
The construction of a categorisation system for Total Care Products

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Acknowledgement

This dissertation would not have been possible without the support of many people that contributed in making the effort complete. I would like to thank Dr. Mohamed Arif, who highlighted the importance of the Total Care topic and encouraged me to contribute to this field. I am extremely grateful to Dr. Alaa Abdul-Ameer for his truly positive support and valuable feedback that allowed me to stay in the right path throughout the period of writing this research. In addition, I would especially like to thank Professor Robert Whalley for his guidance, time and patience.

Finally, my wife, family and friends really deserve special thanks for allowing me to take periods of their time in order to accomplish this work.

Abstract

Market competition and business environment of several industries is pushing companies to change their focus from hardware-based products to function based products. Total Care Products, which refer to products that are based on hardware, software and services, may be sold as a function rather than as hardware. In Total Care Products, also known as Functional Products, the supplier takes care of every aspect of the product, which allows the customer to focus on value rather than hardware. This imposes challenges that require a change in business models in which the price is related to the functionality, not to what the asset is worth. It also impacts the way business is conducted as maintenance and spare parts will no longer be sold, but instead they become a cost, which encourages the supplier to increase efficiency, decrease production cost and improve product knowledge. These factors motivated suppliers in many industries to introduce different products that have some characteristics of the Total Care concept, which made it ambiguous on how many types of Total Care products are available and what is the difference between them. In this work, a case study was conducted on the Internet industry highlighting 53 companies that come under 4 different service sectors. The main results include the establishment of a categorisation system for Total Care products that shows 4 levels and the characteristics each level possess. The categorisation system allows suppliers to classify their Total Care products in a structured way and helps their customer's select the Total Care type that fits their requirements. The system assists suppliers to switch from conventional products to Total Care products by clarifying the different types of Total Care products they can introduce with minimum effort and business risk.

Keywords: Total Care, functional, categorisation, efficiency, products.

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Chapter 1

Introduction

People in organisations tend to receive recognition by applying superior quality and innovative standards. Once a specific standard or practice is known to have value, many parties tend to focus on how it can be implemented to achieve excellence. This gives advantages over competitor's products and promotional procedures.

A new concept came to existence after the rising competitiveness of companies to provide value adding services to the customers that would save money by avoiding capital investments on purchasing products and reduce the cost of training, spare parts and maintenance.

1.1 The traditional business relationship

The traditional business relationship between customers and suppliers/manufacturers tend to start when a customer negotiates the price and specification of equipment with the supplier. The customer then allocates capital investment and purchases new industrial equipment. Therefore, having the advantage of the latest in technology at the time of the purchase. As time passes and technology advances, the equipment loses its performance. The customer might face the risk of running out of spare parts and compulsory upgrading the equipment to cope with the latest available technology. Although costly maintenance programs were conducted throughout the life of the equipment, the customer had to

allocate capital to invest in new equipment to ensure reliability and availability of the function of the equipment.

On the other hand, the supplier/manufacturer receive high income for selling the equipment and additional money would be returned by supporting the equipment with services such as maintenance and repair, and spare parts throughout the life of the equipment.

As cash flow is an important factor for any organisation, and in order to keep the business running, manufacturers are kept under pressure to ensure regular sales of their products. They would also look into decreasing the cost of manufacturing the product, which might compromise the quality and performance.

1.2 The new business relationship

International competition is forcing various industries to improve the tools and methods for the design of products to meet the needs of the customer. Manufacturing companies are striving to increase their revenues and profitability in such a competitive environment and are forced to generate new business relationships with customers in order to ensure continuity and growth.

As mentioned by Alonso, Thompson and Elfsrom (2004), a structural change is shifting the focus from the production of products to the production of services, creating what is known as Total Care Products or Functional Products.

Lindhahl et al. (2006) defined the business concept of Functional sales products as follows: To offer from a life-cycle-perspective a functional solution that fulfils a defined customer need. Lindahl (2001) mentioned that the functional solution can consist of combination of system supply, hardware and services.

Functional Products, also known as Total Care products as cited from Kumar, R. and Kumar, U. (2004), emerge in the Jet Engine industry (Alonso, 2004); where the focus on the product life-cycle view had to be refined. According to Marcus et al. (2005) in functional products, the manufacturer/company offers the functionality of the product, including hardware and support services like, maintenance, logistics, financing, and training over the life-time of the offer. The “Functional Products” concept focuses on delivering the service that the product is designed to deliver, rather than only manufacturing and selling the hardware and its system. This can be thought as turning the production of products to production of services and how the same customer needs can be fulfilled by services instead of selling hardware and systems as shown in Figure 1-1.

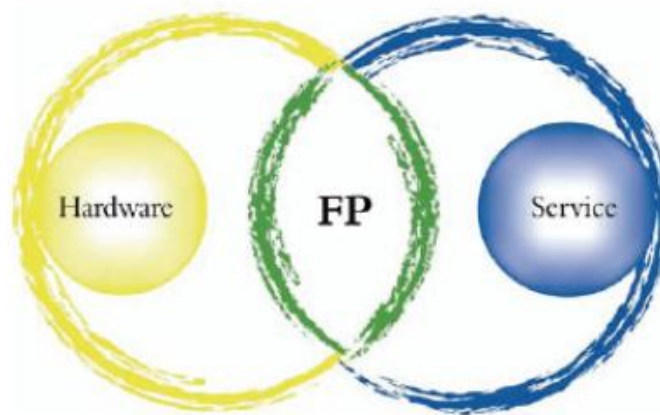


Figure 1-1 Functional Products components (Ericson, 2006)

The manufacturer owns the product while the customer only purchases the function that the product delivers. This change will increase the risk on the manufacturer, since a guarantee of product availability is necessary, which creates new requirements on the manufacturer's process to adapt with. With functional products, it is no longer a design-manufacture-sell issue; it's a total care issue throughout the life cycle of the product. With the introduction of the concept in the market, new challenges require to be solved, such as the considerable variety of different types of Total Care products that need to be organized and classified.

1.3 Problem Statement

The general concept of Total Care was developed by the manufacturing industries through strategic plans of efficient high technology market management. This general concept approach was covering the physical products and services that relate to these industries. However, the developed approach did not drag other industries interest to the Total Care concept. Instead, these industries with different activities were involved in adapting elements of the general concept in their daily business routine. The different approaches to use the Total Care concept shows the importance of categorising the elements available based on merging the characteristics of the Total Care products with the different business needs.

1.4 Aims and Objectives

This work aims to develop user understanding and familiarity of the effective selection of different products and services related to the Total Care concept. This can be expressed by the following objectives:

- a. To investigate the adoption of the Total Care concept through the Internet Industry.
- b. To create a categorisation system for Total Care products and services, which clarify the different types of products and services characteristics available in different fields.
- c. To show how the Total Care concept is related to the project management applications.
- d. To provide appropriate understanding of the Total Care concept in order to assist the user for efficient business and minimum risks.

Researches have concentrated their efforts in studying the Total Care concept in relation with the manufacturing industry, which highlighted the need to conquer new areas that were yet to be tapped. The Internet industry has many companies from different sectors that compete each other in providing suitable products for their customers, and this work will focus on studying this industry to find out whether these companies have used the Total Care concept or not.

The nature of the Total Care concept allows suppliers to offer a diversity of products and services. Market competition drives the variety of products, which raised the issue of creating a categorisation system for Total Care products that clarifies the different characteristics available. The construction of the categorisation system would allow ease understanding of the variety of products and all characteristics involved. It will help customers and suppliers to customize certain products by selecting the needed characteristics and avoid others. The suppliers would be able to switch from conventional

products to Total Care products with minimum business risks by selecting the suitable level of characteristics that meets their capabilities and desire. In project management, selecting the procurement method that suites each project is a critical task that needs to be accompanied as a fundamental part in any project strategy. The Total Care concept is a strong option that provides the project manager with flexibility and ease in the capital cost and value creation for his project.

1.5 Dissertation organisation

This section will demonstrate how the dissertation is organized in order to achieve the aims and objectives. To start the study, a literature review will be conducted to show the work that has been done on the Total Care topic. It will cover the aspects that Total Care products possess, in addition to the advantages and disadvantages of the concept for both the supplier and the customer. The chapter will touch on the principal characteristics of Total Care products, leading the way to describe the “Life Cycle Assessment” of the concept. As Total Care products are a switch from selling hardware and systems to selling services, a section that describes the general concept of services will be provided, which will cover the definition and characteristics of services. The chapter will conclude by describing the concept of categorisation systems. It will cover the principles of categorisation system design and management along with the challenges that appear when developing one and the basic requirements of constructing it.

Next is the methodology chapter that the dissertation is based on. The chapter will focus on defining the methodology used in collecting and analyzing the data and the approach

followed to build the categorisation system for the characteristics of the Total Care products. It will start by going through the data collection approach, followed by the detail method of conducting the study and analyzing the findings. It will also cover the way data was distributed, which leads to creating the categorisation system for the characteristics of the Total Care products.

Following will be the analysis chapter that will start by putting certain definitions and assumptions that the analysis will be based on. It will then consider analyzing 53 Internet companies that come under 4 different sectors, which offers a variety of Total Care products. The analysis will focus on the characteristics of the services the companies offer, which will reveal whether the Total Care concept is being used on the Internet or not. This chapter will define the different characteristics of the Total Care categorisation system found both in the literature review and during the analysis, followed by its construction.

The last chapter will highlight the conclusions and recommendations of the dissertations. The conclusion will summarize the findings from the analysis section and the main points that have been found in the dissertation. The recommendations part will be targeting both suppliers and customers in order to add value to their decisions when they deal with Total Care products. The following chapter will exhibit the literature review that focused on the Total Care concept in detail and what researchers have said about it. It will be the first step towards achieving the aims of this dissertation, as the concept of Total Care will be understood from this chapter.

Chapter 2

Literature Review

This chapter provides a review of the literature on the Total Care concept and the categorisation system employed. The literature review focuses on the work done by researchers and explains the aspects of Total Care and the fields of implementation, in order to help achieving the aims and objectives of the dissertation. In addition, it covers the difference between Total Care products and conventional products, and the advantages Total Care products have for customers and suppliers. The chapter describes the concept of services and how it is linked to Total Care and shows the principles of categorisation system design and the challenges that appear during its development.

2.1 Functional Products

A considerable amount of work has been carried out in order to define Total Care products and the value that could be added to customers, manufacturers and suppliers. While some authors base their research on the design process of Total Care Products, others have expanded their work to cover the product support strategy and life cycle simulations.

Functional products were introduced as an alternative to selling and supporting conventional products, where the manufacturer in this case delivers the product performance and function, not the hardware. For example, the customer does not buy the industrial products/systems/machine, but instead buys the performance such as torque per

hour, volume per hour, kilowatt per hour etc. It is the manufacturer's responsibility to deliver the performance of the product, which will change the product support strategies when compared to the conventional product as analyzed by Tore and Uday (2005). Therefore, Michaels (1996) describes the monetary worth of service products depends on the "functional worth" to the customer, which means that the focus on the quality of the product is very important to succeed and allowing the payoff after a specific period of time of using the product's functionality.

Figure 2-1 shows the concept of Total Care Products, where the service support system supports the hardware and its core functions

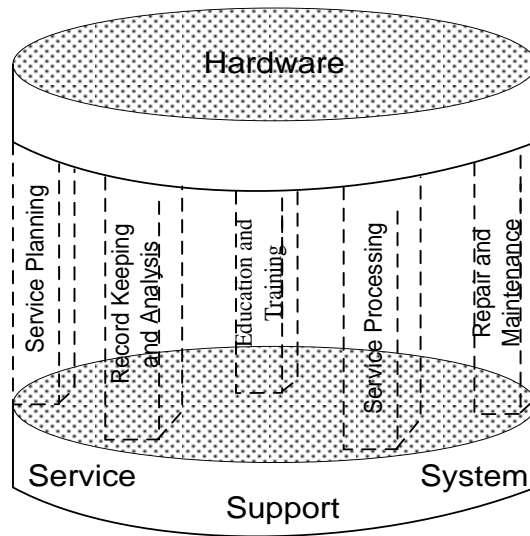


Figure 2-1: Concept of Total Care Product (Alonso-Rasgado, 2004)

2.2 Case studies

Researchers have contributed to the field of Total Care by studying how companies create their functional products and the process of combining its components. According to Sundin et al. (2005) many companies have developed functional products sales

including large organizations such as BT Products, Volvo Aero and ITT Flygt. Löfstrand (2007) have studied a number of companies such as Volvo Aero, Volvo Car Corporation and Hägglunds Drives AB to create a comprehensive researcher understanding.

