A LEAN VIEW ON AN EASTERN CAPE LOGISTICS SERVICE PROVIDER

By

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DECLARATION

This work has not been previously accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

Signed:…….

Date:…….

STATEMENT 1

This dissertation is being submitted in partial fulfilment of the requirements for the degree of Masters in Business Administration.

Signed:……..

Date:……..

STATEMENT 2

This dissertation is the result of my own independent work/investigation, except where otherwise stated. Other sources are acknowledged by text references. A reference list is appended.

Signed:……

Date:……

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ABSTRACT

Global competition is forcing all organisations, both manufacturing and service orientated, to review their facilities and processes from a productivity and quality standpoint.

The concept of lean manufacturing has evolved from mass production methodologies developed by Henry Ford. Lean methodology, as developed by the Toyota Motor Company of Japan, yields consistent product quality at a lower cost, while delivering greater variety to the customer.

The purpose of this research was to identify lean methodology application to the service industry and to evaluate its application to UTi South Africa (PTY) LTD.

The research presented an empirical study of how a lean tool can be applied at UTi South Africa (PTY) LTD service operations and possible lean models for UTi Port Elizabeth.

The research study found that lean methodology can be applied to the freight forwarding industry and that opportunities exist for lean to improve productivity.

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CHAPTER 1

INTRODUCTION, PROBLEM STATEMENT AND OVERVIEW OF THE STUDY

1.1 INTRODUCTION

Since South Africa's return to the international arena in 1994, many companies and industries have found that they are affected by a growing global economy (Amos, Hellriegel, Jackson, Klopper, Louw, Oosthuizen, Slocum and Staude, 2005: 99). Similarly, Erasmus, Schenk, Swanepoel & Van Wyk, (2005) state that for South Africa to endure in this international war of competition, a colossal effort will be required from its population. South African business will play a fundamental role in fronting this 'economic war'. South African organisations must take heed of global trends and developments and identify potential opportunities and threats (Amos, et al., 2005: 99). To remain world class, South African businesses will need to learn from those companies that are 'market leaders'.

Hill (2007:431) states that one of the "Achilles heels" of international business is that, in the fullness of time, competitors ultimately emerge. If managers do not take specific steps to reduce their firm's cost structure they will be outflanked by a more efficient global competitor.

One of the main questions driving South African business is how to maintain competitiveness given the onslaught of global competition, especially from rising economic giants – China

and India. It is imperative for South African managers to continually look for new ways of producing products or delivering a service in order to remain competitive or gain competitive advantage over international organisations.

1.1.1 South African business: Competitive standing and efficiency

According to Amos, et al. (2005: 99), the *International Institute for Management Development* (IMD) issue an annual World Competitiveness Report, in which countries are ranked based on 286 measures in the areas of (1) economic performance; (2) government efficiency; (3) business efficiency; (4) infrastructure. In the 2006 *World Competitiveness Report* South Africa was ranked 38th out of 60 countries in business efficiency and 44th in the standings overall, see *Annexure 1: World Competitiveness Scoreboard 2006* (National Productivity Institute, 2007).

The conclusion drawn from this report is that South African business is going to have to work hard to improve their competitiveness. Productivity is one of the expressions of the internal efficiency of an organisation (Erasmus, et al., 2005), and productivity improvement in South Africa will also depend on:

- The quality of the labour force;
- Management responsibilities;
- Productivity incentive schemes;
- Labour market flexibility; and
- Management-union co-operation.

This means that South African managers will need to develop managerial skill's (management responsibilities) and enhance productivity (productivity incentive schemes) in order to improve competitiveness. According to Erasmus, et al. (2005) productivity is the primary feature in the prosperity for a nation. This could mean that the success of South African organisations will determine the long-term prosperity of the population of the country. South African business carries a huge responsibility for the nation.

According to Hill (2007: 467), companies which display superior performance over time, tend to have strong adaptive cultures. These adaptive cultures are made up of managers who have an innate concern about customers, stockholders and employees. The current business environment, especially union-management relations, illustrates some of the challenges that will be faced both now and in the future for this country. No business objectives can be achieved without a motivated workforce intent on delivering shareholder value.

1.1.2 Importance of customer service

According to Pearce and Robinson (2003: 139) any service activities of a firm can be a key source of competitive advantage. Firms that do not pay attention to the service aspects of the business will not be able to compete effecitively in the global economy. Davis and Heineke (2005: 162) state that some of the primary distinguishing factors of service design and development is that, in a service context, the process and the product must be produced concurrently, in

addition every time a customer gets in touch with any aspect of the firm this 'moment of truth' can have either a positive or negative effect on that customers future view on the firm. This highlights the need for managers to be aware of business processes and methods of world class service delivery. As customer demands increase, firms need to be agile and flexible in order to react or to meet those demands.

Similarly, Bardi, Coyle & Langley (2003: 572) state that an organisation can achieve a competitive advantage by providing superior levels of logistical customer service. The potential advantage exists in viewing customer service as a "product" which can add significant value for the buyer (Bardi, Coyle & Langley, 2003: 95). Organisations realise that increased market competitiveness is directly related to customer service, especially in the area of logistics. According to Pearce and Robinson (2003: 33) many companies have made the customer service initiative a key aspect of their corporate mission which have led to some firms gaining a competitive advantage in the market place. The organisation in which the research will be conducted provides logistics services to market leaders in the business world.

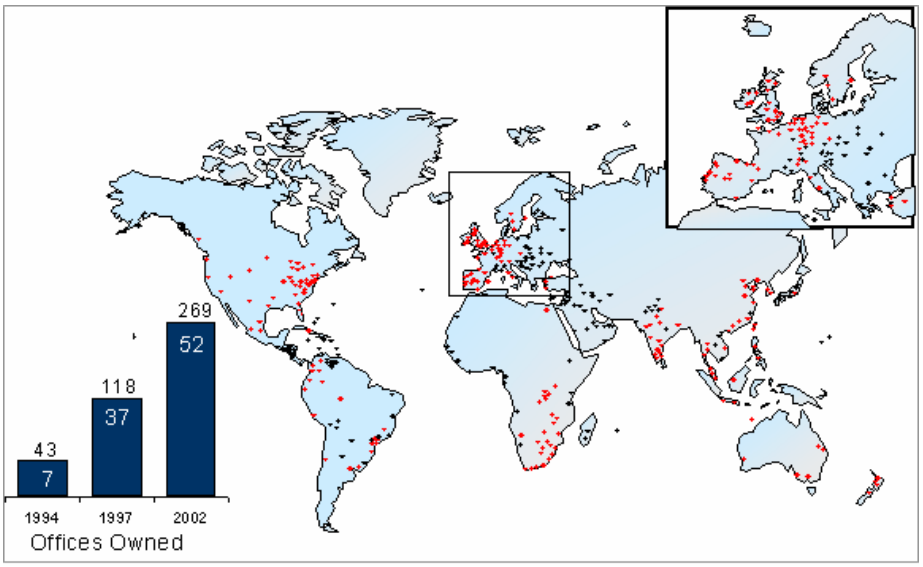
It has now been established that business efficiency and customer service are key factors in determining the competitiveness of an organisation. An introduction to the organisation in which the research will be conducted will follow.

1.1.3 The organisation to be analysed

The organisation in which the study took place is UTi International Worldwide Inc. Their core focus is service delivery in the field of supply chain solutions and logistics. For this organisation to remain competitive it is of the utmost importance that ways for improved customer service are continually determined in order to maintain a competitive edge in the global arena. Herewith, is a brief profile of the organisation.

The company was founded in South Africa in 1976 by three South Africans who remain as senior executives and major shareholders to this day. In 1987 the company listed on the Johannesburg Stock Exchange as UNISERV which included subsidiaries offering services in international freight forwarding and clearing, as well as domestic courier and distribution services. In 1993 UNISERV acquired UNION-TRANSPORT, which was at the time, the 3rd biggest freight forwarder in Germany and adopted Union-Transport as its trading name. Union Transport was listed on the Luxembourg exchange in 1995. In 2000 the company was listed on NASDAQ and the name was changed to UTi.

FIGURE 1.1. UTI GLOBAL OFFICES



Souce: Annual report to shareholders 2003

Today, UTi Worldwide Inc. (UTi) is an international, non-asset-based supply chain Management Company providing logistics services, planning and optimisation solutions. The company's services include air and ocean freight forwarding, contract logistics and customs brokerage. Other logistics related services that are also provided include distribution and outsourced services, the co-ordination of purchase orders and the movement and storage of raw materials, supplies, components and finished goods.

UTi serves a large and diverse base of global and local companies. These include customers operating in industries with unique supply chain requirements such as the pharmaceutical, apparel, chemical, automotive and technology industries.

1.1.4 Challenges facing the organisation

Oakland (2007: 101) says that for an organisation to be successful over time performance must begin to be measured by the improvements visible to the customer. Many service organisations are concerned about cost, staff efficiency, customer service and quality issues. Service firms, especially highly competitive service suppliers such as airlines, accounting firms, banks, import-export firms, insurance companies as well as public utilities need to display at least some comprehension of quality improvement and the application thereof. According to Oakland (2007: 106) simply providing a quality service with a high degree of customer satisfaction is not sufficient, the cost of achieving these goals must be carefully measured and managed. Staff efficiency, cost, customer service and quality will now be discussed in relation to UTi Port Elizabeth's current state of operations.

1.1.4.1 Quality

UTi is an ISO9001: 2000 accredited company. There are documented quality processes in place and the company measures quality on a continual basis, using various tools and reports. However, in an analysis of these reports and current tools all these methods are reactive in nature.

A greater focus needs to be placed on the process of delivering the service product in order to prevent quality issues arising after the service has been delivered. As the service product is intangible, quality is difficult to measure and define, although it

does have a direct link to customer satisfaction as discussed in section 1.1.4.4.

1.1.4.2 Staff cost

Staff cost is measured by the productivity ratio:

Productivity ratio:

$$\frac{\text{Staff cost}}{\text{Revenue}}$$

1.1.4.3 Staff efficiency

Number of shipments per person per day:

$$\frac{\text{Number of house bills per month}}{\text{Number of people}} = X$$

Therefore,

$$\frac{X}{\text{Average number of days in month}}$$

= Number shipments per person per day

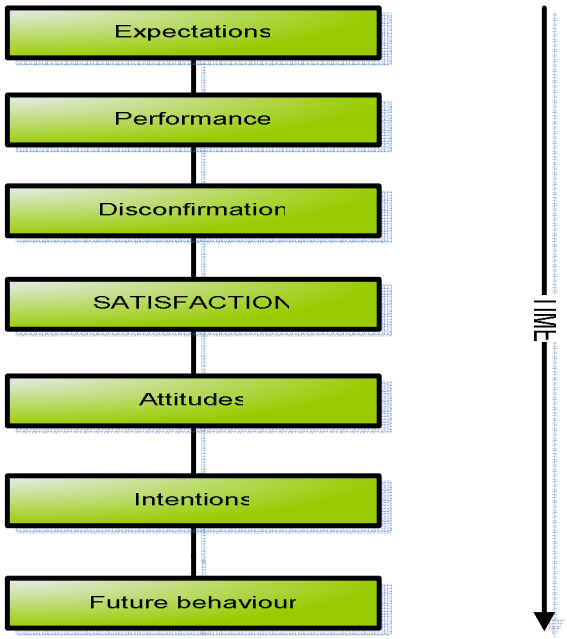
1.1.4.4 Customer service

According to Davis and Heineke (2005: 573), manufacturing and service companies that deliver exceptional service to their clients can achieve a competitive edge in today's highly competitive environment. While the importance of good

customer service is known and appreciated by both manufacturing and service industries alike, it is difficult to define and measure.

Davis and Heineke (2005: 576) go on to add that customer satisfaction can be a market-related measure to the customers reaction to waiting time for a particular service. This indicates that the amount of time a customer has to wait to receive a service, or product of a service, has a direct impact on customer satisfaction with that service. See illustration in Figure 1.2. ("The role of customer satisfaction in a customer behaviour model", Oliver as reprinted by Davis & Heineke, 2005: 577).

FIGURE 1.2. THE ROLE OF CUSTOMER SATISFACTION IN A CUSTOMER BEHAVIOUR MODEL



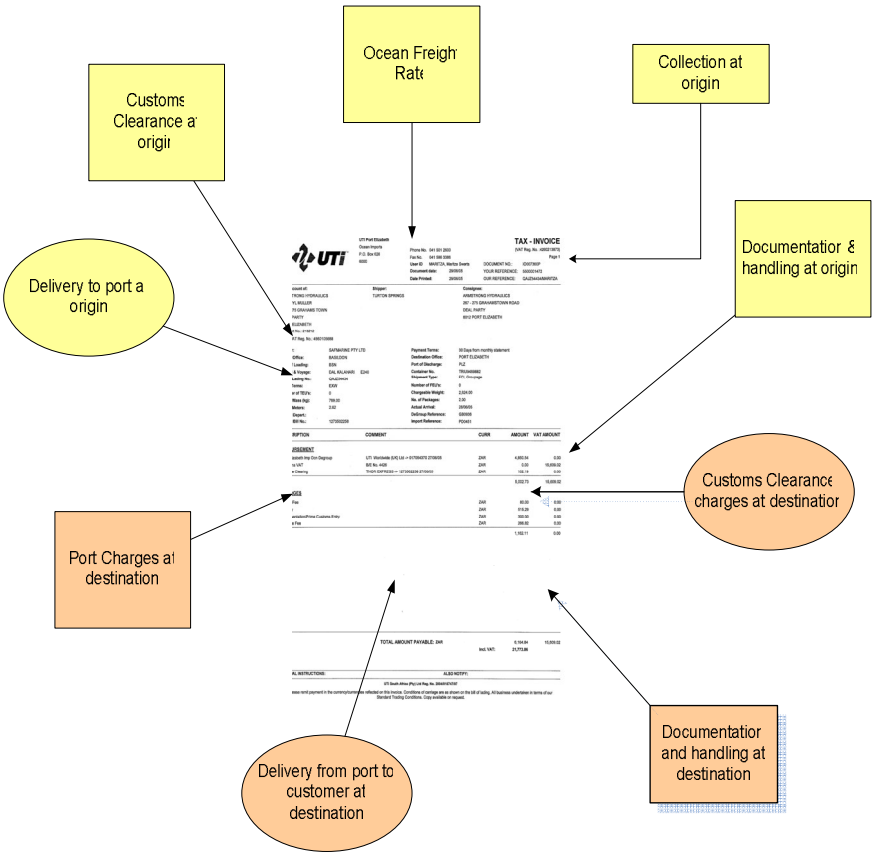
Source: Davis and Heineke 2005: 577.

Customer satisfaction is a good measure of how successful a process is because it provides the association between levels of service the company is providing the customer, with the customer's perception of that service (Davis & Heineke 2005: 576). The customer's perception of a service will impact that customer's future relationship with the service organisation which is directly linked to the long term profit of the said organisation.

The end product of UTi's service to the customer is an invoice for that service. One of the most challenging aspects of UTi's management of a customers supply chain is the delivery of a complete and final invoice to the customer with the arrival or departure of a shipment (depending on import or export process). The task is extremely complex. As stated earlier, UTi is a non-asset-based company meaning that UTi does not own trucks, airplanes or ships. This means that UTi has to co-ordinate the input of several invoices, see Figure 1.3, from third party service providers onto a single UTi invoice to the customer.

Therefore, it is legitimate to assume that the well-timed delivery of an accurate invoice has a definite link to customer satisfaction with a service and is therefore equal to a measure of customer service. If the above measures are not proactively tackled they simply become reactive measures of process efficiency.

FIGURE 1.3. THE COMPLEXITY OF A UTI INVOICE



Source: Researcher's own creation.

Thus it is concluded that some of the measures of customer service or satisfaction with the service are:

- Invoice delivery

Invoice date *less* receipt of shipment (date) by the customer = Number of days difference; and

- Invoice accuracy

Number of invoices issued vs. number of credit notes & supplementary invoices issued over a monthly period.

TABLE 1.1. SUMMARY OF CHALLENGES FACING THE UTI ORGANISATION

MEASURE OF CHALLENGES		
MEASURE	CURRENT LEVEL	DESIRED DIRECTION
Operating Ratio	%	↓
Staff Efficiency	Shipments PPPD	↑
Invoice Delivery	In days	↓
Invoice Accuracy	%	↑

Source: Researcher's own creation.

Service processes generally involve the customer. Thus, any errors that arise within the process adversely manifest themselves to the customer, leaving management with little or no window of opportunity to rectify the issue or situation before the customer is affected by it (Davis & Heineke, 2005: 162). For this reason it is imperative that processes are well-defined and efficient to limit or minimise the negative impact of service delivery failure.

1.1.5 The Lean Approach

As stated by Abdi, Shavarini and Hoseini (2006: 196) organisations are pressured to become more efficient, more effective and competitive global players. This has lead to both service and manufacturing organisations applying an assortment of techniques in an effort to reduce costs, increase flexibility, raise quality, lessen variability and shorten lead times. In order for UTi to remain competitive on a global scale,

the organisation needs to review current processes in order to reduce costs and increase efficiency, but still satisfy the needs of the customer and remain flexible enough to deal with the challenges of the external business environment.

According to Hall (2006: 27), the motor industry has always been at the helm of finding ways of improving processes and methods of production in order to compete in the global market. Likewise, Sewell (1992: 23) argues that service industries should look to manufacturers if they wish to provide a better service, because it is manufacturers - not the service companies - that have the most efficient processes and systems.

One of the most ground-breaking manufacturing philosophies is that of the 'Lean' approach. The lean approach describes management techniques used by the Japanese automotive industry, in particular Toyota. In essence it simply means "*doing more with less*" (Abdi, et. al., 2006: 196). Considering the current financial position, progression and market domination of the Toyota Company, it is worthwhile to evaluate their approach to manufacturing processes and management techniques, as well as the potential for the same to be applied to UTi International Inc.

The definition of lean production as provided by Davis and Heineke (2005: 349) is as follows:

"*An integrated set of activities designed to achieve high-volume flexible production using minimal inventories of raw materials*".

Womack and Jones (1996: 15) state that lean production uses fewer resources when compared with mass production. That is, reduced manufacturing area; half the number of employees; less investment in tooling; a lesser amount of time to bring a new product to the market; less inventory; fewer flaws and a greater range of products. The approach and management of company resources is critical to any organisation's success, regardless of whether the organisation manufactures a product or provides a service.

According to Brown, et. al., (2006: 4), lean systems focus on exactly what the customer requires at a price the customer is willing to pay and at the time the customer requires it. Responsiveness to customer's needs and requirements will ultimately determine UTi's long-term success as an organisation.

Womack, Jones and Roos (1990: 8), predict that lean production will spread outside of the automotive industry and will change almost every business operation, choices for customers, the nature of work, the prosperity of companies and, eventually the destiny of nations. Considering this, South Africa should take heed of this trend towards 'lean' business methodology.

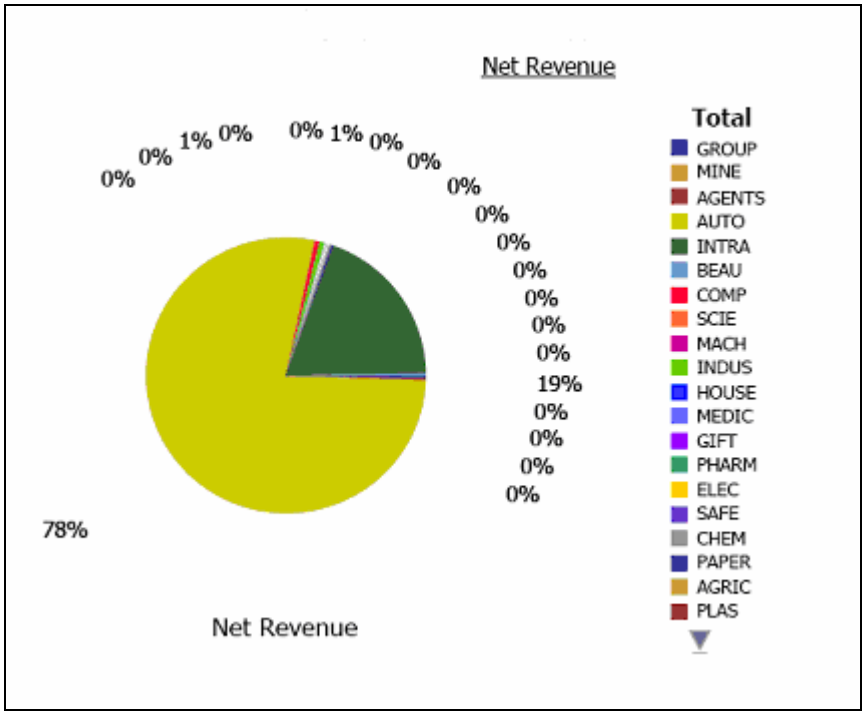
1.2 THE RESEARCH QUESTION AND PROBLEM AREA

Davis and Heineke (2005: 364) state that service organisations present opportunities for the use of lean concepts. The reason for this is that lean production focuses on processes, not on products. Lean methodology can be applied to any group of processes in both the manufacturing and services arena's. This is echoed by Sewell (1992: 23), who states that every firm is an accumulation of systems. These systems must combine to create a process that is efficient and responsive to customer needs. It is the process, above all else, that guarantees good service.

According to Hill (2007: 189) firms are, by and large, more sensitive to the needs of their closest clients or customers. As much as 80% of UTi Port Elizabeth's customers are automotive OEM's or 1st and 2nd tier suppliers to the OEM's in the Nelson Mandela Bay Metropole, see Figure 1.6., (UTi Financial data, 2007). UTi Port Elizabeth's top 10 customers are automotive customers. There is a strategic advantage to aligning the service organisation with the needs of the customer, considering the make up of UTi Port Elizabeth's customer base.

One could ask the question - *if a logistics service provider thinks like an automotive manufacturer and tackles processes like an automotive manufacturer, the organisation become better service providers to automotive manufacturers?*

FIGURE 1.4. UTI PORT ELIZABETH'S CUSTOMER BASE



Source: Researcher's own creation.

