The influence of selected human factors as antecedents to the efficiency of upstream supply chains

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ABSTRACT

Although theory suggests the importance of the influence of selected human factors as antecedents to the efficiency of upstream supply chains, research findings of the actual influence human factors may have are lacking in evidence. This study examines its influence on the basis of a literature study as well as an empirical study in an attempt to find hard facts to its role in supply chain efficiency. Six different human factors were identified, based on opinions from key opinion leaders in this field of study and investigated its relevance by means of empirical research. Results suggest that the selected human factors that play a definite role in upstream supply chain efficiency are: individual's principles, individual's goals and company's goals for the individual - common goals, personality, ability/trainability, general skills and training, and mutual trust and understanding. Findings presented interesting results that should influence the way management handles its human assets in the organisational environment.

KEY WORDS

Upstream supply chain, supply chain efficiency, human factors, individual's principles, common goals, Personality, ability/trainability, general skills and training, and mutual trust

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LIST OF ABBREVIATIONS:

CSCMP	Council of Supply Chain Management Professionals
CFA	Confirmatory Factor Analysis
CSF	Critical Success Factor
HBS	Harvard Business School
HRM	Human resource management
KMO	Keiser-Meyer-Olkin (KMO) Measure of sample adequacy
OM	Operations management

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CHAPTER 1

NATURE AND SCOPE OF STUDY

1.1 Introduction

Although much emphasis is placed in the literature on the construction and engineering of a profitable supply chain, limited information is actually available on the effect human soft issues may have on the supply chain (Shub & Stonebraker, 2009:31).

In an interview Lu (2012) lists the following factors, that he labels “human factors”, as affecting the efficiency of the supply chain:

- Individual’s principles;
- Individual’s goals;
- Personality;
- Ability/Trainability/Skills;
- General skills and training;
- Remuneration/Compensation;
- Foundation of understanding;
- Responsibility;
- Mutual trust and understanding;
- Communication;
- Common goals; and
- Reputation.

The effect of some of the above factors as antecedents to the efficiency of a supply chain have been researched, either combined or in isolation. However, there is a need to quantify this effect, and that is what prompted further research on the subject and hence, this study.

1.2 Context of the study

Bendoly, Donehue and Schultz (2005:738) state that the impact of behavioural issues on economic activity is studied extensively in many fields, including economics, accounting, marketing, and management. However, its field of study has received less attention in operations management than in other economic and management disciplines. Much research has been done in the field of operations management with regard to the effects systems and subsystems have on the efficiency of supply chains. The effects of human factors on the upstream supply chain have also been researched to a lesser extent than the effect of systems on the supply chain. Bendoly *et al.* (2005:738) point out that the adverse influence of human factors can render a supply chain inefficient.

Two issues have also received increasing attention in business and management literature since the turn of the 21st century: These are the move away from products towards services, now dominating the economies of most industrialised nations (Raturi and Evans 2005:5) and the increasing awareness of the effect of humans on the operation of the whole supply chain (Shub & Stonebraker, 2009:31).

1.3 Definitions of Terms

Ahmad and Schroeder (2003:19) state that sophisticated technologies and innovative manufacturing practices alone may in fact do very little to enhance operational performance, unless the requisite human resource management (HRM) practices are in place to perform a consistent social technical system. Ahmad and Schroeder (2003:19) furthermore state that the impact of HRM practices on organisational performance has been the subject of much attention over the years. This points to the human element, but still does not distinguish between “human resource management (HRM)” and “human factors” (which include the whole area of industrial psychology). In their classic work Katz and Kahn (1966) have already recognised the effect of humans on the organisation as an open system and have identified the effect that humans have on the efficiency of the supply chain.

The fact that human interface has already been mentioned by Katz and Kahn in 1966, points to the importance of humans in effective and efficient operations management.

The terms “value chain” and “supply chain” are used indiscriminately, and often (incorrectly) as substitutes for each other (Monczka, Handfield, Patterson & Waters, 2010:9). The following definitions are therefore required in an attempt to distinguish between them:

- **Supply Chain**

A supply chain is a set of connections which describe how the flow of materials runs from suppliers through facilities. These materials are then transformed into useful products which are then distributed at centres and finally delivered to customers. An efficient supply chain focuses on high productivity in material flow minimising all costs, also that of products and services. A responsive supply chain focuses on customer availability and responsive services as described by Raturi and Evans (2005:196).

Supply chains exist in manufacturing and service industries, their highest priority and purpose being to create value to customers. Supply chains make up a crucial part of the organisation’s activities with regard to supply and demand. Each supply chain is unique to a specific organisation. One company cannot copy another company’s supply chain and expect it to fit their exact needs with regard to successful operations (Jacobs, Chase & Aquilano, 2009:358).

The crucial fact is that supply chain management has a direct influence on the profitability of any existing organisation and poor management of this aspect of business may most certainly have dire consequences to the one who dares to be so ignorant to ignore it (Hendricks & Singhal, 2003:502).

An important factor in supply chain identification and management is the communication between the customer and the supplier, the customer and his personnel and the supplier and the supplier’s personnel. For a supply chain to perform optimally, every person that is involved needs to be up-to-date with everything regarding the flow of products or services in the supply chain. Well researched and maintained supply chains have been a source of competitive advantage throughout history. Companies no longer only compete on comparative products, but compete through optimising their supply chain to be more competitive, more cost-effective and more profitable whilst improving customer service and adding value (Raturi & Evans, 2005:197).

- **Value Chain**

The term value chain has originally been coined by Michael E. Porter in 1985 in his work called: “Competitive Advantage: Creating and Sustaining Superior Performance” and can be described as follows: It can be seen as the successive stages through which value is produced, created or added when producing, distributing, and servicing a distinct service or product. Stages through which the afore mentioned value can be created in the value chain may include: receiving and distributing of raw materials, converting raw materials into a finished product (also known as beneficiation), identifying and gathering of customers and distribution of the physical product as well as providing customer support (Porter, 1998:33).

Identification of its value chain allows an organisation to improve and refine its operations in its efforts to improve quality, add efficiencies, and increase profits. (The American Heritage Dictionary of Business Terms, 2010:1).

The term value chain refers to a structure that enables the user to theoretically and graphically capture a number of activities, processes and products that contributes to reaching the required level of service and the manufacturing of a specific product, and the ***linkage*** between particular products and services in the organisational environment. It may be debated as important that each of these activities, processes and products create and hold value to the customer and process; activity; service and transforms it into profits for the organisation deploying these resources and efforts.

From the above it is evident that not all the activities of the supply chain necessarily add value as is the case per definition of the value chain. The difference being that the value chain describes the internal workings of a specific organisation and that the supply chain basically includes internal as well as external players in the organisational environment.

Jacobs *et al.* (2009:435) are of the opinion that it may be useful to communicate the idea that operations and all other activities has to work cross-functionally in attempts to optimise organisational performance in order to create a notion of avoiding the dreaded “functional silo” syndrome.

Jacobs *et al.* (2009:365) also define the upstream supply chain as the supply chain responsible for supplying goods and services to the organisation. A good way of describing it is: the company's suppliers. Information is the primary element flowing upstream in different forms such as orders, feedback, and payment information.

Monczka *et al.* (2010:6) define “upstream” as the “tiers of suppliers” in the supply chain that can be seen as in front of the organisation they supply to, moving materials in, and “downstream” to “tiers of customers” after the organisation in the supply chain has received its products or services.

It is evident from the above statements that human factors play a definite role in the operational aspects of the supply chain. Through this study an attempt will be made to evaluate the actual impact of these variables on one another as well as on the upstream supply chain itself.

As can be seen from the literature above, the term value chain can be coined as more theoretical and graphical and explains the linkage between particular products and services ***in the organisational*** environment, whereas the term supply chain describes the actual set of connections for material - and service flows with regard to a specific facility ***for the organisation***. The value chain can also be seen as a structure that captures the linkage of an organisation’s activities that is aimed at creating value for the customer and well as profit for the organisation (Jacobs *et al*., 2009:435). When a picture is formed of how organisations fit together through organisational links, it is called a supply chain. It can be seen as outwards from the viewpoint of a specific company.

For the purposes of this research we will focus on the **upstream supply chain** and its efficiency due to the fact that supply chains exist in both manufacturing and service industries across the board, which makes up a crucial part of the organisation's activities with regard to supply and demand, and describes the very reason an organisation will be allowed to exist. A profitable organisation will typically supply a product or service which is in demand from a consumer/customer at a cost which is both acceptable to the consumer as well as profitable to the organisation, creating shareholder wealth. The more efficient the organisation’s supply chain, the more profitable the organisation itself in creating a competitive sustainable advantage with regard to its competition. The investigation specifically focussed on the upstream supply chain as the term allowed for the

measurement of efficiency up to a specific point in the organisation as well as narrowing down the field of research with regard to the subject in an attempt to increase accuracy of data that has been gathered.

1.4 Problem Statement

According to Lu (2012) the individual's principles, individual's goals, personality, ability/trainability/skills, general skills and training, remuneration/compensation, foundation of understanding, responsibility, mutual trust and understanding, communication, common goals, and reputation can all be labelled as "human factors". It also appears as if these "human factors" affect the efficiency of the supply chain.

"South Africa received the invitation to join the BRIC group -- which currently includes Brazil, Russia, India and China -- from China's foreign minister" said a statement from South Africa's minister of international relations and cooperation, Maite Nkoana-Mashabane (Reuters.com:2012). According to communication from the South African Government (Bua Briefs 4, 2012:Online), the BRICS summits convene to specifically identify and look for grounds of common interest on those areas seen as important by the major emerging economies it represents. The South African Government aims to strengthen South Africa's relations by following this foreign policy objective of managing with leading developing economies.

As a result of the facts as stated above, we may be quite certain, due to the weight of probabilities, that the awareness of human factors in the efficiency of the supply chain in the South African environment will also have to be focussed on more to become as competitive as the rest of the countries included in BRICS. The *Global Competitiveness Report* (2012:4) argues that a government's attitude with regard to markets, freedom of free market systems and the efficiency of its operations, can also be seen as very important and that healthy market competition from domestic as well as foreign economies can furthermore be seen as important with regard to the enhancement of market efficiencies and business productivity, ensuring that the most efficient firms will thrive (2012:7). Customer orientation is mentioned as a demand on which market efficiency depends on (2012:7).

To create a motion of clarity between the terms efficiency and effectiveness the following definitions have been identified:

- **Efficiency**

Raturi and Evans (2005:143) state that efficiency must be seen as the measure of how well the organisation is performing relative to expectations. Jacobs *et al.* (2009:6) define it in short as: “doing something at the lowest possible cost.”

- **Effectiveness**

Jacobs *et al.* (2009:6) define effectiveness as: “doing the right things to create the most value for the company”.

The necessity of an investigation into the influence of selected human variables on the efficiency of the upstream supply chain is clearly visible. This study aims to empirically investigate this influence in an attempt to clarify its role.

1.5 Research Objectives

1.5.1 *Primary Objective*

- To determine which of the selected human factors have a significant effect on the efficiency of the upstream supply chain of an organisation.

1.5.2 *Secondary Objectives*

- To establish through a literature study which human factors contribute the most to influence the efficiency of the upstream supply chain.
- To determine through an empirical study the effect these selected human factors have on the efficiency of the upstream supply chain.

1.6 Significance of this Study

The main focus of this research will be to determine whether supply chain management is actually dependent on the influence of human factors on the upstream supply chain, and if so, to what extent.

This research will therefore provide guidance and clarity to managers concerned with planning and management of operations and supply chains with specific emphasis on human factors that have direct influences on daily duties. As mentioned earlier, since the inclusion of South Africa in BRICS, an understanding of the influences of human factors on supply chain efficiency in mind may now be more important than ever before, in an attempt to develop and maintain competitive supply chains relative to the other members of BRICS.

1.7 Delimitations of the Study

The outcomes of this research can be seen as representative of certain product and services industries in South Africa.

Although this field of study may rub shoulders with aspects of organisational behaviour, the emphasis will be on operations management.

A convenience sample was drawn from employees in the product and service environments.

The study focussed on the following human factors as identified in an interview with Lu (2012) and disregarded those that may be perceived as system issues to determine which of the human factors he mentioned (listed below) may be of importance with regard to the efficiency of the upstream supply chain:

- Individual's principles;
- Individual's goals and company's goals for the individual- Common goals;
- Personality;

- Ability/Trainability;
- General skills and training;
- Mutual trust and understanding.

1.8 Assumptions

It was assumed that respondents had sufficient knowledge to be able to clearly articulate answers to the questionnaire.

1.9 Research Methodology

The research methodology consists of the following methods.

1.9.1 *Literature and Theoretical Review*

The literature study and theoretical review was conducted from books, articles, journal articles, reports from corporate businesses, documents and Internet sources.

Definitions, according to literature were evaluated and linked to benchmarks of theoretical requirements.

1.9.2 *Empirical Research*

- The empirical data was gathered through interviews and questionnaires.
- Convenience sampling was used by means of questionnaires administered to managers currently enrolled as MBA students as well as managers that are not students, as it was perceived to be representative of the different managerial levels associated with the management of different supply chains.
    - The Statistical Consultation Services of the North-West University performed descriptive statistics and frequency analysis with the use of IBM SPSS Statistics Version 20, Release 20.0.0 (2011) on the dataset. They also assisted in capturing the data from the questionnaires and creating a dataset.

1.10 Limitations

The conclusions of the study were derived from empirical research which might possibly have been location-specific as well as industry-specific associated limitations.

1.11 Chapter Division

The study consists of the following chapters:

1.11.1 *Chapter 1: Introduction and Problem Statement*

This chapter will contain the following:

- the problem statement;
- objectives of the study;
- research methodology;
- definitions of major concepts.

1.11.2 *Chapter 2: Literature review: Discussion of the impact of selected human factors on the upstream supply chain.*

The literature in books, articles, journal articles, reports from corporate businesses, other documents and internet sources, pertaining to operations management and the effect selected human factors have on **the upstream supply chain,** has been scrutinised in an attempt to establish what the current view is with regard to the impact it might have on one another.

1.11.3 *Chapter 3: Research*

- With reference to the literature study in Chapters 2 and 3, the development of a questionnaire will be discussed. Reasons for the questions included in the

questionnaire will also be discussed together with a discussion of the sampling method.

- Analysis and outcomes of the questionnaires are discussed and the results are interpreted.

1.11.4 *Chapter 4: Reporting and Discussion of Results, Recommendations and Conclusions*

This will be the closing chapter. Below are points of discussion that will be included in this chapter:

- Conclusions will be derived from information obtained through literature study as well as empirical research.
- Current models and benchmarks will be evaluated, analysed and compared with the findings of the literature review and empirical research.

1.12 Sampling

- **Convenience sampling** was used by means of questionnaires administered to managers currently enrolled as MBA students as well as managers that are not students, as it was perceived to be representative of the different managerial levels associated with the management of different supply chains.
- The sample was representative of product and service organisations.
- Respondents had to be fluent in English as first or second language.

The following table shows the profile of the respondents as planned:

Table 1.1: Profile of respondents

Description of respondent type, e.g. Manager, Union representative, Student	Number to be sampled
Top Management	60
Middle Management	60
First Level Management	60

1.13 Chapter Summary

From the literature as provided above it is evident that selected human factors definitely play vital roles in the management of current upstream supply chain efficiency, future success and sustained competitive advantage of supply chains. This view may be seen as basic and even as common knowledge to those who operate and spend their lives in a supply chain environment, however, very little literature actually exists on the extent to which the upstream supply chain may be influenced by these selected human factors.

The main goal was to clarify any uncertainty of the importance and role human factors play in the upstream supply chain.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In chapter 2, the focus falls on different human factors that were previously researched in depth in other literature. Views from different authors have been used as basic motivation to clarify certain concepts and to create certain ideas that might have had an influence on the outcome of this work. The main idea has been to meet primary and secondary objectives as set out in Chapter 1 as well as to find answers to the main problem statement.

The literature in books, articles, journal articles, reports from corporate businesses, other documents, Internet sources and interviews, pertaining to operations management and the influence certain human factors might have on the efficiency of the upstream supply chain, has been scrutinised to establish what the current views are with regard to the impact it might have on one another.

Every single quotation and viewpoint in this piece speak of admiration and respect for the original authors and the work they had already done in this field of study.

2.2 Discussion of different human factors

The first step in an attempt to answer the research question has been to define the terms: human factor, efficiency, supply chain, efficient supply chain and upstream supply chain. Thus the following:

In concept, literature on supply chains and associated concepts mostly provides a range of definitions for the identified terms and seldom a single, common definition.

The terms and concepts of value chain and supply chain are often confused with one another although being two totally different principles. The differences will be clarified per

definition and further discussions will focus on the supply chain and more specifically, the upstream supply chain.

2.2.1 OPERATIONS MANAGEMENT

“The design, execution, and control of operations that convert resources into desired goods and services, and implement a company's business strategy” (Businessdictionary, 2012:online).

2.2.2 SUPPLY CHAIN

A supply chain is a set of connections which describe how the flow of materials from suppliers runs through the facilities. These materials are then transformed into useful products which are then distributed at centres and finally delivered to customers (Raturi & Evans, 2005:196).

Monczka, *et al.* (2010:9) define the term supply chain as a series of actions and organisations through which materials or products move on a journey, starting at primary suppliers and ending at the clients.

Jacobs, *et al.* (2009:358) explain the term supply chain as a picture of the links between organisations, viewed from a particular company or client.

To illustrate the main difference between the concepts of **supply chain** and the **value chain**, Jacobs, *et al.* (2009:403) define a **value chain** as a map of the process stages in the supply chain, which identifies the steps or processes that add value while attempting to eradicate those that lead to waste. Kotler and Armstrong (2010:70) argue that each department in the organisation can be thought of as a link in that particular company's **value chain**. Each department ***carries out value creating activities*** to design, produce, market, deliver, and support the organisation’s products or services. Successes in terms of an organisation’s value chain cannot only be seen as how well each department performs its work, but should also be seen in conjunction with the level of participation and coordination between various departments and their activities.

This document will focus on the **upstream supply chain** and will use the definition from Monczka *et al.* (2010:9) as stated above, as its main grounds for arguments through the remainder of the study. This definition is considered as being the most suitable with regard to the background of the study.

2.2.3 EFFICIENCY

Business Dictionary.com (2012:Online) defines efficiency as the evaluation of that which is actually produced or performed against that which can be achieved with the same expenditure of resources (money, time, labour, etc.). It is an important factor in determining productivity.

Raturi and Evans (2005:143) state that efficiency must be seen as the measure of how well the organisation is performing in perspective to expectations. Jacobs *et al.* (2009:6) define it in short as: “doing something at the lowest possible cost.”

Investopedia.com (2012:Online) also explains efficiency as an important quality if viewed from the point that all inputs may be regarded as in short supply. They explain that time, money and raw materials are in short supply and need to be conserved while attempting to sustain adequate levels of output or general production. In the simplest terms, being efficient means that the amount of wasted inputs is reduced.

Coetzee (2002:42) claims that the term efficient behaviour most of the time implies a certain level of activity. He states that the trademarks of efficiency can be seen as doing things right with the focal point being the volume of work in conjunction with the level of speed at which it is performed, in other words, getting more done in the same amount of time. It is usually focussed on the short-term which means it is task orientated and purposeful with regard to time. Its purpose has a resilient view on the present with an immediate need for satisfaction, focussing on the outputs.

Monczka *et al.* (2010:470) define efficiency as a paradigm for measuring the success of reaching a goal - it evaluates the amount of resources that are used to reach the goal as well as that which has to be sacrificed to reach the goal.
Bowersox, Closs and Cooper (2010:41) describe efficiency of the supply chain as an evaluation of the amount of resources spent or found necessary to reach a certain level of

logistical effectiveness. They also claim that effectiveness and efficiency of logistical performance cycles are key concerns in supply chain management.

Chopra and Meindl (2010:45) explain that supply chain efficiency can be seen as the opposite of the costs associated with manufacturing and delivering the end product or service to the customer. Increases in operational costs will lead to lower levels of efficiency. It must be kept in mind that for every cent spent to increase responsiveness of a supply chain, the additional costs involved will tip the scale towards lowered efficiency.