The case study showed that Hägglunds Drives AB management relied on high quality, as it reflects availability of the service, which prevents production losses for the pumps that their customers use. The qualities of products the design department in the company was focusing on were torque, life cycle, good support to clients and total systems, which is what the Total Care concept is about.

Löfstrand (2007) case study on Volvo Aero and Volvo Car Corporation highlighted the potential challenges of having highly geographically distributed partners and increasingly cross-functional project team members. It built an understanding of the companies' ability to enter functional product agreements successfully. Concerns with business risks and opportunities were emphasized as customers ask the companies to take more responsibilities when preparing agreements.

As products become more complex, performance forecasting is required in both the short term and long term. It has become very important to identify potential causes of failures in the functional capability of the product throughout its life cycle in order to minimize cost on manufacturers who deal with Total Care Products. Therefore, the functional capability, service reliability, service life, lifecycle cost and environmental impact must be considered from a holistic point of view from the first stage of the design, as outlined by Bo et al. (2007).

Figure 2-2 shows the factors dictating the optimal design of a product from a total cost point of view:

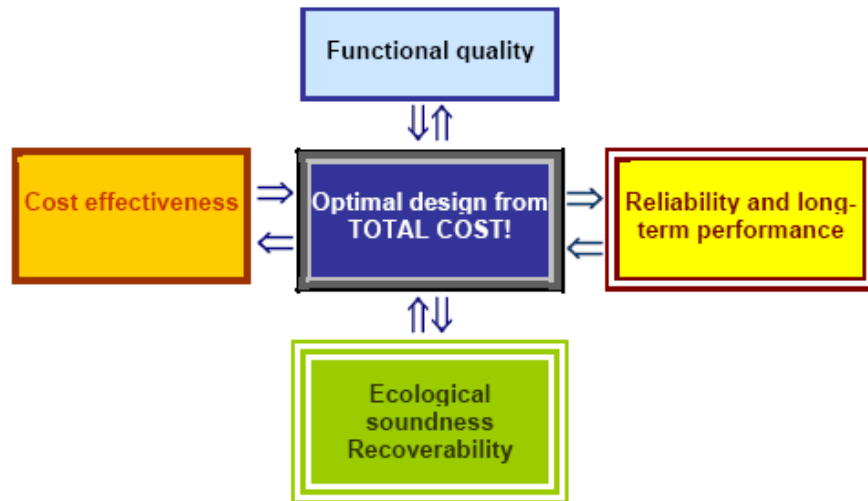


Figure 2-2: Factors dictating optimal design of a product from a total cost point of view (Bo et al. 2007).

Lindahl et al. (2007) indicates that the supplier's focus on offering integrated products and services, which are functional products, can be a driving force for developing new and innovative technical solutions. To develop products and services that lead to added value for customers, the companies need to visualise their customer needs. The first step of achieving this is by understanding the aspects of Total Care products and their characteristics.

2.3 Aspects of Total Care Products

According to Alonso and Thompson (2006), the Total Care Product's main aspects are the architecture and business aspects as illustrated in Figure 2-3.

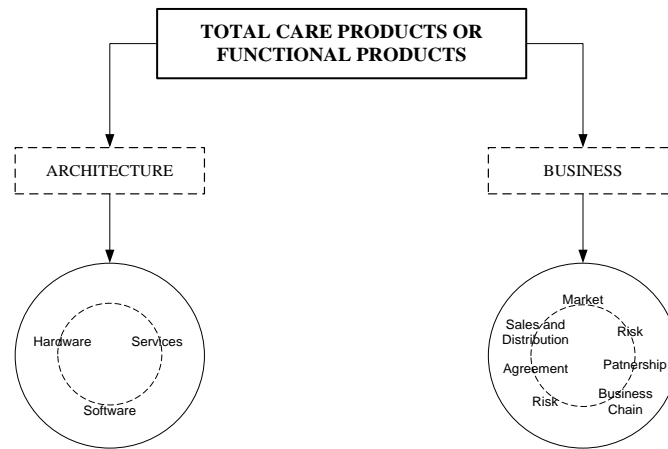


Figure 2-3: Main aspects of Total Care Products (Alonso and Thompson, 2006)

The architecture aspect includes the hardware, services and software that may be considered as integrated parts of the hardware and service support system.

The hardware part involves identifying high value “core” elements that can be reused in product remanufacturing that keep their value with replaceable hardware elements that include corrosion damaged parts, bearings and gears. The driving software of the hardware system can be updated frequently as technology advances in order to give leading edge performance. The service parts of the architecture aspect consist of a system of subfunctions that are internally compatible and the required interface that has external inputs and outputs.

The business aspect of the Total Care Products deals with the creation process of the product. It starts, like any new product investigation, with market analysis. Then, it covers the risk assessment of the market, which provides an insight of the long term business scenario that can be achieved through forecasting trends in economic development. Doing so will help identify any partnership required to create the Total

Care Product along with the business models to simulate the business chain. To test the robustness of the business network, a further risk assessment is performed followed by the agreement between the partners to progress toward sales and distribution.

2.4 Advantages of Total Care Products to suppliers

By implementing the concept of Functional Products, Volvo Aero, Volvo Car Corporation and Hägglunds Drives AB would benefit by having the advantages of Total Care products that were discussed by Alonso and Thompson (2006). The benefits for suppliers include the following:

2.4.1 Smooth Cash Flow

The Total Care Product would guarantee smooth cash flow that can be generated by providing the required function throughout the life cycle of the product or the agreement.

2.4.2 Long Term relationship

The Total Care agreement would establish a long term relationship between the customer and the supplier, which will ensure long term constant flow of income as the function is provided. Good feedback from the customer would facilitate hardware and service improvement, which would reduce the life cycle cost of the product.

2.4.3 Sustainable design

As the suppliers learn from the valuable feedback they receive periodically from the customer, they would benefit from the improvements in the design reflect in the sustainable design plus a competitive advantage.

2.4.4 Product knowledge

The setup will increase the supplier's knowledge of the product in the working environment. This will allow practical improvement to be implemented and would reduce product failure and increase its availability to ensure constant flow of revenue.

2.5 Advantages of Total Care Products to customers

Customers of Volvo Aero, Volvo Car Corporation and Hägglunds Drives AB would benefit from the advantages of Total Care products. Alonso and Thompson (2006) have discussed the benefits for customers as the following:

2.5.1 Elimination of high capital investment requirement

With Total Care Products, there is no need to allocate high capital investments to acquire equipment. The agreement is based on providing the equipment to the customer if necessary, while the ownership of the equipment stays with the suppliers. Instead, there will be a predictable periodic expenditure that is based on the functional usage of the equipment. The customer can forecast the expenses based on the forecasted usage of the equipment during a specified period of time.

2.5.2 Risk Management

The customer pays for the function only when it is used. This would create an incentive for the suppliers to guarantee high levels of availability. The customer would not be concerned about specific equipments as the focus would be on the functional availability, where an agreed level is guaranteed by the suppliers.

2.5.3 Elimination of obsolescence concerns

In order to ensure high levels of availability, the suppliers would regularly upgrade the equipment components to keep the performance as agreed. This guarantees that the customer will be provided with technologically advanced equipment that eliminates the fear of obsolete and outdated equipment.

2.5.4 Good working conditions

The suppliers will make sure that the equipment is in a good working condition, as required to provide good performance. This would increase the confidence of the customer and will keep his satisfaction level high.

2.6 Principal Characteristics of Total Care Products

Total Care Products can become tailored to the requirement of the customer. As every customer might have different requirements, there is a great need for both the customer and supplier to fully understand the principal characteristics of Total Care Products. Volvo Aero, Volvo Car Corporation and Hägglunds Drives AB ensure that they focus on the principal characteristics when creating a Total Care product for their customers. This will benefit both and will help avoid future conflicts in a long term business relationship. Alonso and Thompson (2006) listed the principles as follows:

2.6.1 Customer support level definition

The suppliers and their customers have to interact together in order to identify and determine the level of service support and hardware required for the customer's business needs. This is an important point as the agreement will be based on the outcome of

meetings and conversations between the two parties regarding the required support for the customer.

2.6.2 Life Cycle Cost

Sandberg, et al. (2005) developed life-cycle simulation models for cost estimation of Functional Products. This allows the suppliers to have a clear picture of what would be the total cost of the life cycle of the Total Care product. Assessing the life-cycle cost of a product during products development is crucial for product success, where usually it is only in the early phases of product development that large changes are affordable.

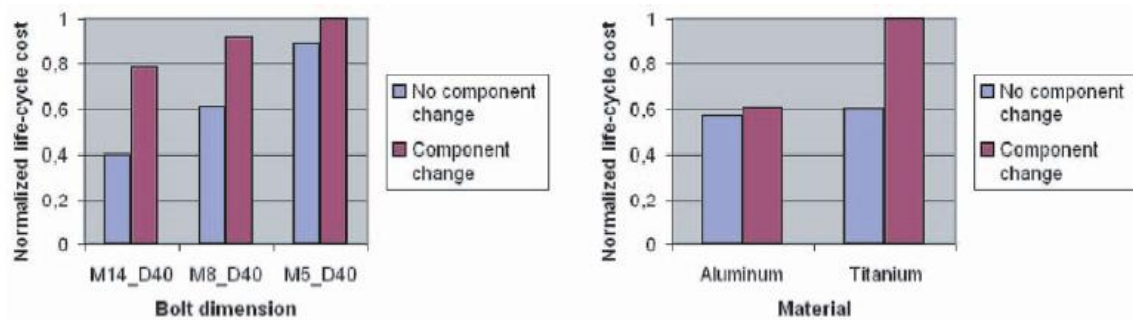


Figure 2-4 Life cycle cost due to bolt dimension choice and material choice (Sandberg et al. (2005))

Figure 2-4 gives an example of Sandberg, et al. (2005) model for life-cycle cost estimation in flange design scenarios. It focuses on the life-cycle cost due to choice of bolts and material. The graphs created by the model illustrates the selection of a low-cost hardware that can be changed often as in “component change”, where the other possibility, denoted as “no component change”, is to develop an expensive hardware that does not need to be changed during the entire life cycle of the product. The model calculates the sum of the costs for facing, drilling operations, material, bolts and

assembly. If no component is change, the facing drilling, and material costs are counted only once, while the maintenance costs are counted for multi times depending on the product's maintenance occasions.

Apart from the fact that there are few models for Total Care products, most models focus on manufactured products and their life cycle. Such models might not be capable of estimating the life cycle costs of non-manufactured Total Care products like online storage services, which recognizes the need to focus on new areas where Total Care is used.

2.6.3 Sustainable Hardware Design

The suppliers reuse and re-manufacture the outdated hardware to create new hardware. Some components of the equipment can be used again with some modification to ensure reliability, which reduces the cost of new equipment and makes the process more environment friendly.

2.6.4 Availability

Availability is one of the main characteristics of Total Care Products. The suppliers benefit from the high levels of uptime and continuous availability of the equipment, as they only get paid when the product is used. This would encourage the suppliers to ensure the equipment is running correctly, which increases the confidence to the customer.

2.6.5 Product knowledge

With Total Care Products, the supplier is responsible for the service support of the product. This allows the supplier to work closely with the equipment in real operating environment, which would increase the level of knowledge and understanding of the product that will eventually lead to increased equipment availability, reduced failure and maintenance cost.

Table 2-1 is a comparison of the basic differences between a Functional Product and a Conventional Product from the manufacturer's perspective as mentioned by Tore and Uday. (2005):

	Conventional Products	Functional Products
Ownership of product	Customer	Supplier/Manufacturer
Support liability	Support generates revenue for the supplier as the customer pays for it.	Supplier is responsible for the support and adds costs to his overhead.
Functional Characteristics	The manufacturer focuses on selling the hardware and profits from supporting it.	Reliability, Availability, Maintainability and Supportability are crucial.
Price	Manufacturer wants maximum profit from product and supporting services at lowest cost.	Customer and manufacturer focus on the performance, to generate profit at lowest product life cycle cost.
Profit generation	Manufacturer profits from sales of hardware and delivery of support services.	Customer and Manufacturer profit from the performance of the product.
Services negotiation	The focus is on price, performance and cost. Customer controls operation and maintenance processes and costs.	The focus is on performance at lowest costs. The manufacturer/supplier control operations, support services and maintenance costs.
Optimization of processes with respect to efficiency and effectiveness	Manufacturer and customer optimize own processes with respect to cost and profit generation. Customer will focus on balancing operational, maintenance, support costs and product performance.	Manufacturer and customer focus on optimizing the performance of the function and the processes related to that to generate maximum profit at lowest costs.

