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DECLARATION

I hereby declare that the project is based on my original work except for quotations and citation which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at USM or any other institutions.

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LEAN MANUFACTURING - TOYOTA PRODUCTION SYSTEM (TPS) -
A Case of Dell

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Chapter 1

Introduction

1.1 Introduction

Dell is one of the most highly rated PC companies and receives a lot of compliments for its products and customer service. On the internet, customers narrate a lot of pleasant experiences they had with Dell. One of customer who praises the Dell customer which they never had a problem with service Many users claim in their testimonials that all their PCs and printers are of Dell and are so satisfied that they have never needed to try any other manufacturer. A large number of customers claim to be regular Dell customers and are greatly pleased with the fast delivery system and convenient return policy. A user experiences with others whereby he wanted to have his laptop battery exchanged. The Dell customer service replaced the battery within 24 hours, without charging any shipping cost. Customer has a good experience with Dell customer service. Guidance was so effective through the installation process of a computer, by the Dell technical support. The most common compliment that Dell receives is about the free shipping cost. Another compliment is that Dell always keeps on informing the customers about the current stage of the orders are during the delivery process. If the orders are delayed, customers are informed beforehand. Quite often, the items are delivered earlier than they are expected. Many online reviews speak of the concern the Dell customer service shows if complaints are made by the customers. Hence,

a large number of customers advise others in their reviews to try shopping from Dell Dell implementing Toyota Production System Model and a few other model as their delivery system help the business to growth faster compare with other industry. The delivery of orders placed online is usually very fast and efficient. The concession coupons serve to please the customers very well because they enable the users to have substantial discount on their purchases.

To become competitive in the industry, Dell needs to do innovation. Effective service innovation will help Dell to become competitive by providing services that are more innovative and will help generate income for them. Every business must create new business opportunities. Therefore, service innovation is both market oriented behavior and business development strategy. The process of service innovation helps Dell to create knowledge and accumulate experiences through learning. Service delivery innovation demand derives from a lack of required competences and capabilities to serve customers. Incidents like delivering wrong products or late delivery are often occurring can also be resolved with excellent delivery system provided. With existing delivery system, there some improvement needs to be done in order to avoid incident that make the customer unhappy and unsatisfied. Better improvement will help Dell to provide an impeccable delivery service to their customer. With such improvement it will help Dell intern of mention points below:

- Reduce travel time and mileage per stop to improve productivity of the workforce.

- Automate support work.

- Enable technicians to become more profitable.

- Retain customers through improved service levels.

1.2 Background

The company was founded in 1984 by Michael Dell, now the company is one of the world's largest suppliers of personal computers and related products. It designs, develops, manufactures, markets, and services personal computers, servers, printers and other products. The company primarily operates in the Americas. It is headquartered in Round Rock, Texas and employs about 66,000 people. Dell's simple concept focus on selling personal computer systems directly to the customer in that way Dell could best understand their needs, and provide the most effective computing solutions to meet those needs. The company announced plans to begin selling through retail stores. This direct business model eliminates retailers that add unnecessary time and cost, or can diminish Dell's understanding of customer expectations. The direct model allows the company to build every system to order and offer customers powerful, richly-configured systems at competitive prices. Dell also introduces the latest relevant technology much more quickly than companies with slow-moving, indirect distribution channels, turning over inventory in just five days on average. On February 13, 2004, Dell reported fourth-quarter income of $749 million (24% annual increase), on revenue of $11.5 billion.

This represents an average 10 years growth rate of revenue and earnings of 28% and 33%, respectively. This success is not just due to top line growth, but also to dramatic improvements in the efficiency of Dell's operations. Dell generates over $1,000,000 in revenue per employees. It operates on only 4 days with of inventory. And it has an incredible cash conversion cycle of negative 37 days. This level of operation performance has attracted the attention of many business people and academic who have sought to understand the secret sauce of Dell operations. Dell assembles desktop computers, laptop computers, servers,

enterprise storage devices, and workstations. All of these product are assembled to custom specification after order have been place, therefore , Dell hold essentially no finished goods inventory.

The entire component that goes into this product is purchased from other companies. Even the Dell labeled chasses, keyboards, and mice are manufactured by other companies on contract. Therefore, Dell is quite different from traditional manufacturers in that it does not own or operate any injection molders, pick and place circuit board assemblers, or sheet metal stamping machines. In addition to its computing products, Dell sells branded computer peripherals and consumer electronics such as monitors, printers, PDAs, MP3 players, and LCD televisions, all of which are made by contract manufacturers. Dell has three geographic business units which are Americas, Europe Middle East Africa (EMEA), and Asia Pacific-Japan (APJ). Each of these business units has its own operations division. The operations group in the Americas is Dell Americas Operations (DAO). The EMEA operations division is the European Manufacturing Facility (EMF). And the APJ region is the Asia Pacific Customer Center and the China Customer Center (APCC/ CCC).As can be seen from these names, Dell's operations organizations are often synonymous with the name of its associated manufacturing facilities. Dell reported that 69% of its revenue came from the Americas, 21% from EMEA, and 10% from APJ. Dell Inc. listens to customers and delivers innovative technology and services they trust and value. Uniquely enabled by its direct business model, Dell sells more systems globally than any computer company, placing it No. 25 on the Fortune 500. Dell's climb to market leadership is the result of a persistent focus on delivering the best possible customer experience by directly selling standards-based computing products and services. Revenue for the last four quarters totaled $57.9 billion and the company employs approximately 78,700 team members around the globe. Dell was founded in 1984 by