An investigation of the application of lean manufacturing tools and techniques to UTi Port Elizabeth's business processes needs to be considered as this may indeed lead to improved process efficiency and ultimately to increased customer satisfaction.

The researcher will address the following main research problem:

Can lean principles and tools be applied to UTi Port Elizabeth's service operation?

1.3 SUB-PROBLEMS TO BE ADDRESSED IN THE STUDY

In order to answer the main research problem the following sub-problems will need to be addressed.

1.3.1. What is UTi Port Elizabeth's current performance against measures of cost control and customer satisfaction?

1.3.2. What does a literature review reveal about the successful application of lean manufacturing concepts to the service industry?

1.3.3. How can current operations be analysed? and

1.3.4. What changes will occur in the application of lean analysis to service operations?

1.4 PURPOSE STATEMENT

The purpose of this study will be to discover if the lean methodology and approach to manufacturing, has practical application to service operations at UTi Port Elizabeth. The unit of analysis will be the ocean freight import shipping file (quantitative data) and ocean freight import managers and supervisors (qualitative data). The ocean import file determines the final output of the service - the UTi invoice for the service - discussed in section 1.1.4.4.

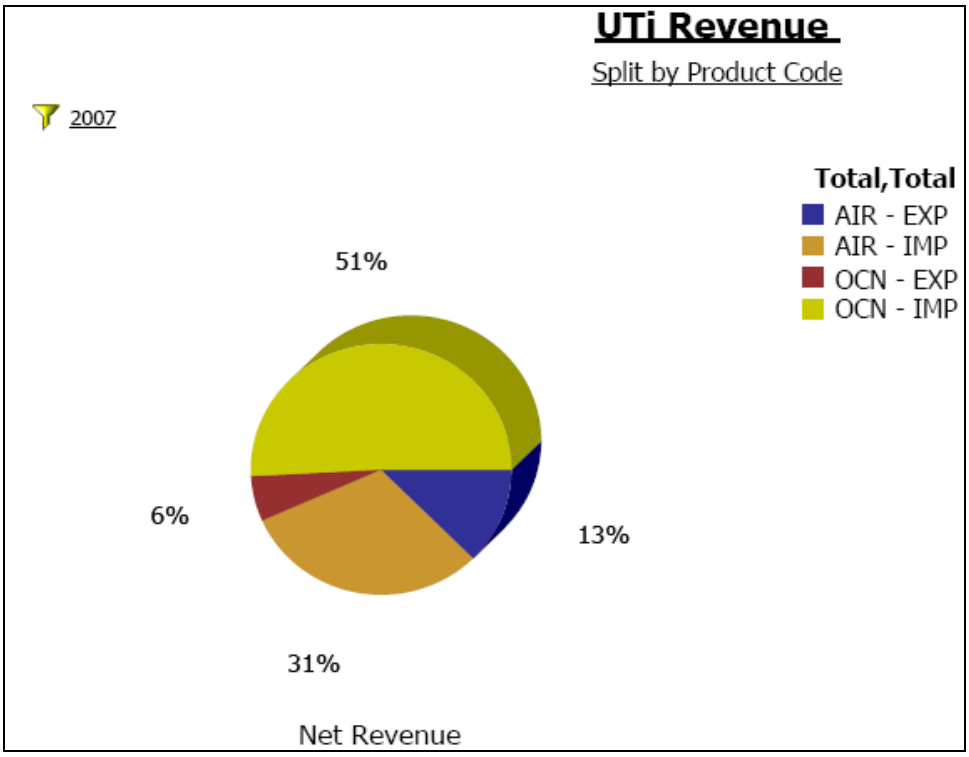
Lean methodology is generally described as an integrated set of activities designed to achieve high-volume, flexible processes using a minimal amount of inputs, simply put, '*the ability to do more with less*'(Davis & Heineke, 2005: 364).

1.5 SELECTED SAMPLE

A judgemental sample has been selected in accordance with information and advice received from the operations manager at UTi Port Elizabeth. The selected sample will be the ocean freight imports operation at UTi Port Elizabeth. The reason for selecting this sample is because:

- The ocean freight import department is the most process orientated team at UTi Port Elizabeth.
- The team also generates the highest revenue within the UTi Port Elizabeth operation, See Figure 1.6.

FIGURE 1.5. UTI FINANCIAL DATA, 2007



Source: Researcher's own creation.

1.5.1 The ocean freight imports process relies on 6 of the 8 teams within the entire UTi Port Elizabeth operation and is the most representative of the operation as a whole.

Therefore, taking the above factors into account, the ocean freight imports operation will be the most representative of all UTi Port Elizabeth operations for the purposes of this study.

1.6 RESEARCH DESIGN AND METHODOLOGY

The overall theme of the research is action research within the phenomenological paradigm. This approach is chosen as the researcher and the research are part of the proposed change

and analysis. The overall purpose of the research is to assess whether the selected lean tool, value stream mapping, will reveal process inefficiencies within UTi Port Elizabeth's ocean freight import process.

To accomplish this there will be three stages to the research process.

1.6.1 First stage: Literature review

The research will commence with a review of the existing literature on lean manufacturing. The review will then progress to an investigation on the successful application of the lean approach to service industries. It will be important to develop a framework of correlations between the successful application of 'lean' to service industries and the industry of freight forwarding. Finally the value stream mapping tool will be discussed.

1.6.2 Second stage: Exploratory research

Exploratory research consisted of data collection to ascertain UTi Port Elizabeth's current performance in reference to business efficiency measures of the following:

1.6.2.1. Invoice accuracy

A sample of files determined the current level of invoice accuracy by measuring the number of supplementary invoices and credit notes per ocean import file;

1.6.2.2. Staff efficiency

Six months data was used by taking the number of house bills of lading over the number of employees in the ocean freight imports process.

1.6.2.3. Productivity ratio

Six months data on staff cost over revenue generated by the ocean freight imports process.

1.6.2.4. Semi-structured interviews

These have been held with the ocean freight process team supervisors and managers to establish the current functioning of the ocean freight import process.

1.6.2.5. Process measurement

Time sheet, work sampling and standard time studies have been used to determine the process cycle time.

1.6.3 Third stage: Process analysis

By definition, value stream management (VSM) is a process for planning and linking lean initiatives through systematic data capture and analysis (Tapping and Shuker, 2003: 5). In this phase a *current state* diagram will be developed. The current state will be analysed and a proposed *future state* will be presented and discussed.

1.7 DATA COLLECTION PROCEDURE

The research will use a variety of data collection methods based on the appropriate stage of research.

1.7.1 First Stage: Literature review

The scope, context and parameters of the literature review:

1.7.1.1 Key words

The researcher will make use of the following key words or combination of key words:

- Lean;
- Lean and manufacturing;
- Lean and servicing;
- Lean and customer service;
- Lean and tools; and
- Value stream mapping.

1.7.1.2 Time frame

The researcher will examine relevant literature between the periods of 1990 to date. The reason for the year 1990 is that it coinsides with the release of the book, *The machine that changed the world*, by Womack and Jones. A literature review will continue throughout the study.

1.7.1.3 Geography

The research will not be limited to any particular country and therefore, any literature worldwide will be acceptable but limited to the language of the researcher (English).

1.7.1.4 Multidisciplinary approach

The primary purpose of the research is to apply 'lean' methodology to the service environment. Therefore, the researcher will not be limited to any particular discipline. The only criteria will be for 'lean' to be applied to a process.

1.7.1.5 Information sources

The following information sources will be consulted:

- Journal articles;
- Theses and dissertations;
- Conference proceedings;
- Books; and
- Internet.

1.7.2 Second stage: Exploratory research

In order to ascertain the level of invoice accuracy and quality, a sample of shipping files will be drawn from six months of historical shipping files. Using a confidence interval, the sample proportion will determine the number of files containing at least one credit or supplementary invoice, or both.

Staff efficiency will be measured month on month using a six month period of historical data.

Productivity ratios will be measured month on month using a six month period of historical data.

1.7.3 Third stage: Process analysis

A detailed analysis of the current ocean freight import process involving a physical check through of the process and measurement thereof. The research instrument used was semi-structured interviews and quantitative data on the functioning of the team. A proposed future state will be presented based on any information or process improvements uncovered in the current state value stream mapping process.

1.8 ETHICAL CONSIDERATIONS IN CONDUCTING THE RESEARCH

In the area of business research there are no formalised guidelines on ethical conduct in research (Collis and Hussey 2003: 38). Due to the current employment relationship between UTi Port Elizabeth and the researcher, ethical conduct will have to be maintained within the boundaries of the employment relationship.

1.8.1 UTi Port Elizabeth

The researcher will have to adhere to the rights of UTi Port Elizabeth in terms of privacy of the results of the research. Results of the research may contain trade secrets and

confidential and/or proprietary information of UTi Port Elizabeth. In this case, it would provide substantial benefit to competitors of the firm. It will be important to ensure that UTi Port Elizabeth is protected and a confidentiality agreement is reached and a contract signed between researcher, UTi Port Elizabeth and sponsor. This is in accordance with point 4f of the code of conduct for researchers at Nelson Mandela Metropolitan University (NMMU). Consent will be obtained from UTi Port Elizabeth before publication of any results.

1.8.2 Participants within the UTi Port Elizabeth operation

According to Collins and Hussey (2003: 38), informed consent of participants is ethical in any research undertaking. In this case, the researcher will present a detailed outline and purpose of the study to UTi Port Elizabeth employees (participants). This is in accordance with point 4e&f of the code of conduct for researchers at NMMU. The researcher will also present a timetable for the study which is acceptable to UTi Port Elizabeth and, as far as possible, has minimal interruption to the business operations of the firm. In order to maintain a sense of anonymity with participants responses and statistics were recorded. This is in accordance point 4f in the code of conduct for researchers at NMMU.

The researcher will have to consider the rights of UTi Port Elizabeth at all times. The researcher believes that this is a ‘common courtesy’ which should be afforded the organisation in allowing research to be conducted during the operational hours of the firm. It is to this end, that the rights of UTi Port Elizabeth will be considered before any publication of results of

the research. According to Davis and Heineke (2005: 97), stakeholders in organisations have become more aware of issues which may cause the public image of an organisation to be cast in a bad light. Due to the employment relationship between the researcher and UTi Port Elizabeth this would be a strong consideration in negotiating the publication of any results.

1.9 DEFINITION OF CONCEPTS

In order to pursue a study of lean methodology and its application to the UTi environment the following terms synonymous with lean theory will need to be understood and clarified.

Process cycle time: Is the time required for a process to meet a particular demand for a certain period.

Muda: An activity which uses resources but adds no value (Womack and Jones, 1996: 308).

Process: A sequence of single operations to create a product or complete an order (Womack and Jones, 1996: 309).

Value: A capability provided to a customer at the right time, suitable price, as determined in each case by the customer (Womack and Jones, 1996: 311).

Value stream: Precise actions required to design order and provide a definitive product from conception of an order

through to delivery of raw material to the customer (Womack and Jones, 1996: 311).

Value stream mapping: Classification of the precise actions occurring in the value stream for a particular product or product grouping (Womack and Jones, 1996: 311).

The following concepts used in the UTi working environment will need to be understood and clarified.

Document Distribution Team: A team of four employees involved in compiling a set of documents complete with a UTi invoice for delivery to the customer (Wampach, 2007).

Bill of Entry Team: A team of ten employees which processes entries into customs (SARS) in order to obtain customs release of imported goods (Wampach, 2007).

Degroup Team: A team of eight persons involved in referencing and registering of shipping files. Degroup is synonymous with the ocean freight process only (Wampach, 2007).

Deliveries Team: A team of seven employees involved in expediting shipments from destination port to customer premises and raise the final invoice to the customer (Wampach, 2007).

Forwarding Team: A team of eight employees involved in expediting ocean freight shipments from source to destination port [Port Elizabeth] (Wampach, 2007).

1.10 SUMMARY

In this chapter the main problem and sub-problems have been defined. The delimitations of the research study have been explained. Key concepts used in the research study have been discussed in order to introduce the topic under investigation.

The significance of the research has been explained and the reasons why the research was conducted have been discussed. In addition, the research methodology used in the study was introduced and briefly explained. A more detailed account of the research study will follow in chapters 3 and 4.

Chapter 2 will begin with a literature review on lean manufacturing and its application to the service industry.

CHAPTER 2

A HISTORY OF LEAN MANUFACTURING AND APPLICATION TO THE SERVICE INDUSTRY

2.1 A BRIEF HISTORY OF LEAN MANUFACTURING

The Toyota Motor Company of Japan first drew world attention in the 1980's when it became apparent that there was something exceptional about Japanese quality and manufacturing efficiency (Liker, 2004: 3). Western countries and the United States of America in particular, needed to determine what Toyota and other Japanese manufacturers were doing differently. The release of Womack and Jones' book called 'The machine that changed the world' in 1990, introduced Lean Manufacturing (or simply referred to as lean) which is used to describe the Toyota Production System (or TPS).

The origins of lean manufacturing began post WWII, with Eiji Toyoda's visit to Ford's Rouge plant in Detroit. Eiji studied the Ford production process in detail and brought back this knowledge to Japan. Through discussion with the chief production engineer of Toyota, Taiichhi Ohno, it was soon realised that mass production would never succeed in Japan, but it was through this visit to Rouge that the origins of the Toyota Production System and eventually lean production were realised (Womack, et. al, 1990: 49). It was Taiichhi Ohno who, through his genius and continuous drive to improve, developed the principles of lean. This system of production was soon

followed by other Japanese organisations and the superiority of the Japanese economy followed (Womack, et. al, 1990: 68).

According to Womack (1996: 15), lean provides a way of doing more with less. This is done by lining up value creating activities in the most optimal sequence with as minimal interruption as possible. Womack (1990: 13) differentiates between three primary forms of production (paralleled with human development):

- Craft production – The very first production technique deployed by mankind. Key aspects are: highly skilled workers; simple but adaptable tools; high degree of customisation;
- Mass production – Pioneered by Henry Ford. Key aspects are: highly standardised products; division of labour into narrowly defined jobs; single purpose machines; interchangeable parts and high volume throughput; and
- Lean production – Combines advantages of both craft and mass. Employs multi-skilled workers; uses increasingly automated machines producing greater variety; uses less resources than mass production with the resultant continuous pursuit of perfection being the primary driving force.

Bicheno and Pieterse (2008: 19), provide an abridged view of the five key principles which form the core basis of lean thinking:

- Precisely specify the value for a specific product;
- Identify the value stream for each product;
- Make value flow without interruptions;

- Let the customer pull the value from the producer; and
- Pursue perfection.

At the core of these five principles is the elimination of “muda”. Muda is a Japanese word for waste, and waste is any human activity which absorbs resources but creates no value for the end customer (Womack, et al. 1996: 15). According to Liker (2004: 29) Toyota has identified seven major types of muda:

- Overproduction: Producing items where no orders are in place. This results in additional staff, storage and transportation costs because of additional inventory;
- Waiting time: Any time spent waiting for the next processing step, tool, supply or part; or having no work because of stock outs or processing delays, equipment breakages or bottlenecks due to capacity constraints;
- Unnecessary transport: Carrying work-in-process long distances; movement of finished goods out or into storage locations; or movement between processes;
- Over processing or incorrect processing: Includes executing unnecessary steps to manufacture parts, and any unnecessary motion. Even providing higher-quality products than necessary;
- Excess inventory: Any surplus raw material, WIP, or finished product resulting in longer lead times, obsolescence, damaged goods, transportation and storage costs;
- Unnecessary movement: Any unnecessary movement employees have to perform by carrying out their activities. For example, looking, reaching, stacking of tools and walking; and

- Defects: Production of any defect part or correction – rework, scrap, inspection.

In 1960 the USA was by far the world's most dominant industrial power. By 1981 this giant was humbled as Japan entered into a voluntary export restraint due to pressure from the US government (Hill, 2007: 206). US manufacturers simply couldn't compete with Toyota and its suppliers. The Toyota Production System is acknowledged as the source of Toyota's superior performance as a producer of motor vehicles (Spear & Bowen: 1999: 97). This confirms that it is the manner in which Toyota builds its cars rather than the car design and marketing that make it such a ferocious competitor. Similarly Hill (2007: 247), states that Toyota's competitive advantage comes from its superior production system. Any company which can amass, at any point in time, between $30 to $50 billion in cash reserves is enough to convince anyone that Toyota must be doing something right (Liker & Meier, 2006: 3).

2.2 LEAN MANUFACTURING IN THE SERVICE INDUSTRY

Lean methodology and its application to a manufacturing environment, other than automotive, are obvious. What is not obvious is how this can be applied to a service environment. Womack et al (1990: 9) state that they believe that the basic ideas of lean production are universally applicable. This is because lean methodology focuses on the process, not the output. Bearing in mind that, the output of a service is intangible - how can the same principles be successfully applied? Maleyeff (2006: 675) says that in service systems, the five fundamental principles mentioned in section 2.1., do not

always apply in obvious or definite ways. Does a lean service model exist in reality? Davis & Heineke (2005: 364) confirms that although there are numerous dissimilarities between manufacturing and service operations, both share the most basic attributes of production. Both utilise processes that add value to fundamental inputs with the objective of creating an end product or service.

Bowen and Youngdahl (1998: 208) say that many service firms have already embraced the principles of lean manufacturing to form what is called "Lean Service". Similarly, Kerr (2006: 31) states that many organisations have began to consider a lean system as a process improvement tool, not just in a manufacturing context, but in anything from transportation to accounting. However, practical application of these lean manufacturing tools still seems to evade one's rational thought when approaching the service industry. Ehrlich (2006: 41) identifies some common 'myths' which are used to rationalise why lean cannot be applied to non-manufacturing scenarios:

- Creative work cannot be standardised;
- Every customer request is different;
- Tasks are not repeatable;
- Time needed is unknown; and
- Different steps are needed for each cycle.

Yet the lean model has indeed expanded beyond the factory floor to many different types of operations. Liker and Morgan (2006: 5) say that the lean movement has gone beyond the shop floor to service industries. In one example, US hospitals are all aware of lean principles or are in the process of implementing some kind of lean programme. While lean

principles have had overwhelming success in the manufacturing world, the 'true' lean service model is still under development. To illustrate the adoption of lean in services some of the success stories in the application of lean principles to the service industry are discussed.

2.2.1 Airline Industry: Southwest Airlines

In a review of studies on successful application of the lean service model Abdi et. al. (2006: 202) found that the Southwest Airlines (SWA) operations and strategy is an example of the "lean" production-line method of service. The study revealed that SWA's operations are driven from a value chain perspective and are supported by flow production and JIT pull. SWA's continued focus on waste elimination and the removal of services that are considered unimportant by the customer, such as in flight meals, has earned the airline the "triple crown" (smallest amount of late flights, mishandled bags and lowest amount of passenger complaints according to Department of Transportation records) whilst retaining the lowest cost per available seat mile of the ten top airlines in the US from 1985-1995).

2.2.2 Food Industry: Taco Bell

Bowen and Youngdahl (1998: 214) believe that Taco Bell is the benchmark in the lean production approach to service. At the beginning of the 1990's Taco Bell began determining what their customers valued in a meal. They found that their customers wanted fast food, and accurate orders, in a clean restaurant and at the correct temperature (FACT). Taco developed its

strategy to bolster and champion any activities that assisted the organisation to deliver FACT. To this end, the company reduced performance tradeoffs by delivering FACT, while simultaneously reducing costs and offering a new value menu of inexpensive meals.

2.2.3 Medical industry: Sapphire Engineering (part of IDEX Corporation)

Sapphire Engineering is a medical device company that manufactured in batches for lot control and efficiency. The company needed to work within stringent tolerances of 40 millionths of an inch in a "clean room" environment. The company had been attempting once-off improvement events but had never achieved any real bottom line results. The company embarked on a lean programme. Through the use of value stream mapping and the elimination of batches, the company's on-time delivery and quality improved dramatically. The results from improved performance have shown on both the bottom line and in market share, (Duggan, 2006: 20).

2.2.4 Health care: Shouldice Hospital

Shouldice hospital focuses on the service delivery of patients with abdominal hernias. The entire hospital system is driven by "patient pull". Starting from the screening process where potential patients complete a medical application form obtained from the hospitals website (www.shouldice.com). On the application form is a diagram of the mid to lower chest where the patient is asked to indicate the position of the hernia to be repaired. The surgeon is able to level production capacity

requirements by determining the risk of the procedure for each patient and giving them an operating date. The operating theatre is also arranged in a U-shape, similar to that of work cells found in manufacturing. This arrangement allows for sharing of information, expertise and a single anaesthesiologist. As a result of the hospitals “lean approach” to service, patients recover faster with fewer complications and receive the service at a lower cost (Bowen and Youngdahl 1998: 219).

Some impressive results of lean application in the service industry have been uncovered. An evaluation of lean tools and principles will follow and consideration will be given to the application of lean tools and principles to the service industry.

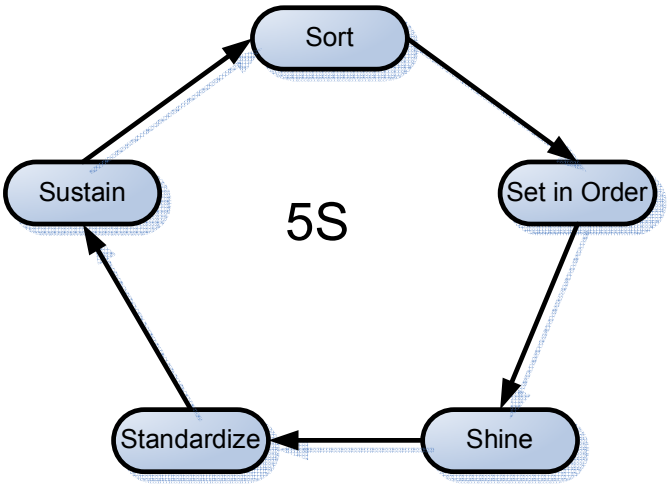
2.3 LEAN TOOLS

In this section the researcher will present a lean tool as it is known in the manufacturing context, then discuss its purpose and relate its application to the service environment by way of example.