Table 2-1: comparison of differences between Functional and Conventional Products (Tore and Uday, 2005)

2.7 Life Cycle Assessment (LCA)

In relation to the methods used to calculate the life cycle cost of a product, the importance of assessing the product's life cycle appears when the agreement between the supplier and the customer lasts for a long period. According to Lindahl et al. (2006), Life Cycle Assessment (LCA) is a method for assessing the environmental aspects and potential impacts throughout a product's life, from raw material acquisition through production, use and disposal. Companies seek to adapt product focused life-cycle assessment to help in decisions related to design. The assessment is achieved by the following:

- An inventory of relevant inputs and outputs of a product system is compiled.
- The potential environment impacts associated with those inputs and outputs are evaluated.
- The results of the inventory analysis and impact assessment phases are then interpreted.

Resource use, human health and ecological consequences are the general categories of environmental impact that are required. The principles and framework for conducting and reporting Life Cycle Assessment studies are described in detail by the International Standard ISO 14040 (1997).

2.8 Total Care in project management

As the focus on the procurement method that each project should take is getting increasingly important and is considered a fundamental part of any project strategy. It has

been found that it is having a significant impact on the performance of the project because of the influence it applies to the time and cost of any project.

According to Kamara et al (2000) client requirements refer to the objectives, needs and expectations of the client. These requirements are considered as a description, with respect to functions and attributes, of the facility that satisfies the business needs of the client.

Client requirements mainly come from their objectives of doing the project. Tookey et al (2001) consider that understanding a client’s objectives must relate closely to the motivations for making a decision to invest, which normally focuses on three main factors that are Cost, Time and Quality. Dzung et al (2005) appreciate those factors as part of the negotiation between the client and contractor, which can be seen as a process of seeking an agreement point in a multidimensional space. In Table 2-2, Cheung (2000) lists the client’s requirements that are taken from the main factors and others that are widely recognized as most valid by researchers like Hassan (2001), Skitmore et al (1994), Nedo (1985) and Tookey (1999)

Client Requirements	Researcher’s opinion			
	Hassan	Skitmore et al	Nedo	Tookey
Profitability	Yes			
Capital cost	Yes	Yes	Yes	Yes
Quality	Yes	Yes	Yes	Yes
Time-scale	Yes	Yes	Yes	Yes
Maintenance costs	Yes			
Facility performance	Yes			Yes
Reliability & Accountability	Yes	Yes	Yes	
Early occupation	Yes			

Table 2-2 Factors of client requirements (Cheung, 2000)

Peter et al (1998) sees that some clients stress that certain requirements are more important than others. In Figure 2-5, Hassan et al (1999) show the opinion of clients on the importance of the different factors to them, as taken from workshops and industry:

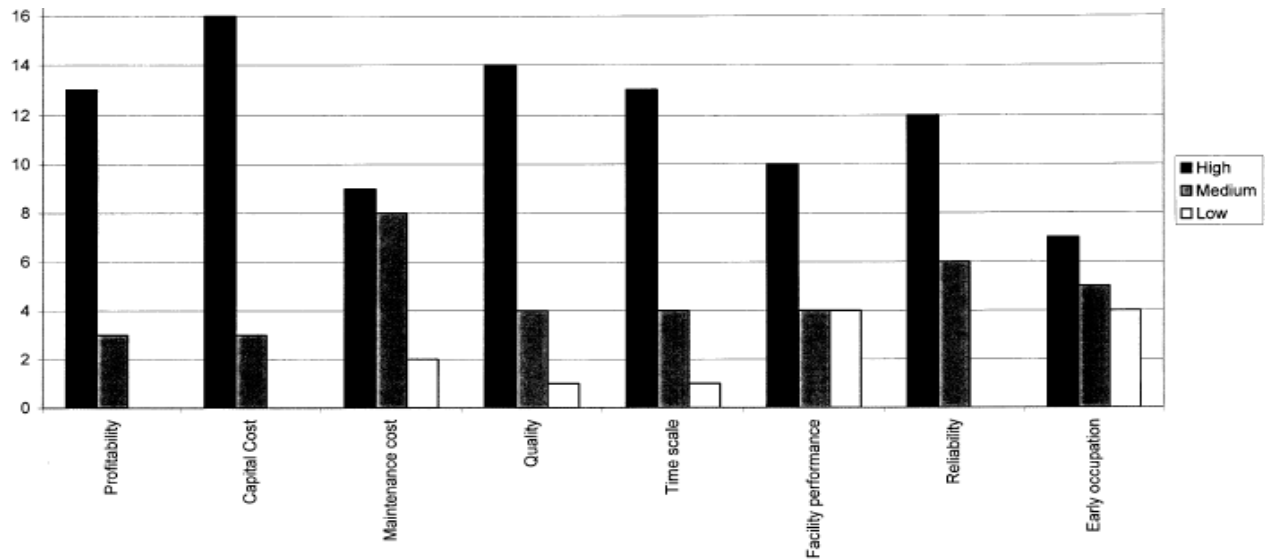


Figure 2-5 Importance of different factors considered by clients (Hassan, 1999)

The factors that have shown importance to clients in Figure 2-5 are inline with the main characteristics of Total Care products. This illustrates the criticality of selecting the right procurement method that suite the needs of the client and how the Total Care concept deals with the main factors that both clients and researchers focus on when it comes to project requirements and procurement, which shows how Total Care products fit in the project management process.

2.8.1 Rolls Royce as a aerospace leader in Total Care

Rolls Royce (2007a) offers a long-term rate per hour engine maintenance service and takes full responsibility for the services that the aftermarket needs. By 2003, their Total Care packages cover 35% of the flying hours of the existing Rolls-Royce fleet and 45%

of new engines delivered. To date, Rolls Royce Total Care business that has been contracted is worth \$15 billion. Table 2-6 shows the increase in Total Care engine flying hours compared to the traditional engine flying hours for the period between 1993 and 2003, along with the number of engine units in service.

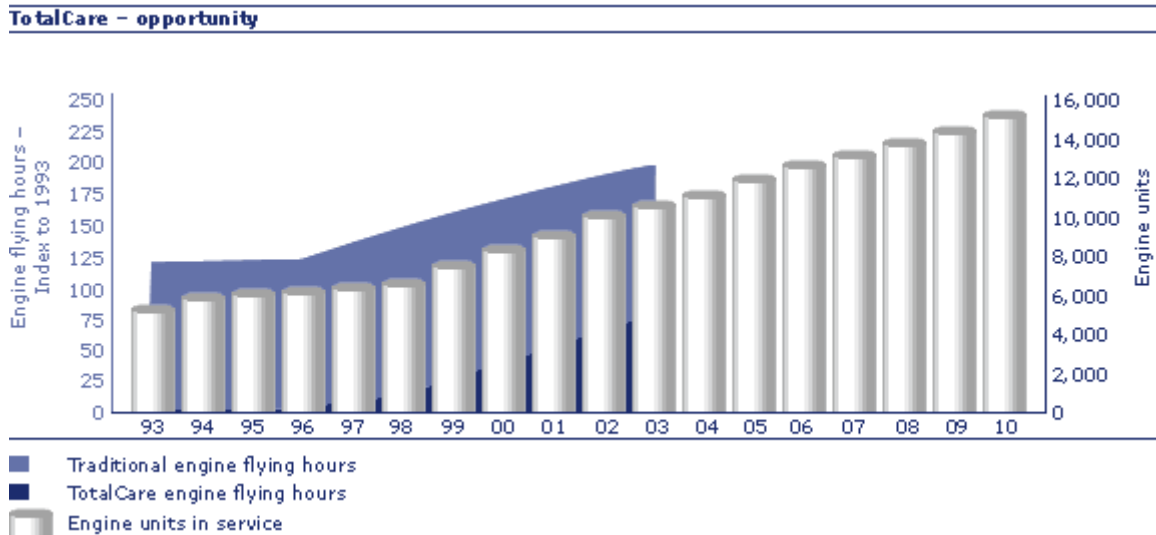


Figure 2-6 Total Care flying hours and engine units (Rolls-Royce.com, 2007)

In December 2007, Rolls Royce (2007b) announced that Emirates Airlines has signed a long-term Total Care agreement valued at \$340 million that covers the fleet management of the carrier’s Trent 500 engines. The contract establishes an agreement were Emirates will hand over full responsibility for management of the engines fleet at an agreed dollar rate per flying hour. The solution that is tailored to Emirates operations, will allow the carrier to forecast engine maintenance cost more accurately and focus on their core business.

2.9 The Concept of Services

In 1900, before electric light bulbs became the standard light source, William Coleman was selling a new brand of gasoline lamp in Oklahoma. Coleman faced difficulties in selling his gasoline bulbs for a town full of “after-dark” shopkeepers. He found that another salesman used to sell the shopkeepers gasoline bulbs that soon stopped working. Coleman revised his approach and started renting the lamps to the shopkeepers for \$1 per week, with a money-back guarantee if the lamp failed, instead of selling the lamp for \$15. The service-contract succeeded because it was less risky, which allowed Coleman to install his bulbs (Kawasaki, 1999). The service that Coleman offered is a typical example of turning a conventional product into a Total Care product.

2.9.1 Definition of Service

Cowell (1984) considers the continuous change in society and industry contributes to the different views of what constitute a service. Kotler (1982) definition of service is as follows:

“Any activity or benefit that one party can offer to another that is essentially intangible and does not result in the ownership of anything”.

The definition of services according to the International Organisation for Standardization (1991) is “a subset of a product. A product being the results of a production process”.

While Shostack (1981, 1984a) stated that the difference between products and services is “a product is defined by its existence in both space and time, and is tangible, whereas a service doesn’t have a spatial element to it, but is defined in time”. Johne and Storey (1996) noted the difference between the two is that services can not be held in stock,

whereas products can. A fundamental difference between products and services as Cowell (1984) mentions is that service developments are not patentable, which is considered by Cowell (1988) to be primarily responsible for investment being directed towards existing service improvements rather than towards developing novel concepts and services. As commented by Stanton (1981) and Gronroos (1978), the service is the object of marketing, that is, the company's core market offering to customers is the sale of the service. McCarthy (1960), Booms and Bitner (1981), Lovelock et al (1999) noted that a similar approach to Goldstein's were discussed regarding the definition of the nature of service. Goldstein et al (2002) mentioned that it can be achieved by identifying and utilizing the service for individual components and elements.

2.9.2 The Characteristics of Service

To better understand services and their relation to Total Care products, Alonso and Thompson (2006) have listed five main characteristics of services as follows:

2.9.2.1 Intangibility

Physical products like hardware and associated systems are tangible, while services are intangible, and can be assessed from their reliability and how the customer finds them useful and meets his requirement.

2.9.2.2 Inseparability

The customer first buys the service, before even its production and consumption. Therefore, services are inseparable from the means of production. While physical

products are normally produced, sold and then consumed, with a clear separation of the three phases.

2.9.2.3 Perishability

When something can not be regained when it is not used in time or when it is unsold, it is called to be perishable (12Manage.com, 2007). Services are perishable because they only have value when they are produced and consumed. Many goods may not be perishable, because they can be stored in warehouses if they were not consumed directly after production.

2.9.2.4 Ownership

When services are performed, no ownership is transferred from one party to another. The main reason for the inability to own a service is the intangibility and perishability nature of services. The customer might get the right to receive a service, such as the right to use a car for a period of time when renting, but not to own one.

2.9.2.5 Heterogeneity

Heterogeneity is the variation in state or condition. In services, heterogeneity is the variation in service that consumers receive. These variations depend on the capacity, load and readiness of the supplier. Consumers might receive different services from different service providers or within the same service provider when a different technician provides different levels of service quality. Variety also happens to be in products, but since products are tangible, they can be assessed to determine the differences between a product and another, while it might be harder to assess for services before using them.