According to Chopra and Meindl (2010:45) the cost-responsiveness efficient frontier can be explained graphically as in figure 2.1, showing the lowest possible cost for a given level of responsiveness/efficiency and is defined and based on the use of existing technologies. Not every firm is able to operate on the efficient frontier which represents the cost-responsiveness of the best supply chains. The idea explains that the firm that is not in the efficient frontier can improve both its responsiveness and its cost performance by moving towards the efficient frontier where the relation of cost and responsiveness will be optimal for the specific organisation.

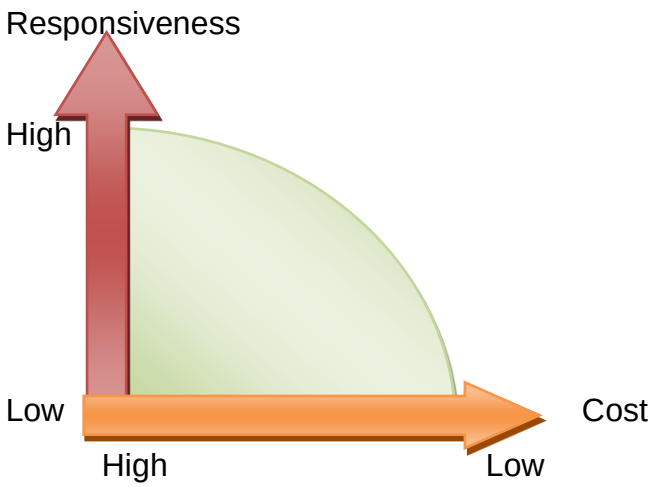

Figure 2.1 Cost-Responsiveness Efficient Frontier (Chopra and Meindl. 2010:45)

2.2.4 EFFICIENT SUPPLY CHAIN

Jacobs *et al.* (2009:364) define efficient supply chains as the following: “Those supply chains that utilise strategy aimed at creating the highest cost efficiency. For such

efficiencies to be achieved, non-value added activities should be eliminated, scale economies should be pursued, optimisation techniques should be deployed to get the best capacity utilisation in production and distribution, and information linkages should be established to ensure the most efficient, accurate, and cost effective transmission of information across the supply chains. Supply chain efficiency also focus on long-term sustainability and "doing things right".

Efficiency of the supply chain - this concept is identified by Bowersox, Closs and Cooper (2010:41) as a measure of resource expenditure necessary to achieve effectiveness in an organisation's logistics.

An efficient supply chain mainly focuses on higher than average material flows due to increased productivity with its sight set on minimisation of the costs involved in shipping or transportation of the product from the factory to the customer as described by Raturi and Evans (2005:196), and is a measure of how successful resources in the supply chain are utilised (Petterson, 2008:3).

Jacobs *et al*. (2009:359) explains that there are two major measures of efficiency in the supply chain, namely: 1) inventory turnover and 2) weeks-of-supply. The total extent and size of inventory at each stage of the supply chain ties up money and increase supply chain costs. They state that operations should be linked to such an extent as to optimise synchronisation of each stage in the supply chain and thus minimise the size of buffer inventory tying up company funds unnecessarily as the efficiency of the supply chain in both measures focus mathematically on the same thing. Inventory turnover is basically the inverse of weeks of supply and can be calculated on the organisation as a whole or on individual entities or departments as follow:

1) $\text{Inventory Turnover} = \frac{Cost\ of\ goods\ sold}{Average\ aggregate\ inventory\ value}$

(Values of 6 to 7 are typical for manufacturing and service organisations but vary between industries.)

- The following bullets are of importance with regard to cost of goods sold:
    - It is sometimes referred to as cost of revenue.
    - It is the amount of money it costs the organisation to produce the goods or services provided to customers on an annual basis.

- It does not include selling and administrative expenses.
- It includes raw material, work-in-process inventory, finished goods and distribution inventory that can be viewed as company property.

- Average aggregate inventory value = the total value of all items held in inventory valued at cost. This measurement is used only with regard to production or retail organisations and excludes those of the services environment.

2) Weeks of supply = $\left(\frac{Average\ aggregate\ inventory\ value}{Cost\ of\ goods\ sold}\right) \text{ x } \frac{52}{1}$ weeks

- Weeks of supply can be seen as a measure of choice where distribution of inventory is dominant.
- It measures how many weeks' worth of inventory is caught up by the system at different points in the supply chain at a particular point in time. It also gives an indication of the amount of capital that is absorbed by the system and may indicate areas where improving the system, may lead to improved cash flow figures.

Jacobs *et al.* (2009:358) argue that a sound strategic objective would be to establish where the most important locations in the supply chain would be for the organisation to have the proper amount of inventory, and then see to it that it is held at those correct locations in its supply chain.

The author suggests that the efficiency of the supply chain, based on the above analysis of inventory levels and weeks of supply, may be dependent on human variables due to the fact that the planning, as well as the physical movement of inventory is planned and done by human intervention (labour). Enterprise resource systems may reduce the effect of human factors on the supply chain due to the fact that it may decrease human interference. The stock and some information still physically need to be handled by humans at certain points in time throughout the supply chain and thus support the argument that human factors influence supply chains.

2.2.5 UPSTREAM SUPPLY CHAIN

Jacobs *et al.* (2009:365) also define the upstream supply chain as the supply chain responsible for supplying goods and services to the organisation. A good way of describing it is: the company's suppliers. Information is the primary element flowing upstream in different forms such as orders, feedback, and payment information.

Monczka *et al.* (2010:6) define "upstream" as the "tiers of suppliers" in the supply chain that can be seen as in front of the organisation they supply to, moving materials in, and "downstream" to "tiers of customers" after the organisation in the supply chain has received its products or services.

Figure 2.2: Illustration of upstream vs. downstream activities in the supply chain.
Source: Compiled by author from different sources.

2.2.6 SUPPLY CHAIN MANAGEMENT (SCM)

Businessdictionary.com (2012:Online) defines SCM as the process in an organisation's supply chain through which material and information flows are managed. The main aim is to ensure the highest level of customer approval at the lowest possible cost.

It is stated that a high level of dedication is expected from supply chain partners in order for supply chain management to be efficient. They have to work together closely to synchronise order generation, order taking and order fulfilment in an attempt to construct a comprehensive venture that extends far beyond the producer's location.

Kotler and Armstrong (2010:71) state that a value delivery network is established when the company, suppliers, distributors, and ultimately, customers form a network through which they will form partnerships with each other in order to advance and improve the performance of the entire system they form part of. They also state that more and more companies currently form partnerships with other organisations in the supply chain in an attempt to improve performance of the actual network responsible for adding, or creating value for customers (customer value delivery network).

Hugo and Badenhorst-Weiss (2011:4) exemplify that according to the definition of the Council of Supply Chain Management Professionals (CSCMP), supply chain management environs: “the planning and management of all activities involving sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes ordination in collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers and customers. In essence, supply chain management integrates supply and demand management within and across companies”.

Due to the above, as well as findings and arguments in 2.1.3 on the efficiency of the supply chain, it is suggested that supply chain management more than just depend on, but actually manages the human factors that determines the efficiency of the upstream supply chain.

2.2.7 HUMAN FACTORS

Kendra Cherry (About.com, 2012:Online) validate it as follows: “Human factors is an area of psychology that focuses on a range of different topics, including ergonomics, workplace safety, human error, product design, human capability and human-computer interaction. In fact, the terms human factors and ergonomics are often used synonymously with human factors being commonly used in the United States and ergonomics in Europe. Human factors work to apply principles of psychology to designing products and creating work environments that boost productivity while minimizing safety issues. The field of human factors formally began during World War II, when a range of experts worked together to improve the safety of airplanes. Since that time, human factors psychology has continued to grow and today plays an important role in many other fields, including computing, manufacturing, product design, engineering, military and government industries.”

Chapanis (1991:2) defines human factors as a field of study regarding the knowledge of: "human abilities, human limitations, and other human characteristics."

The FAA Systems safety handbook (2000:17-1) defines human factors as a multidisciplinary effort to generate and compile information about human capabilities and limitations and apply that information to equipment, systems, software, facilities, procedures, jobs, environments, training, staffing, and personnel management to produce safe, comfortable, and effective human performance.

Human factors can thus be seen as those variables that act as antecedents and influence human behaviour in the supply chain and eventually influence supply chain efficiency as a result of the state of the individual's self.

2.3 Human factors that may have an impact on the performance of the supply chain

In an interview with Mr. Lu Bin (2012), Deputy Supervisor of the Logistics department of a Fortune 500 organisation, he explained that human factors that may have an impact on the performance of the supply chain may in his opinion generally be identified as the following:

- Individual's principles
- Individual's goals and company's goals for the individual - common goals
- Personality
- Ability/Trainability
- General skills and training, and
- Mutual trust and understanding

A short analysis of the influence of each of the above on the efficiency of the value chain will follow in an attempt to establish which can be regarded as more important.

Shub *and Stonebraker* (2009:31) identify four human variables in supply chains as: "Staffing, training, Evaluation and Compensation". These four variables also correspond with some of the human factors that Mr. LU Bin (2012) has identified with regard to

influencing the supply chain and will be investigated and discussed in further detail throughout this document.

The aim of the following discussion is to clarify each concept.

2.3.1 INDIVIDUAL'S PRINCIPLES / MORALS

Mcleod (2011:Online) elucidate on the fact that Lawrence Kohlberg's theory of moral development specifically identifies six stages of moral development as can be seen in Table 2.1 (Usefulcharts.com:2012). Mcleod (2011;Online) also explains that according to Kohlberg, the six stages of development are arranged in three levels as shown graphically in table 2.1. Kohlberg explains that principles used in the working environment can mostly be found from levels two and three, namely:

- The level of conventional morality. On this level moral values are inherent to the individual performing the correct function in maintaining the usual order and function based on the expectancies of other individuals in its own right, and
- The level of post-conventional morality. On this level morality is defined based on conditions of conforming to collective standards, rights, or duties inherent to supporting authorities. These standards are internal with the individual's decisions to take action that are founded in an inner process of thought and judgement with regard to right and wrong.

The individual's principles can thus be seen as morals developed over a period of time. It acts on a conscious and subconscious level and influences the individual's actions and reactions when operating in certain environments and situations.

Mullarkey, Jackson and Parker (1995:63) suggest that in the above context, principles in the supply chain environment should rather be seen as principles and tools of *Kaizen*, Total Quality Control (TQC) and Total Quality Management (TQM). This should assist employees in identifying and eliminating root causes of problems and stimulate improvements with regard to processes and actions. They claim that in reviewing these aspects, the individual is able to learn new principles from further training and development program.

Table 2.1 : Kohlberg's Six Stages of Moral Development

Pre-Conventional Morality		
Stage 1:	**Obedience or Punishment orientation**	This stage can be seen as the stage where all young children start at and few adults remain in. Rules are seen as fixed and absolute. Obeying the rules is important as it means avoiding punishment
Stage 2:	**Self-interest orientation.**	As children grow older they begin to see that other people have their own goals and preferences and that often there is room for negotiation. Decisions are made on the principle of "What's in it for me?"
Conventional Morality		
Stage 3:	**Social conformity orientation**	By adolescence, most individuals have developed to this stage. There is a sense of what "good boys and girls" do and the emphasis is on living up to norms and expectations because of how they impact day-to-day relationships.
Stage 4:	**Law and order orientation**	Individuals usually consider society as a whole when making judgements when reaching adulthood. The focus is on maintaining a state of law and order by means of following rules, attending to one's duty and respecting authority.
Post-Conventional Morality		
Stage 5:	**Social contract orientation**	At this stage, individuals understand that there are different opinions of what is right and wrong and that laws are really no more than a social contract based on majority decisions and inevitable compromise. People sometimes disobey the rule in this stage should they find them as in consistent conflict with their personal values and may also argue for some laws to be changed should they perceive them as no longer valid. Modern democracies are based on reasoning of this stage.
Stage 6:	**Universal ethics orientation**	Very few people operate at this stage all the time. It is based on abstract reasoning and the ability to put oneself in other people's shoes. At this stage, people have a principled conscious and will follow universal ethical principles regardless of what the official rules are.

Source: (www.usefulcharts.com/psychology/kohlberg-stages-of-moral-development.html)

In essence Mullarkey *et al.* (1995:63) claim that the principles of the individual may be overruled by adopted principles, and learned from programmes before filling a position in a particular supply chain, as discussed in the previous paragraph. It may also render the individual to be more suitable for a specific position in a specific organisation.

Coetzee (2002:35) explains guiding principles of behaviour as shared values which are instrumental in creating commitment in an organisation. He claims that it represents the essence of any organisation, reflecting the true nature of the organisation in showing the expected behaviour of employees. It therefore has a determining influence on human actions and the culture of the organisation.

Coetzee (2002:77) also describes principles as values or standards that are utilised in conjunction with the individual's judgement of actions that can be seen as being important and also being of value with regard to life itself. He claims that these principles may also be described as:

- Established long-lasting beliefs with regard to what can be seen as important.
- Conscious desires for affection from those individuals that may guide the individual's actions at work as well as off the job.
- Societal or organisational beliefs with regard to right and wrong and what is acceptable and what not.
- Being different from attitudes by being something the individual believes.
- They can be universal, cultural or individual.
- Timeless behavioural guidelines that have not changed over time.
- Individual values that are closely related to personal goals.

From the above it can be established that principles form an integral part of shaping human actions, as well as organisational culture. It also serves as foundation to the individual's place in the organisation and could act as antecedent to the efficiency of the upstream supply chain of the organisation.

2.3.2 INDIVIDUAL'S GOALS AND COMPANY'S GOALS FOR THE INDIVIDUAL - COMMON GOALS

Coetzee (2002:35) explains that goals can be perceived as dreams or ideals for which the individual will do his/her utmost in the attempt to be reached. The reward for reaching these goals have to bring into being, material goods which does not yet exist. He also explains that for goals to be effective, it must be seen by the individual as both challenging and realistic and that the starting point for manager-leadership can be seen as the development of goals. These goals have to be transferred and communicated to team members in such a way that they adopt it and see it as their own. In achieving this, manager-leaders make sure that their goals result in focussed efforts in the required direction with regard to their vision or required result. It also creates support in terms of shared values, explained as the guiding principles of behaviour. Kreitner and Kinicki (2008:227) explain a goal as that which an individual is trying to accomplish. It must be noted that most organisations start as an idea from an individual and then grow to something bigger and their definition can in this sense thus be seen as appropriate.

Coetzee (2002:64) also attempts to explain the importance of goals in this context as a preventative mechanism against experiences of unworthiness, frustration, depression, stress and forms of neurosis and job dissatisfaction by the individual. This can only be achieved as long as the individual has goals that he/she can add a value to in terms of importance to him/her.

Coetzee (2002:108) mentions a concept of extreme interest. He states that people who are at the top of their game all share a universal strategy by being goal orientated in their approach to life. He also quoted Edwin Locke by saying that: "a goal is that which a person wishes to achieve - it is thus the object of destiny as a result of action or behaviour". Coetzee (2002) stated that Locke's view is that goals and intentions consciously created by the individual will set the terms through which he/she will act and determine behaviour.

Kreitner and Kinicki (2008:246) explain that goal-setting researchers have identified two types of goals, each with its own distinct characteristics, namely: 1) performance outcomes goals and 2) learning goals. Performance outcomes goals focus on a specific, desired result to be achieved and learning goals are associated with the development and aquisition of skills, creativity and knowledge. They also explain that the term "management

by objectives" as a management system has been acknowledged for many years and that the key characteritics of this concept are: participation in decision-making, goal-setting, and feedback. This management system also gives recognition to the motivational impacts of setting performance goals, together with goal based reward plans and encourages its utilisation in different organisations.

Kreitner and Kinicki (2008:227) have quoted Edwin Locke, a leading authority on goal setting, in defining an individual goal as what an individual is trying to accomplish. They also explain that the motivational effect of performance goal based reward plans has been recognised for a long time.

According to Locke, as quoted by Kreitner and Kinicki (2008:228), the purpose of setting goals as motivational mechanisms can serve the following purposes, namely:

1. Creating awareness and focussing attention as well as efforts in an attempt to guide the individual in spending time on activities appropriate to reaching set goals and away from those activities that may be seen as a waist of effort.
2. It can motivate the individual to be selective in his/her efforts and give perspective on what is expected.
3. It can motivate the individual to persevere in his/her attempts to reach set objectives over an extended period of time.
4. Goals, that are perceived as not easily reachable though perceived by the individual to be important, serve as a steady reminder to focus efforts in the appropriate direction.
5. It encourages the group or individual to develop and apply strategies and action plans to accomplish what is required from them.

Kreitner and Kinicki (2008:229) further discuss practical lessons from goal-setting research and highlighted the following: They explain that research has shown support for goal-setting as a motivational factor in organisations on a consistent basis. The setting of performance goals increases performance throughout the organisation, starting at individual level and having an effect on teams and groups. They report that supportive evidence has been published in support of the above by showing positive results in six other countries or regions, namely Australia, Canada, the Caribbean, England, West Germany, and Japan. They categorically state that these positive results to setting performance goals can be seen as effective across cultural borders as well, and that four

practical insights have been developed from reviewing study results found over the past few decades - these insights are:

1. The higher the goals, the greater the performance if kept specific.
2. The effect of specific, demanding goals can be enhanced by means of constructive feedback.
3. Self-set goals are just as effective as participative and assigned goals.
4. Commitment to goals, in conjunction with the use of short-term incentives, affect outcomes with regard to set goals as its incentives improve individual commitment.

Coetzee (2002:109) states that goals have a number of motivational mechanisms. This statement corresponds to those earlier mentioned by Kreitner and Kinicki (2008:228), namely:

1. It directs attention in the short term as well as in the long term, by motivating individuals and groups to spend their energy on those areas of business which will have the largest impact on performance and ensure accomplishment of what is expected of them.
2. It serves as a guide to organize and adjust efforts in order to reach set objectives.
3. It establishes a set of common values and creates common ground for individuals to understand what the organisation expects of them.
4. Its very nature is to motivate and trigger the development of strategies and action plans.

The setting of goals is also seen as being an effective motivational factor with regard to motivation through clarification of the individual's role perceptions, by means of developing and setting performance objectives

Kreitner and Kinicki (2008:249) found grounds for the idea that the effects of goals, setting of goals, achieving or not achieving set goals by the individual and the organisation, will have a greater impact if accompanied by constructive feedback after being evaluated. They see feedback as an objective, bi-directional communication of information about individual as well as group work efforts that usually focuses on the current status of a situation with regard to ultimately reaching the expected goals. They claim that feedback

synchronises standards and expectations between management and employees for work to be performed.

With regard to **goals** discussed **in context of the supply chain**, Bowersox *et al.* (2010:378) explain three key elements to maintaining continuous long-term relationships in the business environment , namely; 1) mutual, premeditated strategic and operational goals, 2) evaluated on a system of bi-directional measures between management and the individual or group and 3) the process of feedback. Their statement directly impacts on **human factors in the supply chain** as it forms the basis of communications, goal setting, trust relationships and efficiency as part of supply chain performance.

It must also be noted that the efficiency of the supply chain is subject to the ability of the organisation to communicate its goals clearly and efficiently to its employees to ensure that employees all aim to satisfy a common goal at stake. The fact that the individual must understand where he fits into the strategic planning of the organisation in achieving its goals must also be noted. Individual goals set by the organisation should always aim at satisfying organisational goals in the long run, aimed at creating a sustainable long-term competitive advantage.

2.3.3 STRATEGY

According to the definition of human factors as stipulated earlier in this document, strategy was excluded from the study as not being a “human factor”. An individuals’ personal strategy may be an important issue when considering the “how” of individual goal achievement at a higher level and a brief discussion will therefore be included.

The individual's ability to follow corporate strategy can be seen as part of his/her actions in fulfilling a function in the upstream supply chain, and thus can be seen as important. It may therefore be more of a factor in the trust relationship between the organisation, the individual and collaborative partners in the supply chain relationship. It may also be argued that the individuals’ own strategy to fulfil corporate goals in support of corporate strategy may also be aimed at fulfilling upstream supply chain goals.

It could be argued that strategy can more accurately be classified as a system issue, rather than a human factor. Hence the fact that strategy is not elaborated on in much more detail

in this study. This is also supported by the lack of evidence to strategy seen as a human factor impacting on the efficiency of the upstream supply chain.