2.3.1 Five S

According to Seddon (2005: 180), 5S provides a standard working environment. Through standardised work, waste is removed. 5S also provides a visualisation of work and waste and enables the employee to see the process flow. See Figure 2.1.: The 5S Circle of Accomplishments

FIGURE 2.1. THE 5S CIRCLE OF ACCOMPLISMENTS



Source: Tapping and Shuker (2003: 89).

According to Seddon (2005: 179) 5S is made up of the following:

- Seiri (sort) - Immediate disposal of unnecessary items;
- Saiton (Set in order) - To put things in order;
- Seiso (Shine) - Clean to original condition;
- Seiketsu (Systemise) - Clean working area free from bad habits; and
- Shitsuke (Sustain) - Be clean mannered, use polite behaviour.

The theory of this work method is that through a methodical approach employees will experience ownership in the work environment. This facilitates self-discipline and the enhancement of quality and safety in the work place.

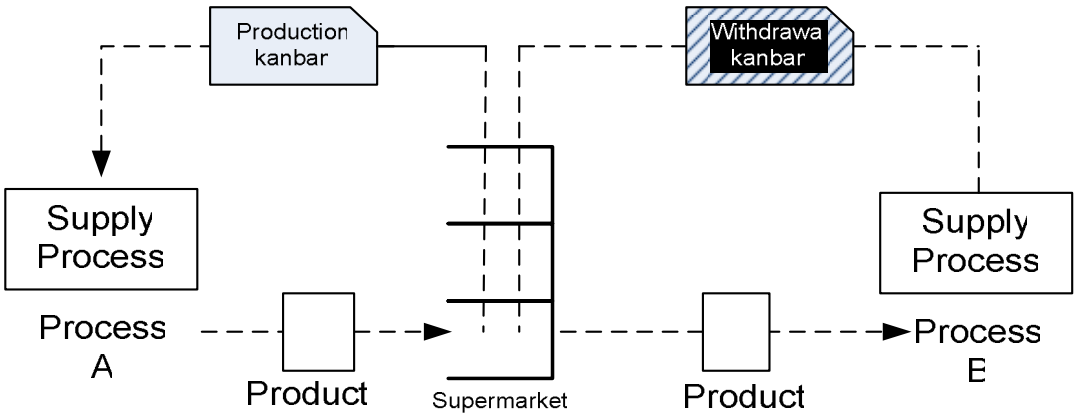
According to Bicheno and Pieterse (2008: 51) 5S is, more than likely, the most commonly used lean tool in the service industry. However, Seddon (2005: 190) warns that 5S may only

give service organisations the impression of going lean but in reality nothing changes. A typical example of 5S is a row of box files on a shelf being given an identifiable pattern across the spine to indicate the order in which they belong. If employees usually spend a large amount of time searching for these files, this may save time and improve productivity.

2.3.2 Kanban

Pieterse (2007: 136) describes kanban as a process of arranged signals used to trigger a process in the production line to manufacture only a required quantity. The kanban signal is in the form of a card which is used to control the work in process, production of material and flow of stock. Through the use of kanban, a pull system is created between production stages, only according to the rate of parts being produced by downstream processes (Pieterse, 2007:18). The kanban system creates flow within the process. The supermarket pull system (Figure 2.2) allows certain 'upstream process' to still function in batch mode, and the supplying process only needs to restock what has been withdrawn.

FIGURE 2.2. THE SUPERMARKET PULL SYSTEM



Source: Pieterse (2007: 81)

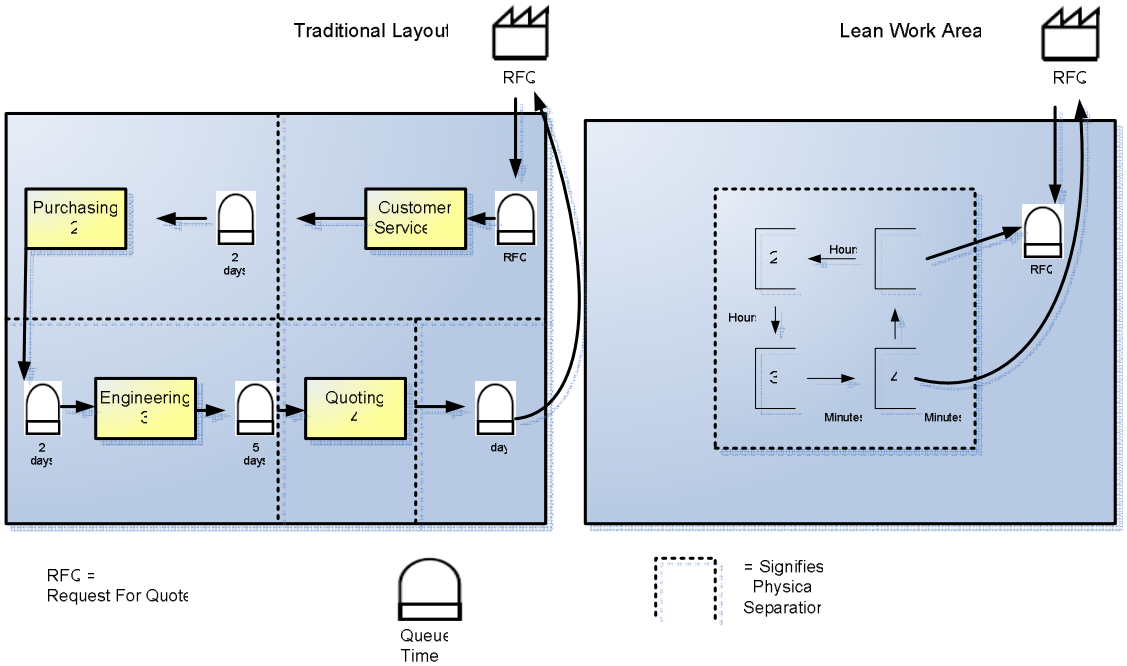
The downside of kanban flow is that any stoppage would disrupt the entire chain, this makes the whole manufacturing or service process inter-reliant (Pieterse 2007: 7).

2.3.3 Group Technology (cellular layout)

The kanban single-piece flow system is the opposite to mass production. In a mass production system processes are grouped together according to functional divisions where specialised labour carries out narrowly defined tasks. One of the core principles in lean methodology is that of single piece flow. To accomplish single piece flow lean deploys a work area design methodology called group technology. Group technology assembles all machines necessary to produce a part into manufacturing cells. These cells produce “families of products” through common parts which flow through identical or related processes (Davis & Heineke 2005: 351).

Tapping and Shuker (2003: 111) describe a lean work area as a self-contained, adequately staffed area that includes a number of value-adding processes. The arrangement of these cells can be in U-, C- or L shaped zones. See Figure 2.3: Cellular work areas. Davis Heineke (2005: 421) say that the fundamental goal in planning a layout in the service environment is to minimise travel time for employees and generate understandable flow for clientele when they come into contact with the service delivery process.

FIGURE 2.3. CELLULAR WORK AREAS VS. TRADITIONAL FUNCTIONAL LAYOUT



Source: Tapping and Shuker (2003: 112).

An excellent example of group technology in operation can be found at the Cape Town Waterfront at a restaurant called the Cape Town Fishmarket. In this restaurant two sushi chefs prepare food in the center of a circular conveyer belt. Patrons collect their food off the conveyer belt. The plates are different colours which indicate the price of the dish selected. At the end of the meal a waitress will count plates, note colours and hand the bill to the patron.

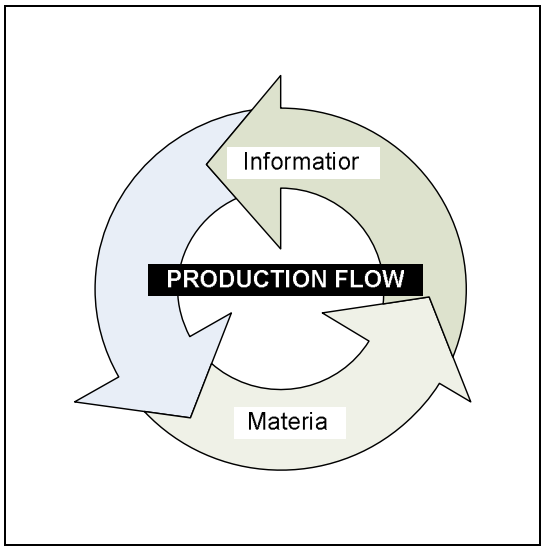
2.3.4 Value stream mapping

According to Tapping and Shuker (2003: 11), before a business can begin improving its processes it must first understand what it is currently doing relative to cycle time, process communications, work standards, capacity and so forth. In order to achieve this it is necessary to specify the value stream. Womack et al (1996:19) describe the value steam as an arrangement of precise activities necessary to bring a product or service through three essential management tasks:

- Problem-solving task: running concept through design and engineering to product launch;
- Information management task: running from order-taking to comprehensive scheduling and delivery; and
- Physical transformation task: the movement of raw materials to finished product in the customer's possession.

Rother and Shook (2003: 3) say that in taking a value stream perspective means looking at the whole process, beginning to end, and not only individual parts of any process. Through doing this, improvements can be made to the entire system and not only to individual parts of the system. Value stream mapping is a tool used to envisage the flow of raw material to finished product – beginning to end (Seddon: 2005: 184). It is the concept of flow which is important in identifying the manner in which material / information or product moves through the manufacturing or service process. Not only is the physical flow of material important, but also the movement of information through the process. This is how the process knows what to do next (Figure 2.4.)

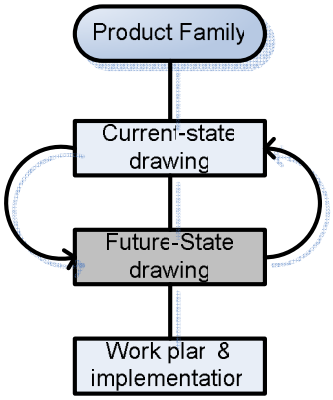
FIGURE 2.4. INFORMATION AND MATERIAL INFLUENCING PRODUCTION FLOW



Source: Rother and Shook 2003: 9.

Value stream mapping follows specific steps, as shown in Figure 2.5. The first step is to draw the current state by collecting information found on the 'shop floor'. This information is used in constructing the future state. The arrows in the figure indicate that construction of the current state and future state are concurrent events. Future state innovations could come to mind as one is mapping the current state. (Rother and Shook 2003: 9)

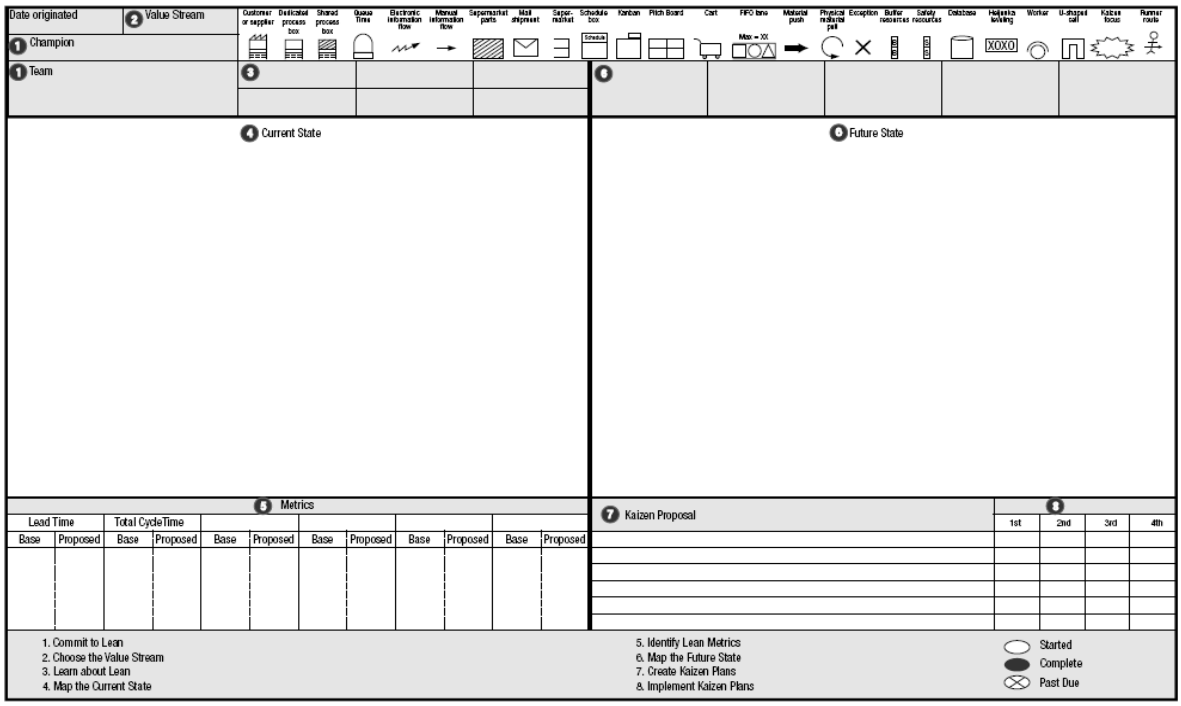
FIGURE 2.5. THE VALUE STREAM MAPPING



Source: Rother and Shook (2003: 9).

Value stream mapping deploys very specific formats and the use of icons which describe activities within the process. The layout of the map is called the 'story board' which can be viewed in Figure 2.6.

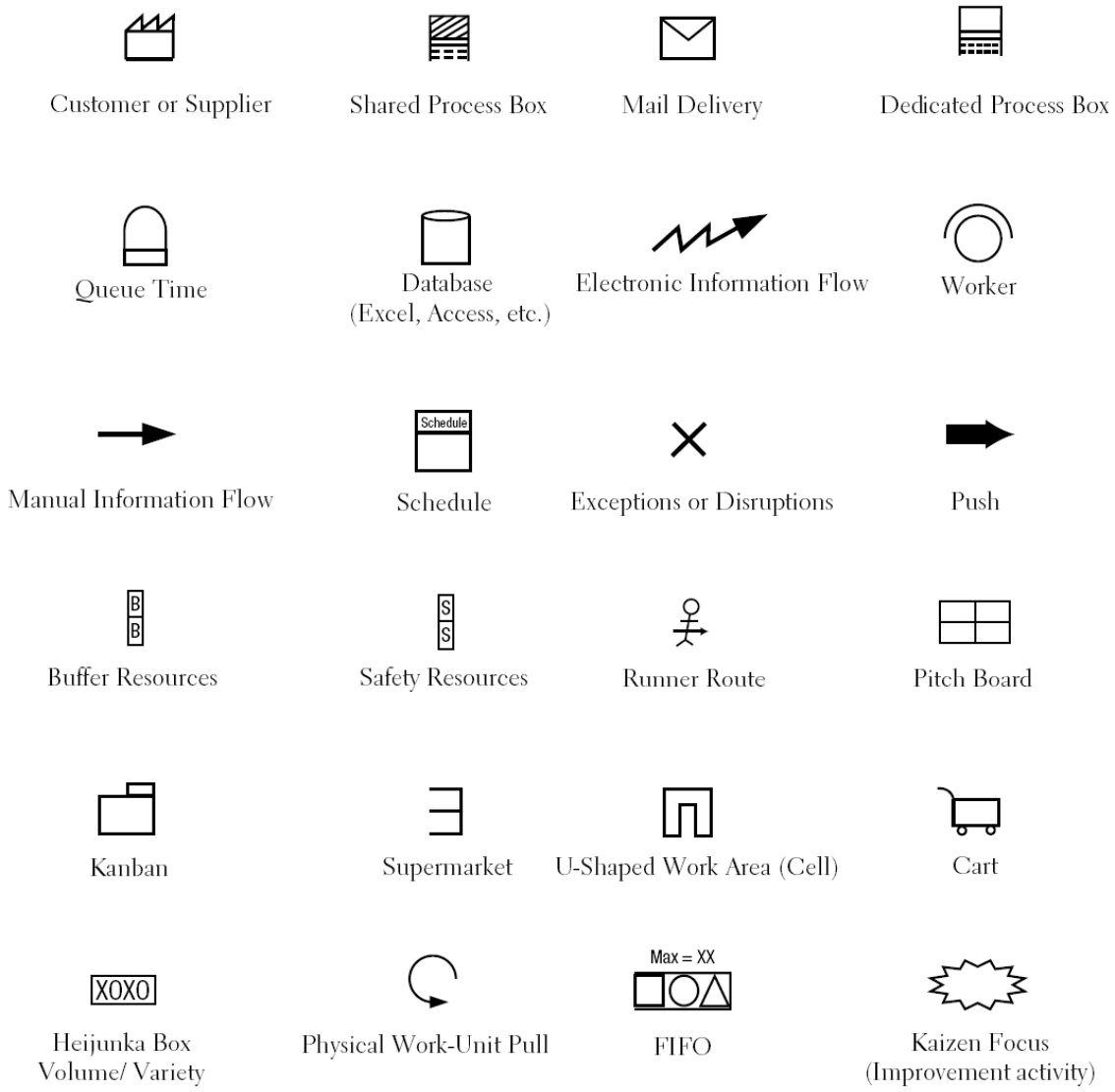
FIGURE 2.6. THE VALUE STREAM STORY BOARD



Source Tapping and Shuker (2003) CD Rom.

The icons which are used can be viewed in Table 2.1.:

TABLE 2.1. VALUE STREAM MAPPING ICONS



Rother and Shook (2003: 13) say that it is possible to develop icons specific to the business process under analysis, however, they must be kept constant within the organisation so other employees or managers can understand the drawing.

Conversely, Seddon (2005: 194) believes that value stream mapping is of little worth in service organisations. Seddon considers that the constraint of a machine is not pertinent to service flow; in reference to the role of employees as substitutes for manufacturing equipment. This means that they are imperative functions or activities. However, in the service environment, flows are dictated by customer demand. Seddon believes that any standardisation in a service system prohibits that system from absorbing variety leading to inflexibility when dealing with customer demands. This argument is contrary to that of Tapping and Shuker (2003: 2), who say that value stream mapping is an imperative in any lean implementation.

2.4 ELIMINATION OF WASTE – A SERVICE CONTEXT

The central theme for the application of any lean tool must be to eliminate *muda*, as described in section 2.1. While an association can be found between waste found in manufacturing and waste found in the service environment, many of these applications are of lesser importance in a service environment. Simply put, much of the terminology used in a manufacturing context would be incompatible with the service environment (Maleyeff 2006: 683). Maleyff (2006: 683) provides a table of the seven categories of waste in the service context. See Table 2.2.

TABLE 2.2. THE SEVEN CATEGORIES OF WASTE IN THE SERVICE CONTEXT

Categories of waste	
A	Delays
B	Mistakes
C	Reviews
D	Movement
E	Duplication
F	Processing inefficiencies
G	Resource inefficiencies

Source: Maleyeff, 2006: 683

Maleyeff (2006: 683) goes on to define:

- Delays: time wasted directly or indirectly as a result of queues (e.g. file placed in an intray) or delays in information being transmitted;
- Reviews: inspection activity around completed work or work in progress for omissions or mistakes (e.g. checking technical accuracy);
- Mistakes: internal or external failure costs which results in work having to be repeated;
- Duplication: any activity which is done elsewhere in the service system or can be done, with less effort, in another part of the service system (e.g. same data is entered on two different locations in the system);
- Movement: the physical transport of information, personnel or equipment (e.g. traveling to attend a meeting with a

customer to find the route cause of a mistake, or completing an incident report on a particular service failure);

- Processing inefficiencies: unproductive use of resources to perform a specific task (e.g. generating a report without a standard template, so that the employee needs to "reinvent the wheel" every time that a report is required); and
- Resource inefficiencies: any management of employees, equipment, material or capital resources in ways that do not create value (e.g. a work schedule which does not correspond with customer demand or holding meetings which do not result in improved value for the customer).

2.5 SUMMARY

The chapter began by revisiting a brief historical background on the rise of the Toyota Motor Company and the development of lean principles which drive continuous improvement at Toyota.

The second part of the chapter focused on the application of lean manufacturing principles in the service environment. A brief review followed regarding the success of lean application in service companies such as Southwest Airlines; Taco Bell; Shouldice Hospital; and Sapphire Engineering.

This was followed by a review of some lean tools and their application to the lean environment, namely 5S; group technology; kanban and value stream mapping. With every tool the researcher provided a practical application by way of example, on the application of the relevant tool. A counter

argument was given to the application of the tool in the service environment.

Chapter 3 will focus on the research design and methodology followed in furthering the investigation into the application of lean principles and tools in the freight forwarding environment.

CHAPTER 3

RESEARCH DESIGN AND METHODOLOGY

3.1. INTRODUCTION

In chapter 2 the theory of lean manufacturing principles was introduced and examples given in lean application relative to the service industry. The literature review was used to establish the answer to sub-problem 1.3.2: What does a literature review reveal about the successful application of lean manufacturing concepts to the service industry?

It has been identified that lean has been successfully applied to many service industries that have produced impressive results.

The purpose of this chapter is to explain the research methodology followed for this study.

The methods and procedures to be dealt with in this chapter include:

- The sample selection method; and
- The data collection procedure and technique.

An explanation of how the samples were chosen is also provided.