2.9.3 Stages of Service Design Process

Alonso and Thompson (2006) discussed three main stages of the service design process, which are necessary to the design of the service of any Total Care Product. But before the service design process commences, a strategic assessment is required to evaluate the probable impact of implementing the proposed service on the future profitability of the company, which is done by comparing the proposed service with existing portfolio of business activities. The assessment goes further by assessing opportunities, information on potential customers and regulatory requirements. Hax and Majluf (1991) discuss that all these activities are performed in the context of the company's "Mission Statement". After considering the results of the strategic assessment, the service design process can commence with the following sequence:

2.9.3.1 Concept Development

As mentioned by Britan and Pedrosa (1998), this stage starts with the identification and understanding of the customer's needs and expectation from the service. The requirements are obtained by using appropriate tools to ensure the understanding of the customer. The gathered information is then combined with the supplier's requirement identified in the strategic assessment in order to create the appropriate attributes for the new service.

Griffin and Hauser (1993) noted that identifying customer's needs is a qualitative research task. Edvardsson and Olsson (1996) suggest that differentiating between primary and secondary customer needs is useful.

The difference would be that the primary need is the reason why the customer experiences a certain need. There are six steps for identifying customer needs as outlined by Ulrich and Eppinger (1995), which are:

- Market requirements,
- Collection of data,
- Data interpretation,
- Hierarchical order of needs,
- Importance of the needs,
- Results analysis.

The results will be used by the development team to produce a list of specifications that aim to describe in detail what the product or service must do. Once customer requirements and specification are ranked, the concept design for service begins by providing a sketch of the attributes, functions, products and services that satisfy the customer needs.

2.9.3.2 System Design

This stage is responsible for translating concepts into specifics regarding the individual elements that will make the design. Britan and Pedrosa (1998) identified the categories that those elements fall in, which are as follows:

- Front line and service support staff of the company.
- The customer

- Customer interface
- Technology, including both hard and soft.
- Service/products
- Internal and external organisational structure

Johne and Storey (1996) consider this stage is where a detailed description of the proposed service is produced. It also includes the identification of subsystems and interactions between them and other service systems. Shostack (1984a, 1984b) discusses that by the end of system design stage, the supplier should have a clear definition of the needed activities to generate the service in order to take it to the next stage where service system modeling is undertaken to visualize the service structure and check its functionality and sensitivity of the system of service.

2.9.3.3 Testing and Implementation

The test and implementation stages starts once the system detailed design has been performed and before full scale implementation of the service. As cited from Johne and Storey (1996), authors consider this stage important because faults and defects can be identified and corrected before full scale implementation. Langeard et al. (1986) mentioned that customer acceptance of the new service is accurately gauged before launching the product. Bitran and Pedrosa (1998) ensure that at this stage the service can be assessed against performance and function expectations. In addition, Wheelwright and Clark (1992) see that the customer's understanding of the service concept is increased and valuable feedback is provided. They also view that to maximize the benefits of

service testing, it is important to undertake it in an environment that is close to the market condition.

Shostack (1984b) believes that the implementation stage of service design consists of three aspects:

- Implementation of operation planning, which is concerned with developing a detailed implementation schedule and performing operations testing.
- Implementation of communication strategy, which covers many detailed elements including promotion, advertising and publicity.
- Market introduction, which is devoted for the official launch of the product where the service is closely monitored and feedback is obtained.

2.10 Categorisation systems

The online Oxford English Dictionary defines the term as following:

Categorize: place in a particular category, classify (2007)

Jacob (1991) interprets categorisation as a term which refers to the process of dividing the world of experience into groups – or categories – whose members bear some perceived relation of similarity to each other.

Crawford et al. (2005) see that many of the categorisations we make are an unconscious part of our thought processes. Taylor (1999), Bowker and Star (2000) also suggest that the need to categorize and organize is part of our nature.

2.10.1 Principles of categorisation system design and management

Crawford et al (2005) consider that designing a categorisation system presents many challenges, the first of which is where to start. Categorisations serve a purpose, and the system is shaped according to that purpose and objective. Knowing the categorisation system's objective will derive the scope of the system, its hierarchy and what differentiates between its entities. The categorisation system must be designed and managed against several performance criteria and constraints. As argued by Kwasnik (1992), Doty and Glick (1994), categorisation systems can be considered as "theories". Both are tools to make sense of a situation, where a categorisation system is shaped around a purpose, theories are built around desired ends and it is necessary to organize this in a meaningful way.

2.10.2 Challenges in developing a categorisation system

Three challenges set by Bowker and Star (2000) that is facing the development of categorisation systems. These challenges are as follows:

a. Comparability

In order to have comparability in a categorisation system, there needs to be some standardisation of the language used in describing activities. This will ensure better communication and understanding of the system among users without the need to learn new terminology.

b. Visibility

As categorisation is about organising things, visibility is a result of things being organised and categorised, and things that are not categorised become invisible. The challenge is to choose things that are necessary to be added to the categorisation system and ignore the remaining parts or activities that might not be relevant.

c. Control

Controlling the system's application is one of the challenges in creating a categorisation system. It is necessary to keep the categorisation system simple when designing it, which would require some degree of judgment and discretion in identifying its categories and the rules for categorising. Discretion and judgment are based on experience and training, which needs a level of control over the categorisation system.

2.10.3 Construction of categorisation systems

As discussed by Crawford et al (2005), researchers use different types of categorisation systems including: hierarchical systems, parallel systems, composite attributes and exceptions. Because it is widely used, the literature review will focus on the hierarchical categorisation system. Figure 2-5 shows an example of a hierarchical categorisation system. In this example, the system is divided first by its size in dollar amounts, and then divided again by the product type, followed by another division of sub-products of each product. The system might take time to describe because of its details, but it gives a clear understanding and perception.

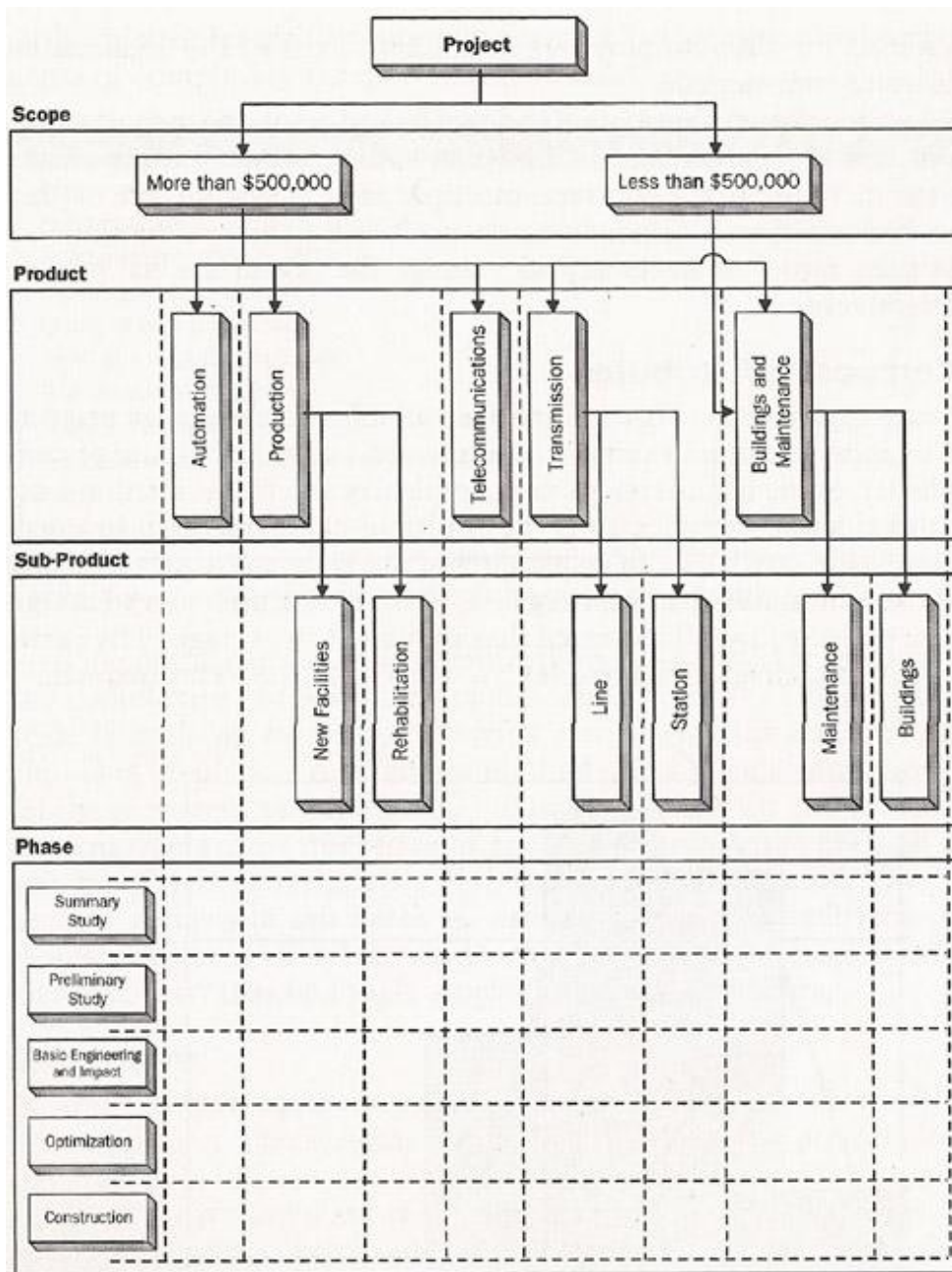


Figure 2-7 an example of a hierarchical categorisation system (Crawford et al. 2005)

Additional attributes were overlaid to the system in the “phase” section, which deals with an important aspect of the categorisation system components. These attributes share common interests in each component of the categorisation system that requires them to be overlaid in this manner.

2.11 Literature Review Summary

The literature review chapter was directed toward covering what researchers have reported on the Total Care concept and its comparison to conventional products. It highlighted the principle characteristics of Total Care products and their advantages to suppliers and customers, along with examples of usage in terms of engines provided by Rolls Royce to Emirates Airlines. The concept of services was defined to link it to the nature of Total Care products. As the dissertation aims to develop a categorisation system for Total Care products, the literature discussed the principles of categorisation system design and the challenges that appear when developing one.

It has been found that researchers had little interest in categorizing the different types and uses of Total Care products. This research aims to fill this gap by focusing on creating a categorisation system for Total Care products after studying their use and availability in the Internet industry.

Chapter 3

Methodology

The literature review presented in chapter 2 has shown a lack of focus on the categorisation of the different types of Total Care products and have concentrated specifically on the manufacturing industry. This chapter will focus on defining the methodology used in collecting and analyzing the data and the approach followed to build the categorisation system in order to achieve the aims and objectives of the dissertation.

3.1 Case study Approach

The methodology that will be used in this contribution is the case study methodology. The selection of this methodology was driven by the way it will highlight different perspectives of the Total Care concept. The case study was found to fit the purpose of the research because it examines existing cases where functional products are used, and how those product's life cycle was dealt with. As the data collection would be extensive, drawing on multiple sources of information, the detailed description of the case and themes will be grouped and then analysed. Finally, the research will report the "lessons learned", from the case and the literature review in terms of outcomes as highlighted by Mattias et al. (2006).

The challenges with the case study methodology would be to identify the case among a host of possible candidates, decide whether to study a single or multiple cases, getting

enough information to get a good depth for the case and deciding on the boundaries in terms of time, events and processes

3.2 Data Collection Method

The collection of data and the results of the analysis were structured to help organizing the facts that support the analysis. The observational methods used to collect the data were consistent and reliable. Consistency was ensured by collecting the data in the same manner and using the same techniques, and aligned with the framework selected for the study. Reliability was established by the similarity in the results of the collected data from different sources with an accepted percentage of agreement between the results.

The following were the methods and techniques used to collect and analyse the information:

3.2.1 Conducting the study

Following the selection of the methodology, the first step was to list different Internet service sectors. After listing many service sectors, four were chosen based on their relativity to the idea of selling the performance/function of products instead of selling the products themselves, which is the basic concept of Total Care.