Almost all the information available on this topic indicate that it is more of an organisational factor than it is a soft issue, and falls more under the topics of ability and trainability when interpreted from a human factor point of view. This topic is mostly discussed from the viewpoint of corporate responsibility and an opportunity exists for further investigation in future studies.

As a result of the above findings, strategy will not be included in further discussions during this study.

2.3.4 PERSONALITY

Kreitner and Kinicki (2008:37) confirm that thinking as well as acting can be seen as unique to each individual. Every individual adds his/her own style to the term personality. They describe the term personality as a “combination of a stable set of physical and mental characteristics that is responsible for a person’s identity”, and further acknowledge that these individual characteristics or qualities can be seen as the product of the interaction between hereditary and environmental influences (Kreitner & Kinicki, 2008:133). Hogan and Benson (2009:1) also posit that individual leadership traits can be seen as a functional personality derivative. These personality and leadership traits can in return enhance characteristics associated with organisational effectiveness.

It is therefore important that the different individual personality characteristics in an organisation that may cause unwanted tention be managed effectively. Kreitner and Kinicki (2008:374) describe the fact that conflicts between different personalities can be regarded as inevitable, as a result of the different combinations of traits that can be associated with different personalities. They explain that conflict in this regard can be regarded as interpersonal disagreement founded in personal aversion, disagreement or dissimilar styles.

The influence of negative interactions because of on personality differences between individuals, groups or teams, can severely damage the efficiency of any supply chain due to the fact that individuals do not communicate optimally with those whom they are in

conflict with. Harrison, Price, Gavin and Florey (2002:1031) describe personality elements as deep-level diversity, meaning that individual differences are found when individuals interact with each other, and develops over time. These differences appear through behavioural patterns, communication style of both verbal and non-verbal nature and sharing of private information. They explain that immeasurable differences might be responsible for deep-level diversity. Harrison *et al.* (2002:1042) suggest in their research that personality conflicts might be even more important to organisational performance than surface-level differences seen as age, gender, ethnicity, and marital status. They also suggest that individuals tend to collaborate more effectively when outcomes are based on team performance rather than individual performance.

The above serves as motivation to the viewpoint that organisations should profile which personality traits they are looking for in their employees and then take the time to search for such individuals (Greenberg and Sweeney, 2008:64). Care should be taken during job interviews to ensure that the prospective employee being interviewed actually has the personality traits the organisation is looking for (Greenberg and Sweeney, 2008:64). Different organisations will look for different personality traits due to differences in organisational cultures. Personality is inherent to the individual and changing it to fit the organisation will be a mistake as old habits die hard.

Taking the time to employ the individual with the personality that best fit the organisational culture, may actually be seen as an investment, as it allows management to place individuals that can be utilised in positions and teams where they can succeed immediately (Malakain, 2008:86), thus improving profitability and creating a sustainable competitive advantage for the organisation itself (Greenberg and Sweeney, 2008:64), creating shareholder value by means of increasing efficiency and effectiveness of not only the supply chain, but everything the organisation does.

2.3.5 ABILITY/TRAINABILITY

Kreitner and Kinicki (2008:138) define ability as a broad and steady quality accountable for an individual's maximum physical and intellectual performance. It opposes that which can be seen as typical and is totally unique to the individual.

Coetzee (2002:121) explains the principle that individuals can be intelligent in a variety of ways. Psychologists have acknowledged at least seven different kinds of intelligence that can be seen as foremost intellectual ***abilities***, namely:

- Global comprehension –I Individual's ability to comprehend what words mean.
- Word fluency – Individual's ability to generate isolated words in a way that enables him/her to execute specific symbolic or structural requirements.
- Numerical - Individual's ability to perform arithmetical computations accurately and quickly.
- Spatial perception – Individual's ability to make out spatial patterns and picture the way the geometric shapes will look when transformed into shape or location in his/her mind.
- Memory – Individual's ability to commit paired words, symbols, numbers and other things to memory.
- Perceptual speed – Individual's ability to recognise figures, make out similarities and differences, and perform tasks concerning visual perception.
- Inductive reasoning – Individual's ability to reason and motivate from particular to general conclusions.

It is noted from the above that an individual's intellectual abilities will certainly impact his/her relationships in the organisational environment, based on effort-to-performance to a larger or slighter extent should it be that the individual depends on those kinds of efforts, tasks or goals involved to fulfil his/her functions within the organisation.

During research, the author's general idea of ability was developed and impacted on to explain that ability may also be seen as a characteristic/trait of the individual to develop and foster trust relationships between himself/herself and the rest of the supply chain. His conclusion is that ability is a characteristic trait that is formed within the individual and has been fostered and nurtured since birth. It must also be noted that abilities can be learned over a period of time, but can do more damage when it appears to be superficial to the other parties involved. Organisations are expected to employ individuals with abilities that suit the needs of the organisation.

Ability can also be seen as part of the foundation of understanding between the individual and the organisation of what will be expected from the individual as an employee during

the interview phase, as well as the employment phase, should the individual's abilities suit the needs of the organisation.

On trainability, Dierdorff and Surface (2004:1) explain that it professed to be a combination of two factors, namely 1) basic skills like reading and mathematical skills, and 2) cognitive ability. Measurement of these two factors serves as an indication of "training readiness", or trainability. They also proved that language and numerical ability were strongly correlated with skill-based training performance. Trainability can therefore be defined as the individuals' ability to consume knowledge.

Gill (2011:146) also concludes that an optimal level of intelligence exists as predictor to trainability with regard to the individuals' potential to learn decision making skills and improve decision making potential. He also claims that the association between intelligence and trainability may be overemphasized with regards to an individuals' trainability. He therefore proclaims that it would be better suited to view intelligence as a predictor to an individuals' **capacity to learn** and not necessarily his/her **capacity to achieve**.

In context of this study, trainability is thus regarded as the individuals' capability to learn and adopt skills, methods and systems in an appropriate way to influence upstream supply chain efficiency, also implementing the above-mentioned in adapting to operational and environmental requirements.

2.3.6 GENERAL SKILLS AND TRAINING

Kreitner and Kinicki (2008:138) define a skill as a character trait associated with an individuals' explicit capability to physically control objects.

Monczka *et al.* (2010:284) state that a relational level of importance exists between the knowledge, skills and tools (tools can also be seen as intellectual aids) of employees and that of suppliers, to be able to efficiently and effectively do what is expected of them.. Their opinion is that well-developed and targeted training programmes show potential to improve quality and productivity and have the ability to impact positively on morale as well. They explain that teaching or training should include diagnostic tools, analytical tools as well as training on decision-making and problem solving for quality to improve. Their view includes

that education, further education as well as self-improvement should be encouraged due to their belief that that training is normally aimed at the development of specific skills and tasks appropriate to the fulfilment of a specific job. Self-improvement is more concerned with the improvement of the individual's quality of life. They explain that organisations investing in these principles generally have discovered that their employees proved to be extraordinarily motivated and caused them to bring supplementary benefits to both the workplace as well as their individual lifestyles.

Monczka *et al*. (2010:285) explain that the onus lies on management to put organisational principles into practice in order to provide support from base level should an individual need it to perform organisational duties. This should have the effect that every individual will understand what the organisation is aiming to achieve and work towards reaching of individual and organisational goals. They also state that creating and maintaining the energy required to reach both individual as well as organisational objectives, can be obtained through training, and that it is imperative to retain momentum with regard to this over the long term.

Thublier, Hanby and Shi (2010:12) state that due to the interrelationship formed between supply chain partners, creating dependence on one another, grounds that establishes room for relying on skills and capabilities of the different entities associated with a particular business relationship within a supply chain, become a prerequisite for success. One of the reasons, as well as a benefit to why supply chains actually exist, is that different organisations will specialise in implementing different skills from individuals successfully. An organisation will utilise the skills and training from the employees of another organisation, and compensate that organisation for that specific shortcoming in skills and training in its own resources/employment profile.

Shub and Stonebraker (2009:34) explain that training under normal circumstances can be regarded as the role of employee coaching, forming part of organisational improvement and career development. This makes up a blend of transactional-based and relationship-based strategies. Shub and Stonebraker (2009:34) reported that training forms an integral part of successful companies' employment programmes, while such training forms are usually hugely neglected in less successful companies.

2.3.7 REMUNERATION/COMPENSATION

Nieman and Bennet (2011:255) explain remuneration as that which employers offer employees in return for the services they render, or the skills and knowledge they possess in order to fulfil the needs of the organisation. There is a strong correlation between remuneration and an employee's motivation to remain in an organisation's service, and can be a strong determinant with regard to employee loyalty towards the organisation. It is normal practice for an organisation to expect certain outputs from employees in return for the remuneration they receive. The aspect of remuneration has also been identified as a major cause for employee dissatisfaction and it is believed to be an influential factor to both the individual as well as the organisation. Nieman and Bennet (2011:255) also explain that remuneration orientated dissatisfaction in the organisation may lead to "unsatisfactory performance, absenteeism, go-slow situations, mental health conditions, mental withdrawal, strikes and ultimately, high labour turnover."

The statements above lead to thought that valuable human capital may also be under threat as a result of high employee turnover rates and that these valuable losses are of immense value as intellectual capital may be seen as one of the most important aspects of an organisation. It will also have a direct effect on the training budget as replacement employees will in many situations have to be trained as a result of a gap in skills and knowledge between what the individual has and what the organisation would like them to know.

The point must be taken that the initial positive effects of remuneration will soon be forgotten by the ambitious employee and that he/she may demand an increase in remuneration or consider moving to greener pastures if negotiations are unsuccessful. Promotion within the organisation usually leads to an adjustment in remuneration where the employee will be more comfortable with the perception of what his/her services are worth. It is important that a balance be kept between the employee's perception, and what the organisation may think he/she is worth. An employee's idea of what his/her services are worth is as a dynamic aspect that will change over time as employees gain more experience and they will develop the perception of their services' increasing in value as a result of experience gained.

Coetzee (2002:154) explains that individuals may perceive remuneration or compensation as the employers' way of giving recognition for performance. Employees may perceive remuneration and compensation as of positive reinforcement when above average performances are achieved, followed by a pleasing occurrence or, remuneration can be a negative reinforcement when objectionable performances are achieved, followed by penalising the individual or withdrawing privileges. Coetzee is of the opinion that distinct behaviours can be eliminated and others reinforced by means of different remuneration strategies. Positive remuneration should cause recurrence of wanted outcomes or behaviour while penalisation should eradicate the recurrence of unwanted behaviour.

Coetzee (2002:154) states that remuneration should rather be linked to performance and not a job grade or level. It will be advantageous to pay for performance as the advantages seem to outweigh the disadvantages that might occur as a result of the before mentioned.I Individuals experience being empowered to perform if they are motivated to make positive contributions in exchange for being rewarded for their outputs. It must be noted that the organisation will have to be cautious in this approach due to the fact that it may later become counter-productive. In the light of the above it must be noted that remuneration or compensation can by no means be seen as a replacement to verbal feedback, but should rather be used as backup to positively, or negatively reinforcing the desired effects of verbal feedback.

The individuals' perception of fairness with regard to the rewards and recognition he/she receives can also trigger perceptions of even-handedness or injustice when he/she evaluates actual rewards as being more or less in value with relation to what he/she perceives as the value of that which he/she is being rewarded for (Coetzee, 2002:163).

In essence, remuneration or compensation should never replace verbal feedback but should rather be used as a positive or negative reinforcement of verbal feedback. It may also be used as a basis of motivation by means of incentives when organisational targets are set to reach certain goals. Care must be taken that every individual in the organisation stands a chance to qualify for such incentives, even if it is proportionate to the role the individual played in reaching the set goals to prevent conflict and negativity between employees that may have a negative impact on a positive effect it was intended for.

Shub and Stonebraker (2009:34) state that remuneration and compensation in general entail actions associated with human resource departments of organisations and are based on the negotiations of basic wages and remuneration systems, encouragement (incentive) systems and perks, as well as benefit systems, each of which proportions a mix of transaction-based or relationship-based strategies.

This indicates that remuneration can rather be regarded as a systems issue, not a human factor and will thus not be discussed any further throughout the course of this study.

2.3.8 RESPONSIBILITY

Responsibility is defined by Businessdictionary.com (2012:Online) as "a duty or obligation to satisfactorily perform or complete a task (assigned by someone, or created by one's own promise or circumstances) that one must fulfil, and which has a consequent penalty for failure."

Monczka *et al*. (2010:28) describe responsibilities as the span, or extent of control the individual is given with regard to his/her tasks as associated with what the employer expects. This means that every functional group in an organisation will be given responsibility in terms of the tasks they have to perform within the organisation. Responsibilities are evaluated on tasks for which the individual, the department **and** the functional groups have been delegated authority to make decisions for and for which they will be held responsible on the outcomes that are all included.

Myrna (2010:51) explains that strategic delegation can improve an organisation's performance, productivity and profitability by way of optimizing the individual employee's output in terms of value. He sees delegation as a "fine art" that the top performing individual needs to receive training in, and states that delegation can be seen as a skill. He states that when a task is delegated, responsibility for that specific task must also be delegated. Delegated responsibility also implies that the annual performance review of each individual now becomes the employees own duty to take care of by making an appointment to be evaluated. Responsibility may in fact be closely aligned to accountability and delegated to the competent employee who can operate independently. In concept, management stays responsible for employing responsible individuals with good work-ethics to whom responsibility, as well as accountability can be delegated to, and the

employee becomes responsible for what he is assigned to do. Management can only delegate responsibility if they are convinced that the employee is competent to do what is required from him/her. It is also managements' responsibility to see that the employee receives the necessary training where competencies may be lacking, or must be prepared to mentor the individual in the identified competencies where attention is needed, until the employee is found to be competent enough to accept responsibility. By no means may responsibility be abdicated to an incompetent individual. Delegation is imperative to organisational growth.

It has been found that the individual's ability to take responsibility for his/her actions in fulfilling a function in the upstream supply chain is of the utmost importance. Responsibility is allocated to individuals when individual and corporate goals are set, and supportive evaluation and feedback systems regulate the individual's capability to take on less or more responsibility. It may therefore be more of a human factor related to the trust relationship between the organisation, the individual and collaborative partners than in the operational supply chain relationship.

Lack of documented empirical support precludes responsibility from being a significant human factor impacting on supply chain efficiency. The topic of responsibility is mostly discussed from the viewpoint of corporate responsibility and therefore an opportunity exists for further investigation in future studies. However, because responsibility could not be linked and discussed on the basis of reliable references with regard to human factors and will not be included in further discussions during this study.

2.3.9 MUTUAL TRUST AND UNDERSTANDING

Kreitner and Kinicki (2008:317) define trust as a mutual devotion to intentions and actions between individuals. They explain that the individual will find it easier to trust others when he/she perceive their actions as showing trust in him/her. Distrust is formed when other's behaviour is perceived as untruthful or violating current trust relationships. An individual will normally respond in the same way he/she feels he is being treated with regard to trust. The individuals' inherent personality characteristics to the propensity to trust also has an impact on trust relationships as this serves as the primary corner stone to the individuals' motivational aspect with regard to trusting in others.

Mutual trust and understanding is an aspect of the employer-employee relationship that can motivate empowerment of the individual within an organisation, thereby possibly affecting the efficiency of the supply chain positively.

Monczka *et al*. (2010:111) mention that “collaborative trust relationships” are becoming more and more evident in today’s organisations, and that a movement away from conventional adversarial interactions and towards the formation of reciprocated trust and dedication, exists. They have identified four phases to which it can be attributed, namely “distrust, suspicion, co-operation and eventually trust”. They claim that these four phases elucidate the process of moving from traditional adversarial interactions between employers and employees. Firstly it is traditionally believed that one party can only benefit at the expense of the other. The second phase is where a history of trading starts to develop between the parties involved, this history will form the basis of the development of a functioning working relationship between the parties involved and improve relational steadiness. Thirdly, collaboration and development between supply chain partners start to form, through which purchasers become acquainted with the idea and positive effects of relying on a more intimate supply base. In this stage, relationships become stronger and closer and spark the beginning of actual team efforts, where partners jointly strive to reduce costs and show progress with regard to service improvements and product delivery through improved lead times. This implies that the supply chain becomes more flexible in its response to the demands posed by the market they operate in. Supply chain partners then strive to achieve common goals and clients become more aware of the potential benefits sparked as a result of supplier inputs when new products and services are designed. In the fourth and final stage, partners have developed trust relationships and the commitment to cooperation is accentuated by shared strategies aimed at improving performance. Trust and the sharing of valuable information becomes common practice and are aimed at ultimately reducing costs, improving quality and improving services. This is where collaborative relationships actually become the stronghold in the sense that different organisations in the supply chain relationship actually become extensions of each other’s operations.

Exactly the same four steps come into play between individuals working in the supply chain as this is where contact between organisations is established, as well as the individuals in the same organisation serving the same supply chain. From the evidence presented trust is identified as one of the major human factors that counts as an

antecedent to the efficiency of the supply chain. This will be tested empirically in chapter three.

Bowersox *et al.* (2010:378) discuss the opinion that without meaningful trust, none to very little real collaboration can exist in supply chain relationships. They explain that the issues associated with human behaviour with regard to trust and organisational culture may be regarded as the most complicated to resolve when collaborative partnerships are at stake. It is explained that trust is multidimensional in its nature and that more than one typology of this concept exist. The most meaningful way of explaining trust in terms of supply chain collaboration, is by distinguishing between reliability-based trust and character-based trust. This viewpoint is shared by Haghpanah (2010:1), stating that almost all societies an social structures need measures of trust in them in order for individuals - agents or humans - to establish successful relationships with partners. Establishing trust also improves the chances of a successful supply chain relationship, as well as increases the overall benefit to the agent involved.

Reliability-based trust is based on an organisation's perception of a potential partner's actual behaviour and operating performance. The relevant issue at hand is the perception of the partner's willingness to perform, as well as their capability of performing as promised. Should a supply chain partner not be able to rely on the chosen partner's promised performance, efforts to establish collaborative relationships will fail as a perception of untruthfulness develops over time. The nonperforming partner organisation will also be regarded as incapable of delivering on its promises with the perception of being unreliable, hampering all efforts to form and establish a trust relationship (Bowersox *et al.,* 2010:378).

Character-based trust is based on an organisation's culture and philosophy. Character-based trust is based on the reciprocal perception of supply chain partners being interested in each other's welfare. Partners will not feel vulnerable to the actions of one another when this aspect of trust is developed, and supply chain partners will protect each other's interests (Bowersox *et al.,* 2010:378). Trust relationships can only develop over time following repeated interactions between collaborative partners in the supply chain, and remains one of the most important factors with regard to supply chain efficiency. The fact that these trust relationships are built between humans in different stages of the supply chain, may lead to the conclusion that trust may also be seen as an important human

factor and antecedent to the efficiency of the upstream supply chain. The success of these trust relationships may be influenced by the organisational philosophy and policies that remain in the hands of the individual, and its success will be determined on the basis of the extent the individuals in the supply chain are capable of building these trust relationships with the common cause to effect.

Haghpanah (2010:1) in turn also explains the dominance of important sources of information relevant to modelling trust as “direct observations and reported observations”. It is explained that direct observations are more reliable, but can however be expensive and time-consuming to obtain, while reported observations are cheaper and more readily available. The downfall of reported observations are that they are often less reliable.

Should a single individual in the supply chain not be able to build this trust relationships, the whole supply chain’s efficiency may be under threat. Any chain is only as strong as its weakest link and trust can easily become the weakest link, due to the individual’s interventions in a noble concept. Its rightful vulnerability lies in the fact that human nature has scarred this concept to its core over centuries of abuse.

Bowersox *et al.* (2010:380) explain that the dominance associated with the resolution of “power, leadership, conflict, co-operation, risk, and reward issues” can be regarded as essential in efforts to manage relationships. They state that the efficiency of the supply chain can ultimately be seen as dependent upon efforts to develop trust among supply chain participants.

In an analysis of supply chains models, Thublier *et al*. (2010:12) identify one of the shortcomings of current models on supply chains as “insufficient trust and relationship building skills between suppliers, the focal firm, customers and consumers and inadequate process orientation including appropriate metrics, information and integration”. Thublier *et al*. (2010:12) went on to relate this shortcoming to efficiency and effectiveness of supply chains. From the evidence presented, trust is identified as one of the major human factors that counts as an antecedent to the efficiency of the supply chain. This will be tested empirically in chapter three.