3.2. RESEARCH PROBLEM AND HYPOTHESIS

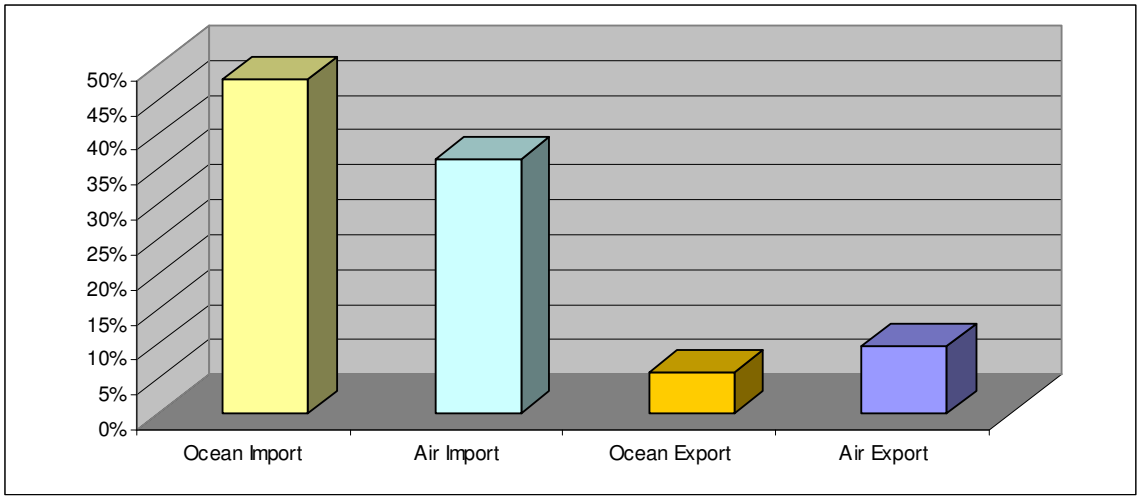
The main research problem to be addressed is: Can lean theory and tools be applied to UTi Port Elizabeth's service operation? In answering this question it was necessary to determine UTi Port Elizabeth's current state of operations.

In order to do this a judgemental sample was chosen. According to Collis and Hussey (2003: 159) a sample is selected by the researcher based on the researcher's experience with the phenomenon under study. The selected sample in this study is the ocean freight imports process. The sample has been selected for the following reasons:

- It is the most complex process within UTi Port Elizabeth;
- It involves input from 6 of 8 departmental functions within the UTi Port Elizabeth operation; and
- It generates the highest revenue for UTi Port Elizabeth.

To quantify the proposed sample selected, a matrix was constructed to evaluate shipment count for the period 01 July 2007 to 30 June 2008, (see annexure 2). Figure 3.1. provides a graphical representation of the results.

FIGURE 3.1. SHIPMENT COUNT BY MODE: JULY 2007 – JUNE 2008



Source: Researcher's own construction.

The graph reveals that ocean imports represents 48% of the total shipment count of UTi Port Elizabeth while all product groups are important, ocean imports is the most significant in terms of shipment processing and therefore, most representative of the operation as a whole.

The next section describes how the current state of the ocean imports process was determined.

3.3. DETERMINING THE CURRENT STATE OF THE OCEAN FREIGHT IMPORTS PROCESS

In section 1.1.4 of chapter 1 challenges facing the UTi Worldwide organisation were identified and in this next section are applied to the ocean freight imports process.

3.3.1. Measurement of challenges facing the ocean freight imports process

A challenge facing all organisations and the ocean freight imports process is cost control. A measure of cost control in the ocean freight imports process is the productivity ratio. Given by:

$$\frac{\text{Sum of ocean imports employee cost}}{\text{Revenue generated by ocean freight imports}} = \text{Productivity ratio}$$

This ratio divides the total employee costs involved in the ocean imports process (being the largest cost) by the total revenue generated by the ocean freight imports process. For the purposes of this research, the author requested eight months data from 01 January 2008 to 30 August 2008. Due to the sensitivity of the information only a combined total figure was provided by the Financial Manager.

Only once the above measure of the ocean freight imports process had been determined, could the researcher evaluate the efficiency of the ocean freight imports process. As discussed in section 1.1.4.3. employee efficiency will be measured by:

Number of shipments per person per day:

$$\frac{\text{Number of housebills processed by ocean imports per month}}{\text{Number of employees in the ocean freight imports process}} = X$$

$$\frac{X}{\text{Average number of days in a month}} = \text{Number of shipments per ocean freight imports (process) employee per day}$$

For the purposes of this research the author selected six months of data from 01 January 2008 to the 30 June 2008, see annexure 3, shipment statistics report.

Ensuring customer satisfaction with the ocean freight imports process is a challenge facing the UTi organisation. In chapter 1, section 1.4.4, the difficulty of measuring customer service was discussed, and the satisfaction thereof. It was discovered that customer reaction to waiting time for a particular service is a good market-related measure of customer satisfaction with a particular service. The output of UTi's service – a UTi invoice – was discussed and the complexity of generating this document was described. This resulted in two measures of customer satisfaction with UTi's service. This has been evaluated in the ocean freight imports context, that is:

$$\bar{x} = \frac{\sum^{r} x}{n}$$

$$\frac{\sum(\text{Ocean imports invoice date} - \text{receipt of shipment date by client})}{\text{Number of observations}}$$

= Mean ocean imports invoice delivery performance

$$\bar{x} = \frac{\sum^{r} x}{n}$$

Calculate the standard error;

$$\sigma_x = \frac{\sigma_{\bar{x}}}{\sqrt{r}}$$

Set 95% confidence limits for the actual mean time from the date the invoice was raised to the actual date of receipt of the invoice by the customer:

$$\bar{x} - 1.96 \frac{\sigma_{\bar{x}}}{\sqrt{n}} \leq \mu \leq \bar{x} + 1.96 \frac{\sigma_{\bar{x}}}{\sqrt{n}}$$

And,

$$\frac{\text{Number of ocean import files containing a credit a supplementary invoice or both}}{\text{Number of ocean import invoices issued}} = \text{Ocean imports invoice accuracy ratio}$$

In both the above measures a sample selection formula was used to determine the sample size. Davis and Heineke (2005:

258) suggests the following formula for determining sample size, that is:

$$r = \frac{Z^2 p(1-p)}{E^2}$$

Where

N =	Number of observations made, in this case study the number of ocean import files.
Z =	Number of standard deviations associated with the given confidence level.
p =	Estimated proportion of time that the activity being measured occurs, in this case study a credit note or supplementary invoice in the ocean import file.
E =	Absolute error that is desired.

In order to obtain a list of ocean import files, a profitability report (Report number 50177) was run out of the UTi Port Elizabeth finance system – Navision – for the period Posting Date: 01/01/08..22/08/08. An extract of this report can be viewed in annexure 5.

Column A was inserted and the files were numbered 1 to 10,887. A systematic sampling technique was used to select the ocean import file numbers to be used in the analysis. Collins and Hussey (2003: 157) describe the method of systematic sampling as the population divided by the required sample size (n) and the sample chosen by taking every 'nth' subject.

In summary the measurement of challenges facing the ocean freight imports process is as follows:

Cost control:

- Productivity ratio; and
- Employee efficiency.

Customer satisfaction:

- Ocean imports invoice accuracy ratio; and
- Mean imports invoice delivery performance.

These four measures represent the "Measurement of Challenges" facing the UTi Worldwide organisation now adapted to the ocean freight imports process. The research study has answered sub-problem 1.3.1 What is UTi Port Elizabeth's current performance against measures of cost control and customer satisfaction?

3.3.2. Collecting data for the current state

Rother and Shook (2003: 3) describe value stream mapping as a pencil and paper tool which visually represents all actions (both value added and non-value added) needed to bring a product from raw material to final delivery of the finished article to the customer. This was the tool that was selected to analyse the ocean freight imports process. Tapping and Shuker (2003: 3) say that value stream mapping is a process for planning and linking lean initiatives through methodical data collection and analysis. Tapping and Shuker (2003: 55) go on to add that to improve any value stream one needs to examine

and comprehend it. This way any waste (muda) within the process can be identified and action taken to minimise the processing time, thus contributing to improved productivity and customer satisfaction.

To fully understand the ocean freight imports process from the value stream perspective, Tapping and Shuker (2003: 56) provide guidelines for collecting data for the current state, which is applied to this research.

3.3.2.1. Determine the main processes

Semi-structured interviews were held with the team leaders of each functional team within the ocean freight imports process.

A total of five teams were identified:

- Forwarding Team;
- Degroup Team;
- Bill of entry Team;
- Deliveries Team; and
- Document distribution Team.

A standard questionnaire was used to guide the interview and the team leader was asked to complete certain sections of the questionnaire, see annexure 4. General questions were asked and recorded regarding the basic functioning of the work process within the team.

3.3.2.2. Work measurement

Once an overview of the functional teams within the ocean freight import process had been obtained then more specific work measurement could take place. Davis and Heineke (2005: 255) describe work measurement as the methodology used for establishing time standards. Depending on the complexity of the functions within a team's process, work measurement techniques were deployed to determine time standards for each functional team. For all functional teams the following standard data was collected, see annexure 4 – Determine Main Processes Questionnaire (Tapping and Shuker, 2003:56):

- Total time per workday;
- Regularly planned downtime (team meetings, lunch breaks etc.);
- Available time (downtime – total available time);
- Frequency at which work is delivered to the next process;
- Cycle time – depending on team task complexity different methods were deployed within the team (standard time; work sampling and time sheets); and
- Queue time – amount of time an ocean import file could wait before a downstream team begins working on it.

The results of the processes questionnaire for each functional team within the ocean freight import process are now discussed.

Forwarding Team

A ‘work sampling’ technique was used in this analysis due to the complexity of the tasks performed by this functional team.

Davis and Heineke (2005: 257) describe the work sampling technique used in this study. Work sampling is mainly concerned with how employees spend their time among various functions. This technique was used to establish the amount of time a forwarding operator spends on various functions within the forwarding team. The steps (adapted from Davis and Heineke 2005: 256) were as follows.

I. To determine the number of observations required the researcher used the following formula:

$$r = \frac{Z^2 p(1-p)}{E^2}$$

II. Once the number of observations required was calculated, it was then necessary to establish observation times. These observation times needed to be randomly selected, and so the following process was determined, see annexure 6):

- A list of working hours was drawn up from Monday to Friday;
- A specific number was assigned to each minute between ‘00’ and ’59’ minutes;
- A random number table was drawn up to set up the schedule of observations. The RANDBETWEEN function in Microsoft excel was used to determine the random number (i.e. =RANDBETWEEN(100,159)), i.e. ‘1’ represents all sets of numbers for 8 o’clock and ‘00’ – ‘59’ represents each minute, from 1 minute to the 59th minute;

- To ensure this was a perfectly random study, the researcher also “randomised” the forwarding controller at each observation point; and
- The data collection process took place over two weeks.

The observation sheet can be viewed as annexure 7. Once all the above data was collected, the following calculations were made.

$$\left\{ \text{Percentage of Time Spent on Forwarding Activities} \times \text{Total Available Work hours per Day} \right\} \times \text{Number of Days in Month (20)} \times (60) = \text{Forwarding Minutes per Month}$$

$$\left\{ \text{Forwarding Minutes per Month} \times \text{Number of Forwarding Controllers} \right\} / \text{Number of Ocean Import Files} = \text{Forwarding Minutes per Ocean Import File}$$

Degroup Team

This team’s function is to reference and register the shipping file onto the UTi ‘domestic’ system (local SA operating system); process and pass cargo dues (Portnet charge for using their equipment), recovery of the UTi origin invoice and local vendor charges (shipping line).

In order to calculate the degroup cycle time per file, the researcher randomly selected ten files and attached a time sheet to the front of the file. Team members were requested to complete start and finish times for each relevant degroup process within a file. See annexure 8.

Once the researcher obtained the time sheets they were summed and the mean degroup process time was determined by:

$$\bar{x} = \frac{\sum^{r} x}{n}$$

Bill of entry Team

The bill of entry team process was more defined than that of the forwarding team. This team works primarily within one operating system, the UTi domestic bill of entry system, and their sole responsibility is the preparation and submission of bills of entry to Customs (SARS). The challenge facing work measurement in the bill of entry team was the length of time required to capture a bill of entry. A single bill of entry could result from the capture of one invoice with one part number to 100 invoices with 300 part numbers to capture, a vastly differing data capture requirement.

In order to overcome this challenge the researcher conducted the following analysis to calculate the value added time for a single bill of entry. That is, the time that an entry clerk actually spends working on the file. To do this the following steps were followed.

I. Bill of Entry Team members timed the bill of entry capture and quality control process on a spreadsheet held on the internal bill of entry shared folder. See annexure 9.

II. Calculating the mean time in minutes to produce a bill of entry:

$$\bar{x} = \frac{\sum^{r} x}{n}$$

III. Calculating the standard error of the bill of entry times:

$$\sigma_x = \frac{\sigma_{\bar{x}}}{\sqrt{r}}$$

IV. Set 95% confidence limits for the actual mean time for a bill of entry clerk to complete the process:

$$\bar{x} - 1.96 \frac{\sigma_{\bar{x}}}{\sqrt{n}} \leq \mu \leq \bar{x} + 1.96 \frac{\sigma_{\bar{x}}}{\sqrt{n}}$$

With the outcome of this calculation, the researcher has been able to establish that there is a 95% chance that the bill of entry cycle time is between x and y.

Deliveries Team

The deliveries team's tasks were similar in their complexity, when compared with the degroup team. The same methodology was applied as with the degroup cycle time study. The deliveries time sheet can be viewed in annexure 10.

Document distribution

According to Collis and Hussey (2003: 171) non-participant observation is to view and record what people do in terms of

their actions and their activities without the researcher being involved. This method of non-participant observation was selected as the technique for the analysis of this functional team.

The document distribution team's tasks were found to be much less complex. A time study was appropriate for the measurement of this team (Davis and Heineke, 2005: 255).

I. Calculate normal time:

Normal time (NT) = Observed performance time per unit x performance rating

II. Calculate standard time:

Standard time = NT (´ + Allowances)

The data capture sheet for the standard time calculation can be seen as appendix 11.

3.3.2.3. Determining the value added percentage

The total file lead time is required in order to determine the value added percentage. The total lead time is defined as the total time, in hours, from the point at which the file is opened to when the file is closed and all relevant documents, complete with UTi invoice, is sent to the customer. This data could be collected from the file front cover see, annexure 12, and UTi's track and trace system called eMpower, see annexure 13. The same set of files that were used in the 'invoice accuracy ratio' calculation was used for this sample (section 3.3.1.).

In order to measure this team, the number of hours from receipt of documents to the date the invoice was batched was measured to give a total file lead time. This was calculated as follows:

I. Calculate the file lead time from the selected sample:

Date file cover stampec as 'batched - Date shipment was bookec (eMpower) = Total file lead time

II. Calculate the mean:

$$\bar{x} = \frac{\sum^{r} x}{n}$$

III. Set 95% confidence limits for the actual mean time for a bill of entry clerk to complete a bill of entry:

$$\bar{x} - 1.96 \frac{\sigma_{\bar{x}}}{\sqrt{n}} \leq \mu \leq \bar{x} + 1.96 \frac{\sigma_{\bar{x}}}{\sqrt{n}}$$

When the above data was collected the researcher could draw the current state map. This was done by a physical walk through of the file process. Tapping and Shuker (2003: 57) suggest 'going to where the action is' by beginning with the most downstream process, in this case the *Document Distribution Team* and ending with the *Forwarding Team*.

3.4. POSSIBLE ERRORS WITHIN THE RESEARCH

3.4.1. Measurement of challenges

The measurement of the challenges facing the ocean freight import process is not definitive in nature, neither are these the only challenges facing the UTi organisation. There is no conclusive evidence suggesting that addressing this particular set of 'challenges' will increase profitability or the success of the firm. Furthermore there is no conclusive evidence that lean can effectively address these challenges, although in chapter 2 Maleyeff's findings (Maleyeff, 2006: 683) on categories of waste in the service context were discussed, which can be highlighted within the results of the research and through the value stream mapping tool.

In chapter 2 the success of lean within the service industry was discussed. None of these service industries were related to the international freight forwarding industry. There is no evidence at this time, which suggests that application of lean tools and techniques to a freight forwarding organisation will improve efficiencies and / or profitability.

3.4.2. The selected sample

The ocean freight imports team represents only 48% of the total operation of UTi Port Elizabeth. While the percentage is significant, it may not provide conclusive evidence to all other modes (air imports, air exports and ocean exports). The processes that these functional teams follow are different to the ocean freight import process. Therefore, separate research

may need to be conducted on each functional process to provide conclusive evidence that lean can improve efficiencies of any functional process. On the other hand, it was highlighted in chapter 2, Womack et al (1990:9) state that the principles of lean are universally applicable as the primary focus of lean is on the process, not the output. This suggests that the judgemental sample chosen may indeed be representative enough.

3.4.3. Measurement of the functional teams

3.4.3.1. Forwarding Team

The error in the sample size selection technique was 10%. This is relatively high and therefore, results can only be interpreted within 90% accuracy. A larger sample size may yield different results.

3.4.3.2. Bill of entry Team

The measurement of this functional team involved team members measuring and recording their own bill of entry input and quality control times. Participants may have worked faster or slower than normal when measuring themselves. This may mean that the calculated confidence interval for this team may not have been an accurate reflection of the true processing time of a bill of entry.

3.4.3.3. Degroup Team

Only five time sheets were returned. The calculated mean may not be representative of true degroup processing time. Participants also measured themselves, therefore, they may have worked faster or slower when being measured which could have distorted the results even further.

3.4.3.4. Deliveries Team

Only eight time sheets were returned, like the Degroup Team, the calculated mean may not be representative of the true deliveries processing time. Participants also measured themselves and the same error may apply as with degroup and bill of entry processing time.

3.4.3.5. Document distribution Team

Problems of *observation bias* (Collis and Hussey, 2003: 172) may have arisen in the standard time study of this functional team.

3.4.3.6. Creating the current state value stream map

There is no evidence which suggests that by creating a value stream map of the current state and viewing the value stream can make any process more efficient or increase productivity in the ocean freight imports process. This tool may only assist in bringing inefficiencies to view but does not offer any assistance in creating solutions for those inefficiencies.

3.5. SUMMARY

The purpose of chapter 3 was to document the research process and define how the data is collected and analysed. A wide variety of data collection tools were presented and utilised in the study.

Chapter 4 will analyse the data and interpret the empirical study to ascertain if the lean theory and the tool, of value stream mapping, can be applied to the ocean freight import process and if its application can lead to improved operational performance.

CHAPTER 4

FINDINGS AND RESULTS OF THE STUDY

4.1. INTRODUCTION

This chapter deals with the findings and the results of the research study.

Firstly, the results on the study of "challenges facing the UTi organisation" will be presented and discussed. This will be followed by a discussion on the functional teams within the ocean freight imports process. Due to the unique characteristics and nature of data collection for every functional team, it is necessary to discuss the results of data collection for each functional team independently.

Statistical calculations will be presented and results interpreted.

An analysis of the entire ocean import operation will be presented by way of a 'value stream map', the lean tool selected for this analysis.

Finally, the questionnaires will be analysed and the results presented. Bar graphs and pie charts have been used to present the data in a visual form.

4.2. MEASUREMENT OF THE CHALLENGES FACING THE OCEAN FREIGHT IMPORTS PROCESS

4.2.1. Measures of ocean import operational performance: Productivity ratio

As indicated in chapter 3 cost control is extremely important to a firm's survival. For the purpose of this study, cost control is manifested in a ratio, named the *productivity ratio*:

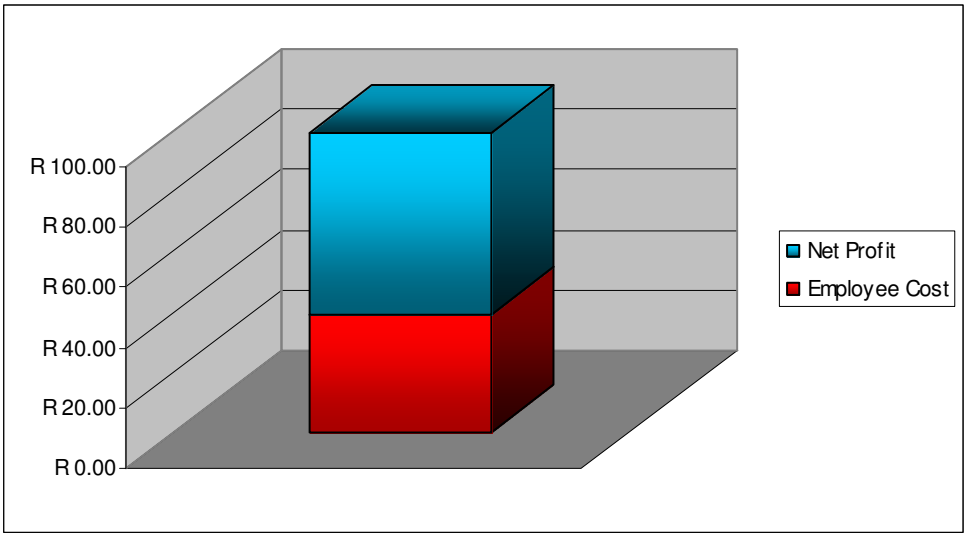
$$\frac{\text{Sum of ocean imports employee cost}}{\text{Revenue generated by ocean freight imports}} = \text{Productivity ratio}$$

For the UTi ocean freight imports process:

$$\frac{\text{R4 605 million}}{\text{R11 657 million}} = 39.5\%$$

The ratio reveals that 39.5% of all revenue generated is absorbed by employee cost. That is, for ever R100.00 earned, R39.50 is taken by the costs of employees within the ocean freight imports process (See Figure 4.1.)

FIGURE 4.1. EMPLOYEE COST VS. REVENUE EARNED



Source: Researcher's own construction.

4.2.2. Measures of ocean import operational performance: Number of shipments per person per day

Shipment count per person is a measure of employee productivity. The same way that in a factory environment productivity would be measured by the number of units sold or produced divided by the number of man-hours worked or number of factory employees.

Therefore, for the purposes of this study, productivity is:

$$\frac{\text{Number of housebills processed by ocean imports per month}}{\text{Number of employees in the ocean freight imports process}} = X$$

$$\frac{X}{\text{Average number of days in a month}} = \text{Number of shipments per ocean freight imports (process) employee per day}$$

The total number of house bills of lading for the period 01 Jan. 2008 to 30 June 2008 was: 5015

Therefore: $\frac{\text{5015 House bills of lading}}{\text{6 months}}$

= 835.83 House bills of lading processed by ocean freight imports per month

Number of employees in the ocean freight imports process:

Department	Male	Female
Forwarding	2	6
Degroup	1	6
Deliveries	1	6
Bill of Entry	8	2
Batching	2	2
Sub total	14	22
Total	**36**	

Therefore;

$$\frac{\text{835.83 HBL}}{\text{36 Employees}} = 23.22$$

Average number of working days in a month = 20 days

Number of shipments per employee per day is:

$$\frac{23.22}{20}$$

$$= 1.16$$

Productivity is represented in the ocean freight imports process as 1.16 shipments per person per day.