As shown in Figure 3-1, the selected Internet services sectors were online storage services, Web conferencing services, E-Payment Gateway services and Web Hosting Services.

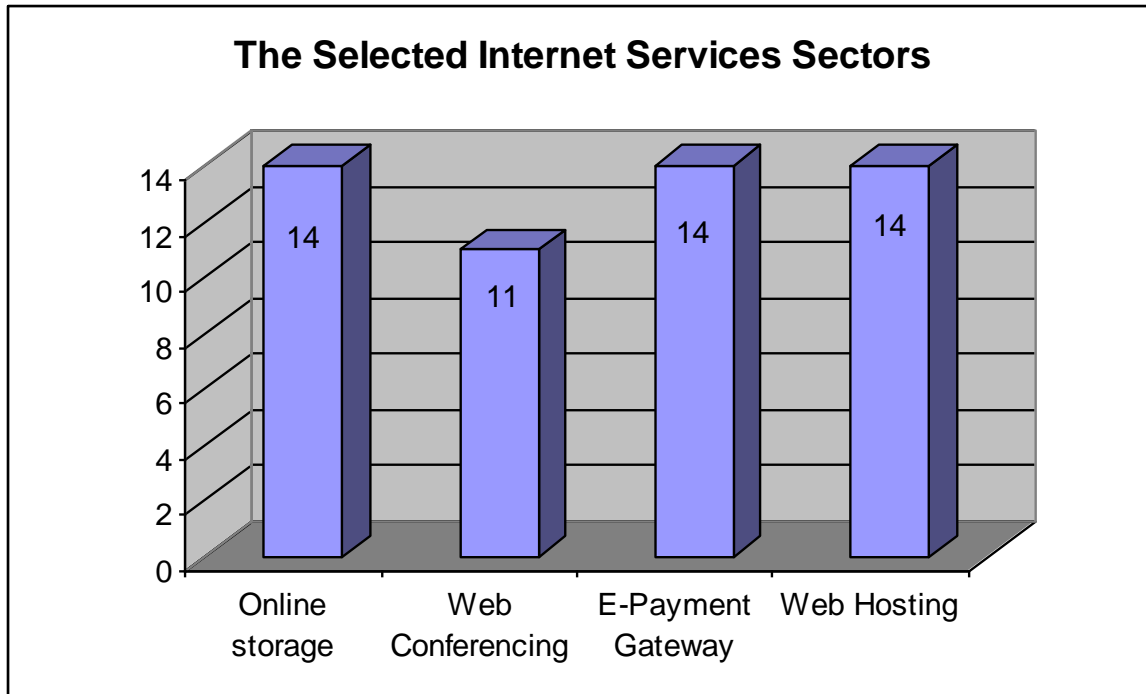


Figure 3-1 the selected Internet service sectors of the research.

The next step was to conduct a detailed search on each sector to determine the companies that offered different types of charging systems and different ways of performing the services they provide. A total of 53 companies covering 4 sectors were selected and a detailed analysis was conducted on each company to check their service's compatibility with the Total Care concept.

In order to establish a clear understanding on the services that companies offer, an email was sent to a number of companies asking them if they use a charging system based on usage. The communication channel conducted through email was effective to get a fair appreciation on the reasons companies have selected certain business models while others have selected different ones. The other way of gathering data was from the companies websites. The information published online on the companies' websites had a wealth of knowledge that allowed a detailed analysis on the way their business was conducted. The

websites posted information regarding the pricing models, service description, support scheme, management options and payment solutions. The posted information was the base of the analysis and when things were not clear or further information was required, an email was sent to the company and whenever a reply was received, the information was added to their research profile.

This approach assisted on analyzing the companies' services on whether they follow the basics of Total Care concept or not. The way information was divided helped in establishing the categorisation system for Total Care products, as the system was based on what companies offer in terms of support, pricing model, maintenance and other characteristics that will be mentioned in detail in the chapter 4.

3.2.2 Analyzing the findings

The study focused on specific principles such as pricing models, service description, support scheme, management options and payment solutions. A general comparison between companies from each sector was done to highlight the differences between them and how those differences were derived.

After collecting all required information regarding companies' services, each sector was analyzed separately in order to have a fair understanding on the way each one was conducting its business. The analysis was focused on the principles that differentiated companies that follow the Total Care concept from the ones that did not. The results were then organized and the analysis was done in the same way for other sectors.

The analysis section was an introduction to the establishment of the Total Care categorisation system. After analyzing the companies from different sectors, the overall differences in Total Care characteristics each company had were noted and prepared to be classified for proper categorisation.

3.3 Distribution of Data

After completing the analysis, it was clear that companies from different sectors had common characteristics. Many were found to have parts of the Total Care concept embedded in their products. This necessitated the importance of properly distributing the results in order to assist in creating a pattern that would ease the process of creating a categorisation system for Total Care.

This stage was important, because it was the first step to create a categorisation system for Total Care. By this time, it was evident that Total Care does exist on the Internet. Although companies were not referring to the term “Total Care” when they displayed their services, the usage based charging system showed that this concept is widely used and in a variety of ways. This added more value to the efforts of creating a categorisation system that would classify the different ways of using Total Care, and what each type possess in terms of the concept characteristics.

3.3.1 Categorisation of characteristics

After distributing the data, it was found that there were ten common characteristics each of the analyzed companies had. The ten characteristics were then defined in detail in

order to clarify the difference between them and the reasons why they relate to the categorisation system.

The characteristics were then designed in a hierarchical format and the columns were divided into four different cells to demonstrate four different levels or types of Total Care categories. The levels highlighted the different types of Total Care categories that were found in the products of the analyzed companies'. Each category was then described based on the characteristics it had.

3.4 Methodology Summary

The Case study approach was the base of this dissertation, as it was found to fit the purpose of the research because it considers existing cases where Total Care products are used. The observational methods used to collect the data from the 53 companies coming from 4 different sectors were consistent and reliable. The data sources were concentrated on the information available in each company's website, in addition to the facts received from email communication with the companies.

The overall differences in Total Care characteristics each company had were recognized and prepared to be classified for proper categorisation. It was found that companies from different sectors had common characteristics, which necessitated the importance of distributing the results in order to ease the process of creating a categorisation that was designed in a hierarchical format to demonstrate the different types of Total Care categories.

Chapter 4

Analysis

This chapter provides an analysis of the data based on the case study methodology described in the previous chapter. The chapter is divided into three sections. The first section defines the assumptions that the analysis will be based on. The second section covers the analysis of different procurement methods and how Total Care is compared to them. In addition, it will include an analysis of a number of Internet companies and how they use different types of Total Care products. The final section presents the Total Care categorisation system, which organises the different types of Total Care products that were demonstrated in the findings of the specific sectors analysis.

4.1 Total Care Definitions and Assumptions

Chapter 2 covered the literature produced by researchers about the Total Care concept in different industries. To set the ground rules for this dissertation, the analysis would be based on the following definition and assumptions, which are derived from the literature review.

4.1.1 Definitions

In order to ensure consistency, the analysis will be based on the following definition of Total Care:

Total Care or Functional Products are summarized as hardware and systems that are turned into services. Their charging methods are based on usage/performance throughout the period of the agreement rather than physical values. The manufacturer/supplier is

responsible for supporting the product whenever required to ensure availability. Whenever the term “Conventional Products” is used, it would refer to the hardware and system products that are sold with regard to their physical value, not their performance.

4.1.2 Assumptions

Some companies might provide products that have some of the Total Care characteristics but not all. The variety of products is derived from the different needs and requirements of the customers. This dissertation would consider all types as Total Care products and the categorisation system in section 4.3 will cover those types and the different characteristics they possess.

4.2 Analysis of the procurement methods attributes

Edwards (2001) emphasizes that the growing attention to new and alternative procurement methods to achieve project objectives pushes people to look into details and risk associated with them. There are many procurement methods that have different attributes that clients can benefit from. Turner (1995) studied the attributes of the main common procurement methods, and the following is an analysis that compares them to the Total Care concept:

4.2.1 Supply of materials, equipment or labor

In this type, the procurement method covers materials, equipment or artisan labor on a per day basis. The materials are often offered under the seller’s standard conditions of sale. The advantages to client include delivery at the earliest, and the liability of defects

up to a certain period would be taken by the seller. The scope of supply depends on what the seller is requested to supply in addition to spares and replacements when necessary.

4.2.2 Professional services

Professional services have no intrinsic value except for the particular buyer for a particular project. They are normally defined in numbers and types of specialists, in addition to the time and duration of commitment. The scope of supply consists of technical assistance, training or designs work, which commits specific personnel to do a specific job, with a defined responsibility and authority for the personnel.

4.2.3 Traditional Design-Bid-Construct / Single Lump Sum

In such procurement methods, a specific price is given for the work, with provisions for price adjustment due to increase of labor and materials cost. The scope of supply requires a precise definition of work scope, reasonable financial risk from contractor, close control of changes and stable market with no political uncertainty.

Even with close control of changes, contractors get into financial risks with such procurement methods. Periods of market stability can be hard to predict, and this exposes the profits the contractor would gain to risks by the fluctuation in material and labor cost during the period of the agreement.

4.2.4 Turnkey/ Design and build

Through this method, the contractor receives full responsibility for the design, procurement, construction and commissioning where no client involvement is required

until given the keys when the project is complete. The scope of supply covers the context definition of the facility, including the equipment, material and labor supply list, technical services supply list and detailed schedules for delivery, construction and commissioning performance guarantees.

4.2.5 Management Contracts

In such contracts, the manager takes the responsibility for managing the operation, which remains owned and financed by the owner. The manager is given authority to manage, not just to provide advice or consultancy services.

In order to have a successful contract between the owner and the manager, the scope of supply should include a clear definition of each party's responsibilities, including what facilities or services are to be supplied by the owner. It would cover the processes and procedures for communications, decision making and monitoring, ending with the training, know-how transfer, financing and compensation.

The problem with such contracts is that the manager is not compensated based on performance. As far as the operation is smooth, he would receive the same compensation with no regards to the extra savings that could be achieved. This does not encourage the manager to implement best practices as there is no incentive for doing more than what is required and mentioned in the contract.

4.2.6 Total Care agreements

With Total Care agreements, the supplier is responsible for providing the function required by the client, which gets charged a fee on a per unit basis. For example, a client might require a photocopy facility, where the supplier provides the photocopy machines while keeping their ownership and charges the client a rate for each photocopied paper. The scope of work includes a clear definition of the required function, agreement period, support and maintenance level and the charging rate per unit.

Total Care agreements focus on the delivery of performance and required end results, which is what the clients need. The supplier benefits from the availability of the function at all times because of the charging method, which encourages periodic maintenance and keeping the equipment in good condition.

4.3 Data Analysis

Internet companies use the Total Care concept to reduce the clients' capital investment costs by providing the function they need without the worrying about maintenance and management requirements. This is done along with a usage based charging method. The following analysis covers a total of 53 Internet companies that provide some of the different types of Total Care products. The companies have been selected from different fields and provide different product ranges. The analysis will focus on the options each company is providing to their customers and what those options consist of so far as Total Care is concerned. Comments on the reasons why companies have selected this approach in providing their services would be listed accordingly.

4.3.1 Online Storage Services

Online storage services are one of the options of storing data. People can securely store their files or backups on a remote server without the worry of losing data when their computer gets damaged or when losing their flash disk memory stick. This service replaces the need to buy and manage a remote server to securely store personnel or business data.