From the above, it can be stated that the ability to trust, as well as trustworthiness of both the individual and the organisation, counts as the basics of business ethics and that it acts

as an antecedent with regard to the efficiency of the upstream supply chain. This construct will also be tested empirically in chapter three.

2.3.10 REPUTATION

Lack of documented empirical support precludes reputation from being a significant human factor impacting on supply chain efficiency, and does not support the idea of reputation as a human factor and antecedent in the efficiency of upstream supply chain. The information available on this topic indicates that it is more of an organisational factor than it is a soft issue.

As a result of the above, reputation could not be linked and discussed on the basis of reliable sources with regard to human factors and will not be included in further discussions during this study.

2.4 The relationship between human factors and supply chain efficiency:

It is evident from the previous paragraphs that some researchers have already spent some time on different aspects that can be regarded as relevant in supporting this study. The core facts being that the six selected human factors could be identified throughout the literature as mentioned as being influential on supply chain efficiency.

To clarify, the six selected factors that could be linked to the theme of this study on the basis of supportive data from reliable sources are:

1) **Individual's principles/morals** form an integral part of shaping human actions, as well as organisational culture. It also serves as foundation to the individual's place in the organisation and could act as antecedent to the efficiency of the upstream supply chain of the organisation (Coetzee, 2002:35; Mullarkey *et al.,* 1995:63).

2) **Individual's goals and company's goals for the individual - common goals,** directly impacts on human factors in the supply chain, as it forms the basis of

communication, goal setting, trust relationships and efficiency as part of supply chain performance (Coetzee, 2002:35; Kreitner & Kinicki, 2008:246).

3) **Personality,** different organisations will look for different personality traits as a result of differences in organisational cultures. Personality is who the individual is. It forms and influences the base level human actions, interactions and performance (Hogan & Benson, 2009:1; Harrison *et al*., 2002:1031 Kreitner & Kinicki, 2008:133).

4) **Ability and trainability:** Ability can be seen as part of the foundation of understanding between the individual and the organisation, and of what will be expected from the individual as an employee. In the context of this study, trainability on the other hand is regarded as the individuals' capability to learn and acquire skills, methods and systems in an appropriate way to influence upstream supply chain efficiency, also implementing the above-mentioned in adapting to operational and environmental requirements (Coetzee, 2002:121; Dierdorff & Surface, 2004:1; Gill, 2011:146).

5) **General skills and training**: A relational level of importance exists between the knowledge, skills and tools of both employees and suppliers to be able to do efficiently and effectively what is expected of them in their job. Training represents a blend of transactional-based and relationship-based strategies. Training therefore forms an integral part of successful companies' employment programmes and is normally absent in less successful companies (Kreitner & Kinicki, 2008:138; Monczka *et al*., 2010:9; Thublier *et al*., 2010:12).

6) **Mutual trust and understanding:** It can be stated that the ability to trust, as well as trustworthiness of the individual and the organisation, form the basics of business ethics and that it definitely acts as an antecedent with regard to the efficiency of the upstream supply chain (Bowersox *et al.,* 2010:378; Kreitner and Kinicki, 2008:317; Monczka *et al*., 2010:111)

2.5 Chapter summary

Monczka *et al*. (2010:470) explain that the importance of measuring supply chain performance is important for forming and adapting business strategies deemed as essential to the competitive organisation in terms of efficiency, profitability and effectiveness. They identify four main reasons, namely: 1) to act as a supportive tool with regard to better decision making, 2) it enables and support more efficient communications in the organisation as well as to supply chain partners, 3) it enhances the availability of feedback with regard to performance on an individual as well as organisational level and, 4) it can be seen as a motivational factor to reason direct and indirect behaviour between the individual as well as organisations.

Literature states that upstream supply chain efficiency can be seen as dependent on the existing human factors, regarded as antecedents and this study aims to clarify this concept by investigating the perception of upstream supply chain efficiency from the customer's point of view. The author attempted to identify predictors based on selected human factors that might enable management to ultimately increase efficiency by understanding the influence it has on the upstream supply chain's efficiency. Human factors can be seen as soft issues, which are the most difficult constructs to manage in any environment with very little available research that has been done on its effect, specifically in this field of upstream supply chain efficiency.

Baltzan and Phillips (2010:167) state that the critical success factor (CSF) is a factor that is critical to an organisation's successes.

When combining the two statements above, it may be accepted that human factors have become critical success factors to today's organisation. It has thus become imperative for the organisation to understand what influence these human factors as critical success factors have on their daily business ventures and how to manage them to create and sustain a competitive advantage in any industry.

The identification of human factors as done throughout Chapter 2, as well as its prevalence, may bring some clarity to its influence on the efficiency of the upstream supply chain.

The FAA Systems safety handbook (2000:17-1) states that human factors may be considered as relevant when an organisation's strategy, planning, cost and schedule baselines are taken into consideration. Consideration should also be given to integration of human factors into these aspects. It may also be viewed as an element of the technical trade-offs and the spin-off that may arise from doing that, is that performance may in all probability, increase. The understanding of human factors that have an influence on efficiency can also affect staff turnover positively and secondarily, lower staff training and retraining expenses.

Atrainability.com (2012:Online) states that psychologists have been interested in the cognitive and social factors that affect workers' performance and minimise error occurrence for many years. The fact remains that human error cannot be eliminated and remains an essential part of the human condition. Humans who act professionally will always try to avoid making errors, although even the most highly trained and motivated professionals will inevitably make mistakes. By attempting to understand the human factors involved in daily operations, trainers might attempt to mitigate the antecedents of such errors.

In summary, the following human factors were identified in theory as antecedents to the efficiency of the upstream supply chain: 1) Individual's principles, 2) Individual's goals and company's goals for the individual - common goals, 3) Personality,
4) Ability/Trainability, 5) General skills and training, and 6) Mutual trust and understanding. They will all be tested empirically in Chapter 3 in an attempt to validate theory.

Theory, as discussed in Chapter 2 proved that each of the above actually has some influence on the efficiency of the upstream supply chain and that supply chains in general are dependent on human factors.

CHAPTER 3

EMPIRICAL RESEARCH

3.1 Introduction

This chapter will discuss the empirical research that was done in detail. The primary objective was to determine which of the selected human factors had a significant effect on the efficiency of the upstream supply chain of an organisation and if its results would correspond to the literature study of Chapter 2. Secondarily, the objective has been to determine the effect these selected human factors have on the efficiency of the upstream supply chain.

The approach to the study is addressed in this chapter. It will provide explanations to the following aspects:

- Research design.
- Research instruments that were used.
- How data was collected.
- Analysis of data retrieved from the research instruments.
- A summary of the research question, based on the analysis of information retrieved from the measuring instruments will be discussed in an attempt to clarify the answer to the research question.

3.2 Data gathering:

3.2.1 Research design:

The research design can be seen as the map of how research participants will be gathered, as well as to the methods that will be used to gather information from them. By doing this, researchers aim at the development of methodical approaches to formulate answers and give clarity with regard to a research problem or hypothesis (Wellman, Kruger & Mitchell, 2010:52). Researchers usually adopt one of three research approaches in their efforts to gather meaningful information in their research efforts, namely:

Quantitative or qualitative or sometimes a combination of quantitative and qualitative research. The quantitative research paradigm focusses on the quantification of constructs studied from an outsiders' perspective by means of objective numbers based data (Babbie & Mouton, 2010:49; Welman *et al.*, 2010:8). The qualitative research paradigm design does not focus on numbers, but rather on the quality of the information and is aimed to attain an insiders' perspective. (Babbie & Mouton, 2010:53; Welman *et al.*, 2010:8).

A **quantitative** research paradigm was selected in an attempt to meet the research objectives.

The basic design of the research has been to utilise a research instrument to determine the influence of selected human factors as antecedents to the efficiency of the upstream supply chain. The six constructs that were identified in Chapter 2 as being influential with regard to the upstream supply chain efficiency were included as variable and tested accordingly. The research instrument is in the form of a questionnaire, testing five different constructs separately as well as in relation to one another. The data gathered with the questionnaires, have been statistically analysed as reported in 3.3 later on in this chapter.

3.2.2 Scope:

The study focussed on statistically and empirically testing the influence of selected human factors as antecedents to the efficiency of the upstream supply chain. Data was gathered from subjects mainly found in managerial positions with the specific focus on supply chains. Subjects were asked complete the questionnaires, with the person they deal with most in their upstream supply chain in mind, in an attempt to increase specificity of the data gathered from the questionnaire.

3.2.3 Description of sample population:

A method of **non-probability sampling** has been used by means of **convenience sampling**. The term non-probability sampling means that the probability that any element or unit of analysis will be included cannot be specified (Welman *et al.*, 2010:67). The term convenience sampling means that those subjects that were easiest to obtain in an attempt to attain a sample, were used (Welman *et al.*, 2010:67). The population consisted of all

individuals employed in upstream supply chains. The target population consisted of first and second year MBA students at the North-West University as well as individuals outside the academic environment, a total of 180. Although the chances of convenience sampling being representative are described by (Welman *et al.*, 2010:70) as very low, the sample in this study can be seen as representative due to the fact that it has focussed on individuals in managerial positions currently in the process of studying for their Master's Degree in Business Administration (MBA), as well as individuals in managerial positions outside the academic environment. These individuals have been selected from three basic groups, namely: first year MBA students, second year MBA students and individuals in management positions outside the academic environment. The motivation behind selecting MBA students has been that individuals who were enrolled were perceived to be representative of the supply chain environment, representing different industries and filling different positions on various levels of authority throughout the supply chain. The focus has NOT been to enrol on the basis of participation in the MBA course, but rather as individuals playing a role in the supply chain. A total number of 180 questionnaires were distributed and 145 (80.6%) of the distributed questionnaires were gathered from responding individuals.

A secondary distinction has been made on the basis of: first year MBA students, second year MBA students and individuals in management positions outside the academic environment for reasons of interest and in an attempt to establish if perception would differ with more exposure to theory on the subject, and if so, to what extent. These participants were tested using the above-mentioned questionnaire. More detail to the composition of the study population is supplied in table 3.1 below:

Table 3.1 Target population details:

Sample population group:	Number of participants:	Percentage representation:
First year MBA Students	48	33.1%
Second year MBA students	67	46.2%
Managers outside the MBA environment.	30	20.7%
Total:	145	100%

In addition to the questionnaire, the author had the privilege of an unstructured interview with a representative of a Fortune 500 company on a recent visit to China. This has been done in an attempt to gather as much insight as possible into human factors as antecedents to the efficiency of the upstream supply chain. The information as shared has been found to be reliable and extremely useful, based on supportive literature as stated in Chapter 2. The interview itself has been dealt with in Chapter 2 as part of the literature study. Mr LU Bin is the Deputy Supervisor of the logistics department of a Fortune 500 organisation and information gathered from his interview partly served as one of the corner stones to this study.

3.2.4 Research instrument:

A survey instrument, in the form of a questionnaire, has been developed through application of data that was gathered in the literature study (Chapter 2). The questionnaire was structured in three sections, namely: Section A: Demographic information, Section B: Background information and Section C: Actual empirical research, as can be seen below. It has been developed by the author and measured six different predetermined constructs, each with approximately five different questions of its own that were focussed on the underlying construct itself. The actual questionnaire has been developed by the author in collaboration with a specialist in the field of operations management and can be referred to in Appendix A.

Constructs and Questions:

Section A: Demographic information:

A1: Gender.
A2: Race.
A3: Highest qualification.
A4: Employment history with regard to type of employee the individual works for.
A5: Industry sector of **your** organisation
A6: Industry sector of **your supplier's** organisation
A7: The individual's role/level in the organisation
A8: In which province in South Africa do you work?
A9: Age.

Section B: Background Information (Likert scale questions)

B1.1 to B1.5: What is the nature of the relationship between you and your suppliers?

B2: How often do you interact with your suppliers?

B3: How often do you exchange information and knowledge with regard to the required service/product with your suppliers?

B4: How do you **mainly** interact with your suppliers?

B5: What kind of information do you receive from your suppliers?

B6: Please indicate how long, on average, does a supplier take to fulfil your order?

B7: An efficient supply chain is best described by the following:

B8: Do you get feedback from your suppliers and what do you do with this feedback? (Open ended)

B9: Do you get feedback from your suppliers and what do you do with this feedback? (Open ended)

Section C: Human Factors (Likert scale questions)

- CA1 to CG 6 consisted of four-point Likert style questions that could be answered as: 1) Strongly disagree, 2) Disagree, 3) Agree and 4) Strongly agree.
- This has tested the subjects' perception of a particular construct with regard to its influence on upstream supply chain efficiency.
- Constructs were divided into the following:

  - CA: Individual's principles/morals.
  - CB: Individual's goals and company's goals for the individual - common goals.
  - CC: Personality.
  - CD: Ability/trainability.
  - CE: General skills and training:
  - CG: Mutual trust and understanding

The questionnaire focussed on testing the constructs as mentioned below under section C by means of recording the individual's perceptions mainly through **four-point summated or Likert scaled questions**, consisting of an assortment of statements referring to attitudinal objects, where subjects had to indicate how they perceive each statement with regard to a certain statement (Welman *et al.* 2010:157) as: 1) Strongly disagree, 2) Disagree, 3) Agree and 4) Strongly agree. These constructs have been created intentionally and can be seen as conceptual ideas used to characterize a differing

compilation of behaviours or observable fact (Welman *et al*, 20010:21). A four-point Likert scale has been used in an attempt to force subjects to take a definite stand with regard to answering the questions, ensuring conclusive data. Subjects could either respond positively or negatively to the questions, with an option to the degree to which they agreed or disagreed.

3.2.5 Collection of data:

Questionnaires have been handed-/sent out by the author and collected from the target population in hard copy as well as per electronic mail. Assistance has been obtained from the Statistical Consultation Services of the North-West University for further analysis of the data.

The participating population have been guaranteed that their responses would be recorded anonymously and that their participation could in no way be traced back to the individual, as no personal information was recorded on the questionnaires. The population has been invited to attain the results of the study from the North-West University, once the study has been completed.

3.2.6 Results:

Results have been interpreted on the basis of:

- Descriptive statistics.
- Confirmatory factor analysis.
- Reliability.
- Correlation.
- Paired T-Tests, and
- Anovas.

3.3 Descriptive statistics and Frequency analysis:

The Statistical Consultation Services of the North-West University performed descriptive statistics and frequency analysis with the use of IBM SPSS Statistics Version 20, Release 20.0.0 (2011) on the dataset. They also assisted in capturing the data from the questionnaires and creating a dataset.

3.3.1 Sample population: demographic and background information (Sections A and B of questionnaire)

A total number of 180 questionnaires have sent out and 145 questionnaires gathered from responding individuals. These 145 responses have been retained for analysis and calculated as a response rate of 81%.

What has been interesting is the fact that only 28% of the population are female and that 72% of the population are male as shown in Figure 3.1. 42% of all respondents have a degree and another 42% have a post-graduate degree. 26% of all respondents have a diploma or lower qualification. One respondent did not answer the question.

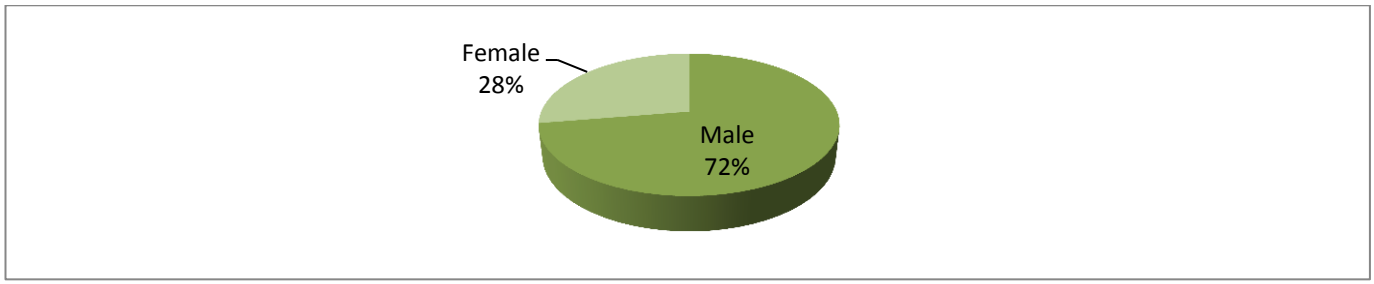

Figure 3.1: Gender division of population.

Respondents have been asked to identify the type of organisation they have worked for the previous three months. Figure 3.2 illustrates that 56% of respondents are currently working in the private sector, 15% in the public sector, 14% work for multinational organisations and 15% are self-employed or work for an entrepreneur. Three individuals did not answer the question. Multinational organisations and “working for an entrepreneur” can in actual fact be seen as a sub-level of the private sector, the division has been made in an attempt to establish if there is any noticeable difference in that could be allocated to this category.

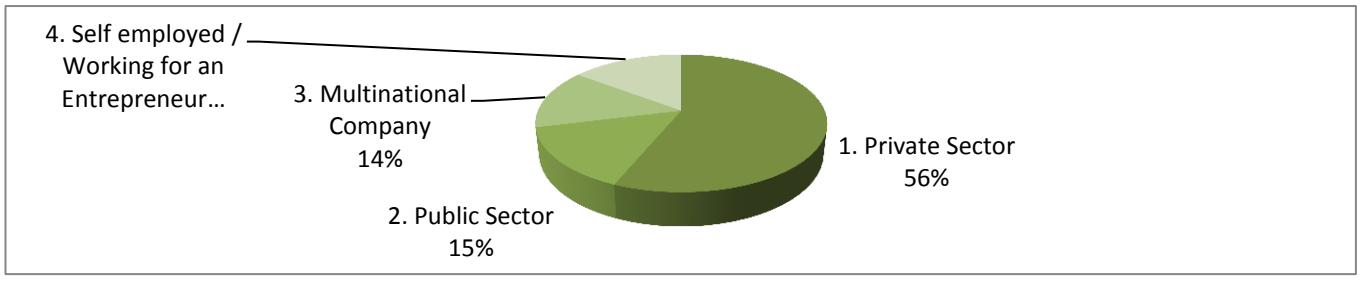

Figure 3.2: Three month employment history

Respondents have also been asked to identify the type of industry in which they were employed. The numbers illustrated in figure 3.3 indicate the responses: 42% were employed in manufacturing, mining or product beneficiation, 36% were employed in the service or professional industry and 22% in distribution, financial or retail. Four individuals did not answer the question.

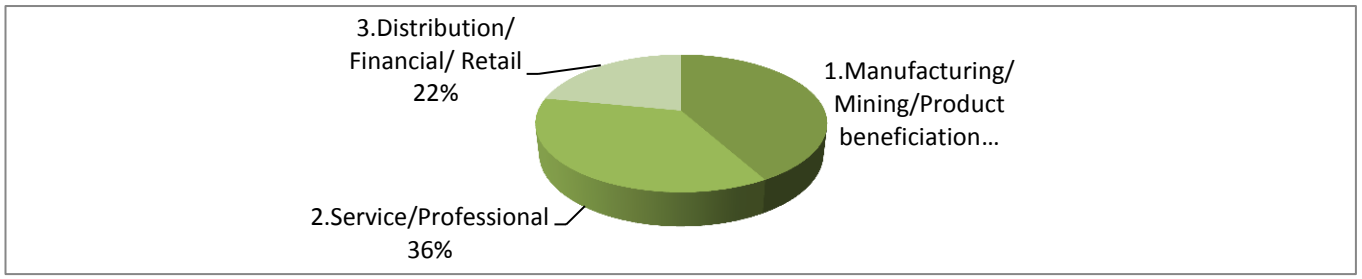

Figure 3.3 Industry Sector of Employment

It has also been asked to which sector the respondents' suppliers could be allocated to and the numbers are illustrated in figure 3.4 below as 45% being in manufacturing, mining or product beneficiation, while 29% are employed in the service or professional industry, and 26% in distribution, financial or retail. 4 individuals did not answer the question.