4.2.3. Measures of customer satisfaction with the ocean fright imports process: Invoice delivery performance

In chapter 1 it was revealed that waiting time for delivery of a service was a market related measure of customer satisfaction with that service.

Firstly, determine sample size given by:

$$r = \frac{Z^2 p(1-p)}{E^2}$$

That is;

Z = 1.96 (corresponding to 95% confidence)
P = 0.20 (estimated percentage of files containing an invoice / supplementary invoice or both.
E = 0.07 (absolute error).

Therefore, when substituting the values in the formula:

$$\frac{(1.96)^2 (0.20)(1 - 0.20)}{(0.05)^2}$$

$$= 245$$

The required sample size would be 245 ocean import invoices.

For the purposes of this study invoice delivery performance is defined as:

$$\frac{\sum(\text{Ocean imports invoice date} - \text{receipt of shipment date by client})}{\text{Number of observations}}$$

= Mean ocean imports invoice delivery performance

$$= \frac{1132}{245}$$

$$= 4.62 \text{ days}$$

With a standard deviation of,

$$\sigma_X = 3.35 \text{ days}$$

Determine confidence limits of 95%:

$$\bar{x} - 1.96 \frac{\sigma_{\bar{x}}}{\sqrt{n}} \leq \mu \leq \bar{x} + 1.96 \frac{\sigma_{\bar{x}}}{\sqrt{n}}$$

That is,

$$4.62 - (1.96)\frac{(3.35)}{\sqrt{4.62}} \leq \mu \leq 4.62 + (1.96)\frac{(3.35)}{\sqrt{4.62}}$$

$$= 4.17 \leq \mu \leq 5.00$$

Interpretation: There is a 95% probability that the true mean time in days, from the date the UTi invoice is raised to the date the invoice is received against signature by the customer is between 4.17 and 5 days.

4.2.4. Measures of customer satisfaction with the ocean freight imports process: Invoice accuracy ratio

As a measure of customer satisfaction, the number of credit notes and/or supplementary invoice raised is a good indication of the quality of service delivered on a particular ocean import file. For the purposes of this study, it is assumed that a credit note or supplementary are a result of an error or omission within the ocean imports process. The error may be one of

many causes which are not determined within the scope of this research.

For this section of the study, files had to physically drawn and the paperwork studied, therefore a new sample size needed to be determined. That is,

$$r = \frac{Z^2 p(1-p)}{E^2}$$

$$= \frac{(1.96)^2 (0.20)(1 - 0.20)}{(0.07)^2}$$

$$= 125.44$$

Invoice accuracy ratio is:

$$= \frac{\text{Number of ocean import files containing a credit note and/or supplementary}}{\text{Number of ocean import invoice observations}}$$

$$= \frac{35}{125}$$

Invoice accuracy ratio = 28%

To summarise, the measure of challenges facing the UTi organisation (specific to the ocean freight imports process) is reflected in Table 4.1.:

TABLE 4.1: MEASURE OF CHALLENGES

MEASURE OF CHALLENGES		
MEASURE	CURRENT LEVEL	DESIRED DIRECTION
Productivity Ratio	39.5%	↓
Staff Efficiency	1.16 Shipments	↑
Invoice Delivery	4.17 - 5 days	↓
Invoice Accuracy	28%	↑

Source: Researcher's own creation.

4.3. MEASUREMENT OF FUNCTIONAL TEAMS

In this section, data on each functional team will be presented independently. The results of the measurement technique utilised will also be presented and discussed.

The discussion will proceed as follows (by functional team):

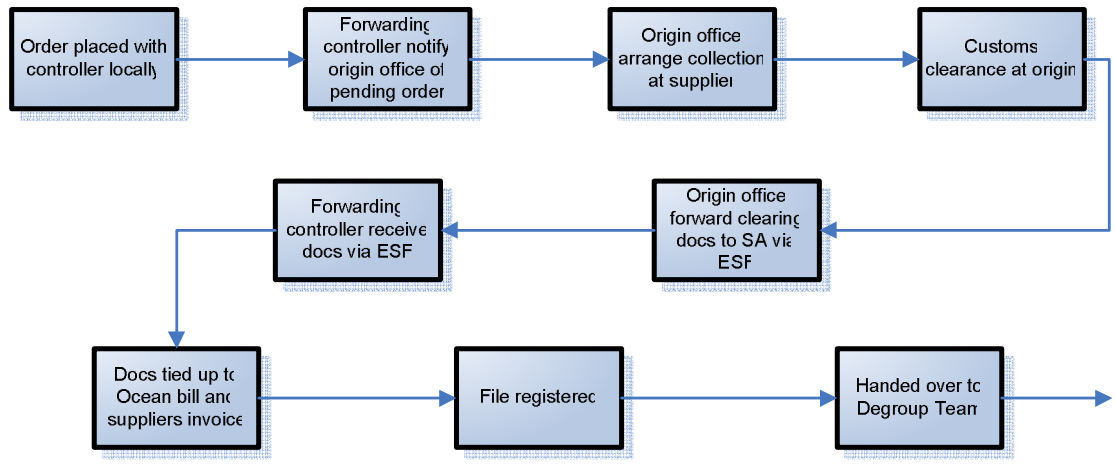
- Demographics;
- Work hours per day,
- Basic diagram of the current process;
- List of tools;
- Intervals of handover to downstream process; and
- Measurement of results.

4.3.1. Forwarding Team

4.3.1.1. Determine main processes

Demographics	Team leader sex: Male Male team members: 2 Female team members:6
Standard work time	08:00 to 17:00 with 1 hour lunch = 8 hours
Allowances for breaks	Two 15 minute breaks per day
Total available work time	7.5 hours
Intervals of handover to next process	08:30am; 11:00am; 14:00pm
List of tools	1) eMpower 2) ESF (Electronic Shipping File) 3) e-mail 4) UTi Domestic system 5) Shipping line / port website 6) Telephone 7) Excel status report

FIGURE 4.2. BASIC FORWARDING PROCESS



Source: Researcher's own construction.

4.3.1.2. Presentation of results

The measurement technique used to analyse the forwarding team was as follows:

Step 1: Determine sample size (number of observations)

$$r = \frac{Z^2 p(1-p)}{E^2}$$

That is,

Z = 1.96 (corresponding to 95% confidence)

P = 0.30 (estimated time a forwarding controllers spends on non-forwarding activity)

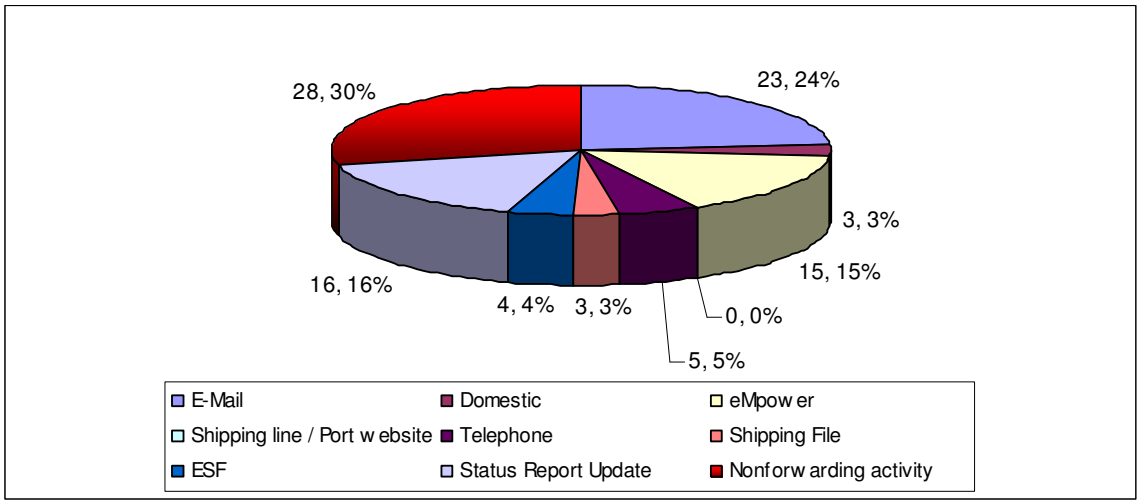
E = 0.10 (absolute error)

$$\frac{(1.96)^2 (0.30)(1 - 0.30)}{(0.10)^2}$$

= 80.67 observations

Step 2: Interpret the results recorded on the observation sheets. Figure 4.3. details the results of the observations of the forwarding team. It can be determined that the most utiliSed tool for the forwarding team is e-mail (23.24%) followed by status report updates on excel at 16.6% and eMpower at 15.5%.

FIGURE 4.3. RESULTS OF THE WORK SAMPLING STUDY



Source: Researcher's own construction.

The forwarding team spend 28% of their day on non-forwarding activity, therefore, 72% of *total available work time* is available for actual forwarding functions. In order to calculate the amount of 'forwarding minutes' to be allocated to an ocean freight imports file the following calculation:

{Percentage of Time Spent on Forwarding Activities X Total Available Work hours per Day} X Number of Days in Month (20) X (60) = Forwarding Minutes per Month

{Forwarding Minutes per Month X Number of Forwarding Controllers} / Number of Ocean Import Files = Forwarding Minutes per Ocean Import File

That is;

(0.8 x 7.5) (20 days) (60 minutes) = 7200 minutes

(7200 minutes x 8) / 836 files

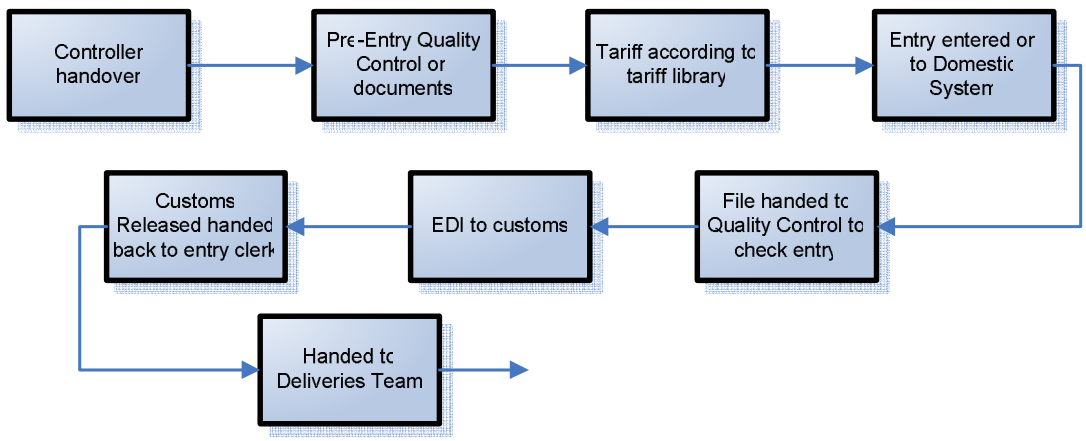
= 68.90 Forwarding Minutes Allotted per file

4.3.2. Bill of entry Team

4.3.2.1. Determine main processes

Demographics	Team leader sex: Male Male team members: 8 Female team members:2
Standard work time	08:00 to 17:00 with 1 hour lunch = 8 hours
Allowances for breaks	Must be taken within 1 hour lunch or 1 hour lunch used during the course of the day for any breaks.
Total available work time	8 hours
Intervals of handover to next process	Continuous – file handed to deliveries by hand. Cut-off at 3pm everyday for handover to deliveries.
List of tools	1) UTi Domestic System 2) Customs tariff book / Jet System 3) Explanatory Notes 4) Alphabetical Index 5) SDS Notes 6) BOE Team Board 7) Telephone 8) SARS website / Google

FIGURE 4.4. BASIC BILL OF ENTRY PROCESS



Source: Researcher's own construction.

4.3.2.2. Presentation of results

A total of 69 bill of entry times were recorded. Two value added processes, BOE capture time and quality control time, were recorded and added together to give the total value added time for a bill of entry.

Step 1: Calculate the mean time in minutes to process a bill of entry.

$$\bar{x} = \frac{\sum^{r} x}{n}$$

That is;

$$\bar{x} = \frac{4225 \text{ (minutes)}}{69 \text{ (Bill of entries)}} = 61.232 \text{ minutes per bill of entry}$$

Step 2: Calculate the standard error

$$\sigma_{\bar{x}} = 89.65 \text{ minutes}$$

Step 3: Set confidence limits for the actual mean time for a bill of entry clerk to complete a bill of entry

$$\bar{x} - 1.96 \frac{\sigma_{\bar{x}}}{\sqrt{n}} \leq \mu \leq \bar{x} + 1.96 \frac{\sigma_{\bar{x}}}{\sqrt{n}}$$

That is;

$$6.232 - (1.96)\left(\frac{89.65}{\sqrt{69}}\right) \leq \mu \leq 6.232 + (1.96)\left(\frac{89.65}{\sqrt{69}}\right)$$

$$= 40.08 \text{ minutes} \leq \mu \leq 82.38 \text{ minutes}$$

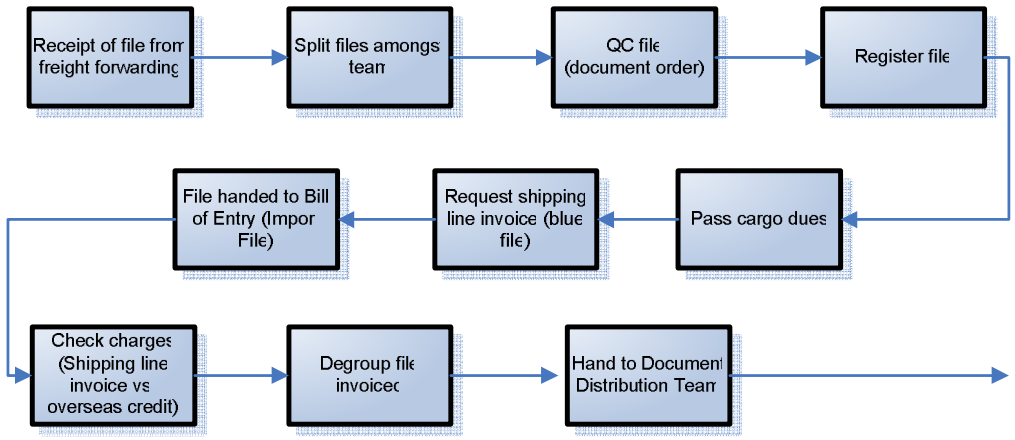
4.3.3. Degroup Team

4.3.3.1. Determine main processes

Demographics	Team leader sex: Male Male team members: 1 Female team members:7
Standard work time	08:00 to 17:00 with 1 hour lunch = 8 hours
Allowances for breaks	Must be taken within 1 hour lunch or 1 hour lunch used during the course of the day for any breaks
Total available work time	8 hours
Intervals of handover to next process	Handed to BOE at: ▪ 08:30am

	▪ 11:00am ▪ 14:30pm ▪ 15:00pm (Fridays only)
List of tools	1) UTi Domestic System 2) Ports on-line website 3) Navision 4) Rate profiles 5) Excel (Groupage / Consol Split) 6) eMpower 7) Shipping line web-site

FIGURE 4.5. BASIC DEGROUP PROCESS



Source: Researcher's own construction.

4.3.3.2. Presentation of results

Of the 15 degroup time sheets issued only five were returned with completed time data. To establish the time taken for the degroup team to process a shipping file the following steps were taken:

Step 1: Sum the total of the sample files:

$$X = 335 \text{ minutes and } 31 \text{ seconds}$$

Step 2: Calculate the mean time in minutes to perform the degroup function:

$$\bar{X} = \frac{\sum^{r} x}{n}$$

That is;

$$\bar{X} = \frac{335.31}{5}$$

$$= 67.06 \text{ minutes}$$

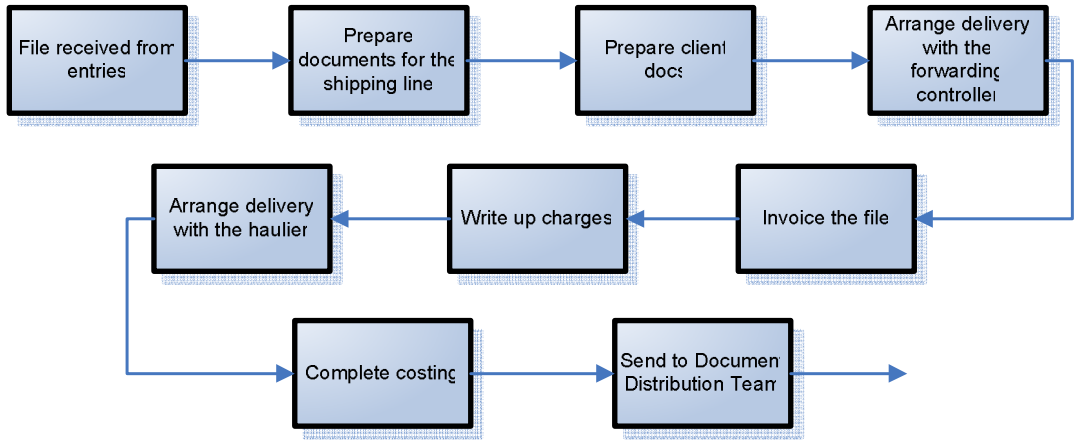
4.3.4. Deliveries Team

4.3.4.1. Determine main processes

Demographics	Team leader sex: Female Male team members: 1 Female team members:6
Standard work time	08:00 to 17:00 with 1 hour lunch = 8 hours
Allowances for breaks	20 minutes allowed
Total available work time	7.4 hours
Intervals of handover to next process	Continous
List of tools	1) Domestic System 2) eMpower

	3) Navision 4) ESF

FIGURE 4.6. BASIC DELIVERIES PROCESS



Source: Researcher's own construction.

4.3.4.2. Presentation of results

Of the 15 deliveries time sheets issued only 8 were returned with completed time data. To establish the time taken for the deliveries team to process a shipping file the following steps were taken:

Step 1: Sum the total of the sample files:

$X = 315$ minutes

Step 2: Calculate the mean time in minutes to perform the degroup function:

$$\bar{x} = \frac{\sum^{r} x}{n}$$

That is;

$$\bar{X} = \frac{315}{8}$$

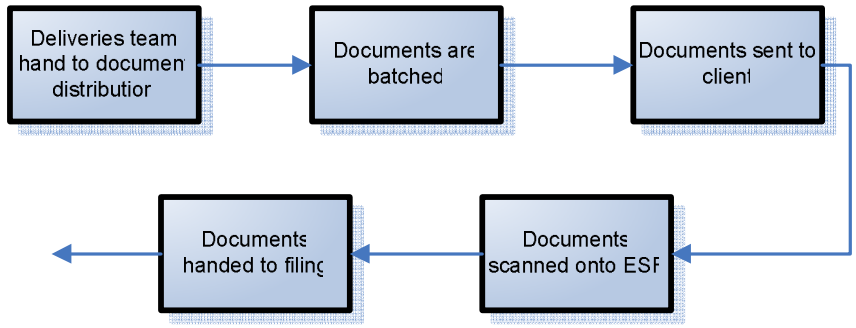
$$= 39.38 \text{ minutes}$$

4.3.5. Document distribution Team

4.3.5.1. Determine main processes

Demographics	Team leader sex: Male Male team members: 2 Female team members:2
Standard work time	08:00 to 17:00 with 1 hour lunch = 8 hours
Allowances for breaks	30 minutes allowed
Total available work time	7.5 hours
Intervals of handover to next process	Continuous – collection minimum. of 3 times per day
List of tools	1) Navision 2) ESF 3) eMpower

FIGURE 4.7. BASIC DOCUMENT DISTRIBUTION PROCESS



Source: Researcher's own construction.

4.3.5.2. Presentation of results

The time study produced the following results tabulated below (Table 4.2):

TABLE 4.2 DOCUMENT DISTIBUTION TIME STUDY RESULTS

DOCUMENT DISTRIBUTION			
		Performance	***NT***
Element	$\bar{T}$	**Rating**	
Receive files from Invoicing	0.91 / 13 files	100%	0.07
Batch documents and send to client	74.27 / 8 files	80%	7.42
Scan docs onto ESF	67.76 / 10 files	100%	6.78
Hand docs to filing	0.827 / 4 files	100%	0.03
Normal time for one file			14.29

Source: Researcher's own construction.

Standard time = 14.29 x 0.95 = 13.58 Document distribution minutes per file

4.4. TOTAL FILE LEAD TIME

The total file lead-time, given in days, is the time from the point the file is opened, to the point the file is closed and the 'BATCHED' or 'SCANNED' stamp is entered on the file and dated. The following process was followed:

Step 1: Calculate the sample size – the same sample data as invoice accuracy ratio was used for this calculation (see section 4.2.4.)

$$n = \frac{Z^2 p(1-p)}{E^2}$$

Step 2: Calculate the sum of 125 files:

Date File Cover Stamped as 'Batched' - Date Shipment was Booked (eMpower) = Total File Lead Time

$$X = 4509 \text{ days}$$

Step 3: Calculate the mean lead time per file

$$\bar{X} = \frac{4509 \text{ days}}{125 \text{ files}} = 36.07 \text{ days}$$

Step 4: Set 95% confidence limits for the total file lead time

$$\bar{x} - 1.96 \frac{\sigma_{\bar{x}}}{\sqrt{n}} \leq \mu \leq \bar{x} + 1.96 \frac{\sigma_{\bar{x}}}{\sqrt{n}}$$

That is,

$$35.731 - (1.96)\left(\frac{10.679}{\sqrt{125}}\right) \leq \mu \leq 35.731 + (1.96)\left(\frac{10.679}{\sqrt{125}}\right)$$

$$= 33.895 \text{ days} \leq \mu \leq 37.567 \text{ days}$$

Interpretation: The probability is 95% that the actual mean total file lead time, from the point the file is opened to the point the file is closed with all relevant documentation and the UTi invoice, is between 33.895 and 37.567 days.