Table 4-1. compares different types of data storage with Online Storage services

	Online Storage	USB Drive	CD-ROM	Zip Disks
Nothing to break	YES	NO	NO	NO
Safer from theft	YES	NO	NO	NO
Add storage space	YES	NO	NO	NO
Remote file sharing	YES	NO	NO	NO
Secure web access	YES	NO	NO	NO

Table 4-1. Data storage comparison (Xdrive.com, 2007)

Many companies provide online storage services using various business models. Most companies provide a relatively small storage area for free to allow people test their service. They charge the users when additional storage is required in terms of dollars per month. Table 4-2. lists 14 companies that provide online storage services:

Online Storage		
Xdrive.com	Myotherdrive.com	MediaMax.com
iBackUp.com	Box.net	Elephantdrive.com
OnlineStorageSolution.com	DataDepositBox.com	Divshare.com
Webcargo.net	Godaddy.com	Amazon.com S3
Mozy.com	Ewedrive.com	

Table 4-2. Online Storage Providers

Each company provides different options, allowing its customers to choose the one that suite their needs. All of them provide management and support for their services with no additional fees. Table 4-3. is an example of what MediaMax.com is providing for its customers:

Free	<ul style="list-style-type: none"> ➔ 25 GB of secure online storage ➔ Download or share 1GB/month ➔ Send files up to 10 MB in size
Premium \$4.95/month	<ul style="list-style-type: none"> ➔ 100 GB of secure online storage ➔ Download/share 10 GB/month ➔ Send files up to 1 GB in size
Elite \$9.95/month	<ul style="list-style-type: none"> ➔ 250 GB of secure online storage ➔ Download or share 25 GB/month ➔ Host or send files of any size
Professional \$29.95/month	<ul style="list-style-type: none"> ➔ 1000 GB of secure online storage ➔ Download or share 100 GB/month ➔ Host or send files of any size

Table 4-3. MediaMax.com products list (MediaMax.com, 2007)

Other companies provide different rates with different storage space, and most use similar business models. DataDepositBox.com offers its customers a straightforward Total Care concept business model; it charges \$2 for each Gigabyte of storage used. They don't have limited features for their service, it's only \$2 for each Gigabyte regardless how much storage space is required. The following is the company's reason for using this business model:

“We offer this pricing model because our main target is home users and small businesses. They usually do not have a large amount of storage and this pricing model fits them better.” DataDepositBox.com

Elephantdrive.com also provides the “pay per usage” method in their Enterprise Storage Solution option. Although they charge a fixed amount of dollars per month for each license, they add a fee for each Gigabyte used ranging from \$0.3 to \$0.5 depending on the number of licenses required. Through email communication, Elephantdrive.com pointed that the usage based pricing for the enterprise accounts are meant to be for customers who tend to have large amounts of data.

Elephantdrive.com uses this business model because it targets users of high storage requirements. Their customers look for low fees per Gigabyte of storage, because of their high storage consumption, and do not mind paying additional low monthly fees. DataDepositBox.com uses the other business model because it targets small businesses and home users that require small amounts of storage space and would prefer paying only for their usage, instead of a fixed monthly fee that is not linked directly to every Gigabyte of storage used, like the one Elephantdrive.com is offering.

As observed from the listed companies, the business model concept of charging based on usage is applied differently depending on the targeted market segment. Companies can combine both options in their pricing model in order to achieve a greater market share. For large space requirements, they could charge less per Gigabyte used, and for small space requirements they would charge more per Gigabyte used. This will provide a

convenient solution for a bigger number of users that are looking for such pricing options.

4.3.2 Web Conferencing

Web conferencing is a tool that can be used to meet with people online to replicate the real life conferencing theme. Companies and individuals spend a lot of money, time and effort in order to meet with people in different locations for business or personnel reasons. As shown in Figure 4-1, the web conferencing and collaboration websites provide a means to gather all parties in a single location where they can exchange information, talk, chat, present online power point files, use annotating tools to draw on the power point slides and many other features that would replace the need to travel and have face-to-face meetings.

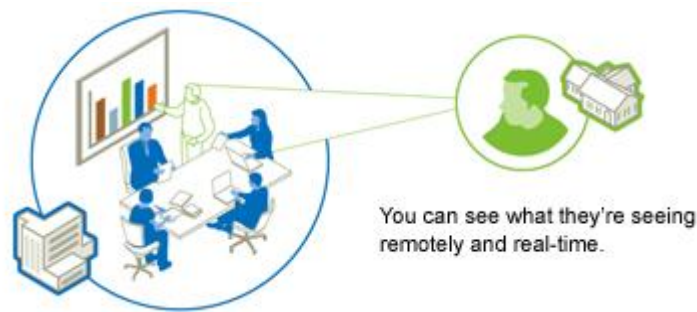


Figure 4-1 Web Conferencing (Webex.com, 2007)

This would save companies a considerable amount of money that would be spent on traveling for meetings abroad and would decrease the amount of logistics and effort required to set up such meetings.

Table 4-4 lists 11 companies that provide the web conferencing facility:

Web Conferencing	
Webex.com	BeamYourScreen.com
OmNovia.com	Teamspace.com
GatherPlace.net	Convenos.com
TeamDesk.net	Strom.com
Webcollab.com	Ilinc.com
	Infiniteconferencing.com

Table 4-4. List of companies that provides web conferencing facility

Many companies that offer this service use different business models in monetizing them and they all provide management and support for their services with no additional fees. Webx.com and OmNovia.com have a variety of charging options for their system. The first option is the fixed monthly membership fee, which allows a predefined maximum number of members in each meeting to meet, with unlimited number of meetings during the month. The other option is payment based on usage; the meeting members would pay a fixed amount of money per minute for each member of the meeting, which is used for users that don't have a lot of meetings during the month. Those users would prefer paying as they use the system instead of paying a fixed monthly fee that might be more expensive.

Other websites such as convenos.com, teamspace.com and gatherplace.com have only the fixed monthly fee membership. Through email communication, the companies were asked about the reason of not having other payment options. The following shows the reasons why the fixed monthly fee was the choice some companies have selected:

“I can understand your need to use the service minimally and intern pay minimally for that use. Perhaps if your need for collaboration increased, then having to pay a penalty for surpassing your set minutes would not be beneficial. Many of our customers tend to prefer not being billed any such overages and would rather have one flat fee that is easily understood. This way you would have the freedom to meet with anyone for as long and as often as you like.” Convenos.com

“The idea of Teamspace is a tool where people should work together for different projects. We think, it is not the ambition to work fast, the ambition is to work successful and efficient in a team. Sometimes this can take time. So this charging model will not be available at Teamspace not either in the future.” Teamspace.com

It shows that the business model is driven by the expected amount of usage/time people might need their product. If customers are divided in two segments, the first would be customers who regularly tend to spend large periods of time during meetings, while the other segment is for customers who tend to spend short periods of time on less frequent meetings. The second segment of customers would prefer paying for their usage only, because they have a clear understanding that their usage is not to the extent that would require them to pay the amount of the fixed monthly charges, which the first segment customers prefer to pay.

Companies like Webx.com and OmNovia.com serve both segments by offering both options. Their market share would possibly be more than others and they could attract more people if they would reduce the \$/minute/user for meetings that exceeds a certain

amount of time, so that it eliminates the stress on meeting members by not penalising them when exceeding their set time and would encourage the long use of the system.

4.3.3 E-Payment Gateways

E-Payment gateways provide an easy, safe and fast way of processing credit card payments in real time via the Internet.

Many companies sell products or services through their websites, and in order to process the payments, it would require a lot of infrastructure investments to keep customers data secured and away from intruders. The E-Payment gateways provide a solution for many companies that want to process online payment in a convenient way for both companies and their customers.

When buyers click on the links to pay in any website that integrates an E-Payment gateway, the system handles the payment in a secure environment and acts as a supplier to fulfill the sale. It deposits the payment into the merchant account when the transaction is completed.

Table 4-5 lists 14 companies that provide E-Payment gateway services:

E-Payment Gateways		
PayPal.com	Protx.com	abcPayments.com
Advansys.com	eWay.com.au	PaymentOnline.com
Payoffline.com	SecPay.com	Ccnow.com
Moneybookers.com	2CheckOut.com	Nochex.com
Amazon.com Payment	checkout.Google.com	

Table 4-5. List of companies that provide E-Payment services

Most if not all E-Payment gateways use the same business model, which is charging per transaction. The charging structure varies from one company to another; Table 4-6 is a comparison of the structure each of the 14 companies charge against their E-Payment service:

E-Payment Gateways			
Company	per transaction	monthly fees	Setup fees
PayPal.com	1.9% to 2.9% + \$0.3	-	-
Payoffline.com	1.25% to 3.00% + 20p	-	-
Moneybookers.com	3.5% + \$0.4	-	-
Checkout.Google.com	2% + \$0.2	-	-
Amazon Payment	5% + \$0.25	-	-
2CheckOut.com	5.5% + \$0.45	-	\$49
Ccnow.com	4.99% + \$0.5	-	\$9.95
Nochex.com	2.9% + 20p	-	£50
Bluepay.com	5.1% + \$0.4	\$8.25	\$149
eWay.com.au	\$0.50	\$16.50	-
SecPay.com	20p	£20	-
abcPayments.com	5% to 7%	-	-
PaymentOnline.com	\$0.25	-	\$100
Protx.com	-	£20	-

Table 4-6, Comparison between E-Payment gateways charging structure

As shown in Table 4-6, a number of companies charge a percentage of the total sale plus a fixed amount per transaction.

Advansys.com, one of the E-Payment providers, when asked about the reason they use “per transaction” fees instead of a fixed monthly fee regardless of the number of transactions a merchant would have, had the following reply:

“We work on a per transaction basis - that is normal in the industry. You won't find any supplier who operates on the basis you mentioned; it's only fair to pay based on a usage and/or transaction value model.”

Protx.com uses a different business model. It provides a fix monthly fee with unlimited transactions for small businesses. They charge £20 per month without linking it to any number of transactions. When asked if the merchant has to pay anything else but the £20, Protx replied:

“For the small business service, there are no set up costs, no annual fees and no integration costs. In fact there are no other fees on our side. However, your bank will charge you a monthly fee and will also charge you a percentage for each transaction made on your account (I believe around 2% per credit card transaction and a flat fee per direct debit transaction).”

Every merchant that deals with credit card processing, whether it's based on the internet or physical shops, would have a bank account where the money will be deposited after the processing is completed successfully. The banks charge fees for their services, which is what Protx was referring to. Some companies like PaymentOnline.com, SecPay.com, Advansys.com and eWay.com.au charge fixed amounts per transaction with no percentage based charges. When eWay.com.au, an Australian Based E-Payment Provider, was asked if the merchant would have to pay additional fees, they had the following reply:

“Your Internet Merchant Facility, as in your bank, will charge you either a flat fee per transaction or charge you a percentage per transaction. Unfortunately every bank is different with the way they charge their merchants. At eWAY we only charge a flat fee of \$0.50c and that is all.”

As shown, the E-Payment gateway industry depends mainly on the Total Care concept. With few exceptions, the charges are based on usage rather than time. Again, companies try to swap between time based charging and usage based charging to attract small businesses to their services. The customers, which are the Internet Merchants, do not get involved in maintaining, managing or dealing with the E-Payment gateway systems. The E-Payment providers' act as a supplier of a Total Care product that turns the hardware, which include servers and system infrastructure, software and manpower into a service that is charged only as it is used.

4.3.4 Web Hosting Services

According to Wikipedia.org (2007), the Internet free encyclopedia, a web hosting service allows individuals and organisations to provide their own websites accessible via the World Wide Web. Companies that provide web hosting services actually provide storage space on servers they own for use by their clients along with Internet connectivity that is required to access these servers.

When an organisation starts developing its website, it will either purchase servers and establish its own data center, which requires capital investment and management expenses, or host it on one of the web hosting providers with a charging method that would be more attractive than purchasing servers or building a data center.

Web hosting companies offer a variety of services; Figure 4-2 shows a number of services that is provided by a typical Internet hosting company.



Figure 4-2 Types of Internet Hosting Services (Godaddy.com, 2007)

The types of services required increase as the company becomes bigger, but the key requirements of Web hosting services are uptime, storage space, memory and data transfer bandwidth.

Many companies provide Internet hosting services, which would allow organisations and individuals host their websites without the requirement of huge capital investment, high maintenance and management costs. Table 4-7 shows a list of companies that provide Internet Web Hosting services:

Web Hosting	
Interland.com	GoDaddy.com
ThePlanet.com	Riothost.com
Webhosting.com	IXWebHosting.com
Fortunecity.com	Kensoft.net
Siteground.com	ExclusiveHosting.net
Amazon.com EC2	Nirvanix.com
Asmallorange.com	Axohq.net

Table 4-7. List of Internet Hosting Companies

As it is the case with other Internet service companies, the Internet Hosting companies have different charging methods and business models to monetize their services. Companies like Godaddy.com, Interland.com, ThePlanet.com, Webhosting.com and

Riohost.com offer Web hosting services with a fixed monthly fee. Their services differ based on the requirement of their clients, but most of their offers also include support, high uptime and sometimes marketing.