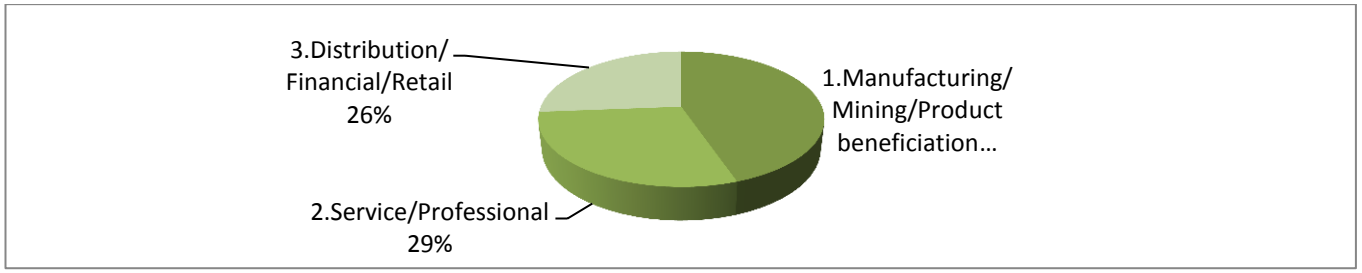

Figure 3.4 Industry Sector of suppliers

Although convenience sampling has been used, the results are as expected with regard to respondents being in managerial positions as shown in figure 3.5, with 23% being in top management, 55% in middle management and only 22% not being in management at the moment. 2 individuals did not answer the question.

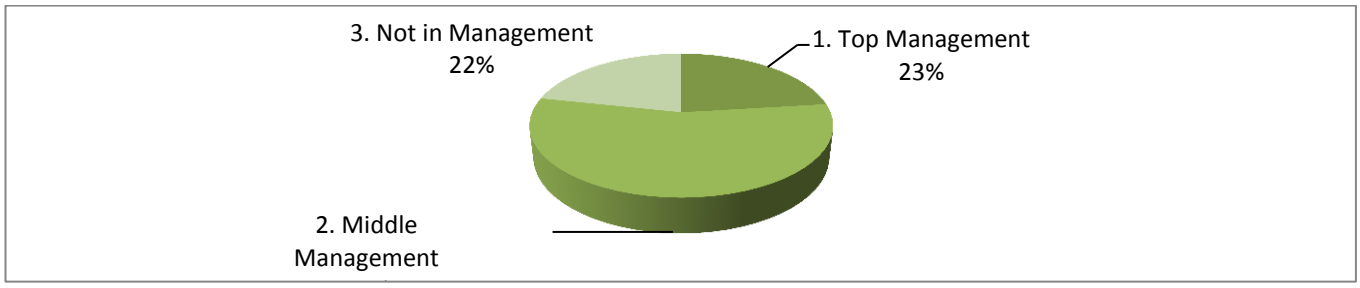

Figure 3.5 Role / Level in the organisation

The average age of respondents was 36 years, with the minimum age being 22 years and the maximum being 57 years with a standard deviation of 7.9.

From the above it is evident that the respondents constituting the sample for the study can be seen as representative of the target population, being individuals mainly employed in managerial position in the supply chain environment.

Figure 3.6 shows that 51% of participants are from the Gauteng province, 23% from North West, 16% from the Free State, 4% from Mpumalanga, 2% from Limpopo, 2% from KwaZulu Natal, 1% from the Eastern Cape and 1% from the Northern Cape. Ten participants did not answer the question.

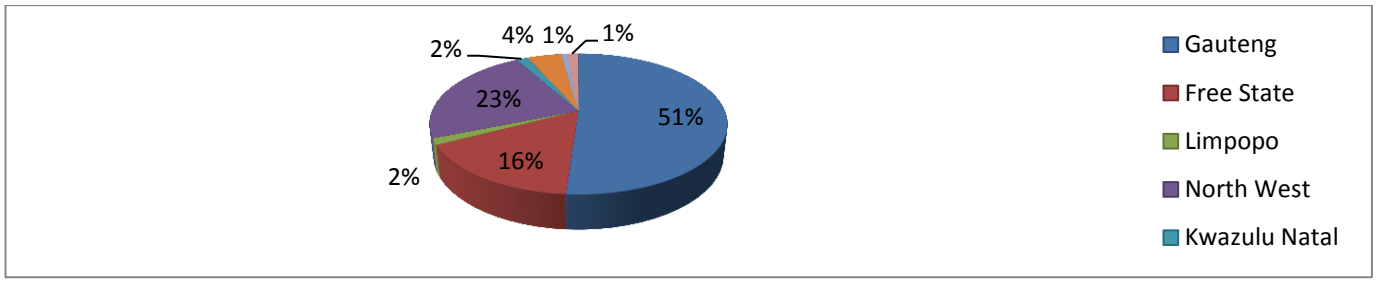

Figure 3.6 Provinces represented in the data

On trying to determine what the relationship between clients and their suppliers are in the upstream supply chain with regard to the sample population, it had been reported that 49% of the relationships are based on formal contracts, 9% are based on verbal contracts or agreements and 42% are based on a combination of formal and verbal contracts as detailed in figure 3.7 below. Nine individuals did not answer the question.

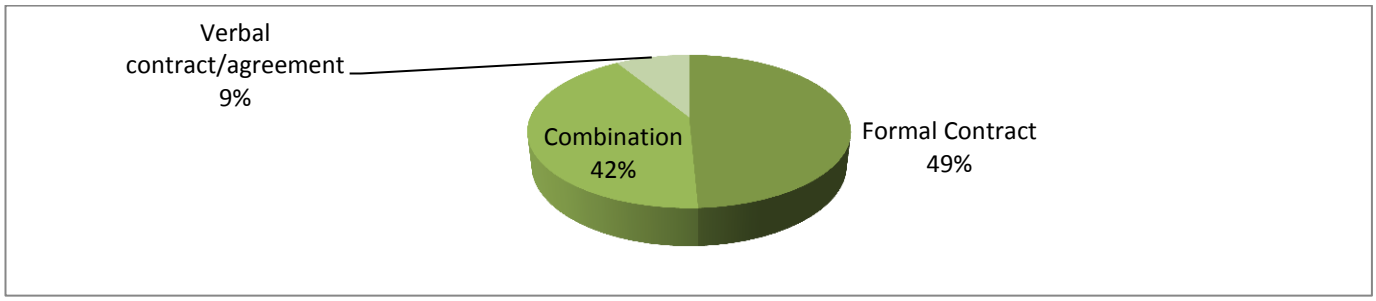

Figure 3.7 Type of business relationship

In supporting the above notion to determine what the relationship is between clients and their suppliers in the upstream supply chain with regard to the sample population, respondents were asked to respond to the following statement: " What is the nature of the relationship between you and your suppliers?". On the statement of the client setting the terms to the business relationship, 19% strongly agreed, 49% agreed, 23% disagreed and 9% strongly disagreed as illustrated in figure 3.8 below. Four individuals did not answer the question. This indicates that the bargaining power in a business relationship is perceived to be largely in the hands of the client with the client mostly setting the terms with regard to doing business. Four individuals did not answer this question.

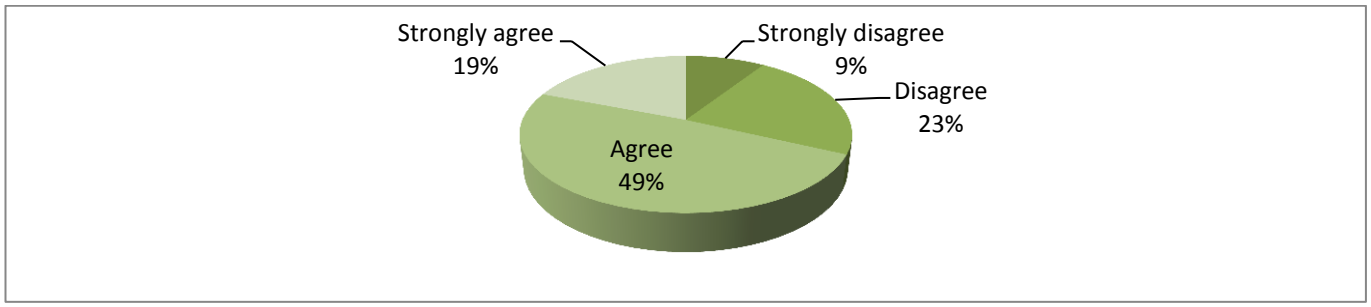

Figure 3.8 You set the terms in the relationship with your supplier

Also in support of the above, the sample population has been asked if they felt that their suppliers are dependent on them. Four individuals did not answer the questions. 20% strongly agreed, 48% agreed, 23% disagreed and 9% strongly disagreed that their suppliers were dependent on them as illustrated in figure 3.9 below. The results show that a combined 68% of participants agreed or strongly agreed to that they believed their suppliers were dependant on them as clients. This supports the perception that the client set the terms as in figure 3.8 above.

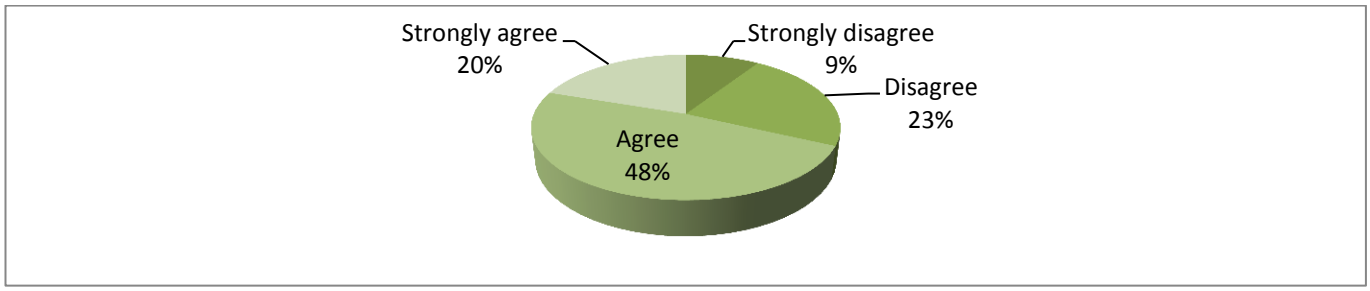

Figure 3.9 My supplier is dependent on me as a customer.

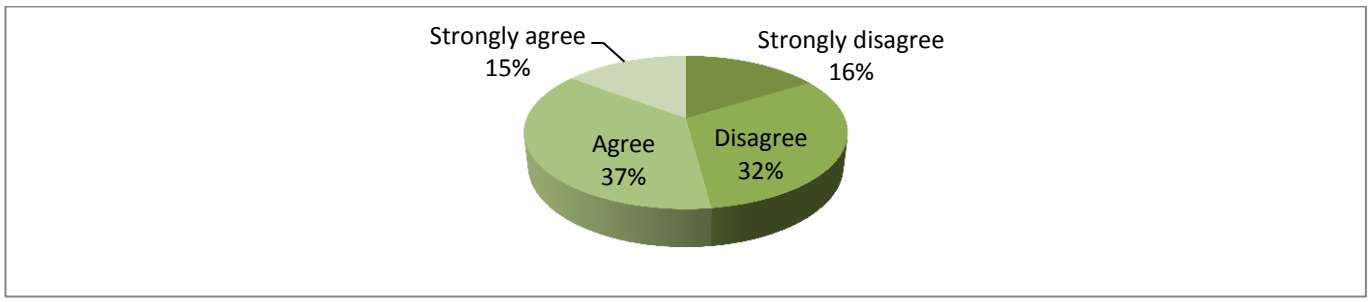

Figure 3.10 I am dependent on a specific supplier

On the question of if participants believe that they are dependent on a specific supplier, three participants did not answer the question. The results are illustrated in figure 3.10. 15% strongly agreed, 37% agreed, 32% disagreed and 16% strongly disagreed that they are dependent on a specific supplier. The results basically show that 52% of participants replied that they are dependent on their suppliers and 48% do not share this notion.

On the question asked if participants are satisfied with their business relationship with their suppliers, 17% strongly agreed, 71% agreed, 8% disagreed and 4% strongly disagreed as illustrated in figure 3.11. Three participants did not answer the question. Responses to the above two questions indicates a strong mutual dependence.

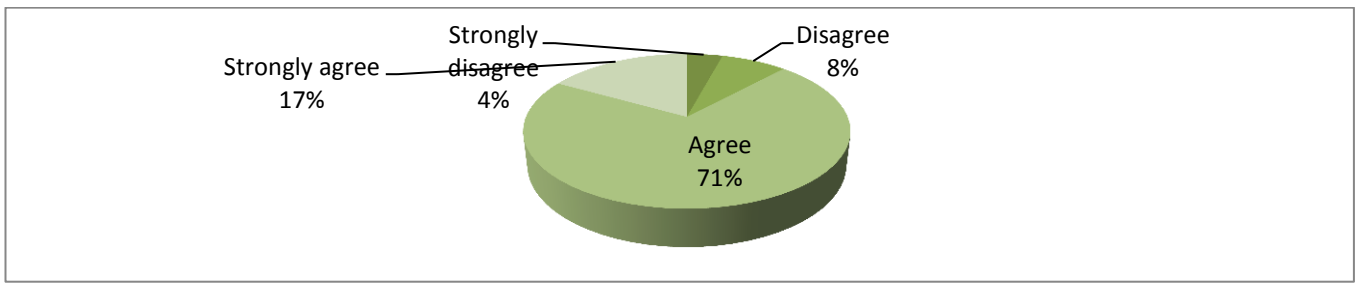

Figure 3.11 I am satisfied with the business relationship.

When asked how often they interact with their suppliers, 32% replied on a daily basis, 25% on a weekly basis, 36% replied at least once a month and 8% replied at least once in

three months. Four individuals did not answer the question. They were also asked how often they exchange information with suppliers and 13% replied daily or more often, 52% replied weekly to daily, 27% replied less than monthly and 8% replied never. Three individuals did not answer this question.

When asked how participants mainly interact with their suppliers, 41% replied directly, 32% replied face-to-face and 21% replied through an enterprise resource planning system. Nineteen individuals did not answer this question.

An efficient supply chain is best described by the following:

Respondents have also been asked to answer the question of: “An efficient supply chain is best described by the following” using a four-point Likert scale, measuring the participants’ perceptions of what he/she would regard as an efficient value chain on 1) strongly disagree, 2) disagree, 3) agree and 4) strongly agree. Results are tabulated in table 3.2 as well as figure 3.12. Participants had to evaluate 10 key elements of efficient supply chains, namely: Cost saving, short delivery time, flexibility in terms of orders, high inventory turnover rates, low weeks of supply in inventory, high production rates, strong information linkages, high capacity utilisation rates, “doing things right” and the ability to accept changes to an order and still deliver on time.

More than 40% of respondents **strongly agreed** that short delivery time, “doing things right” and the ability to accept changes to an order and still deliver on time, are the most important attributes of an efficient supply chain as shown in table 3.2 as well as figure 3.12.

More than 50% of respondents **agreed** that: Cost saving, flexibility in terms of orders, strong information linkages, high capacity utilisation rates, are the most important attributes of an efficient supply chain as shown in table 3.2 and figure 3.12.

More than 40% **disagreed** that low weeks of supply in inventory (as explained on page 18) is an important attribute to supply chain efficiency as shown in table 3.2 as well as figure 3.12. This may be due to the possibility that respondents may not have known or understood the term and that their perceptions with regard to the concept might have been different as to what the literature, as discussed in Chapter 2 explains. It may also point to

the possibility of unsuccessful efforts to adopt and implement a philosophy of just-in-time ordering.

Very low percentages of the participants strongly disagreed to the attributes as can be seen in table 3.2 as well as figure 3.12.

Table 3.2 Response to the question of: An efficient supply chain is best described by the following

Question:	B 7.1	B 7.2	B 7.3	B 7.4	B 7.5	B 7.6	B 7.7	B 7.8	B 7.9	B 7.10
	Cost saving	Short delivery time	Flexibility in terms of orders	High inventory turnover	Low weeks of supply in inventory	High production rates	Strong information linkages	High capacity utilisation rates	"Doing things right"	Ability to change an order and still deliver on time
Strongly disagree	0	0	1	6	5	5	0	2	0	1
Disagree	6	4	11	24	43	26	7	8	3	6
Agree	61	44	57	48	37	49	58	59	48	47
Strongly agree	32	51	31	22	15	19	35	31	49	45
No response in units	3	3	5	8	11	9	4	4	4	4

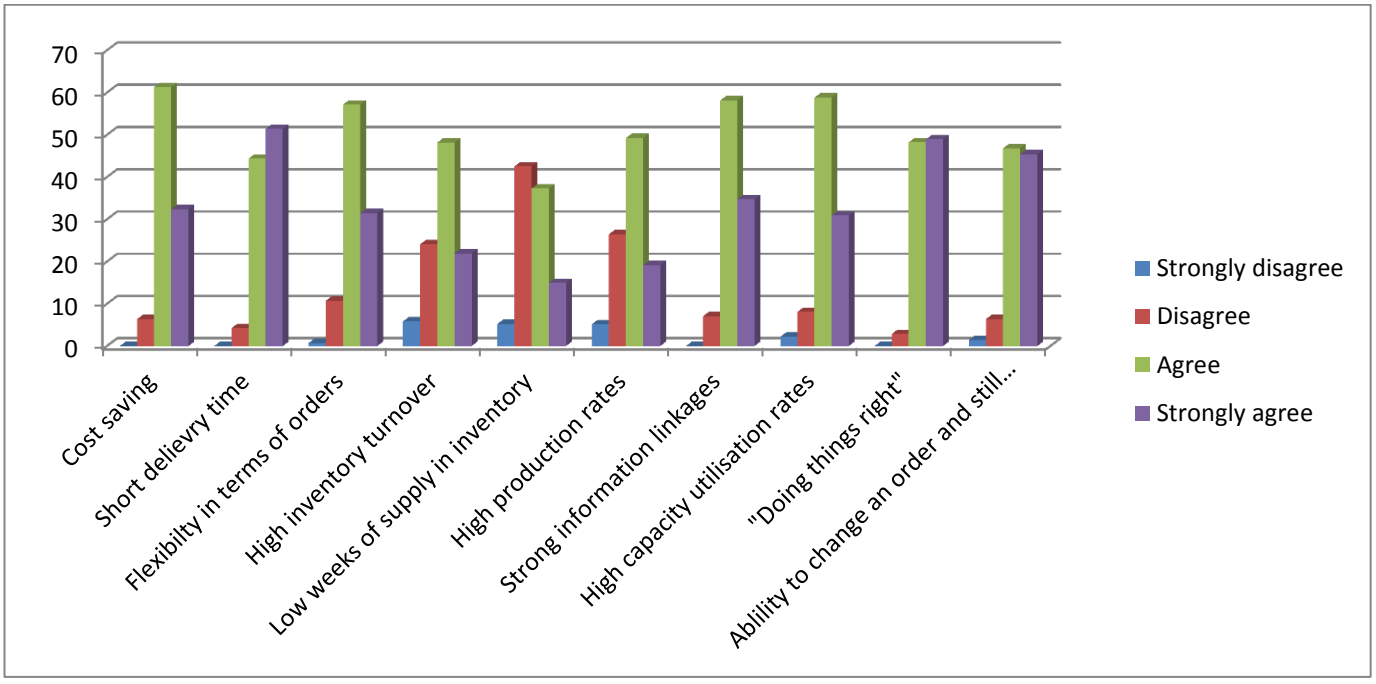

Figure 3.12 Response to the question of: An efficient supply chain is best described by the following

3.3.2 *Descriptive statistics on the constructs (section C of questionnaire) that were tested in the questionnaire:*

Field (2009:22) describes the mean of a sample as a "measure of central tendency" that can be described as the average score. Levine, Stephan, Krehbiel and Berenson (2008:97) describe the mean as "the common measure of central tendency" which indicates a balance point in a dataset. It is commonly seen as the average value in a data set.

Levine *et al.* (2008:107) state that the standard deviation with regard to a sample is the average scatter of values around the mean that can be seen as the quantification of the degree of distinction found in a frequency distribution, indicating the spread (close or wide) of data with regard to the mean. The higher the standard deviation, the larger or wider the data is spread around the mean (Field, 2009:38).

The mean and standard deviation for each of the questions within each construct are given in tables 3.3 to 3.8.