4.5. VALUE ADDED PERCENTAGE

The value added percentage is the sum of all value adding activities over total file lead time, that is:

$$\frac{(68.9 + 82.38 + 67.06 + 39.38 + 13.58) / 60}{(37.567 \times 7 \text{hrs/day})}$$

$$= \frac{4.52 \text{ hrs}}{263 \text{ hrs}}$$

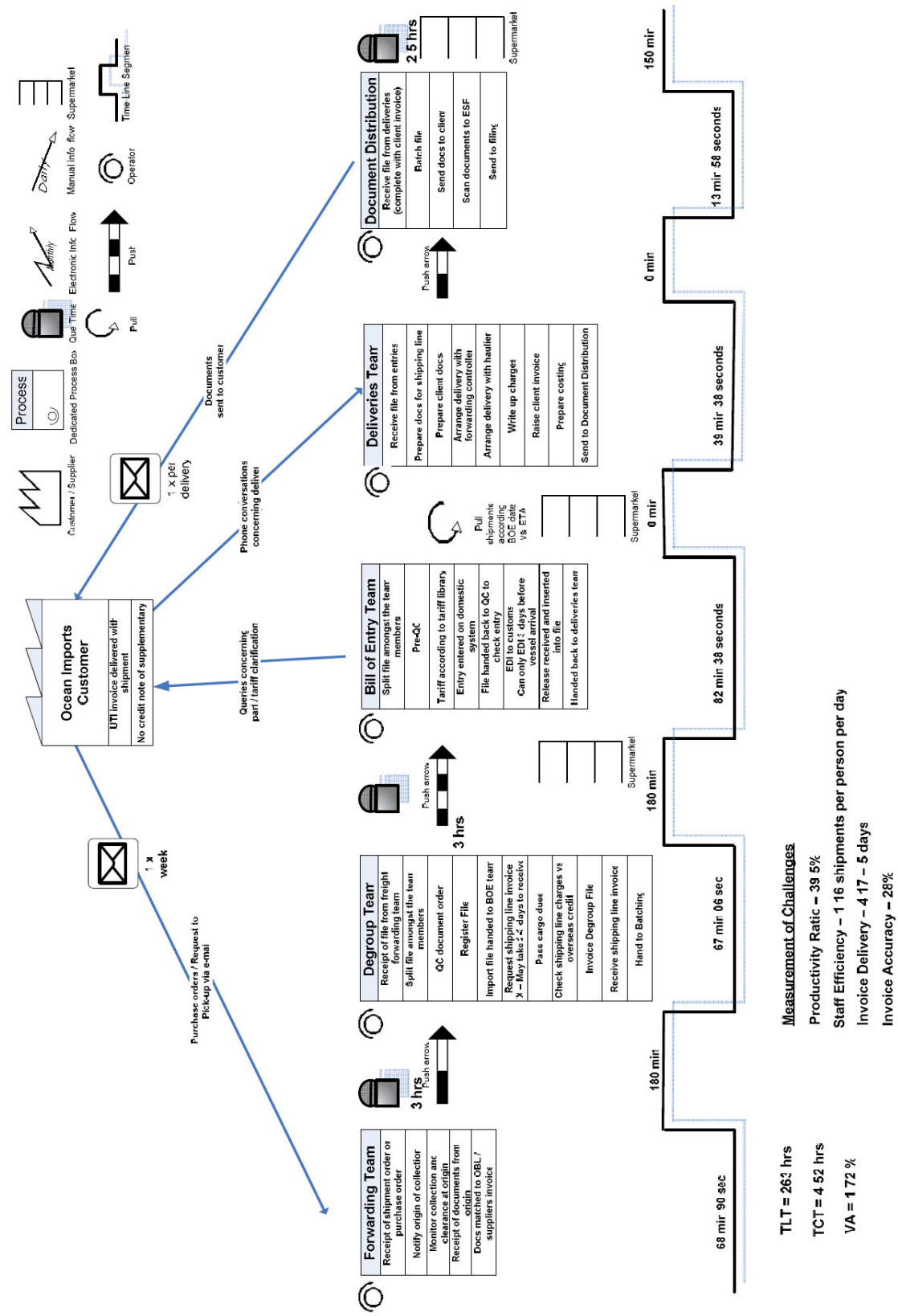
= 1.72% value added time

Interpretation: The percentage of time the ocean imports file is physically being worked on by an ocean freight imports employee is 1.72% of the total file lead time or 4 hours and 53 minutes out of a total file lead time of 263 hours.

4.6. DRAW THE CURRENT STATE

All data was now available to generate the current state value stream map. The current state map can be viewed in Figure 4.6. With the current state documented it is now possible to view the entire ocean freight imports process beginning to end.

FIGURE 4.8. THE CURRENT STATE MAP



4.7. SUMMARY

The results of the research study were presented in this chapter. Formulas and the results of the formulas were presented and discussed along with the results of the semi-structured interviews which were held with the functional team leaders.

Various tools were used to collect the data, namely:

- Semi-structured interviews;
- Confidence interval;
- Sample means;
- Standard time calculations; and
- Value stream mapping – current state.

In chapter 5 the current state map will be analysed. Possible improvements to the ocean freight imports process will also be discussed. A future state map will also be constructed.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

A brief summary of the structure of the research thus far is presented.

Chapter 1 provided an outline of the research paper and the methodology employed. In addition, this chapter introduced the concept of lean methodology and described how this methodology could be used to address challenges facing South African business and the UTi organisation in particular. The main research problem was introduced and the sub-problems were presented.

Chapter 2 was used to introduce to some core concepts of lean manufacturing methodology. This chapter began with a brief history on the origins of lean manufacturing within the Toyota Motor Company of Japan and then moved on to describe some successes of lean manufacturing methodology within the service industry. Key lean manufacturing tools were introduced and arguments given on the practical application of these tools to the service industry.

Chapter 3 described the research design and methodology. The sample selection method and data collection procedure and techniques were introduced and discussed. The lean tool selected for analysing the selected sample was introduced and

the data selection process was described for populating the value stream map.

Chapter 4 presented the findings and results of the study. The chapter began with an analysis of the challenges facing the UTi organisation within the context of the ocean freight imports process. The chapter then progressed to the measurement of the functional teams and concluded with the value added percentage for the ocean freight imports process. Finally, the current state map was presented and the data collected was collated on the current state value stream map.

The purpose of this chapter is to draw conclusions and make recommendations based on the analysis of the current state map. From this analysis this research will conclude whether the lean tool applied (value stream mapping) can assist in achieving the desired directional change against the "challenges" facing the UTi organisation. The results of the study will also be assesed against the results of the literature review and present arguments for or against the views of these authors. Finally recommendations for the UTi organisation will be made and a possible future state presented and discussed.

5.2 AN ASSESMENT OF THE CURRENT STATE MAP

When the individual processes of the functional teams were reviewed it was difficult to envisage the ocean freight imports process from end to end. The current state map was successful in putting together all processes within the ocean freight imports value stream. This discovery is supported by findings in chapter 2 where Rother and Shook (2003:3), stated that

value stream mapping enables the user to look at the whole process from beginning to end without only looking at individual parts.

The time segments assisted in analysing actual value added time of the current ocean freight imports process. It was discovered that only 1.7% of the entire time an ocean freight imports file takes to move through process is spent actually creating customer value. However, it must be noted that actual transit time of the shipment (vessel) in this instance makes up a large percentage of this time. To explain, the main import route to South Africa is from Germany. Actual sailing time from port to port is 21 days. Therefore, the value added percentage may not be an accurate reflection of true value added time within the ocean freight imports process, when taking shipment transit time into account.

When looking at the deliveries team process and document distribution process within the context of the actual transit time of the shipment it revealed that the activities of both these teams need to be completed within one to five days of vessel arrival. The reason for this occurrence is that the bill of entry download will only take place three days before vessel ETA (estimated time of arrival). This process has been put in place because of the financial implications it carries. On bill of entry download duty and VAT is paid, to the South African Revenue Service, by UTi on behalf of the customer. In an effort to ease cash flow, the download takes place as close to the invoicing date as possible, and ETA of vessel, so that the duty and VAT disbursed can be recovered on the invoice to the customer within the shortest amount of time. This limitation within the

ocean freight imports process places a large amount of pressure on these two functional teams to perform their activities within a very short time frame. Inevitably, batch and queue is created when a vessel arrives in Port Elizabeth and a number of shipping files must be processed in order to ensure the delivery of invoice with the shipment to the customer.

From a lean perspective, this is a major obstacle which needs to be overcome. It is here that service flow is deliberately disrupted. The trade-off is now apparent between balancing the needs of the customer with the profitability of the UTi organisation. One of the seven wastes identified in chapter 2 by Liker (2004: 29), *waiting time* is purposely created here. All processing on a particular shipping file will stop until three days before vessel ETA.

The waiting time experienced here may also lead to another of the seven wastes – in a service context - identified by Maleyeff (2006:83), in chapter 2, *mistakes*. Due to the short processing time available for the deliveries and document distribution team, mistakes could be made in invoicing and the batching of documents. However, this is where the arguments of Seddon (2005:194) can be re-introduced. As shown in chapter 2, Seddon believes that value stream mapping is of little value in the service context due to the fact the in a manufacturing environment the constraint is a machine which cannot be substituted for service roles. This leads to inflexibility (Seddon, 2005: 194). In order to protect the working capital of the organisation this constraint is necessary and therefore, the ocean imports process needs to remain flexible in order to deal with this constraint.

It is now possible to suggest some improvements to the current state and evaluate a possible future state by making recommendations on using lean tools and the re-shuffling of processes to take into account the constraint discovered. Through this process the arguments of the various authors researched will be tested to discover if value stream mapping can potentially create improvements against the challenges facing the UTi organisation.

5.3 RECOMMENDATIONS AND POSSIBLE FUTURE STATE

Some potential solutions through the application of lean tools within UTi's ocean import process will be evaluated. These suggested models stem from an assessment of the current state and involve the utilisation of some of the tools found in chapter 2.

5.3.1 Designing a kanban model for UTi Port Elizabeth's ocean freight imports process

In chapter 2 the kanban process within a manufacturing context was analysed. Pieterse (2007:18) says that a kanban system is used by manufacturers to control work in process and inventory flow. Incorporating the 'water spider' concept (Liker and Davis, 2006: 423) a kanban model for the ocean freight imports process can be created.

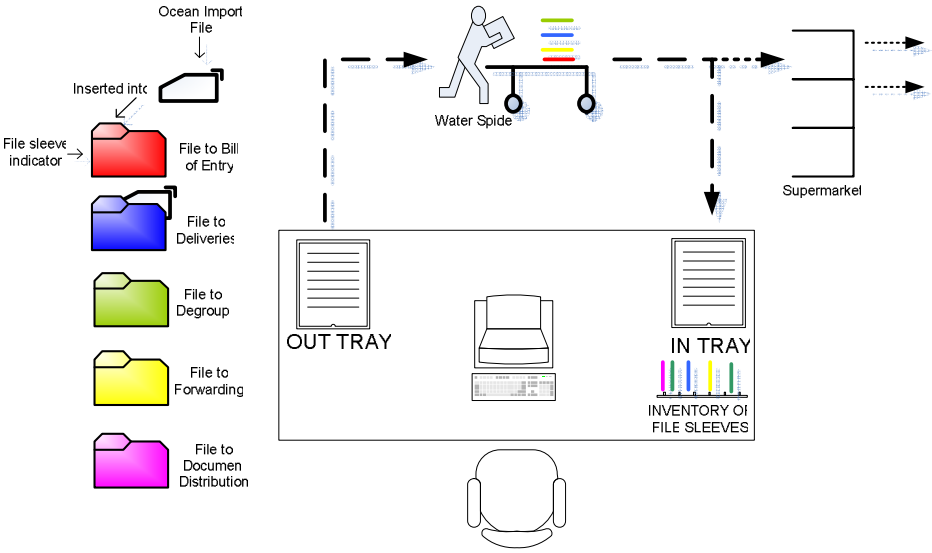
Chapter 2 revealed the seven deadly wastes of manufacturing. Waiting time was specified by both Liker (2004:29), in a manufacturing context, and Maleyeff (2006: 83), in a service

context. Transportation was also confirmed by both authors as a waste in manufacturing and service contexts. In order to address the problems of queue between the forwarding team, degroup team and document distribution team as well as the physical movement (transportation) of files between all teams a kanban system has been designed.

In a typical kanban system cards are used to signal the replenishment of inventory or movement required of a part (Pieterse 2007: 18). For this purpose a file sleeve will be used to signal the movement of the ocean imports file to the next process or the return of a particular file to an upstream process in case of an error or processing issue with the file. Through the utilisation of 5S principles introduced in chapter 2 (Tapping and Shuker, 2003: 89) the researcher has designed a standardised work area for all ocean freight import employees to follow.

The process is simple. When the ocean imports file has been completed, by the forwarding team for example, it is inserted into the coloured *sleeve indicator* and placed in the 'out tray' on the controller's desk, see Figure 5.1. and 5.2.

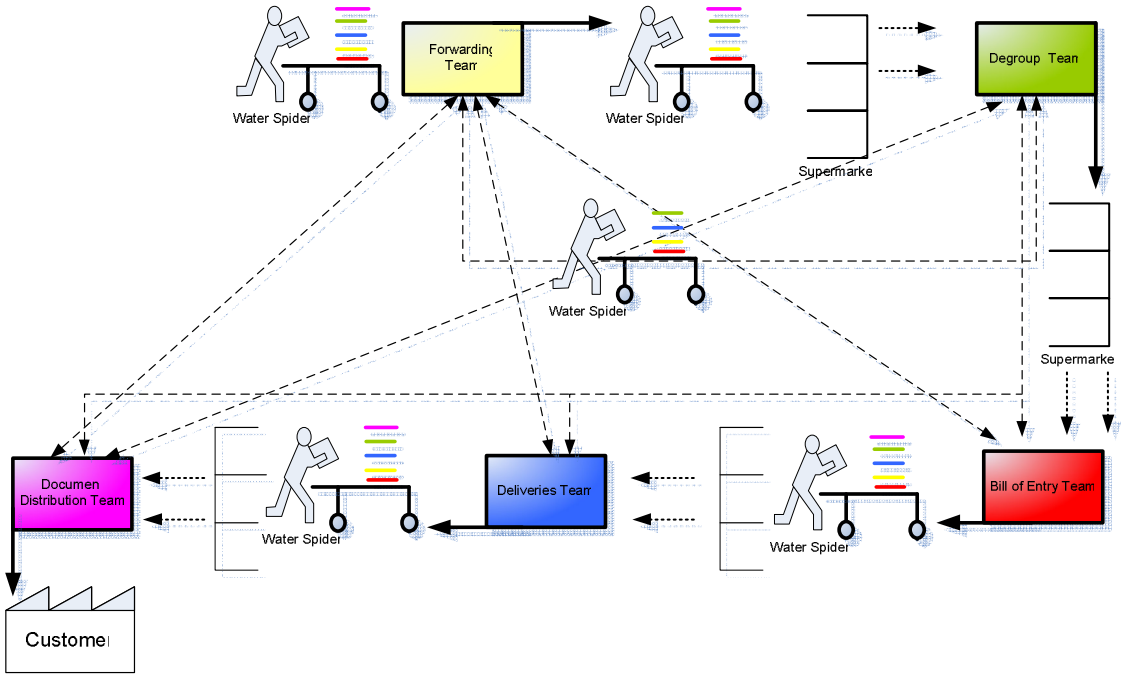
FIGURE 5.1 THE OCEAN IMPORT EMPLOYEE'S DESK INCORPORATING 5S IN THE KANBAN MODEL



Source: Researcher's own construction.

This is a signal for the 'water spider' to collect the file and take it to the next downstream process, or upstream in the case of a query. When the water spider collects the file sleeve containing the ocean freight imports file, the water spider also replenishes the inventory of empty file sleeves on the employees' desk. The water spider proceeds, with the files on the transport trolley, to the supermarket and off-loads the file, in this example, to the Degroup team's supermarket. When offloading files for Degroup the water spider will collect file sleeves for the next downstream or upstream process, and so on. The water spider will continue going from team to team delivering and off-loading files creating a push/pull system and enabling a smooth flow of files around the office.

FIGURE 5.2 A KANBAN MODEL FOR THE OCEAN FREIGHT IMPORTS PROCESS



Source: Researcher's own creation.

Evaluating the kanban model in the context of the current state map, the impact will be in the following areas:

- Waiting time can be reduced, with an estimated 8.5 hours of queue time being taken out of the ocean imports process; and
- Transportation will be reduced as ocean import employees will not have to leave their seats to collect or distribute files. This could, potentially, reduce the amount of employees in the ocean freight imports process, allowing them to become more productive by spending more time at their work stations.

Through the assessment of the current state map it has been possible to develop a 'file flow' model incorporating the use of some lean manufacturing concepts, namely kanban and 5S.

5.3.2 Using group technology (cellular layout) for UTi Port Elizabeth's ocean freight imports process

When evaluating the current state map the researcher has identified that some of the processes within the document distribution team can easily be incorporated into other teams.

Each functional team generates specific documents which are placed in the shipping file. By ensuring that all upstream teams scan the documents they are responsible for, into the ESF (electronic shipping file) system, the document distribution team can be eliminated completely. The researcher suggests that the batching activity be incorporated into the deliveries team. The delivery team ultimately arranges the delivery of the shipment, therefore sending the UTi invoice with the delivery makes sense.

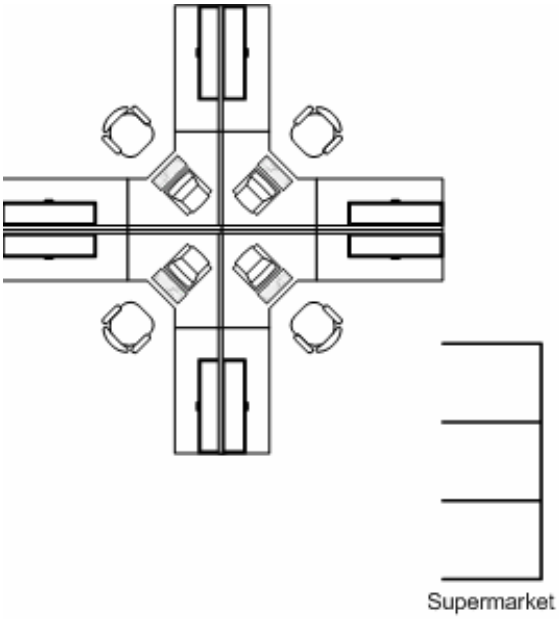
Regarding the specific arrangement of team members within the remaining four teams the researcher suggests a cellular approach. As discussed in chapter 2, Davis and Heineke (2005:351) say that group technology assembles machines necessary to produce one part into manufacturing cells. Imposing this methodology literally on the UTi Port Elizabeth operation would suggest that these functions be arranged in families of products. This would mean an ocean freight imports cell or number of cells; an ocean freight exports cell; an air imports cell and an air exports cell. While this makes sense in

a lean context, the researcher does not believe this will be possible in the foreseeable future.

Based on the analysis of the current state map, the researcher recommends that the functional teams be arranged using group technology.

An analysis of the current set up of the degroup team, Figure 5.3 illustrates the current arrangement. In this model one can see that the arrangement of workers makes it difficult to communicate with one another. A second point to note is that the persons furthest away from the supermarket will have to stand up to get ocean import files or ask a colleague to get files on their behalf. As discussed in chapter 2, any movement or transport is a waste and should be eliminated.

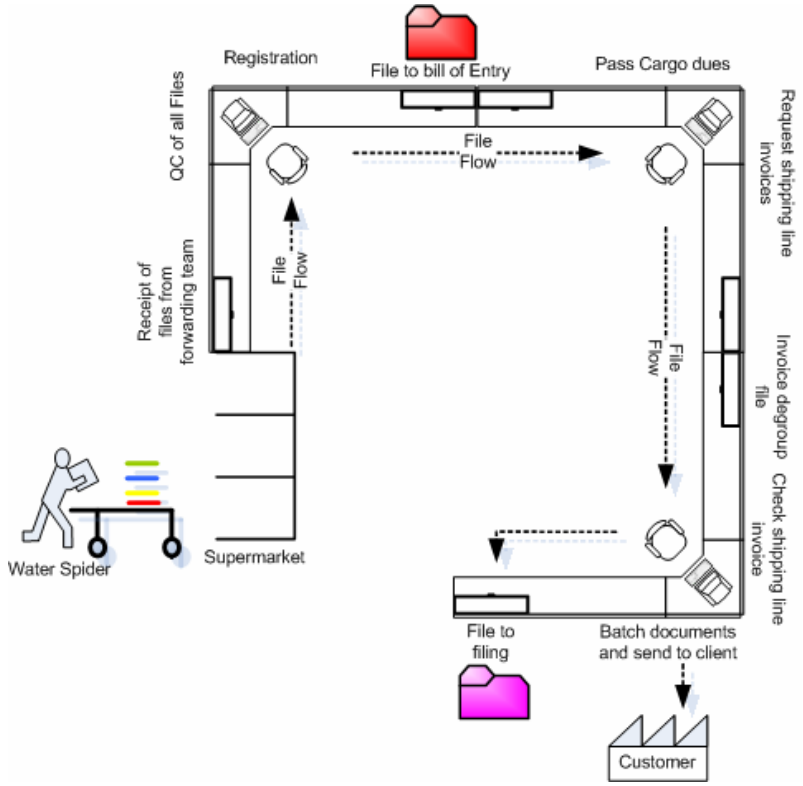
FIGURE 5.3 CURRENT SEATING ARRANGEMENT IN THE DEGROUP TEAM



Source: Researcher's own creation.

