k (against $50k below) and none for Intercontinental - please advise.

Regards

Kevin

To: Kevin Sumbler
cc:
From: Craig Koetsier
Date: 02/12/97 06:53
Subject: November Reserves

UPFA have been processed for both Intercontinental and SAS in November. Please would you reverse the reserve on these two clients.

Regards
Craig.

To: Julia Pattison, Brett Newland, Tony Keating, Duncan Glyde, Robert McNally, Anne Camilla Kolsrud, Craig Koetsier, Carl Peffer, Jonathan Goodman
cc: Richard Taylor, Tim Fetherston-Dilke, Ron Stevens, Oskar Hagland, Tom Sjölund, Tarja Kukkonen, Barry K. Messenger, Gerry Coulter
From: Kevin Sumbler
Date: 97/12/01 06:47 PM
Subject: November Reserves

We have been requested to provide reserves for items which you recently identified as part of the desktop review and, in the case of Nokia, by request of Maritime Management. as a result the following entries have been posted which will impact your November Portfolio results. The entries have been posted into the correct Countries results. These reserves now belong to the Portfolio and will be passed on to GMU's as we go into the new model.

Commercial Banking

Barclays (UK) $150,000

Communications

Ameritech (UK) $100,000

Retail

Sainsbury (UK) $25,000
Edgars (South Africa) $100,000

Consumer

United Biscuits (UK) $100,000
British Sugar (UK) $100,000

Government - Scandinavia

Forsvaret (Norway) $33,000

Government - Other

DSS/NIRS (UK) $160,000

Industrial Products

Charter Group (UK) $60,000
Tetra Pak (UK) $50,000
Nokia (Finland) $1,000,000
Ericsson (Sweden) $600,000

Retail Banking

Postbanken (Norway) $100,000

Transportation/Travel

Intercontinental (UK) $40,000
SAS (Sweden) $50,000
Finnish Rail (Finland) $100,000

Utilities

Eskom (South Africa) $400,000

As the write offs are processed on these jobs these reserves will need to be released so please contact me before the paperwork is processed.

Regards

Kevin

Categories:

Printed By: Kyle Nel