Table 3.3: Descriptive statistics - Section CA, Individual's principles / morals:

Descriptive Statistics		% strongly disagree	% disagree	% agree	% strongly agree	Missing	**Mean**	**Std. Deviation**
Section CA: Individual's principles / morals:								
CA 1	My individual principles (such as ethics, work ethics, etc.) make me efficient in my work	1	3	52	43	0	**3.39**	**0.59**
CA 2	Principles that may increase my efficiency can be learned from training programs (such as Kaizen, Total Quality Management and Total Quality Control).	1	8	62	28	0	**3.17**	**0.63**
CA 3	People with different sets of **principles** can still have a productive working relationship.	2	17	62	19	1	**2.99**	**0.67**
CA 4	My principles make me committed to my work	1	3	58	38	1	**3.33**	**0.58**
CA 5	My supplier's principles definitely influence the efficiency of my upstream supply chain.	0	10	59	31	1	**3.21**	**0.61**

Table 3.4: Descriptive statistics - Section CB, Individual's goals and company's goals for the individual - common goals:

Descriptive Statistics		% strongly disagree	% disagree	% agree	% strongly agree	Missing	Mean	Std. Deviation
Section CB: Individual's goals and company's goals for the individual - common goals:								
CB 1	My career goals have an influence on my efficiency at work.	0	4	46	50	1	**3.46**	**0.58**
CB 2	My personal goals influence my choice of a supplier.	10	32	39	19	0	**2.67**	**0.89**
CB 3	Clear communication of company goals motivates employees to be efficient.	1	6	52	41	1	**3.33**	**0.65**
CB 4	My efficiency with regard to my suppliers is impacted on negatively when my colleagues make fun of my personal career goals	14	50	27	9	1	**2.31**	**0.82**
CB 5	Performance goals motivate me to be efficient in my daily activities (with regard to my actions pertaining to the supply chain that I work in).	1	7	62	30	2	**3.20**	**0.62**

Table 3.5: Descriptive statistics - Section CC, Personality:

Descriptive Statistics		% strongly disagree	% disagree	% agree	% strongly agree	Missing	Mean	Std. Deviation
Section CC: Personality:								
CC 1	My personality influences me to be efficient in my daily dealings with my suppliers.	1	8	56	35	1	**3.26**	**0.63**
CC 2	Personality conflicts will inhibit upstream supply chain efficiency.	5	28	54	13	2	**2.76**	**0.74**
CC 3	My supplier's efficiency will benefit from implementing personality profiling before employing individuals.	5	24	59	13	2	**2.79**	**0.72**
CC 4	Personality rather than ability influences the decision of which suppliers to deal with.	19	49	24	8	2	**2.22**	**0.85**

Table 3.6: Descriptive statistics - Section CD, Ability/trainability:

Descriptive Statistics		strongly disagree	% disagree	% agree	strongly agree	Missing	Mean	Std. Deviation
Section CD: Ability/trainability:								
CD 1	The person that I deal with mostly at my main supplier has the required abilities to serve me as customer.	1	9	75	15	2	**3.05**	**0.52**
CD 2	My suppliers' can increase efficiency by focussed training of their employees.	1	6	62	30	4	**3.23**	**0.59**
CD 3	To ensure efficiency of the upstream supply chain, my organisation strives to apply my abilities to the maximum.	1	15	65	20	4	**3.04**	**0.61**
CD 4	By employing only candidates with the correct abilities, my supplier increases upstream supply chain efficiency.	0	15	65	20	4	**3.05**	**0.59**
CD 5	Suppliers' ability to fulfil my orders efficiently influences my choice to deal with certain upstream suppliers.	0	9	57	35	4	**3.26**	**0.61**

Table 3.7: Descriptive statistics - Section CE, General skills and training:

Descriptive Statistics		% strongly disagree	% disagree	% agree	% strongly agree	Missing	Mean	Std. Deviation
Section CE: General skills and training:								
CE 1	Targeted training programs to the people that directly deal with my suppliers increases efficiency in the upstream supply chain.	1	8	74	17	2	**3.07**	**0.53**
CE 2	The opportunity for self-improvement in my organisation spills over into the efficiency of my supplier.	2	25	58	15	3	**2.85**	**0.68**
CE 3	Employees in the upstream supply chain with the opportunity for self-improvement in **their** organisations are highly motivated to increase the efficiency of **my** upstream supply chain.	1	18	65	16	4	**2.94**	**0.63**
CE 4	My suppliers' efficiency is influenced by focussed training of their employees.	1	13	67	20	3	**3.06**	**0.59**
CE 5	My organisation's shortage of a certain skill supplies the opportunity for another organisation that produces an individual with that specific skill to operate efficiently within my upstream supply chain.	0	19	62	19	5	**3.01**	**0.62**

Table 3.8: Descriptive statistics - Section CG, Mutual trust and understanding:

Descriptive Statistics		% strongly disagree	% disagree	% agree	% strongly agree	Missing	Mean	Std. Deviation
Section CG: Mutual trust and understanding:								
CG 1	Shared vision between the individual and the organisation increases upstream supply chain efficiency.	0	4	63	37	3	**3.33**	**0.54**
CG 2	Mutual trust between the individual and the organisation is a prerequisite for efficiency in the supply chain.	0	2	48	50	2	**3.48**	**0.54**
CG 3	Successful relationships in the upstream supply chain are dependent on mutual trust between supply chain partners.	1	4	54	41	3	**3.35**	**0.60**
CG 4	Successful relationships in the upstream supply chain are dependent on mutual understanding between supply chain partners.	1	4	63	32	3	**3.26**	**0.57**
CG 5	The organisation's level of trust in me positively affects the efficiency with which I deal with my suppliers.	0	7	58	35	4	**3.28**	**0.59**
CG 6	Mutual understanding between supply chain partners is a prerequisite for efficiency in the supply chain.	0	5	65	30	5	**3.25**	**0.54**

Table 3.9: Descriptive statistics – Mean and standard deviation values of Factors / Constructs

Descriptive Statistics - Factors / Constructs			
	N	Mean	Std. Deviation
CA: Individual's principles / morals	145	**3.22**	**0.38**
CB: Individual's goals and company's goals for the individual - common goals	145	**2.99**	**0.44**
CC: Personality	144	**2.76**	**0.48**
CD: Ability/trainability	143	**3.13**	**0.36**
CE: General skills and training	144	**2.99**	**0.42**
CG: Mutual trust and understanding	144	**3.33**	**0.41**

Table 3.9 illustrates the mean and standard deviation calculated for each of the six different constructs (human factors) that were tested in the questionnaire. It can be derived that the constructs (human factors) tested were also closely aligned. It is therefore suggested that participants viewed all six human factors that were tested as relevant with regards to upstream supply chain efficiency and that none of them were seen as irrelevant with regard to the concept.

It would be relevant to note that the construct of *Mutual trust and understanding* has yielded the highest mean of 3.33, with a standard deviation of .041. Second was the construct of *Individual principles and morals* which had a mean of 3.22 and a standard deviation of 0.38. This indicate the two constructs as the most important human factors influencing the efficiency of the upstream supply chain. The mean values and standard deviations of the six selected constructs (human factors) are closely aligned and yielded to be positive on the basis of a score of 3 = agree and 4 = strongly agree in the questionnaire.

This outcome has been expected and corresponds with the literature research reported in Chapter 2.

3.4 Confirmatory factor analysis:

Validity, according to Babbie and Mouton (2007:122-123), refers to the “extent to which an empirical measure adequately reflects the meaning of the concept under consideration” and can be broken up into 1) criterion-related validity which is based on the influence of some external criterion, 2) construct validity which is based on logical relationships between constructs and, 3) content validity, based on the measurement of the extent to which a certain measure explains the variety of meanings incorporated into the tested construct.

Construct validity has been used to determine the validity of the questionnaire as used in the research through the use of **multiple access factoring as well as direct oblimin** as the rotation method.

The above has also been used to determine if the questions covered the full range of the constructs (Field, 2009:12). Field (2009:12) also explains that validity may only be seen as a sufficient measure when reliability has been proven. Validity is primarily important if the researcher plans to use the results from the research instrument in an attempt to understand other aspects as well (Field, 2009:11), and claims that the successful measurement of constructs should relate to others in some logical way as well (Field: 2009:123).

Confirmatory factor analysis (CFA) is an edition to factor analysis to test specific hypotheses with regard to structure and relations considering associations connecting underlying latent variables (Field, 2009:783) and suggests that CFA can be seen as a method to empirically evaluate construct validity. Babbie and Mouton (2007:123) suggest that where CFA is applied, it can be used to assess if a relationship exist between observed variables or constructs with their principal latent constructs included. CFA was done by the Statistical Consultation Services of the North-West University by means of SAS (2011) software, using the dataset as derived from the questionnaires. The Kaiser-Meyer-Olkin (KMO) measure of sample adequacy has also been used and is discussed later on in this chapter, also explaining variation and communalities.

3.5 Reliability:

The reliability and validity of the questionnaire has been tested before the analysis was done. Field (2009:673) also states that the reliability of a scale must be confirmed where factor analysis is used to determine if the conclusions that will be derived may be seen as conclusive.

Field (2009:673) explains that the purpose of a questionnaire is to provide results that may be regarded as consistent, dependable and truthful. Babbie and Mouton (2007:119) explain reliability as “a matter of whether a particular technique, applied repeatedly to the same object, would yield the same result each time”.

Field (2009:674) explains that the Cronbach method of determining reliability of a questionnaire is “most commonly used as a measure of scale reliability” and is founded in a method of splitting data in two. These splits are done in every possible way, thereby

determining the correlation coefficient for every split. An average value on all the correlation coefficients of all the splits is then calculated and will be equal to Cronbach's alpha. Field (2009:675) also quotes Kline with regard to acceptable values of Cronbach's alpha as follows: "Kline (1999) notes that although the generally accepted value of 0.8 is appropriate for cognitive tests such as intelligence tests, for ability tests the cut-off point of 0.7 is more suitable. He goes on to say that when dealing with psychological constructs, values below even 0.7 can, realistically, be expected because of the diversity of the constructs being measured." Field (2009:675) states that values of $p > 0.5$ may thus also be used, but interpretation should be done with caution.

The Cronbach's alpha coefficient has been calculated by the Statistical Consultation Services of the North-West University by means of SAS (2011) software for each of the six constructs tested and has been used to determine reliability on internal consistency. All constructs yielded values of above 0.5 for Cronbach's alpha as shown in table 3.10, with two constructs standing out from the rest. These two constructs were those of CE, general skills and training scoring 0.71 and CG, mutual trust and understanding scoring 0.83.

As a result of the discussion above, the mean results from the questionnaire have been interpreted as reliable and could be used to draw conclusions on the influence of selected human factors as antecedents to the efficiency of upstream supply chains, represented by six different constructs. Further analysis of the responses to each individual question has been found to be unnecessary.

Table 3.10 Reliability statistics.

Reliability	Cronbach's Alpha	Mean	Std. Deviation
CA: Individual's principles / morals	0.56	3.22	0.38
CB: Individual's goals and company's goals for the individual - common goals	0.58	2.99	0.44
CC: Personality	0.53	2.76	0.48
CD: Ability/trainability	0.57	3.13	0.36
CE: General skills and training	0.71	2.99	0.42
CG: Mutual trust and understanding	0.83	3.33	0.41

3.6 Correlation matrix:

The Keiser-Meyer-Olkin (KMO) measure of sampling adequacy has been used to determine sample adequacy. According to Field (2009:547), the KMO can be calculated for individual as well as multiple variables, representing the ratio of the squared correlation between variables to the squared partial correlation of variables. The value of the KMO statistics varies between 0 and 1. A value of 1 indicates that patterns of correlations are relatively compact and that factor analysis should yield distinct and reliable factors. A value of 0 indicates the opposite of 1. Values should be larger than 0.5 with between 0.5 and 0.7 seen as mediocre adequacy, and between 0.7 and 0.8 as good adequacy. Values between 0.8 and 0.9 are seen as great adequacy and above 0.9 are seen as superb adequacy. Table 3.11 gives the KMO values of the constructs as gathered from the questionnaire.

Correlation has been tested by means of the Bartlett's test of Sphericity. Field (2009:607) states that the Bartlett's test of sphericity examines the proportionality of the Residual SSCP matrix of the identity matrix (that the co variances are 0 and the variances are roughly equal). Correlation between variables are also indicated in table 3.11 and should yield scores of $p<0.05$ to indicate enough correlation between questions used to gather information on a particular construct, indicated in table 3.11 by means of p-value.

Table 3.11 shows that the KMO values of all the constructs may be regarded as sufficient in that the values for 3 of the 6 constructs yielded values of between 0.60 and 0.68, which can be seen as mediocre adequacy. The construct that focussed on the individual's principles/morals yielded a score of 0.58, interpreted as low but still usable as it is above the cut-off value of 0.5. The construct that focussed on general skills and training yielded a value of 0.73 which can be interpreted as good adequacy and the construct that focussed on mutual trust and understanding yielded a value of 0.83, which can be interpreted as great adequacy.

All the questions had a p-value of 0.00 on the Bartlett's test of Sphericity, which proved sufficient correlation between questions per construct.

All the questions had a determinant value of higher than of 0.00001 as illustrated in Table 3.11, which proved that there was no severe multicollinearity between constructs

according to the Bartlett's test of Sphericity as stipulated by Field (2009:220-224), indicating that the questions in each construct did not excessively correlate with one another.

The fact that all **constructs** yielded values of **above 0.5 for Cronbach's alpha** as shown in table 3.10, illustrates that constructs were **chosen correctly** and that confirmatory factor analysis for each question in the research instrument was found to be **unnecessary**.

Table 3.11 KMO and Bartlett's values.

Construct	p-value	KMO	Determinant
CA: Individual's principles / morals	0.00	0.58	0.54
CB: Individual's goals and company's goals for the individual - common goals	0.00	0.66	0.61
CC: Personality	0.00	0.62	0.75
CD: Ability/trainability	0.00	0.68	0.67
CE: General skills and training	0.00	0.73	0.44
CG: Mutual trust and understanding	0.00	0.83	0.14

*The fact that **non-probability** sampling was used by means of **convenience sampling** suggests that p-values are therefore best reported for the sake of **comprehensiveness**. The fact that the sample have been taken from different industries, levels in the organisation and different race, gender and age, albeit a convenience sample, warrant the reporting of the p-values. This is also supported by the fact that the p-value throughout the study (with the exception of where correlations were calculated between the six constructs and demographic variables, which was to be expected) were generally well below 0.05.*

3.7 Correlations

Spearman's correlation coefficient (sometimes referred to as Spearman's rho) is described by Field (2009:794) as a "standardised measure of strength of relationship between two variables that does not rely on the assumptions of a parametric test. Spearman's

correlation coefficient is Pearson's correlation coefficient performed on data that have been converted into ranked scores".
Field (2009:181) proposes that the level of significance for the correlation coefficient is p<.05, A value of p<.05 indicates a statistically significant relationship between two constructs.

Table 3.12 illustrates that there were **significant correlations between all of the different constructs at the .01** level of significance (p-value, 2-tailed), much lower than the norm of .05 which implicates that we can be **much more confident with regard to the strength of the experimental effect!** The constructs were thus correlated to one another and they would most certainly have an impact or effect on one another. Field (2009:193)

With regard to Spearman's ρ (reported by SPSS as "r"), Field (2009:56) gives guideline values for the correlation coefficient (r) as:

- r~0.1, small, no practical significant relationship
- r~0.3, medium, practical visible relationship
- r~0.5, large, practical significant relationship

Table 3.12 also illustrates that all the values with regard to the correlation coefficient fell in the ranges of r~0.3 to r~0.5, indicating that all the constructs fell into the ranges indicating **practical relationships** as discussed above, also indicating **significant relationships** between the six constructs as tested in the study.

It can therefore be posited that according to the evidence as reported in Chapter 2 and the results in Table 3.12, when combined, the six selected human factors act as antecedents to the efficiency of the value chain by significantly affecting one another.

Table 3-12 Spearman's correlation coefficient with regard to the six constructs of the study.

Correlations							
Spearman's rho		CA: Individual's principles / morals	CB: Individual's goals and company's goals for the individual - common goals	CC: Personality	CD: Ability/trainability	CE: General skills and training	CG: Mutual trust and understanding
CA: Individual's principles / morals	Correlation Coefficient (r)	1.000	.397**	.288**	.444**	.405**	.490**
	p-value (2-tailed)		.000	.000	.000	.000	.000
	N	145	145	144	143	144	144
CB: Individual's goals and company's goals for the individual - common goals	Correlation Coefficient (r)	.397**	1.000	.387**	.405**	.386**	.502**
	p-value (2-tailed)	.000		.000	.000	.000	.000
	N	145	145	144	143	144	144
CC: Personality	Correlation Coefficient (r)	.288**	.387**	1.000	.263**	.265**	.337**
	p-value (2-tailed)	.000	.000		.002	.001	.000
	N	144	144	144	143	143	143
CD: Ability/trainability	Correlation Coefficient (r)	.444**	.405**	.263**	1.000	.562**	.603**
	p-value (2-tailed)	.000	.000	.002		.000	.000
	N	143	143	143	143	142	142
CE: General skills and training	Correlation Coefficient (r)	.405**	.386**	.265**	.562**	1.000	.630**
	p-value (2-tailed)	.000	.000	.001	.000		.000
	N	144	144	143	142	144	144
CG: Mutual trust and understanding	Correlation Coefficient (r)	.490**	.502**	.337**	.603**	.630**	1.000
	p-value (2-tailed)	.000	.000	.000	.000	.000	
	N	144	144	143	142	144	144
****. Correlation is significant at the 0.01 level (p-value).**							

The Spearman's correlation coefficient has also been tested between the six constructs of the study and other questions presented in the questionnaire as indicated in Table 3.13. **Statistically** significant relationships were identified based on p-values being smaller than .05 between the following questions and constructs only:

- B1.2: What is the nature of the relationship between you and your suppliers: **You set the terms** and the constructs of **1)** CD: Ability/trainability with p=.043, 2) CE: General skills and training with p=.021, and 3) CG: Mutual trust and understanding with p=0.29.

Table 3.13 Spearman's correlation coefficient with regard to the six constructs of the study and other questions in the questionnaire.

Spearman's rho		CA: Individual's principles / morals	CB: Individual's goals and company's goals for the individual - common goals	CC: Personality	CD: Ability/trainability	CE: General skills and training	CG: Mutual trust and understanding
B1.1: What is the nature of the relationship between you and your suppliers: **Formal contract, verbal agreement or both**	Correlation Coefficient (r)	.035	.019	.079	.023	.066	.069
	p-value (2-tailed)	.684	.823	.365	.794	.450	.428
	N	136	136	135	134	135	135
B1.2: What is the nature of the relationship between you and your suppliers: **You set the terms.**	Correlation Coefficient (r)	-.020	.122	-.144	.172*	.194*	.185*
	p-value (2-tailed)	.818	.151	.091	**.043**	**.021**	**.029**
	N	141	141	140	139	140	140
B1.3: What is the nature of the relationship between you and your suppliers: **My supplier is dependent on me as a customer**	Correlation Coefficient (r)	.063	.175*	.155	.145	.120	.153
	p-value (2-tailed)	.458	**.038**	.067	.088	.159	.071
	N	141	141	140	139	140	140
B1.4: What is the nature of the relationship between you and your suppliers: **I am dependent on a specific supplier.**	Correlation Coefficient (r)	.030	-.080	-.026	-.054	-.023	.083
	p-value (2-tailed)	.719	.343	.762	.526	.786	.330
	N	142	142	141	140	141	141
B1.5: What is the nature of the relationship between you and your suppliers: **I am satisfied with the business relationship.**	Correlation Coefficient (r)	.143	.151	.078	.060	.003	.077
	p-value (2-tailed)	.090	.074	.358	.482	.971	.361
	N	142	142	141	140	141	141
B2: How often do you interact with your suppliers: Daily, once a week, at least once a month, at least once every three months.	Correlation Coefficient (r)	.013	.090	.087	-.005	.034	.107
	p-value (2-tailed)	.880	.286	.305	.956	.691	.208
	N	141	141	140	140	140	140
B3: How often do you exchange information and knowledge with your supplier?	Correlation Coefficient (r)	.002	-.097	-.056	-.084	-.062	-.057
	p-value (2-tailed)	.985	.251	.513	.321	.464	.500
	N	142	142	141	140	141	141

*. Correlation is significant at the 0.05 level (p-value).

- B1.3: What is the nature of the relationship between you and your suppliers: **My supplier is dependent on me as a customer** and the construct of CB: Individual's goals and company's goals for the individual - common goals with p=0.38. In practice, this relationship holds very little value and it is recommended to disregard this outcomes.