Using Tapping and Shuker's (2003: 111) description of the lean work area found in chapter 2, the lean work area is a self-contained and adequately staffed area which is made up of a number of value-adding processes. The structure of these cells should be in a U or C shape, as in the case of Figure 5.4. The primary goal of such a layout in the service area is to minimise travel time for employees and generate an understandable flow (Davis and Heineke, 2005: 421). This is achieved with the group technology model for the degroup team. The model is combined with the kanban model, described in 5.3.1. The researcher estimates that at least one employee can be taken out of the degroup process with this model.

FIGURE 5.4 A GROUP TECHNOLOGY MODEL FOR THE DEGROUP TEAM



Source: Researcher's own creation.

Evaluating the group technology model in the context of the current state map, the impact will be in the following areas:

- Transportation will be reduced as ocean import employees will not have to leave their seats to collect or distribute files. This may reduce the amount of employees in the ocean freight imports process, allowing them to become more productive by spending more time at their work stations;
- Unnecessary movement is minimised; and
- Communication within the team is enhanced.

The impact of these changes on the proposed future state map, as seen in Figure 5.5 will be examined. Figure 5.5 provides an answer to sub-problem 1.3.3; how can current operations be analysed? Value stream mapping has provided a view of the possible future state and can be used an analysis tool for the ocean freight imports process at UTi Port Elizabeth.

5.4 ANALYSIS OF PROPOSED FUTURE STATE

- Reduction of employee cost.

The most notable change is the removal of the document distribution team. Four employees can be removed for the ocean freight imports process.

- Reduction of waiting time within the file flow process.

Total queue time has been reduced from 510 minutes to 80 minutes. This has been achieved through the kanban model using the water spider concept (based on the assumption that the water spider can make a round every 20 minutes).

- Push / pull flow created.

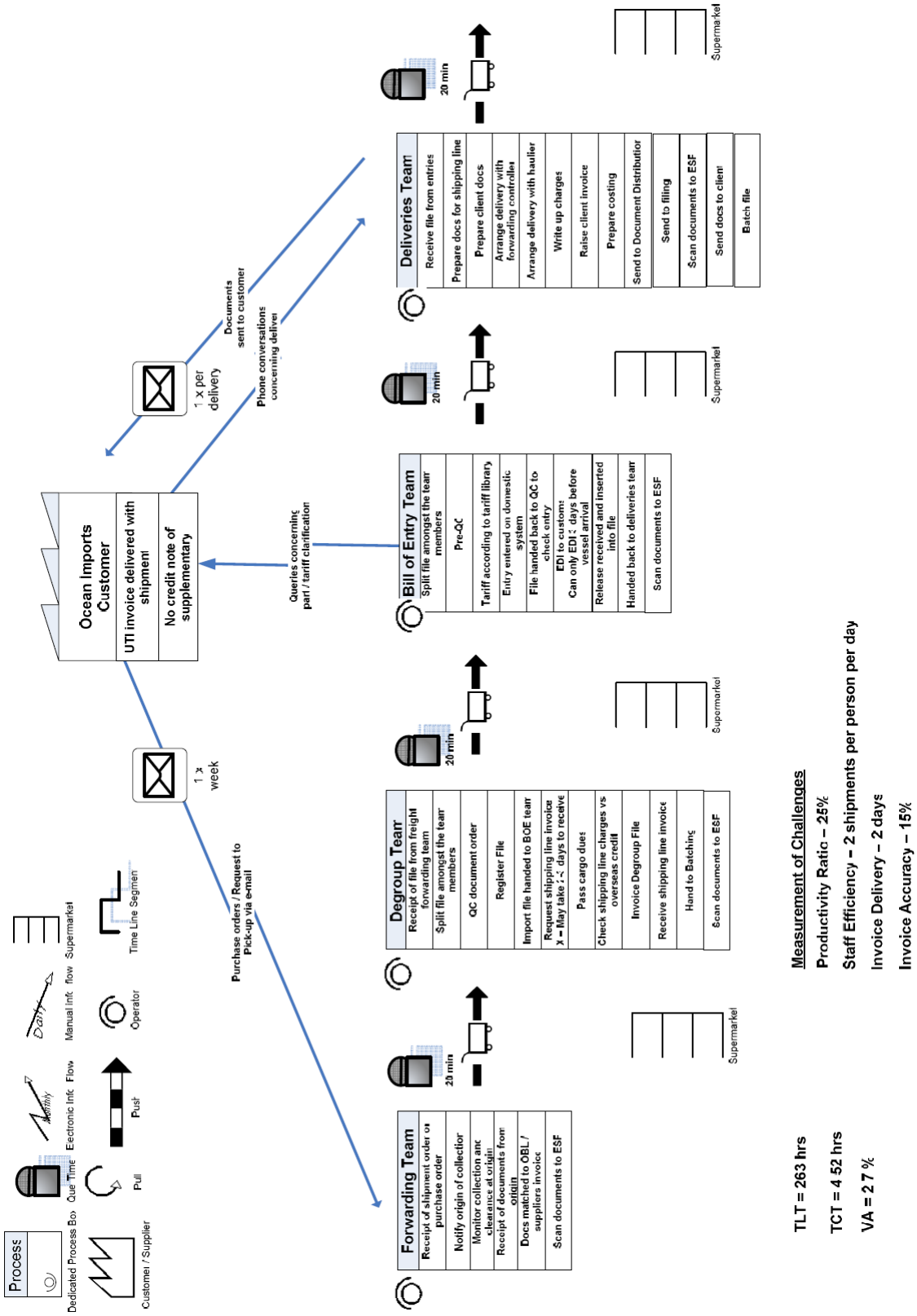
Through the use of the kanban model ocean import employees can control the flow of files creating understandable and visual flow within the file movement process.

- Neat work stations.

Through the utilisation of 5S work areas are tidy. This, in conjunction with the kanban model, will make it easier to identify files which have been mis-laid, are out of place or are under query. This will be visual as the files will be placed outside of the employees in / out tray indicating that there is a problem with the file see Figure 5.1.

Sub-problem 1.3.4 has been answered, what changes will occur in the application of lean analysis to service operations?

FIGURE 5.5 PROPOSED FUTURE STATE



5.5 LIMITATIONS ENCOUNTERED DURING THE RESEARCH

5.5.1 Standardisation

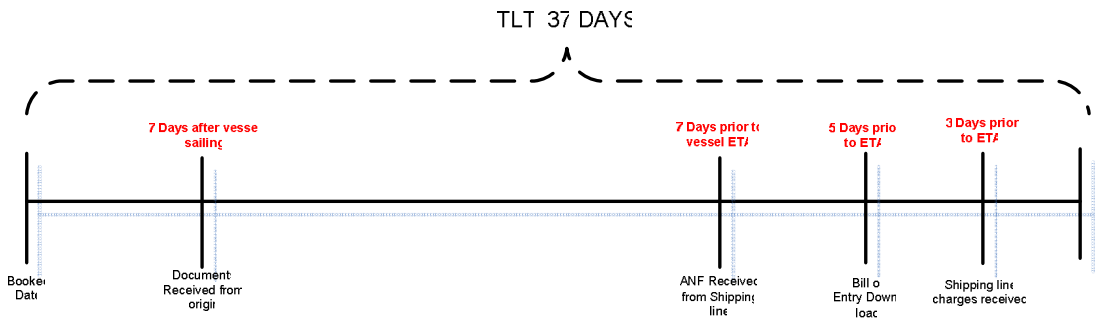
The ocean imports process serves a diverse range of customers and a high level of variety exists. For lean to be successful, a measure of standardisation needs to take place within the ocean freight imports process. This study did not address the issue of standardisation.

5.5.2 Unavoidable waiting periods

The researcher encountered unavoidable waiting periods within the ocean freight imports process, see figure 5.6. These waiting periods were only discovered by the researcher *after* the finalisation of the current state, they are:

- Receipt of documents from origin – will only be received seven days after the booking date;
- Receipt of ANF (Arrival notification from the shipping line) – will only be received seven days prior to ETA of vessel;
- Bill of Entry downloaded to SARS five days before ETA; and
- Shipping line charges only received three days before ETA.

FIGURE 5.6 UNAVOIDABLE WAITING PERIODS



Source: Researcher's own creation.

This hampers flow within the process. As identified in chapter 2, flow is essential for the success of any lean model.

5.5.3 Forwarding Team

The absolute error in the analysis of the forwarding team was 10%, within a 95% level of confidence.

5.5.4 Bill of entry Team

Only 69 bill of entries were timed. In order to create a more accurate confidence interval, a larger sample should be utilised.

5.5.5 Degroup Team

Only five files were measured. To create a more representative mean, a larger sample should be utilised.

5.5.6 Deliveries Team

Only eight files were measured. To create a more representative mean, a larger sample should be utilised.

5.5.7 Document distribution Team

Only thirty-five files were measured. To create a more representative mean, a larger sample should be utilised.

5.5.8 The scale of the study

UTi Port Elizabeth is only one of over 256 offices world wide and the ocean freight imports process only one of many processes within the UTi organisation. The findings may not be applicable to all processes and UTi offices globally.

5.6 OPPORTUNITIES FOR FURTHER RESEARCH

This research study was only confined to the ocean freight imports process of UTi Port Elizabeth and therefore, the results of other offices and departments within South Africa and globally could result in different outcomes than recorded in this study.

In the context of lean methodology, the PDCA cycle needs to be considered. Pieterse (2007: 29) states that continuous improvements are a never-ending cycle of questioning the basic workings of a process. The PDCA cycles are: Plan-Do-Check-Act. This study involves the 'planning' portion of the

PDCA cycle. Further studies could involve the actual implementation of suggested solutions and the 'check' (measurement) of the results with recommendations as further 'actions' to be taken.

Further investigation needs to take place in the development of the lean service model for the freight forwarding industry.

5.7 CONCLUSION

South African business is under growing attack from global companies. It is vital that South African organisations continually seek ways of becoming globally competitive. It is important that UTi International investigates alternative management methodologies and work practices to increase the productivity of employees and reduce operational costs. One of the methods investigated in this research paper was a lean service model. The measurement of challenges facing UTi Port Elizabeth was used to establish UTi's current performance in cost control and customer satisfaction.

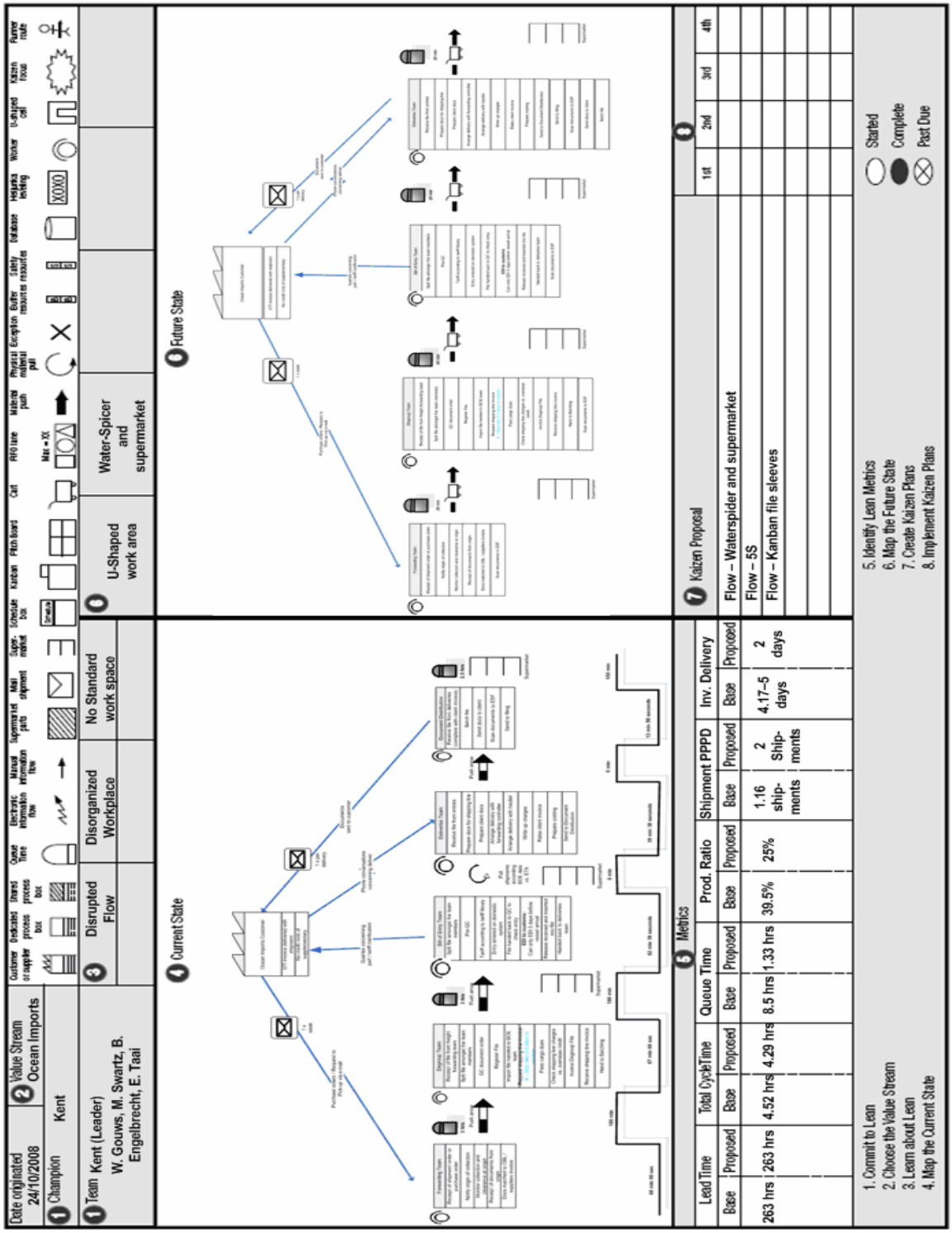
Literature exists on the successful application of lean manufacturing methodology to the service industry. In the cases reviewed, both quality of service delivery and productivity increased dramatically when lean methodology and tools were applied.

A lean tool, value stream mapping, was successfully applied to UTi Port Elizabeth (a service industry). The value stream mapping technique revealed areas of improvement at UTi Port

Elizabeth, and the potential application to the rest of UTi South Africa exists. The completed story board is found in Figure 5.5.

To conclude, the research findings were directly related to the main problem and the answers to the four sub-problems were obtained. A complete value stream story board can be seen in figure 5.7.

FIGURE 5.7 COMPLETE STORYBOARD



Source: Researcher's own construction.

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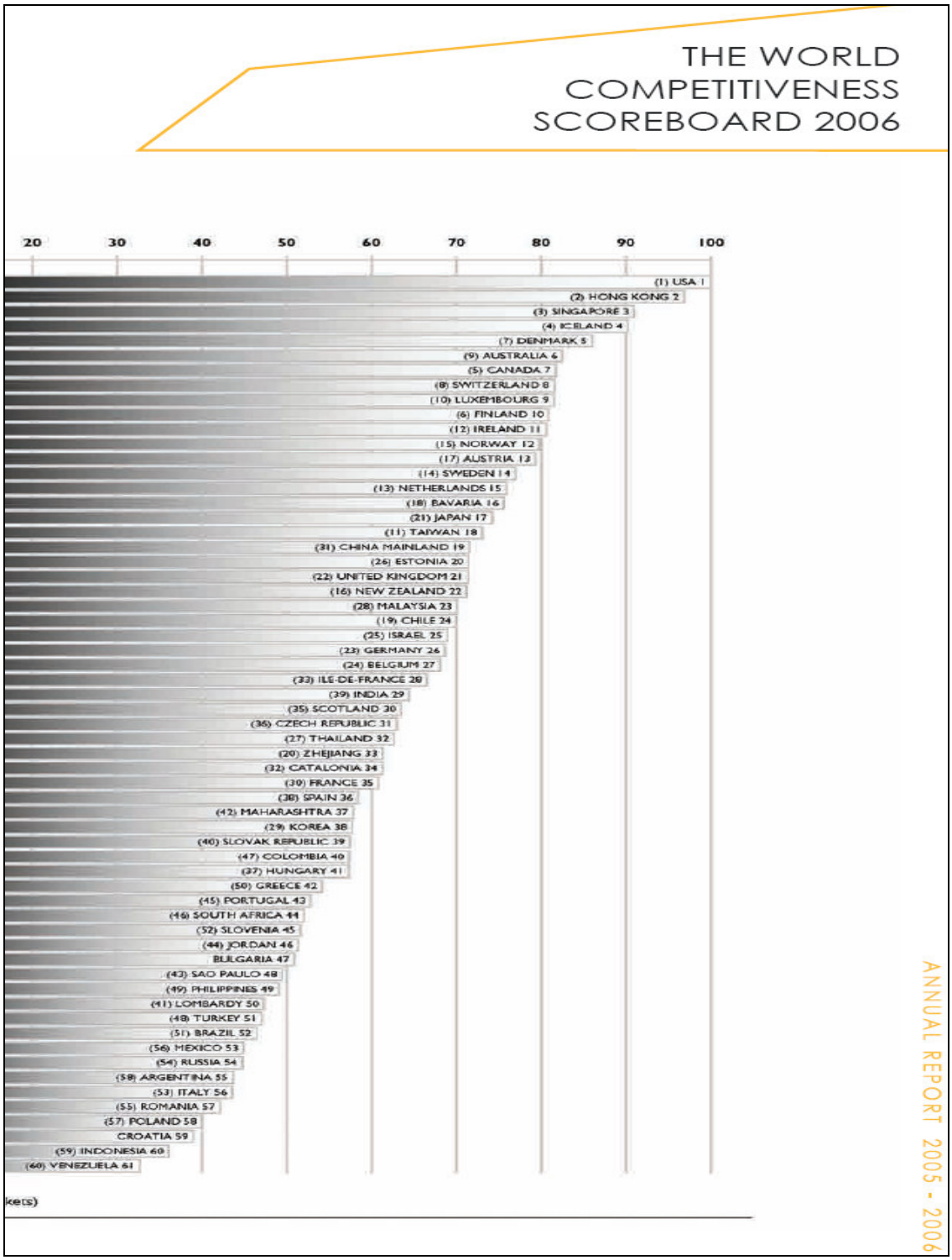
ANNEXURE 1

WORLD COMPETITIVENESS SCORECARD 2006



Source: http://www.weforum.org/en/initiatives/

ANNEXURE 2

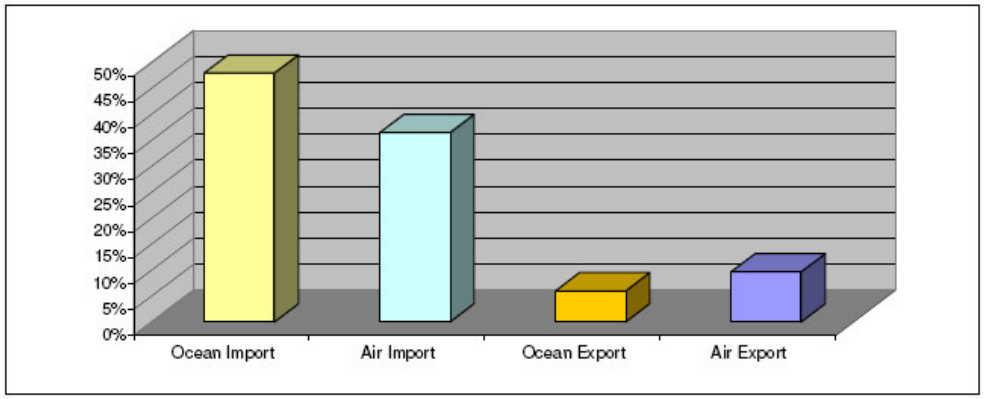
SHIPMENT COUNT FOR PERIOD 01 JULY 2007 TO 30 JUNE 2008

Shipment

No of Housebills/Master jobs		2007/Jul	2007/Aug	2007/Sep	2007/Oct	2007/Nov	2007/Dec	2008/Jan	2008/Feb	2008/Mar	2008/Apr	2008/May	2008/Jun	Total
PLZ		**304**	**267**	**279**	**358**	**283**	**232**	**213**	**319**	**271**	**395**	**303**	**292**	**3,516**
EXP	OCN	115	103	110	116	121	139	58	125	101	133	110	115	**1,346**
	AIR	189	164	169	242	162	93	155	194	170	262	193	177	**2,170**
	Total	**304**	**267**	**279**	**358**	**283**	**232**	**213**	**319**	**271**	**395**	**303**	**292**	**3,516**

No of Housebills/Master jobs		2007/Jul	2007/Aug	2007/Sep	2007/Oct	2007/Nov	2007/Dec	2008/Jan	2008/Feb	2008/Mar	2008/Apr	2008/May	2008/Jun	Total
IMP	OCN	1,129	1,090	768	968	929	579	817	769	940	836	993	979	**10,797**
	AIR	714	761	682	887	734	838	592	622	585	581	567	647	**8,210**
	Total	**1,843**	**1,851**	**1,450**	**1,855**	**1,663**	**1,417**	**1,409**	**1,391**	**1,525**	**1,417**	**1,560**	**1,626**	**19,007**

	Shipment Count			
Monde	Ocean Import	Air Import	Ocean Export	Air Export
	48%	36%	6%	10%