Companies like Nirvanix and Amazon EC2 provide services with a charging method based on usage. Nirvanix.com (2007) claims that the growth of user-generated content applications and broadband subscribers is driving the demand for cost-effective, scalable online storage that is required to meet the increasing growth of creating, sharing, and storing user generated digital media online.

Nirvanix.com (2007) states that the new fast pace environment require an increase innovation cycle to operate in this field. The company lists a number of requirements that allows it to expand including “pay-as-you-go” service models.

This shows how companies are looking for new ways to reach new clients when competition starts to increase. Similarly to Nirvanix, Amazon EC2 provides a service model that focuses on payment for what is used instead of a fixed payment for a fixed service.

Depending on the company, the payment is based on the service’s performance, which is measured by counting the Gigabyte transfer into and out of the datacenter. The performance parameters also cover the average Gigabyte of storage and Gigabyte of memory consumption per hour.

As observed from the listed companies, market competition forces them to look for new ways to serve their clients. The Total Care concept, which is mainly depending on

payment per usage, is finding its way in the Web hosting field to satisfy clients by providing effective solutions that would meet their increasing requirements.

4.4 Total Care Categorisation System

As mentioned in the literature review, the Total Care concept came into existence after the increasing levels of competition. This shows that the main driver to introduce this kind of business relationship is the level of competition between suppliers in each field, the more competition exists, the more detailed and customer focused the Total Care product would be.

As seen in the analysis that covered 53 different Internet companies, there is no single type of Total Care characteristic that is applied to every product. Different types of Total Care products were provided because of the nature of competition in between the field suppliers and customer requirements. Those types allowed companies to offer their clients a variety of options when choosing Total Care products. Some of the differences are driven by customer's demand and the others are driven by the supplier's capability.

The availability of the different types of Total Care characteristics in each product raised the point of creating a categorisation system that clarifies the different types or levels available for Total Care products and what each type consist of. This section will categorize the different types of Total Care products and what characteristics each type would possess.

4.4.1 Total Care Categorisation system characteristics

By analyzing the different types of Total Care products provided by the Internet companies, it was found that they have the same advantages for both the suppliers and customers that were mentioned in the literature review. The advantages for the customers would start with the elimination of high capital investment requirement, risk management by knowing what to expect from the uptime point of view, elimination of obsolescence worries, whilst ending with the assurance of good working conditions. The advantages for the supplier would start with smooth cash flow, long term relationship, sustainable design of the product's hardware and ending by the product knowledge that would come with the practical field operating experience.

After studying the characteristics of Total Care products in the literature review and the list of companies in the analysis chapter, Figure 4-3 was produced to show a mind map of the characteristics a Total Care product would have:

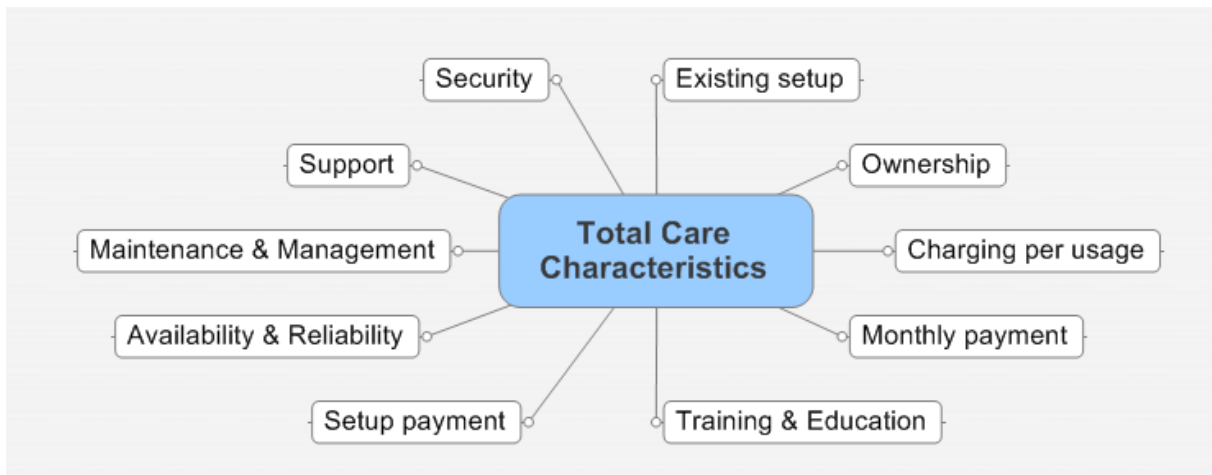


Figure 4-3 Total Care product characteristics mind map

It was found that companies might not provide products with all Total Care characteristics. Therefore, the categorisation system will help categorize the different levels of Total Care products.

The system would have 4 different levels, starting with Level 0 and ending with Level 3. Each level consists of some characteristics of Total Care, where Level 0 would be a mirror of a conventional product, Level 1 as a basic functional product, Level 2 as a medium functional product and Level 3 for products that hold full Total Care characteristics.

4.4.2 Categorisation system characteristics definition

The characteristics that were chosen to be part of the categorisation system covered a major portion of the Total Care products characteristics and should present a fair picture of what they are. The following is a definition of each Total Care characteristic:

4.4.2.1 Charging per usage

One of the main characteristics of “Functional Products” is charging per usage. The customer is only charged for the function when it is used.

4.4.2.2 Monthly payment

Some suppliers charge a fixed monthly payment for their products regardless whether the function is used or not. This payment is set to reduce the risk on the supplier side, which would determine a predefined minimum fee on a monthly basis on return to an agreed level of service performance.

4.4.2.3 Setup payment

Some suppliers charge what is known as a setup payment, which is a one time fee at the beginning of the service that is used to setup the account or mobilize the system to suite the customer requirement. In Level 0, Setup payment refers to the price of the product.

4.4.2.4 Maintenance & Management

The supplier's responsibility is to manage and maintain the product in order for it to perform the way agreed with the customer. Most suppliers provide maintenance and management for their product, which is a basic part of any Total Care product.

4.4.2.5 Support

The supplier provides support for the product whenever required. The product could face some problems that impact its performance, which should be fixed in order to maintain the agreed function with the customer.

4.4.2.6 Availability & Reliability

The supplier benefits from the high availability of the system. Reliability that comes with the high availability allows customers to use the product without interruption.

4.4.2.7 Security

Security is an important part to provide confidence that the product is in a position that allows it to perform without any risks of attack, intruders' interruption or any other means of stopping the product from functioning for reasons that might not be directly linked to operation.

4.4.2.8 Training and Education

Some suppliers provide specific training and product education to the customer's employees in order to give them an understanding of how the system works and what to expect from it.

4.4.2.9 Existing Setup

Some customers would want to switch from existing conventional products to functional products. This depends on the supplier if he agrees to take over the customer's conventional product and provide support and maintenance to run it for him.

4.4.2.10 Product Ownership

The Total Care product ownership stays with the supplier. The customer only receives the functional service. In conventional products, or Level 0 as in the categorisation system, the customer receives product ownership.

4.4.3 Construction of Total Care categorisation system

The Total Care categorisation system in Table 4-8 divides the columns into 4 levels, which describe different types of the products based on their complexity. The Total Care characteristics would be placed on the left side, and the cells that match the characteristics of each level would be filled with either "YES" or "NO". whenever "No" is mentioned, it indicates that normally the product does not come with this feature, which means that the supplier is not responsible for providing it at this level, although the customer can get it by paying additional fees.

Characteristics/Features	Level 0	Level 1	Level 2	Level 3
Charging per usage	NO	NO	YES	YES
Monthly payment	NO	YES	YES	NO
Setup payment	YES	YES	YES	NO
Maintenance & Management	NO	YES	YES	YES
Support	NO	NO	YES	YES
Reliability & uptime	NO	YES	YES	YES
Security	NO	NO	YES	YES
Training and Education	NO	NO	NO	YES
Existing Setup	NO	NO	NO	YES
Ownership	YES	NO	NO	NO

Table 4-8 Total Care categorisation system

Generally the higher the level the more characteristics it consists of. The levels represent what several types of Total Care products would include and how different amounts of responsibilities the suppliers would need to handle.

Level 3 is the only level that provides “Existing Setup”, which means that the supplier can takeover the customer’s existing products and based on an agreement between both parties, the supplier will be responsible for the support, maintenance and reliability while the customer is only charged for the usage.

4.5 Analysis Summary

The analysis chapter shows the different types of procurement methods compared to the Total Care agreements. It presents that many Internet companies provide Total Care products, although they were not named as “Total Care products”, but hold their characteristics. The variety of characteristics each functional product had necessitated the

need for developing a method for effective selection of Total Care products. The chapter was concluded by the establishment of a categorisation system for Total Care products that classifies the major types in four different levels based on their complexity starting with Level 0 and ending with Level 3.

The established categorisation system helps companies classify their Total Care products in a systematic and structured way, which guides them to offer the types of products that suites the level of business risk they would like to take, and it allows their customers to select the product that fits their characteristic requirements.

The next chapter will present the major conclusions and recommendations of this research.

Chapter 5

Conclusion and Recommendations

In the previous chapter, a detailed analysis was conducted for the data gathered in line with the methodology defined in chapter 3. In this Chapter, a summary of the dissertation will be discussed followed by the conclusions along with a number of recommendations, which are considered to be the lessons learnt and the outcome accomplished by the research.

5.1 Research Summary

The aim of this work was to develop a method for effective selection of Total Care products by customers and suppliers through studying new areas where the Total Care concept is used. This was expressed by: first, studying the Internet industry and check whether companies follow the Total Care concept or not; second, creating a categorisation system for Total Care that clarifies the different types of Total Care products characteristics available in different markets.

In order to start the study, a literature review was conducted, which covered the case studies that focused on companies that produced Total Care products. It also described the aspects that Total Care products possess, in addition to the advantages for both the supplier and the customer. The literature review touched on the principal characteristics of Total Care products, leading the way to describe the “Life Cycle Assessment” of the concept of Total Care. As Total Care products are a switch from selling hardware and

systems to selling services, a section that describes the general concept of services was provided, which covered the definition and characteristics of services. It concluded by describing the concept of categorisation systems and covered the principles of categorisation system design and management along with the challenges that appear in developing one with the basic requirements of constructing it.

The case study was selected as the applicable research methodology to achieve the dissertation objectives. The chapter focused on defining the methodology used in collecting and analyzing the data and the approach followed to build the categorisation system for the characteristics of the Total Care products. It started by going through the data collection approach, followed by the detail method of conducting the study and analyzing the findings. It also covered the way data was distributed, which led to creating the categorisation system for the characteristics of the Total Care products.

The analysis section was next. The chapter started by putting certain definitions and assumptions that the analysis was based on. It then considered analyzing 53 Internet companies that come under 4 different sectors, which offer a variety of Total Care products. The chapter then defined the different characteristics of the Total Care categorisation system found both in the literature review and during the analysis, followed by its construction.

5.2 Research Limitations

The dissertation had some limitations and shortcomings that are summarized as follows:

- a. Shortage of references and background on the area of Total Care was a challenge for this research. Finding journals that covered the Total Care concept in many of its fields was not a straightforward task, as many researchers focused their effort on the general concept of Total Care and few aspects in the manufacturing industry. Some went into the details of the concept by looking into the strategic changes that this concept will impose on the business relationship between the customer and supplier. But many factors and areas were not yet covered by researchers, which limited the sources of information that would have helped the study, especially on the work done in different markets that adopted this concept.

- b. The interest of many companies contacted to be involved in the study was inadequate, which made it difficult to assess the different applications of Total Care. This limited the study to the information gathered from their websites and the companies who replied to the emails.