Although the above identified statistically significant relationships, Table 3.13 also illustrates that all the values with regard to the correlation coefficient fell in the range of r~0.1 and smaller, indicating that all the constructs fell into the range indicating **no practical** significant relationships as discussed in the text above. This is only of relevance with regard to the correlations between the six tested constructs **and other questions presented in the questionnaire.**

The fact that **significant correlations between the different constructs at the p=0.01** level of significance (p-value, 2-tailed) is confirmed, boosts confidence levels with regard to the experimental effect, as already mentioned in the previous text.

3.8 ANOVAS and Cohen's effect sizes

Cohen's effect size

Field (2009:56) explains that an effect size can be seen as an objective, standardised evaluation of the importance of an experimental outcome. It gives an indication of the strength of the relationship that exists between two variables and can also be seen as a way to measure the strength of an experimental effect by indicating its importance. Field (2009:57) also explains that the literature has proposed many measures of effect size, but that Cohen's *d* can be seen as the one that is used most commonly.

Guidelines suggest the following values as indication of significance to Cohen's *d* (Cohen, 1988:40):

- *d* ~ 0.2 small effect
- *d* ~ 0.5 medium effect (noticeable with the naked eye)
- *d* ~ 0.8 large effect (practically significant and therefore of practical importance)

The effect size is large and considered as practically significant if the value of *d* is calculated to be equal or higher than 0.8. It also suggests that the effect can be seen as practically important.

Effect sizes shown in Table 3.14 to Table 3.18 were calculated by the Statistical Consultation Services of the North-West University using SPSS (2011) software.

Ellis and Steyn (2003:51) describe the effect size as a measure to describe practical significance that is independent of sample size. The fact that it is independent of the sample size is of high importance as p-values normally decrease when sample sizes increase. It is used to explain statistical significance of correlations found in two-way frequency tables as well as multiple regression fits.

They also elucidate on the fact that the use of p-values is a sufficient way to show statistical significance and that it illustrates the probability that the value that has been obtained may well be obtained when a null hypothesis is true. P-values of smaller than 0.05 indicate statistical significance. The drawback with regard to the use of p-values is that they will decrease as sample sizes increase and therefore not always indicate practical significance.

Ellis and Steyn (2003:52) argue that p-values and statistical interference cannot be seen as relevant when convenience sampling has been used and that data gathered from such methods should **rather be seen as data relevant to small populations**. They state that it would be wrong to “erroneously analyse data as if it has been obtained by random sampling” and may lead to inaccurate conclusions.

Based on the above statement, we can argue that the sample population used in this study may be seen as being diverse, if we take into consideration that the group of MBA students that participated have diverse backgrounds. The commonality being that most of these individuals are in managerial positions and that effect size therefore may be seen as relevant. Even so, none of the d-values were on the level of $d \sim 0.8$, which indicate no large effects. Table 3.14 to Table 3.18 only shows a few effects in the region of $d \sim 0.5$, showing a medium effect and a few *d*-values in the region of $d \sim 0.2$, indicating a small effect.

All the p-values were however below 0.05 and would therefore be statistically significant, have it not been for the sampling method used.

As a result of the above, p-values and effect sizes are therefore included in Table 3.14 to Table 3.18 for the sole purpose of comprehensiveness as if random sampling was used.

The analysis of variance (ANOVA) compares several means (Field 2009:388) with each other. By using this, significant differences would be indicated when the values in the ANOVA columns of Table 3.14 to Table 3.18 are less than 0.05.

Only two significant differences are indicated, the first in Table 3.14 indicating a significant difference for CG: Mutual trust and understanding, from the rest of the constructs with regard to the participants' highest qualification with a value of 0.02, and the second in Table 3.18 indicating a significant difference for the construct of CB: Individual's goals and company's goals for the individual - common goals from the rest of the constructs with regard to second year MBA students, first year MBA students and, individuals outside the academic environment with a value of 0.036.

The rest of these values for the ANOVA are all above 0.05 and this indicates that the groups were not significantly different with regard to the demographic tested in the questionnaire. This supports the fact that the constructs apply across different demographical boundaries, which indicates clearly that the six human variables tested in the study are antecedents to supply chain efficiency irrespective of organisational level, industry, age, race and gender.

Table 3.14 Cohen's d on question A3: Highest Qualification as tested in the questionnaire.

Descriptives							
A 3: Highest qualification.		Mean	Std. Deviation	ANOVA	Welch p-value	Effect size: Diploma or less with …	Effect size: Diploma or less with …
CA: Individual's principles / morals	Diploma or less	3.11	0.31	0.29	0.18		
	Degree	3.25	0.33			0.41	
	Post Graduate	3.24	0.44			0.29	0.02
CB: Individual's goals and company's goals for the individual - common goals	Diploma or less	2.93	0.34	0.39	0.32		
	Degree	2.97	0.48			0.09	
	Post Graduate	3.05	0.43			0.30	0.18
CC: Personality	Diploma or less	2.73	0.38	0.90	0.86		
	Degree	2.78	0.48			0.11	
	Post Graduate	2.77	0.52			0.08	0.02
CD: Ability/trainability	Diploma or less	3.08	0.31	0.90	0.86		
	Degree	3.08	0.36			0.00	
	Post Graduate	3.20	0.38			0.31	0.31
CE: General skills and training	Diploma or less	2.98	0.25	0.69	0.73		
	Degree	2.97	0.36			0.04	
	Post Graduate	3.03	0.51			0.10	0.12
CG: Mutual trust and understanding	Diploma or less	3.35	0.41	**0.02**	0.02		
	Degree	3.22	0.35			0.32	
	Post Graduate	3.43	0.45			0.16	0.45

Table 3.15 Cohen's d on question A4: Employment history as tested in the questionnaire.

Descriptives								
A4: Employment history.		Mean	Std. Deviation	ANOVA	Welch p-value	Effect size		
						Private sector with …	Public sector with …	Multi-national company with ….
CA: Individual's principles / morals	1. Private Sector	3.18	0.36	0.26	0.23			
	2. Public Sector	3.21	0.54			0.06		
	3. Multinational Company	3.36	0.36			0.50	0.28	
	4. Self-employed / Working for an Entrepreneur	3.26	0.23			0.22	0.09	0.28
CB: Individual's goals and company's goals for the individual - common goals	1. Private Sector	2.98	0.42	0.97	0.97			
	2. Public Sector	3.03	0.44			0.12		
	3. Multinational Company	3.00	0.56			0.04	0.05	
	4. Self-employed / Working for an Entrepreneur	3.00	0.43			0.05	0.07	0.00
CC: Personality	1. Private Sector	2.72	0.48	0.55	0.52			
	2. Public Sector	2.74	0.57			0.03		
	3. Multinational Company	2.84	0.51			0.22	0.18	
	4. Self-employed / Working for an Entrepreneur	2.88	0.43			0.32	0.24	0.07
CD: Ability/trainability	1. Private Sector	3.13	0.34	0.68	0.77			
	2. Public Sector	3.15	0.36			0.05		
	3. Multinational Company	3.17	0.39			0.10	0.05	
	4. Self-employed / Working for an Entrepreneur	3.04	0.43			0.22	0.26	0.30
CE: General skills and training	1. Private Sector	2.96	0.40	0.76	0.77			
	2. Public Sector	3.05	0.43			0.21		
	3. Multinational Company	3.04	0.44			0.18	0.02	
	4. Self-employed / Working for an Entrepreneur	3.01	0.48			0.11	0.07	0.06
CG: Mutual trust and understanding	1. Private Sector	3.29	0.40	0.68	0.73			
	2. Public Sector	3.32	0.39			0.06		
	3. Multinational Company	3.39	0.49			0.20	0.15	
	4. Self-employed / Working for an Entrepreneur	3.39	0.44			0.22	0.17	0.00

Table 3.16 Cohen's d on question A7: Role/Level in the organisation as tested in the questionnaire.

Descriptives							
A 7: Role / Level in the organisation.		Mean	Std. Deviation	ANOVA	Welch p-value	Effect size: Not in management with …	Effect size: Middle management with …
CA: Individual's principles / morals	Top management	3.31	0.26	0.34	0.18		
	Middle management	3.20	0.43			0.25	
	Not in management	3.19	0.34			0.34	0.02
CB: Individual's goals and company's goals for the individual - common goals	Top management	3.01	0.39	0.82	0.82		
	Middle management	2.97	0.46			0.08	
	Not in management	3.02	0.43			0.03	0.11
CC: Personality	Top management	2.73	0.38	0.92	0.89		
	Middle management	2.77	0.52			0.08	
	Not in management	2.76	0.51			0.06	0.02
CD: Ability/trainability	Top management	3.15	0.36	0.73	0.72		
	Middle management	3.14	0.37			0.03	
	Not in management	3.08	0.35			0.18	0.15
CE: General skills and training	Top management	3.04	0.38	0.71	0.69		
	Middle management	2.97	0.45			0.16	
	Not in management	3.00	0.37			0.11	0.07
CG: Mutual trust and understanding	Top management	3.40	0.40	0.42	0.40		
	Middle management	3.30	0.43			0.24	
	Not in management	3.29	0.38			0.29	0.02

Table 3.17 Cohen's d on question B 4: How do you mainly interact with your suppliers? As tested in the questionnaire.

Descriptives							
B 4: How do you mainly interact with your suppliers?		Mean	Std. Deviation	ANOVA	Welch p-value	Effect size	
						ERP system with …	Face-to-face with …
CA: Individual's principles / morals	Through an ERP system	3.18	0.43	0.29	.306		
	Face-to-face	3.20	0.27			0.04	
	Directly	3.29	0.38			0.27	0.26
CB: Individual's goals and company's goals for the individual - common goals	Through an ERP system	2.88	0.57	0.35	.478		
	Face-to-face	3.04	0.44			0.28	
	Directly	3.01	0.40			0.24	0.05
CC: Personality	Through an ERP system	2.58	0.55	0.09	.124		
	Face-to-face	2.83	0.36			0.47	
	Directly	2.78	0.49			0.37	0.11
CD: Ability/trainability	Through an ERP system	3.12	0.40	0.94	.938		
	Face-to-face	3.12	0.32			0.01	
	Directly	3.14	0.39			0.05	0.07
CE: General skills and training	Through an ERP system	3.04	0.39	0.82	.819		
	Face-to-face	3.00	0.37			0.11	
	Directly	2.98	0.43			0.14	0.05
CG: Mutual trust and understanding	Through an ERP system	3.25	0.49	0.57	.647		
	Face-to-face	3.34	0.37			0.19	
	Directly	3.35	0.41			0.21	0.03

Table 3.18 Cohen's d on different groups as tested in the questionnaire.

Descriptives							
Group		Mean	Std. Deviation	ANOVA	Welch p-value	Effect size: Individuals outside the academic with …	Effect size: First year MBA with …
CA: Individual's principles / morals	Individuals outside the academic environment	3.16	0.31	.592	.521		
	First year MBA students	3.23	0.35			0.18	
	Second year MBA students	3.24	0.42			0.20	0.05
CB: Individual's goals and company's goals for the individual - common goals	Individuals outside the academic environment	2.97	0.37	.036	.049		
	First year MBA students	2.88	0.46			0.21	
	Second year MBA students	3.09	0.43			0.26	0.46
CC: Personality	Individuals outside the academic environment	2.87	0.36	.198	.129		
	First year MBA students	2.67	0.49			0.41	
	Second year MBA students	2.78	0.52			0.17	0.21
CD: Ability/trainability	Individuals outside the academic environment	3.14	0.32	.538	.534		
	First year MBA students	3.08	0.35			0.18	
	Second year MBA students	3.16	0.38			0.03	0.19
CE: General skills and training	Individuals outside the academic environment	3.05	0.33	.721	.645		
	First year MBA students	2.99	0.42			0.14	
	Second year MBA students	2.97	0.45			0.16	0.03
CG: Mutual trust and understanding	Individuals outside the academic environment	3.36	0.36	.878	.857		
	First year MBA students	3.31	0.46			0.10	
	Second year MBA students	3.32	0.41			0.10	0.01

T-Test:

Guidelines suggest the following values as an indication of significance to Cohen's *d*: (Cohen, 1988:40)

- *d* ~ 0.2 small effect
- *d* ~ 0.5 medium effect (noticeable with the naked eye)
- *d* ~ 0.8 large effect (practically significant and therefore of practical importance)

The effect size can be seen as large and considered as practically significant if the value of *d* is calculated to be equal or higher than 0.8. It also suggests that the effect can be seen as practically important.

Effect sizes shown in Table 3.14 to Table 3.18 were calculated by the Statistical Consultation Services of the North-West University by means of SPSS (2011) software.

The only significant correlation that was identified between the six constructs and demographic information was between the construct of CE: General skills and training, and the industry sector of **your organisation**, divided into: 1. Manufacturing/Mining/Product beneficiation, and 2. Service/Professional with a *d*-value of 0.5, indicating a significant visible correlation of medium size. The rest of the constructs had *d*-values of *d* ~ 0.2, indicating a small correlation between being in: 1. Manufacturing/Mining/Product beneficiation, and 2. Service/Professional and the other constructs as shown in Table 3.19

Table 3.19 Correlation between industry sector of your organisation and the six constructs of the study

A5: Industry sector of your organisation		Mean	Std. Deviation	p-value	Effect size (d-value)
CA: Individual's principles / morals	1. Manufacturing/Mining/Product beneficiation	3.26	0.40	0.10	0.27
	2. Service/Professional	3.15	0.29		
CB: Individual's goals and company's goals for the individual - common goals	1. Manufacturing/Mining/Product beneficiation	2.92	0.50	0.26	0.20
	2. Service/Professional	3.02	0.39		
CC: Personality	1. Manufacturing/Mining/Product beneficiation	2.78	0.46	0.57	0.11
	2. Service/Professional	2.73	0.45		
CD: Ability/trainability	1. Manufacturing/Mining/Product beneficiation	3.15	0.36	0.15	0.27
	2. Service/Professional	3.05	0.34		
CE: General skills and training	1. Manufacturing/Mining/Product beneficiation	3.06	0.39	**0.01**	0.50
	2. Service/Professional	2.86	0.37		
CG: Mutual trust and understanding	1. Manufacturing/Mining/Product beneficiation	3.36	0.43	0.11	0.29
	2. Service/Professional	3.23	0.37		

Table 3.20 Correlation between industry sector of your supplier's organisation and the six constructs of the study

A6: Industry sector of your supplier's organisation		Mean	Std. Deviation	p-value	Effect size (d-value)
CA: Individual's principles / morals	1. Manufacturing/Mining/Product beneficiation	3.25	0.38	0.23	0.24
	2. Service/Professional	3.16	0.40		
CB: Individual's goals and company's goals for the individual - common goals	1. Manufacturing/Mining/Product beneficiation	2.93	0.43	0.09	0.20
	2. Service/Professional	3.02	0.46		
CC: Personality	1. Manufacturing/Mining/Product beneficiation	2.73	0.48	0.09	0.07
	2. Service/Professional	2.70	0.46		
CD: Ability/trainability	1. Manufacturing/Mining/Product beneficiation	3.14	0.35	0.07	0.26
	2. Service/Professional	3.05	0.33		
CE: General skills and training	1. Manufacturing/Mining/Product beneficiation	3.01	0.42	0.08	0.26
	2. Service/Professional	2.91	0.41		
CG: Mutual trust and understanding	1. Manufacturing/Mining/Product beneficiation	3.33	0.42	0.08	0.02
	2. Service/Professional	3.32	0.42		

Table 3.20 illustrates that all constructs had *d*-values of $d \sim 0.2$, indicating a small difference between being in: 1. Manufacturing/Mining/Product beneficiation, and 2. Service/Professional and the other constructs with regard to the ccorrelation between industry sector **of your supplier's organisation** and the six constructs of the study.

3.9 Chapter summary

Based on the empirical evidence as gathered from the data set derived from the questionnaires collected, significance has been determined and proven to each of the following constructs (human factors):

- Individual's principles.
- Individual's goals and company's goals for the individual - common goals.
- Personality.
- Ability/Trainability, and
- General skills and training.
- Mutual trust and understanding.

The significance of each of the above human factors (identified in Chapter 2) has been expected as theory suggested it to be significant. It has been proven that all the constructs had significant correlations to one another and very little/low correlations with demographic variables could however be proven.

Questions used to test each construct have been proven to be relevant to the constructs with the use of the “mean” and all proved a central tendency to the relevant construct they tested with insufficient correlation. As a result of the statistical evidence as illustrated in Table 3.9, it can be derived that the constructs (human factors) tested are also closely aligned.

It would be relevant to note that the construct of Mutual trust and understanding has yielded the highest mean of 3.33 with a standard deviation of .041. Second is the construct of Individual principles and morals which has a mean of 3.22 and a standard deviation of 0.38. This could indicate that these two constructs are more important with regard to the selected human factors’ influence on the efficiency of the upstream supply chain. It must be noted that the notion exists that the mean values and standard deviations of the six selected constructs (human factors) are closely aligned and yielded to be positive on the basis of a score of 3 = agree and 4 = strongly agree in the questionnaire.

The small effect sizes throughout indicate strongly that the results apply across different demographic segments, which strongly support the universal relevance of the relationship between the selected human variables and supply chain efficiency.

The data as presented have been found to be reliable, as well as valid, as discussed earlier in Chapter 3.

CHAPTER 4

CONCLUSION AND RECOMMENDATIONS

4.1 Conclusions

4.1.1 Introduction

Borgström (2004:1) describes the supply chain as an activity system, consisting partly of elements of producing and partly of elements of using as well as an activity system with regard to networking. Its evaluation must therefore be seen as both **quantitative** and **qualitative**. Human elements or human factors come to mind as soon as network activity comes into the equation. The fact that all networks relies on different levels of human intervention serves as motivation that it can serve as antecedents to its efficiency as well. Limited knowledge about interdependencies within supply chains exists.

This study's main aim has been to create awareness and understanding of the influence of selected human factors that acts as antecedents to the efficiency of upstream supply chains and unearthed knowledge with regard to the interdependency between human factors and upstream supply chains.

In an attempt to clarify what the general perceptions with regard to an efficient supply chain are, respondents have been asked what concepts they regard as the main attributes to efficient supply chains. From Table 3.2, and figure 3.12, it is evident that they regard the concepts of **cost saving, short delivery time, flexibility in terms of orders, high inventory turnover rates, high production rates, strong information linkages, high capacity utilisation rates, "doing things right" and the ability to accept changes to an order and still deliver on time** as the most important attributes with regard to supply chain efficiency.

4.1.2 Conclusion

The literature suggests that each of these human factors has its own importance in the concept of an efficient supply chain and trying to link them, based on literature alone, could not give a clear indication/answer. Its relevance has been proven through the use of a literature study that confirmed the association of six selected human factors to upstream supply chain efficiency separately.

The six selected factors that could be linked to the theme of this study on the basis of supportive data from reliable sources are as follows:

1) **Individual's principles/morals** form an integral part of shaping human actions, as well as organisational culture. It also serves as foundation to the individual's place in the organisation and could act as antecedent to the efficiency of the upstream supply chain of the organisation (Coetzee, 2002:35; Mullarkey, *et al.,* 1995:63).

   From the empirical research, it has been determined that of all six constructs, the above was identified as the second strongest human factor, with a mean value of 3.22.

2) **Individual's goals and company's goals for the individual - common goals,** directly impacts on human factors in the supply chain as it forms the basis of communication, goal setting, trust relationships and efficiency as part of supply chain performance (Coetzee, 2002:35; Kreitner & Kinicki, 2008:246).

   The results on this construct has indicated it being as important as the construct of general skills and training, with an affirmative mean of 2.99 as illustrated in Table 3.21.

3) **Personality,** different organisations will look for different personality traits as a result of differences in organisational cultures. Personality is who the individual is. It forms and influences the base level human actions, interactions and performance (Hogan & Benson, 2009:1; Harrison *et al*., 2002:1031 Kreitner & Kinicki, 2008:133).

This construct has yielded the lowest mean score of the six constructs presented in Table 3.21. With a mean score of 2.76 personality also have a relevant relationship to supply chain efficiency.