ANNEXURE 3

SHIPMENT STATISTICS REPORT

Primary Customer	On-Sys	Off-Sys	Hand-ov	Total No. of Hbills	On-sys Clearances	Off-sys Clearances	Total No. of Clearances	FCL TEU	LCL TEU	Total TEU's	Actual Weig
NAME WITHELD	5	0	0	5	5	0	5	0	8	8	3976
NAME WITHELD	1	0	0	1	1	0	1	0	0	0	365
NAME WITHELD	1	0	1	1	0	0	0	1	0	1	19000
NAME WITHELD	1	0	0	1	1	0	1	2	0	2	1675
NAME WITHELD	11	0	0	11	11	0	11	0	7	7	29894
NAME WITHELD	1	0	0	1	1	0	1	1	0	1	3668
NAME WITHELD	4	0	0	4	4	0	4	0	1	1	1902
NAME WITHELD	4	0	0	4	4	0	4	7	0	7	33500
NAME WITHELD	1	0	0	1	1	0	1	0	2	2	1030
NAME WITHELD	1	0	1	1	0	0	0	0	0	0	364
NAME WITHELD	2	0	0	2	2	0	2	0	4	4	753
NAME WITHELD	3	0	0	3	3	0	3	0	1	2	4570
NAME WITHELD	1	0	0	1	1	0	1	0	2	2	693
NAME WITHELD	1	3	0	4	1	3	4	6	1	7	22483
NAME WITHELD	1	0	1	1	0	0	0	2	0	2	5176
NAME WITHELD	1	0	0	1	1	0	1	0	0	0	600
NAME WITHELD	2	0	0	2	2	0	2	0	0	0	520
NAME WITHELD	1	0	0	1	1	0	1	0	1	1	252
NAME WITHELD	4	0	0	4	4	0	4	3	0	3	28805
NAME WITHELD	1	0	0	1	1	0	1	2	0	2	10150
NAME WITHELD	3	17	0	20	3	17	20	13	18	31	170229
NAME WITHELD	1	0	0	1	1	0	1	3	0	3	58560
NAME WITHELD	1	0	1	1	0	0	0	2	0	2	1089
NAME WITHELD	1	0	0	1	1	0	1	0	0	0	2523
NAME WITHELD	1	8	0	9	1	8	9	0	16	16	3530
NAME WITHELD	6	0	0	6	6	0	6	78	0	78	560598
NAME WITHELD	0	30	0	30	0	30	30	86	0	86	688360
NAME WITHELD	0	4	0	4	0	4	4	60	0	60	653400
NAME WITHELD	0	19	0	19	0	19	19	36	0	36	4818621
NAME WITHELD	0	37	0	37	0	37	37	84	0	84	961341
NAME WITHELD	0	18	0	18	0	18	18	102	0	102	1400460
NAME WITHELD	0	5	0	5	0	5	5	5	0	5	105616
NAME WITHELD	0	4	0	4	0	4	4	0	6	6	10172
NAME WITHELD	0	1	0	1	0	1	1	0	2	2	1886
NAME WITHELD	0	1	0	1	0	1	1	0	1	1	2000
NAME WITHELD	0	1	0	1	0	1	1	1	0	1	1800
NAME WITHELD	0	9	0	9	0	9	9	25	0	25	265287
NAME WITHELD	0	2	0	2	0	2	2	6	0	6	20253
NAME WITHELD	0	4	0	4	0	4	4	7	0	7	24955
NAME WITHELD	0	1	0	1	0	1	1	0	2	2	900
NAME WITHELD	0	1	0	1	0	1	1	1	0	1	3205
NAME WITHELD	0	1	0	1	0	1	1	0	2	2	512
NAME WITHELD	0	2	0	2	0	2	2	1	1	2	10056
NAME WITHELD	0	4	0	4	0	4	4	0	6	6	11203
NAME WITHELD	0	1	0	1	0	1	1	0	0	0	13850
NAME WITHELD	0	1	0	1	0	1	1	0	2	2	7245
NAME WITHELD	0	3	0	3	0	3	3	0	0	0	287933
NAME WITHELD	0	1	0	1	0	1	1	0	1	1	311
NAME WITHELD	0	1	0	1	0	1	1	2	0	2	25901
NAME WITHELD	0	45	0	45	0	45	45	116	5	121	2440337
NAME WITHELD	0	1	0	1	0	1	1	0	1	1	830
NAME WITHELD	0	3	0	3	0	3	3	5	0	5	86662
NAME WITHELD	0	4	0	4	0	4	4	6	0	6	95081
NAME WITHELD	0	1	0	1	0	1	1	0	2	2	185
NAME WITHELD	0	1	0	1	0	1	1	0	2	2	779
NAME WITHELD	0	2	0	2	0	2	2	6	0	6	49246
NAME WITHELD	0	1	0	1	0	1	1	0	2	2	98
Total	4524	491	1687	5015	2723	491	3214	4965	1035	6000	42392602

ANNEXURE 4

DETERMINE THE MAIN PROCESSES QUESTIONAIRE

Team Leader: Team Name:

Team leader Sex: M F What is your team size?

How many male? How many female?

What are your teams working hours (total time per work day)?

Please describe the main processes within your team:

Please provide a rough sketch of your team's process:

Please list the tools (and / or systems) used by team members to complete their daily tasks

At what intervals, during the day, do your team hand ocean import files to the next process?

ANNEXURE 5

PROFITABILITY REPORT

Profitability Report **22. August 2008**

Applied filte Does not begin with oip - delete Does not begin with P - delete

UTi South Africa (Pty) Ltd **Report 50177**

imension 1 Code: PLZ, Global Dimension 2 Code: IMP, Global Dimension 3 Code: OCN, Posting Date: 01/01/08. **Report 50177**

	Shipment Job Nc	House Waybill No.	De-Group Reference	Import Reference	nth'
1.00	OIP0014375	5661004789	TH0349	PJ0112	1
2.00	OIP0019010	1255551459	DE2409	PD0398	2
3.00	OIP0021202	1255559229	DE2615	PP0070	3
4.00	OIP0024199	5601011278	MY0049	PK0682	4
5.00	OIP0025961	725103025	US0502	PB0862	5
6.00	OIP0025965	725103031	US0502	PB0864	6
7.00	OIP0025970	725103032	US0502	PB0865	7
8.00	OIP0025982	1255570477	DE3004	PC0403	8
9.00	OIP0027371	1224614608	BE0785	PO0162	9
10.00	OIP0027382	5601013213	MY0050	PH0624	10
11.00	OIP0027884	1273603256	GB0990	PQ0056	11
12.00	OIP0027992	5651008882	SG0137	PH0656	12
13.00	OIP0029590	1255679016	DE3289	PQ0139	13
14.00	OIP0029596	1255678563	DE3291	PQ0141	14
15.00	OIP0029598	1255678655	DE3291	PQ0143	15
16.00	OIP0029599	1255678707	DE3291	PQ0144	16
17.00	OIP0029689	1407604258	ES1550	PO0219	17
18.00	OIP0029938	5861084809	CN0623	PG1108	18
19.00	OIP0029990	5881019483	TW0439	PG1109	19
20.00	OIP0030104	106300192	MX0100	PC0548	20
21.00	OIP0030294	1255681319	DE3358	PE0256	21
22.00	OIP0030457	5860002104	CN0628	PC0558	22
23.00	OIP0030455	1255679442	DE3365	PD1184	23
24.00	OIP0030540	1402604394	ES1569	PQ0197	24
25.00	OIP0030659	5601015088	MY0053	PK0871	25
26.00	OIP0030977	1230602123	TR0086	PO0258	26
27.00	OIP0030983	5851070827	HK0694	PG1170	27
28.00	OIP0030984	5851070828	HK0694	PG1171	28
29.00	OIP0030985	5851070829	HK0694	PG1172	29
30.00	OIP0030986	5851070830	HK0694	PG1173	30
31.00	OIP0030987	5851071039	HK0694	PG1174	31
32.00	OIP0031579	1224617005	BE0845	PR0043	32
33.00	OIP0032237	1255684152	DE3512	PJ0721	33
34.00	OIP0032453	5860015148	CN0652	PG1224	34
35.00	OIP0032454	5860015155	CN0652	PG1225	35
36.00	OIP0032455	5860015157	CN0652	PG1226	36
37.00	OIP0033377	591128740	IN0364	PG1311	37
38.00	OIP0033952	5860018257	CN0665	PG1350	38
39.00	OIP0033953	5860020055	CN0665	PG1351	39
40.00	OIP0033955	5860020058	CN0665	PG1353	40
41.00	OIP0033956	5860020059	CN0665	PG1354	1
42.00	OIP0033957	5860020060	CN0665	PG1355	2
43.00	OIP0033958	5860020061	CN0665	PG1356	3
44.00	OIP0033959	5860021403	CN0665	PG1357	4
45.00	OIP0034037	1255687556	DE3673	PP0357	5
46.00	OIP0034275	5860026855	CN0670	PG1343	6
47.00	OIP0034412	1212606533	FR0539	PF0370	7
48.00	OIP0034448	1255688699	DE3705	PR0215	8
49.00	OIP0035519	5610070264	AU0378	PC0694	9
50.00	OIP0037714	591131320	IN0422	PO0506	10
51.00	OIP0037768	1230602948	TR0112	PR0390	11
52.00	OIP0037869	1255695131	DE3961	PC0806	12
53.00	OIP0037929	591130931	IN0423	PO0446	13
54.00	OIP0038161	1407605681	ES1761	PO0523	14
55.00	OIP0038236	5851083653	HK0737	PT0063	15
56.00	OIP0038296	1255697608	DE3980	PJ1169	16
57.00	OIP0038317	1255697534	DE3982	PJ1175	17
58.00	OIP0038389	1255697435	DE3991	PR0435	18
59.00	OIP0038494	5851083967	HK0738	PT0081	19
60.00	OIP0038624	1255698545	DE4007	PJ1201	20
61.00	OIP0038653	5801010599	BD0019	PT0091	21
62.00	OIP0038870	1212607278	FR0557	PF0460	22
63.00	OIP0038880	5851084304	HK0742	PT0104	23
64.00	OIP0038959	1407605857	ES1783	PS0549	24
65.00	OIP0039146	1281612768	GB1048	PF0469	25
66.00	OIP0039212	5851084721	HK0744	PT0123	26
67.00	OIP0039278	1255699356	DE4061	PJ1256	27
68.00	OIP0039290	5815011730	JP0464	PR0471	28
69.00	OIP0039292	5860052725	CN0776	PT0089	29
70.00	OIP0039417	1224621404	BE0959	PR0477	30
71.00	OIP0039559	1212607381	FR0561	PF0474	31
72.00	OIP0039609	1281612890	GB1050	PF0473	32
73.00	OIP0039696	686109777	US0684	PU0003	33
74.00	OIP0039748	5851085947	HK0747	PT0151	34
75.00	OIP0039751	5851086595	HK0747	PT0153	35
76.00	OIP0039775	1281612958	GB1051	PF0481	36
77.00	OIP0040119	5815012057	JP0468	PP0525	37
78.00	OIP0040469	1255602518	DE4123	PJ1343	38
79.00	OIP0040513	1412602991	ES1825	PR0528	39
80.00	OIP0040514	1412602990	ES1826	PR0529	40

ANNEXURE 6

DETERMINE THE TIME OF OBSERVATIONS

Assignment of numbers to corresponding minutes	
Time	Assigned Numbers
08:00 - 08:59	100-159
09:00 - 09:59	200-259
10:00 - 10:59	300-359
11:00 - 11:59	400-459
12:00 - 12:59	LUNCH BREAK
13:00 - 13:59	LUNCH BREAK
14:00 - 14:59	500-559
15:00 - 15:59	600-659
16:00 - 16:59	700-759

Day of Week	Assigment Number	Observation Time	Assigment Number	Observation Time	Assigment Number	Observation Time	Assigment Number	Observation Time	Assigment Number	Observation Time	Assigment Number	Observation Time	Assigment Number	Observation Time
Monday	122	8:22	222	9:22	355	10:55	444	11:44	525	14:25	627	15:27	747	16:47
Monday	137	8:37	231	9:31	341	10:41	451	11:51	501	14:01	620	15:20	734	16:34
Tuesday	112	8:12	236	9:36	304	10:04	456	11:56	522	14:22	637	15:37	747	16:47
Tuesday	108	8:08	225	9:25	319	10:19	420	11:20	545	14:45	633	15:33	749	16:49
Wednesday	123	8:23	255	9:55	340	10:40	446	11:46	516	14:16	632	15:32	723	16:23
Wednesday	126	8:26	259	9:59	319	10:19	402	11:02	539	14:39	635	15:35	724	16:24
Thursday	131	8:31	214	9:14	357	10:57	438	11:38	540	14:40	648	15:48	713	16:13
Thursday	101	8:01	238	9:38	353	10:53	447	11:47	511	14:11	640	15:40	758	16:58
Friday	132	8:32	258	9:58	341	10:41	424	11:24	524	14:24	611	15:11	710	16:10
Friday	142	8:42	248	9:48	315	10:15	441	11:41	522	14:22	623	15:23	714	16:14

Day of Week	Assigment Number	Observation Time	Assigment Number	Observation Time	Assigment Number	Observation Time	Assigment Number	Observation Time	Assigment Number	Observation Time	Assigment Number	Observation Time	Assigment Number	Observation Time
Monday	130	8:31	217	9:17	323	10:23	445	11:45	523	14:23	612	15:12	716	16:16
Monday	144	8:44	240	9:40	349	10:49	448	11:48	546	14:46	609	15:09	712	16:12
Tuesday	118	8:18	234	9:34	338	10:38	436	11:36	534	14:34	647	15:47	724	16:24
Tuesday	132	8:32	216	9:16	359	10:59	420	11:20	535	14:35	631	15:31	704	16:04
Wednesday	118	8:18	246	9:46	316	10:16	453	11:53	514	14:14	638	15:38	731	16:31
Wednesday	113	8:13	221	9:21	300	10:00	445	11:45	517	14:16	653	15:53	702	16:02
Thursday	147	8:47	203	9:03	333	10:33	430	11:30	558	14:58	605	15:05	710	16:10
Thursday	145	8:45	245	9:45	334	10:34	427	11:27	539	14:39	629	15:29	712	16:12
Friday	122	8:22	247	9:47	352	10:52	417	11:17	509	14:09	641	15:41	735	16:35
Friday	109	8:09	224	9:24	311	10:11	424	11:24	506	14:06	600	15:00	700	16:00

ANNEXURE 7

OBSERVATION SHEET

Observation Sheet										
Forwarding activity - selected tool in use										
Monday	E-Mail	Domestic	eMpower	Shipping Line / Port Website	Telephone	Shipping File	ESF	Status Report Update	Meeting	Non-Forwarding Activity
0800:0859										
0900:0959										
1000:1059										
1100:1159										
1400:1459										
1500:1559										
1600:1659										
TOTAL										
Forwarding activity - selected tool in use										
Tuesday	E-Mail	Domestic	eMpower	Shipping Line / Port Website	Telephone	Shipping File	ESF	Status Report Update	Meeting	Non-Forwarding Activity
0800:0859										
0900:0959										
1000:1059										
1100:1159										
1400:1459										
1500:1559										
1600:1659										
TOTAL										
Forwarding activity - selected tool in use										
Wednesday	E-Mail	Domestic	eMpower	Shipping Line / Port Website	Telephone	Shipping File	ESF	Status Report Update	Meeting	Non-Forwarding Activity
0800:0859										
0900:0959										
1000:1059										
1100:1159										
1400:1459										
1500:1559										
1600:1659										
TOTAL										
Forwarding activity - selected tool in use										
Thursday	E-Mail	Domestic	eMpower	Shipping Line / Port Website	Telephone	Shipping File	ESF	Status Report Update	Meeting	Non-Forwarding Activity
0800:0859										
0900:0959										
1000:1059										
1100:1159										
1400:1459										
1500:1559										
1600:1659										
TOTAL										
Forwarding activity - selected tool in use										
Friday	E-Mail	Domestic	eMpower	Shipping Line / Port Website	Telephone	Shipping File	ESF	Status Report Update	Meeting	Non-Forwarding Activity
0800:0859										
0900:0959										
1000:1059										
1100:1159										
1400:1459										
1500:1559										
1600:1659										
TOTAL										
WEEK TOTAL										

ANNEXURE 8

DEGROUP TIME SHEET

File Number _____ Date _____

#	Process Item	Time Start	Time End	Total
1	Split File Amoungst Team			
2	QC Document Order			
3	Register			
4	Request Shipping Line Invoice			
5	Pass Cargo Dues			
6	Check Charges			
7	Invoice Degroup File			
	Total Time For This File			

ANNEXURE 9

BILL OF ENTRY TIME SHEET

	BOE CAPTURE TIME					QC TIME				
N	File Ref	BOE Capture Date	Time Entry Started	Time handed to QC	Total Entry Capture Time	QC Date	Time QC Started	Time QC ended	Total Entry QC Time	Total Value Added Time - BOE
1	PP123	15 September 2008	8:15	9:30	1:15	15 September 2008	13:15	13:30	0:15	1:30
2										0:00
3										0:00
4										0:00
5										0:00
6										0:00
7										0:00
8										0:00
9										0:00
10										0:00
11										0:00
12										0:00
13										0:00
14										0:00
15										0:00
16										0:00
17										0:00
18										0:00
						Sum of Total Value Added Time				0:00
						Average of Value Added Time				0:00
						Standard Deviation Time				0:00

ANNEXURE 10

DELIVERIES TIME SHEET

File Number		Date	

#	Process Item	Time Start	Time End	Total
1	Prepare Docs from S/Line			
2	Prepare Client Docs			
3	Arrange Delivery F/Controller			
4	Arrange Delivery with Haulier			
5	Write Up Charges			
6	Generate Invoice			
7	Complete Costing			
	Total Time For This File			

ANNEXURE 11

DOCUMENT DISTRIBUTION STUDY

DOCUMENT DISTRIBUTION													
	Viewed Times											Performance	*NT*
Element	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	$\bar{T}$	**Rating**	
Receive files from Invoicing													
Batch documents and send to client													
Scan docs onto ESF													
Hand docs to filing													
Normal time for one file													

OCEAN IMPORT

ACCOUNT NO	371897	IMP REF:	PW 0169
CUSTOMER	Trading	Controller	GCob159
SUPPLIER	Vulcans	DEGROUP	BD0038
INCO Terms	FOB		

IMPORTERS REF: 01209				
VESSEL: MAERSK BOSION		VOY: 0816		
E.T.A. 31/8		POD: PL2		
B/L #: 8569		CONTR # PONU72		
FCL	CONSOL	COLOAD	UTI GRP	BREAK BULK
NO OF PKGS / FCL'S: 11 Cartons				
UNPACK DEPOT: TCD		HAULIER: RTT		

DETIALS	DATE	COMMENTS
DOCS / C&F RCVD	NR	
OBL REQUIRED	Y / N	
INSURANCE	Y / N	
QC		
BDE		
CREDIT BLOCK		
RELEASED		
PP		
VOC		
FILE BACK TO CONTROLLER		

DETAILS	DATE	
URGENT DELIVERY	Y / N	
DELIVERY DATE		
CARGO DUES	—	NR.
RELEASE TO SAINE		
FILE TO INV.		
FILE INV / POSTED		
DOCS TO CLIENT	02/09/08	NIL

02/09/08 mailed

SCANNED

QC Checklist -	Tick
1. HBL / OBL reconciled with Supplier invoices / Packing lists (Weights / nr of packages etc)	✓
2. Supplier invoice / EUR1 (English)	✓

GENERAL COMMENTS:

F2 Remarks
SS

27 AUG 2008

DETAILS FOR HOUSE BILL (HB) - OCEAN

HB No.	758128908 /05		
Shipper (1002838)		Orig Brn	CHI: CHICAGO, IL
Consignee (40003)		Dest Brn	PLZ: PORT ELIZABETH
Current Location	PLZ: PORT ELIZABETH		
Export Gateway	EWR: NEWARK, NJ	Import Gateway	PLZ: PORT ELIZABETH
Port of Departure	JFK: NEW YORK (JFK),	Port of Arrival	PLZ: PORT ELIZABETH
Act Date of Departure	21AUG08	Act Date of Arrival	17SEP08(PLZ)
Est Date of Departure	20AUG08	Est Date of Arrival	17SEP08(PLZ)
Freight Received Date	13AUG08		
Vessel Name	SANTA ADRIANA	Voyage No.	S013
Shipment Type	LCL	Terms	
Export Load Ref.	618147135	Import Ref.	PO2071
MBL No.	2238790	D/C/B/S	CONSOL
Current Status/Date	DC 22SEP08	Dangerous Goods:	N
Pre-Alert Sent	18AUG08		
Degroup/B-Bulk Ref.	US1208		

Client References:

Show Linked Refs ☑

SVT DC

SNO E28075

ONO E28075

Email HB | HB Alert

Ocean Containers:

Container Number	Type	Seal Number	Date Packed	Date Unpacked
MEDU2695460	42G0		13AUG08	

Detail of Cargo:

Marks and Numbers	No of Pkgs	Kind of Pkgs	Desc of Goods	Weight	Volume
	1		SUSPENSION SHOCK ABSORBERS FOR	408.231 K	1.104 M
	1			408.231 K	1.104 M

Shipment History:

No of Pieces	Org Brn	Dst Brn	Status	Status Date	Shipment History	User Code	Input Date (GMT)
1	CHI	PLZ	BO	13AUG08/1634	Vess:MSC VOYAGER/08,ETD:20AUG,ETA(PLZ):25SEP,SUSPENSION SHOCK ABS,Wt:408.231K,Vol:1.104M	CHIDXH	13AUG08 23:36
			H	14AUG08/0811	Consignee Name ARMSTRONG HYDRAULICS SA (PTY) was Changed	PLZLZB	14AUG08 06:11
1	CHI	PLZ	RV	13AUG08/	SUSPENSION SHOCK ABS,Frt.Rcvd:13AUG,,LCL,ETA (PLZ):23SEP	CHIDXH	14AUG08 07:46
			H	15AUG08/0623	Consignee Name ARMSTRONG HYDRAULICS SA (PTY) was Changed	PLZLZB	15AUG08 06:23
			H	19AUG08/0723	Consignee Name ARMSTRONG HYDRAULICS SA (PTY) was Changed	PLZLZB	19AUG08 07:23
			H	20AUG08/0626	Consignee Name ARMSTRONG HYDRAULICS SA (PTY) was Changed	PLZLZB	20AUG08 06:26
			H	23AUG08/1452	(DRV)Documents Received,hbl and supplier invoices.	PLZNXB	23AUG08 13:01
			H	26AUG08/1407	Consignee Name ARMSTRONG HYDRAULICS SA (PTY) was Changed	PLZLZB	26AUG08 12:07