5.3 Conclusion

The analysis exposed that the concept of Total Care does exist in many companies from different sectors of the Internet industry. Market competition forces the companies and suppliers to look for new ways to serve their clients. The Total Care concept, which is mainly depending on payment per usage, is finding its way in the market to satisfy clients by providing effective solutions that would meet their increasing requirements in an efficient manner. The following is a summary of the study's findings:

- a. It was found that some companies offer products that have part of the Total Care characteristics but not all. The reason for such variety is derived from the different needs and requirements of the customers. They would be considered as Total Care products, as the categorisation system is meant to categorize the types and the different characteristics they possess.
- b. A number of companies charge relatively low fees per usage for huge data consumption, which are targeted for big costumers and others charge usage fees plus fixed monthly fees for small data consumption, focusing on infrequent small costumers.
- c. Some business models were driven by the expected amount of usage/time people might need the product. If customers were to be divided in two segments, the first would be customers who regularly spend large periods of time or usage, which prefer paying a fixed monthly fee, while the other segment is for customers who spend short periods of time or usage. The second segment of customers would prefer paying for their usage only, because they have a clear understanding that their usage is not to the extent that would require them to pay the amount of the fixed monthly charges.
- d. Companies try to swap between time based charging and usage based charging to attract small businesses to use their services.
- e. Ten characteristics that appeared in Total Care products were found to be the base of the categorisation system. The construction of the categorisation system was required

to clarify the different types of Total Care product's characteristics available in different markets. They were as follows:

- Charging per usage
- Monthly payment
- Setup payment
- Maintenance & Management
- Support
- Availability & Reliability
- Security
- Training and Education
- Existing Setup
- Product Ownership

The findings and outcomes were in line with the aims and objectives of the research. The study revealed that the Internet industry contains companies that follow the Total Care concept. In addition, the construction of the categorisation system would ease the process for companies and customers to compare the different types of Total Care products as well as their advantages and uses. This will help in integrating the concept into the products they offer.

5.4 Recommendations

After analysing the different types and uses of Total Care products in the Internet industry and other industries covered in the literature review, a general understanding of this topic was acquired that allows to further benefit from the concept if applied effectively.

Thereby, the recommendations section highlights the subject of Total Care by summarizing the actions required to be taken in order to gain more value for the implementation of the concept. The recommendations for both suppliers and customers would add value to their decisions when it comes to deal with Total Care products, and they are as follows:

- a. To avoid disappointing customers who are forced to pay a fixed monthly fee in addition to their usage fees because of their relatively small consumption, companies can attract them by offering their services with out monthly fees, and add a premium to the usage fees. By doing so, the company will reduce the risk and customers will be comfortable in their financial commitments. This would allow them to increase their market share by satisfying the need of a considerable part of the market segment.
- b. Some companies might resist developing a Total Care product because of their fear of change and business risk exposure. This fear can be tackled by developing a Level 1 Total Care product that allows them to receive a fixed monthly income based on an agreed performance that should be supply. By selecting this option, companies would have a less risky relationship and the setup fees would help them with the initial requirement to start the service.

Once they get comfortable with this type of agreements, they can develop Level 2 Total Care products that would be based on charging per usage along with a monthly fee, which is considered the minimum monthly requirements. This will add the

liability of providing product support as well, as a return to the extra fees the customer has to pay. The most advance type is the Level 3 Total Care product. Companies might want to offer such types after developing some experiences with previous levels of Total Care products. The charging fees might be higher in this level, as it does not include monthly or setup fees and adds the liability of support, training and education of the customer's staff.

- c. The customer's usage of the Total Care product changes by time. Suppliers should consider charging less fees if the customer's use of their product exceeds a certain limit. This is like giving a discount for high consumers, which in turn increases market share and profitability.
- d. Customers should suggest to suppliers that offer conventional products to start looking at the different types of Total Care products that can be provided, as this will benefit both the customer and supplier in high competitive markets. The customer should understand the products characteristics before committing to long term agreements with suppliers.
- e. Future researches for Total Care should consider areas that were not yet covered instead of deeply researching on topics from existing fields. Many journals were focusing at the Total Care effect on the manufacturing and Jet engine industries, whereas many other industries lacked the consideration of Total Care. Researches of adopting Total Care in new fields like medical, automotive and construction would add a lot of value, as these areas involve a strong relationship with many sectors.

Reference

12Manage, Rigor and Relevance in Management (2007) *Definition of perishability, description*,
http://www.12manage.com/description_perishability_goods_services_information.html, Date accessed 15/11/2007.

Alonson-Rosgado, T., Thompson, G., and Elfstrom, B.-O, the design of functional (total care) products. *Journal of Engineering Design*, 2004. 15(6): p. 515-540.

AskOxford, the online Oxford English Dictionary (2007), <http://www.oed.com>, Date accessed 15/11/2007.

Bo Carlsson, Dennis Taylor, William Hogland, Marcia Marques (2007), "Design of Functional Units for Products by a Total Cost Accounting Approach" University of Kalmar, SP Swedish National Testing and Research Institute.P13-14

Booms, B.H. and Bitner, M.J., Marketing strategies and organisation structures for service firms. In *Marketing of Services*, edited by J. Donnelly and W. George, pp. 47-51, 1981 (American Marketing Association: Chicago, IL)

Bowker G. C, & Star, S. K. (2000). *Sorting things out: Classification and its Consequences*. Cambridge, MA: MIT Press.

Britan, G. and Pedrosa, L., A structured product development perspective for service operations. *European Marketing Journal*, 1998, 16(2), 169-189.

Cheung Sai-on, Tsun-IP Lam, Mei-yung Leung & Yue-wang Wan (2000) An analytical hierarchy process based procurement selection method, 430.

Cowell, D.E., *Marketing of Services*, 1984 (Butterworth-Heinemann: Oxford)

Cowell, D.G., New Service Development. *J Marketing Management*, 1988, 3(3), 313-327

Crawford, Hobbs, and Turner, Rodney (2005) *Project Categorisation Systems: Aligning Capability with Strategy for Better Results*, pp. 6-34 (Project Management Institute, Inc.)

Doty, H.D., & Glick, W.H. (1994). Typologies as a unique form of theory building: Toward improved understanding and modeling. *Academy of Management Review*, 19(2), 230-251.

Dzeng Ren-Jye & Yu-Chun Lun, (2005) Searching for better negotiation agreement based on genetic algorithm. p.282

Edvardsson, B. and Olsson, J., Key concepts for new service development, *Service Ind. J.*, 1996, 16, 140-165.

Edwards P.J & P.A Bowen (1998) Risk and risk management in construction: a review and future directions for research, 343

Ericson, A (2006). *Functional Product Development: An Explorative View*. Licentiate Thesis, Department of Applied Physics and Mechanical Engineering, Luleå University of Technology. 2006:02. ISSN: 1402-1757.

Goldstein, S.M., Johnson, R. Duffy, J.A and Rao, J., The service concept: the missing link in service design research? *Journal of Operations Management*, 2002, 20(2), 121-134.

Graffin, A. and Houser, J.R., The voice of the customer. *Marketing. Marketing Sci.*, 1993, 12(1), 1-27.

Gronroos, C.A, Service orientated approach to marketing of services. *Eur.J. Marketing*, 1978, 12(8), 589.

Guy Kawasaki, Rule for Revolutionaries – the capitalist manifesto for creating and marketing new products and services, 1999 (HarperBusiness Publishers).

Hassan Tarek, Ron McCaffer & Tony Thorpe (1999) Emerging clients' needs for Large Scale Engineering projects, 24-25

Hax, A.C and Majluf, N.S., 1991, The Strategy Concept and Process: A Pragmatic Approach (Prentice Hall: Englewood Cliffs, NJ).

International Organisation for Standardization, Quality Management and Quality systems Element – Part 2 Guidelines for Services, ISO 9004-2, 1991.

ISO 14040, Environmental Performance Evaluation – Life Cycle Assessment – Principles and Framework, International Organisation for Standardization: Geneva, Switzerland. 1997.

Jacob, E. K. (1991). Classification and categorisation: Drawing the line. In Proceedings of the 2nd ASIS SIG/CR Classification Research Workshop: Advances in Classification Research (pp.67-83). Washington, DC.

Kamara J.M, C.J Anumba & N.F.O. Evbuomwan (2000) Establishing and processing client requirements—a key aspect of concurrent engineering in construction, 19

Kotler, P. and G. Armstrong, Principles of Marketing European edition ed. 1996: London: Prentice Hall.

Kumar, R. and Kumar, U. (2004), “A conceptual framework for the development of service delivery strategy for industrial systems and products”, Journal of Business & Industrial Marketing, Vol. 19 No. 5.

Kwasnik, B.H. (1992). The role of classification structures in reflecting and building theory. In Proceedings of the 3rd ASIS SIG/CR Classification Research Workshop: Advances in Classification Research (pp. 63-81). Pittsburgh

Langeard, E., Reffait, P. and Eiglier, P., Developing new services. In Creativity in Service Marketing, edited by M. Venkatesan, D.M. Schmalensee and C. Marshall, pp.120-123, 1986 (American Marketing Association: Chicago, IL).

Lindahl, M. And Olundh, G. The meaning of functional sales in life cycle engineering: Challenges and opportunities: 8th international seminar of life cycle engineering. Varna, Bulgaria: CIRP, 2001.

Lindahl M, Erik Sundin, Anna Öhrwall Rönnbäck, Gunilla Ölundh2 and Johan Östlin (2007). Integrated Product and Service Engineering – the IPSE project. Royal Institute of Technology , Stockholm, Sweden

Lovelock, C.H. and Wright, L., Principles of Service Management and Marketing, 1999 (Prentice-Hall:Englewood Cliffs, NJ).

Löfstrand, M. A Modelling and Simulation Approach for Linking Design Activities to Business Decisions, 2007, Luleå University of Technology Division of Computer Aided Design

Marcus Sandberg, Patrik Boart and Tobias Larsson (2005), “Functional Product Life-cycle Simulation Model for Cost Estimation in Conceptual Design of Jet Engine Components”. Concurrent Engineering P 3-4

Mattias Lindahl, Erik Sundin, Tomohiko Sakao and Yoshiki Shimomura, An interactive design methodology for service engineering of functional sales concepts – a potential design for environment methodology. Department of Mechanical Engineering, Linköping University, 2006. P.589-594.

McCarthy, E.J., Basic Marketing: A Managerial Approach, 1960 (Irwin:Homewood, IL)

Michaels, J.V. (1996), Technical Risk Management, Prentice-Hall, Upper Saddle River, NJ.

Nedo (1985) Thinking about Building--A Successful Business Customer's Guide to Using the Construction Industry, HMSO, London.

Nirvanix (2007), Demand for digital media applications & new requirements, <http://www.nirvanix.com/solution.aspx>, Date accessed 15/11/2007

Peter Love and Skitmore, Martin R. and Earl, George (1998) Selecting an appropriate procurement method for the construction process: an empirical study. 221-233.

Rolls Royce (2007a), developing the aftermarket, <http://www.rolls-royce.com/investors/reports/2003/review/aftermarket.html>, Date accessed 19/01/2008.

Rolls Royce (2007b), Emirates takes TotalCare on Rolls-Royce Trent 500s, http://www.rolls-royce.com/media/showPR.jsp?PR_ID=40588, Date accessed 19/01/2008.

Shostack, G.L., Designing services that deliver. Harvard Business Rev., January-February, 1984a, 133-139.

Shostack, G.L., How to design a service. Eur. J. Marketing, 1981, 16(1), 49-63

Stanton, W.J., Fundamentals of Marketing (6th Edn), 441 pp., 1981 (McGraw-Hill: New York).

Sundin, E., M. Lindahl, et al. (2005). New Engineering Design for Functional Sales Business. International Conference on Engineering Design, ICED 05, Melbourne, Australia.

Taylor, A.G. (1999). *The organisation of information*, Englewood, CO: Libraries Unlimited.

Teresa Alonson-Rosgado and Thompson, G, a rapid design process for Total Care Products creation. *Journal of Engineering Design*, 2006. 17(6): p. 509-531.

Tookey John E, Michael Murray, Cliff Hardcastle & David Langford (2001) *Construction procurement routes: re-defining the contours of construction procurement*, 24

Tore Markeset and Uday Kumar Lulea (2005), "Product support strategy: conventional versus functional products", *Journal of Quality in Maintenance Engineering* Vol. 11 No. 1, 2005 pp. 53-67

Turner J. Rodney (1995) *The Commercial Project Manager*. pp 245-249

Ulrich, K. and Eppinger, S.D., *Product Design and Development*, 1995 (McGraw Hill Co.: NewYork).

Wheelwright, S. and Clark, K.B., *Revolutionizing Product Development: Quantum Leaps in Speed, Efficiency and Quality*, 1992 (The Free Press: New York).

Wikipedia (2007), *web hosting service*, http://en.wikipedia.org/wiki/Web_hosting_service,

Date accessed 15/11/2007.

Appendix