4) **Ability and trainability:** Ability can be seen as part of the foundation of understanding between the individual and the organisation, and of what will be expected from the individual as an employee. Trainability on the other hand is regarded as the individuals' capability to learn and acquire skills, methods and systems in an appropriate way to influence upstream supply chain efficiency, also implementing the above-mentioned in adapting to operational and environmental requirements (Coetzee, 2002:121; Dierdorff & Surface, 2004:1; Gill, 2011:146).

   Its importance, based on a mean score of 3.13, ranked third from the top for the six human factors that have been tested as illustrated in Table 3.21 , which prove it to have a strong relationship with supply chain efficiency.

5) **General skills and training:** A relational level of importance exists between the knowledge, skills and tools of both employees and suppliers to be able to do efficiently and effectively what is expected of them in their job. Training represents a blend of transactional-based and relationship-based strategies. Training therefore forms an integral part of successful companies' employment programmes and is normally absent in less successful companies (Kreitner & Kinicki, 2008:138; Monczka *et al*., 2010:9; Thublier *et al*., 2010:12).

   The results for this construct have also indicated it being as important as the construct of Individual's goals and company's goals for the individual - common goals, also with an affirmative mean of 2.99 as illustrated in Table 3.21.

6) **Mutual trust and understanding:** It can be stated that the ability to trust, as well as trustworthiness of the individual and the organisation, form the basics of business ethics and that it definitely acts as an antecedent with regard to the efficiency of the upstream supply chain (Bowersox *et al.,* 2010:378; Kreitner and Kinicki, 2008:317; Monczka *et al*., 2010:111)

   Bowersox *et al.* (2010:378) discuss the opinion that none to very little real collaboration can exist in supply chain relationships without meaningful trust. This

statement was confirmed in the empirical research in that the construct dealing with mutual trust and understanding, scored the highest mean (3.33) of all the constructs tested. It proves that participants value trust and would perform more efficiently when the perception of being trusted, exists.

The questionnaire has measured respondents' perceptions on the relationship between human factors and the efficiency of the supply chain by means of six human factor constructs. Results have yielded relatively high mean values on all the constructs as tested together with closely aligned standard deviations on the basis of a score of 3 = agree and 4 = strongly agree. **It can thus be concluded that the six selected human factors as mentioned earlier all have strong relationships with regard to supply chain efficiency.**

In support to the above statement, Table 3.21 illustrates the ranking of the human factors as identified in Chapter 2, based on the means from the data set as analysed in Chapter 3 from largest on top to smallest at the bottom. The fact that there has been a difference in the mean values may indicate its ranking with regard to participants' perspective of its importance.

Table 4.1 Ranking of constructs based on mean values.

Descriptive Statistics - Factors / Constructs			
	N	Mean	Std. Deviation
CG: Mutual trust and understanding	144	3.33	0.41
CA: Individual's principles / morals	145	3.22	0.38
CD: Ability/trainability	143	3.13	0.36
CB: Individual's goals and company's goals for the individual - common goals	145	2.99	0.44
CE: General skills and training	144	2.99	0.42
CC: Personality	144	2.76	0.48

It must be said that all six constructs (human factors) revealed means that have been consistent to the Likert scale scores of 3 (agree) to 4 (strongly agree) on the questions posed in the questionnaire.

This study did not test for any causal relationship between human factors as independent, and supply chain efficiency as dependent variable. No causal relationship can therefore be inferred.

The mean results from the questionnaire have been interpreted as reliable and can be used to draw conclusions on the influence of selected human factors as antecedents to the efficiency of upstream supply chains, represented by six different constructs, based on the fact that all constructs have yielded values of above 0.5 for Cronbach's alpha as shown in table 3.10.

The fact that there were very little difference in the means (as measured by Anova (P.71) and T-tests (P.76)) between the six human factors and the demographical questions indicates that the findings are relevant, regardless of what the participants' demographics have been.

4.2 Recommendations

It is recommended that the management of organisations focus more on the identified human factors if their intention is to increase upstream supply chain efficiency. It is also suggested that upstream supply chain efficiency is dependent on managements' ability to optimise interdependencies, reliability and control of the above human factors.

The management of human factors can therefore be seen as a key issue with regard to creating organisational success by means of creating, as well as maintaining a sustainable competitive advantage and should not be neglected as its management can create a conducive environment.

The following recommendations are of relevance to each selected human factor as studied in this research for the purpose of application in the organisation as well as possible future research:

4.2.1 Individual's principles/morals

- Ensure that potential employees are screened and that principle and morals are evaluated against a set standard of what the organisation expects from their employees.

- Implement rules and standards on established principles and morals to guide employee behaviour.
- Implement organisational principles in the supply chain environment based on principles and tools of *Kaizen*, Total Quality Control (TQC) and Total Quality Management (TQM) to assist employees in identifying and eliminating root causes of problems and stimulate improvements with regard to processes and actions.
- Implement guiding principles for behaviour as shared values which will be instrumental in creating commitment in the organisation.

4.2.2 Individual's goals and company's goals for the individual - common goals

- Create and/or stimulate manager-leadership to develop goals for the individual as well as the organisation.
- Set performance outcome goals as well as learning/development goals to increase employee performance.
- Use communication of goals as motivational factors rather than as a yardstick to enforce disciplinary measures.
- Set specific, measurable, achievable, realistic and time specific (SMART) goals.
- Give constructive feedback with regard to goals and progress with regard to achieving goals.
- Utilise the principle of self-set goals as it will be just as effective as participative and assigned goals.
- Establish and ensure commitment to goals in combination with short-term incentive possibilities to influence outcomes and improve individual commitment.
- Always communicate goals clearly and efficiently.

4.2.3 Personality

- Personality profiling should be done prior to employing individuals in an attempt to increase employee cooperation and minimise conflict within the organisation as well as outwards to clients and suppliers.
- Search for individuals with the required personality traits as required by the organisation. Taking the time to employ the individual with the personality that best

fit the organisational culture, may actually be an investment, allowing management to utilise individuals in positions and teams where they can succeed immediately.

- Positively acknowledge the individual's personality and characteristic traits and constructively build on it to increase the individual's efficiency.
- Manage personality conflicts as positively as possible.

4.2.4 Ability and trainability:

- Introduce a screening test which allows for basic numeracy, literacy, cognitive ability, and communication skills when applicants are interviewed for positions in the organisation where they will deal with suppliers.
- Ensure that properly trained people are employed to deal with suppliers.
- Ensure that employees are trained to deal with suppliers.
- Make sure that employees that are trusted with supply chain activities are trainable and have the required capacity to consume knowledge.
- Ensure that the individuals' abilities suit the needs of the organisation.

4.2.5 General skills and training:

- Introduce a screening test which allows for basic numeracy, literacy, cognitive ability, and communication skills when applicants are interviewed for positions in the organisation where they will deal with suppliers.
- Ensure that properly trained people are employed to deal with suppliers.
- Make sure that training programmes are well targeted at achieving that which the organisation would expect from their employees.
- Ensure that training includes diagnostic tools, analytical tools as well as training on decision-making and problem solving for improvement of quality and efficiency.
- Use training sessions as motivational and inspirational experiences to create aligned commitment between employers and employees as well as between employees and employees.

4.2.6 Mutual trust and understanding:

- Ensure that individuals who are employed are trustworthy.
- Foster trust relationships within the organisation as well as from the organisation outwards to supply chain partners.
- Spend time and utilise resources to ensure that all employees' are aware of what is expected from each individual with regards to organisational outcomes.
- Attempts should also be made to minimise employee turnover and build long term trust relationships.

4.3 Recommendations for future research

Bowersox *et al.* (2010:28) explain the 80/20 rule, also known as the Pareto principle that can be applied to multiple facets of the organisation and the world around it. Would it be true to ask if maybe only 20% of human factors influence 80% of the supply chain's efficiency? Or would this be the exception to the rule? This may be seen as a suggestion for future research and did not form part of this study.

It is also recommended that a study be undertaken to test for any causal relationship between human factors as independent, and supply chain efficiency as dependent variables, indicating if any causal relationship can be inferred between human factors and supply chain efficiency.

It is recommended that further research also be done on possible instruments, procedures and principles in the fields of human factors, supply chains, economics and psychology in attempts to enable management to identify shortcomings in their supply chains with regard to human factors and formulate suggestions on how to handle such challenges.

Thublier *et al*. (2010:12) identify insufficient management capabilities and inadequate guidance from leadership as potential shortcomings found in contemporary supply chain models. They suggested the development of supply chain competency models in an attempt to intensify identification, training and motivation of individuals with the focus on adopting key roles in the supply chain.

The development of an integrated model to link human factors and operations management with regard to the upstream supply chain is recommended, alternatively, it is suggested that benchmarks and models be integrated into a basic model with reference to human factors and operations management as well as the supply chain.

4.4 Evaluation of accomplishment of research objectives

In an attempt to recapture the research objectives as stated in Chapter 1, the following evaluation has been performed:

4.4.1 Primary Objective

- To determine which of the selected human factors have a significant effect on the efficiency of the upstream supply chain of an organisation.

The **primary objective of the study has been met successfully** with the identification of six human factors that have significant effects on the efficiency of the upstream supply chain. These human factors have mainly been identified by means of an interview with Mr. Lu (2012), researched further with a supportive literature study, and empirically tested by collecting data with a questionnaire and conducting the necessary statistical analysis on the data. A conclusion has been drawn and reported.

4.4.2 Secondary Objectives

- To establish through a literature study which human factors contribute the most to influence the efficiency of the upstream supply chain.

The **first secondary objective of the study has been met successfully** with the identification of six human factors, as mentioned above, that have significant effects on the efficiency of the upstream supply chain. These human factors have been researched by means of a supportive literature study. A conclusion has been drawn and reported to which human factors have been reported in literature as the most important as well as to their influence on the efficiency of the upstream supply chain.

- To determine through an empirical study the effect these selected human factors have on the efficiency of the upstream supply chain.

The **second secondary objective of the study was also met successfully** through an empirical study by determining the effect these selected human factors have on the efficiency of the upstream supply chain. A conclusion has been drawn and reported.

FINALLY

This study proved with no doubt that all six selected human factors are antecedents to supply chain efficiency. The existence of these relationships cannot be underestimated in supply chain management and must be controlled to ensure optimal supply chain performance, maximising organisational performance in attempts to create shareholder wealth.

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6. INTERVIEWS

Mr. Lu Bin, Deputy Supervisor of the Logistics department of a Fortune 500 organisation. July 2012

7. APPENDICES:

7.1 Appendix A: Questionnaire.

SURVEY ON THE INFLUENCE OF SELECTED HUMAN FACTORS ON THE EFFICIENCY OF THE UPSTREAM SUPPLY CHAIN.

Potchefstroom Business School (Ethics code: NWU-00067-09-A4)

Dear Colleague:

In recent years, there has been increased interest in the influence selected human factors may have on the efficiency of the upstream supply chain in everyday life situations with regard to operations of organisations. The selected human variables will be investigated in this survey are: the individual's principles, individual's goals and company's goals for the individual, personality, ability/trainability, general skills and training, remuneration/compensation and, mutual trust and understanding.

Jacobs *et al.* (2009:365) defines the **upstream supply chain** as the supply chain that supplies goods and services to the company, in other words the **company's suppliers**.

Monczka, Handfield, Patterson and Waters (2010:9) define the term **supply chain** as a series of **activities and organisations** through which materials move on their journey from **primary suppliers to end clients.**

Will you please be so kind as to participate in a study with regard to the above and complete the attached questionnaire? The survey intends to determine the influence and prevalence of the above selected human factors with regard to the efficiency of the upstream supply chain? This survey will be used to complete one of the required modules stipulated as compulsory for the completion of a MBA programme at the Potchefstroom Business School, North West University.

The survey needs to be completed anonymously and it will be appreciated if you would be so kind as to return it by no later than 18 September 2012. Completion is voluntary and will be seen as consent for the data to be used in statistical analysis.

*It is recommended that you think of one supplier that **you** deal with most and answer the questionnaire with that **supplier** in mind.*

Answering the questionnaire should take no longer than **10-15 minutes**. Be assured that the information you provide will only be used for academic purposes and no financial gain is to come from it in any way.

Thank you.

Herman Pienaar

E-mail: herman@snaptransport.co.za

Contact nr: 082 224 4221

SECTION A: Demographic information ***(Please mark with an X where applicable)***

	Please mark with an X where applicable.					
A1	Gender:	Male (1)	Female (2)			
A2	Race:	White (1)	African (2)	Coloured (3)	Indian (4)	Other (5)
A3	Highest qualification:	Grade 12 or less (1)	Certificate (2)	Diploma (3)	Degree (4)	Post graduate (5)
A4	I was employed during the past three months. (Please mark most appropriate)	In the private sector (1)	In the public sector (2)	At a multinational company (3)	By an entrepreneur (4)	Self-employed (5)
A5	Industry sector of **your** organisation (Select most appropriate)	Manufacturing/ mining/ product beneficiation (1)	Service / professional (2)	Distribution (3)	Financial (4)	Retail (5)
A6	Industry sector of **your supplier's** organisation (Select most appropriate)	Manufacturing/ mining/ product beneficiation (1)	Service / professional (2)	Distribution (3)	Financial (4)	Retail (5)
A7	**Your role/level in the organisation**	Top management (1)	Middle management (2)	First line supervisor (3)	Technical / assistant (4)	Ground level (5)

A8: In which province in South Africa do you work?	
Gauteng	1
Free State	2
Limpopo	3
North West	4
Kwazulu Natal	5
Mpumalanga	6
Eastern Cape	7
Western Cape	8
Northern Cape	9

A9: Age	
Please specify your **age.**	

SECTION B: Background Information

Question B1: What is the nature of the relationship between you and your suppliers?

Please mark the number that describes your situation most appropriately with an "X"

B1.1 Formal contract	Combination	Verbal contract
1	2	3

		Strongly disagree	Disagree	Agree	Strongly agree
B1.2	You set the terms.	1	2	3	4
B1.3	My supplier is dependent on me as a customer.	1	2	3	4
B1.4	I am dependent on a specific supplier.	1	2	3	4
B1.5	I am satisfied with the business relationship.	1	2	3	4

Other? Please specify

……

Question B2: How often do you interact with your suppliers?

Daily	1
Once a week	2
At least once per month	3
At least once every three months	4

Question B3: How often do you exchange information and knowledge with regard to the required service/product with your suppliers?

Often (Daily or more often)	1
Fairly often (Weekly to daily)	2
Seldom (Less than monthly)	3
Almost Never	4

Question B4: How do you **mainly** interact with your suppliers?

Through an Enterprise Resource Planning (ERP) System	1
Through an intermediary outside my organisation (e.g. agent or broker)	2
Face-to-face	3
Directly	4

Other? Please specify.....

Question B5: What kind of information do you receive from your suppliers? (Please choose all the applicable options)

Information about their products and services	1
Information about new technologies/methods	2
Information about available services	3
Operational issues	4

Other? Please specify.....

Question B6: Please indicate how long, on average, does a supplier take to fulfil your order? _____ **days.**

Question B7: An efficient supply chain is best described by the following

Description	Strongly disagree	Disagree	Agree	Strongly agree
1. Cost saving	1	2	3	4
2. Short delivery time	1	2	3	4
3. Flexibility in terms orders	1	2	3	4
4. High inventory turnover	1	2	3	4
5. Low weeks of supply in inventory	1	2	3	4
6. High production rates	1	2	3	4
7. Strong information linkages	1	2	3	4
8. High capacity utilisation rates	1	2	3	4

9.	"Doing things right"	1	2	3	4
10.	Ability to accept change to an order and still deliver on time	1	2	3	4

SECTION C:

Please select the option that best describes your view on the issues mentioned:

*Remember to think of the supplier that **you** deal with most and answer the questionnaire with that **person** in mind where applicable.*

Monczka *et al.*(2010;470) defines efficiency as a standard of measuring how well the goal is reached, what resources are used to reach the goal or what sacrifices are necessary to reach the goal.

Section CA: INDIVIDUAL'S PRINCIPLES / MORALS:		**Strongly disagree**	**Disagree**	**Agree**	**Strongly agree**
CA 1	My individual principles (such as ethics, work ethics, etc.) make me efficient in my work	1	2	3	4
CA 2	Principles that may increase my efficiency can be learned from training programs (such as Kaizen, Total Quality Management and Total Quality Control).	1	2	3	4
CA 3	People with different sets of **principles** can still have a productive working relationship.	1	2	3	4
CA 4	My principles make me committed to my work	1	2	3	4
CA 5	My supplier's principles definitely influence the efficiency of my upstream supply chain.	1	2	3	4

Section CB: INDIVIDUAL'S GOALS AND COMPANY'S GOALS FOR THE INDIVIDUAL - COMMON GOALS:		**Strongly disagree**	**Disagree**	**Agree**	**Strongly agree**
CB 1	My career goals have an influence on my efficiency at work.	1	2	3	4
CB 2	My personal goals influence my choice of a supplier.	1	2	3	4
CB 3	Clear communication of company goals motivates employees to be efficient.	1	2	3	4
CB 4	My efficiency with regard to my suppliers is impacted on negatively when my colleagues make fun of my personal career goals	1	2	3	4
CB 5	Performance goals motivate me to be efficient in my daily activities (with regard to my actions pertaining to the supply chain that I work in).	1	2	3	4

Section CC: PERSONALITY:		**Strongly disagree**	**Disagree**	**Agree**	**Strongly agree**
CC 1	My personality influences me to be efficient in my daily dealings with my suppliers.	1	2	3	4
CC 2	Personality conflicts will inhibit upstream supply chain efficiency.	1	2	3	4
CC 3	My supplier's efficiency will benefit from implementing personality profiling before employing individuals.	1	2	3	4
CC 4	Personality rather than ability influences the decision of which suppliers to deal with.	1	2	3	4

Section CD: ABILITY/TRAINABILITY:		**Strongly disagree**	**Disagree**	**Agree**	**Strongly agree**
CD 1	The person that I deal with mostly at my main supplier has the required abilities to serve me as customer.	1	2	3	4
CD 2	My suppliers' can increase efficiency by focussed training of their employees.	1	2	3	4
CD 3	To ensure efficiency of the upstream supply chain, my organisation strives to apply my abilities to the maximum.	1	2	3	4
CD 4	By employing only candidates with the correct abilities, my supplier increases upstream supply chain efficiency.	1	2	3	4

CD 5	Suppliers' ability to fulfil my orders efficiently influences my choice to deal with certain upstream suppliers.	1	2	3	4

Section CE: GENERAL SKILLS AND TRAINING:		**Strongly disagree**	**Disagree**	**Agree**	**Strongly agree**
CE 1	Targeted training programs to the people that directly deal with my suppliers increases efficiency in the upstream supply chain.	1	2	3	4
CE 2	The opportunity for self-improvement in my organisation spills over into the efficiency of my supplier	1	2	3	4
CE 3	Employees in the upstream supply chain with the opportunity for self-improvement in **their** organisations are highly motivated to increase the efficiency of **my** upstream supply chain.	1	2	3	4
CE 4	My suppliers' efficiency is influenced by focussed training of their employees.	1	2	3	4
CE 5	My organisation's shortage of a certain skill supplies the opportunity for another organisation that produces an individual with that specific skill to operate efficiently within my upstream supply chain.	1	2	3	4

Section CG: MUTUAL TRUST AND UNDERSTANDING:		**Strongly disagree**	**Disagree**	**Agree**	**Strongly agree**
CG 1	**Shared vision** between the individual and the organisation increases upstream supply chain efficiency.	1	2	3	4
CG 2	**Mutual trust** between the individual and the organisation is a prerequisite for efficiency in the supply chain.	1	2	3	4
CG 3	Successful relationships in the upstream supply chain are dependent on mutual **trust** between supply chain partners.	1	2	3	4
CG 4	Successful relationships in the upstream supply chain are dependent on mutual **understanding** between supply chain partners.	1	2	3	4
CG 5	The organisation's level of trust in me positively affects the efficiency with which I deal with my suppliers.	1	2	3	4
CG 6	Mutual understanding between supply chain partners is a prerequisite for efficiency in the supply chain.	1	2	3	4

Question B 9:

Do you get feedback from your suppliers and what do you do with this feedback?

……

……

……

Question B 10:

Do you use it to improve your products/services?

……

……

……

Thank you for taking the time to participate in this survey, your time and effort is highly valued and greatly appreciated.