Michael Dell, the longest-tenured executive to lead a company in the computer industry. The company is based on a simple concept: by selling computer systems directly to customers, Dell could best understand their needs and efficiently provide the most effective computing solutions to meet those needs. Dell is implementing Toyota System as their model in operating the processes for Dell Penang.

Beside from their role in terms of their contribution to the country, employment and economic growth, there is a wide recognition in the literature about the challenges and barriers facing by Dell for example, lack expertise during the hiring time, lack of managerial capabilities, access to management and technology. Dell operation groups have sought to create a model which is Toyota System that would concisely articulate the reason for Dell' operation success.

1.3 Problem Statement

The two main interpretations of the Toyota Production System are the traditional interpretation and the DNA interpretation. The traditional TPS was first developed and articulated by Taichi Ohio and then later refined distilled into graphic and set of ideas called House of Toyota. In this graphic, there is a base or foundation of Standardized Work with two pillars representing the principles of just in time production (JIT) and JIDOKA (error proofing). These pillars support a roof of highest quality, lowest cost, and shortest lead time.

Of course, this organizational, need was not expressed in the same way by all people. Some senior manager stated that there was a need for a model in the same way by all people. Some senior manager stated that there was a need for a model in order to communicate consistently with external stakeholders. Some other Dell employee (mostly those with

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manufacturing backgrounds) were enamored with Toyota Production System or Lean Manufacturing and sought to create something similar for Dell. However most employees in Dell's operation were not completely comfortable with adopting a version of lean or TPS as Dell model of what makes it successful. First, they felt that Toyota and Dell were very different companies in term of the nature of product (modular versus integrated), the relationships with suppliers, and the life cycle of the product and processes. In addition, many people in Dell had a gut-level feeling that Dell worked very differently from other companies.

Improvement need on the existing model in order the operations organization to maintain a low level of backlog order to ensure prompt order fulfillment, even when sales volume is changing rapidly. Secondly by adding order fulfillment processes for new products quickly and the lastly on achieving the lowest manufacturing cost in the industry while maintaining proximity to competing firms in the area of product quality, product performance and selection. Dell usually operates with less than three days of order backlog; improvement will help the production downtime. Avoiding any delay in production reduce the risk of cancelled orders, reduce expediting costs, and reduce the amount of time sales people must devote to fielding order –status enquiries.

Being "obsessed with results" means that everyone knows that they must drop what they are doing and get the situation corrected quickly. This obviously helps Dell keep the production lines running, and therefore keep backlog low. Being "obsessed with result" also naturally means less emphasis on long – range planning. In a company that is changing rapidly, this is probably healthy practice. In other companies with longer cycle times and more stable markets, a lot of time is spent on long range planning. However, this type of long range planning could be waste of resources at Dell that is where improvement needed

because most of the plans would probably change radically by the time they were implemented.

In term of flexibility in doing everything is critical to Dell's low –cost startegy.These expectations are consistent across the associate (non-exempt hourly), managerial and independent contributor staff roles, although the benefit is easiest to see at the associate level. Dell changes its associate staffing levels on weekly and sometimes daily basis. For example, if order backlog level drop to loo low for production to run efficiently, workers will often be sent home early oor reassigned to other part of factory. These frequent changes in schedule can be disruptive on both a practical and psychological basis.

Value of Personal Relationshipis one of the method that Dell uses for employees evaluation which gives significant rewards to only a small fraction of the employees. At first glance, this seems like a recipe for disaster. This type of environmentcould easily lead to unhealthy competition and destructive behavior between co-workers.

According to that, to continue remain in the industry, Dell needs to do innovation. Effective service innovation will help the Dell industry to remain competitive by providing services that are more innovative and will help generate income for Dell as well country. Dell must create new business opportunities and generate new streams of revenue. Furthermore, a powerful way to create new business opportunities and generate more revenue, Dell need to offer customers new products and services that allow more efficient and effective use of the products that they currently sell by adopting service innovation process on their business. These new products may complement existing products, and require new manufacturing and design skills. They must learn to offer services that can make their products yield greater total return over their useful life than can a competitor's products. These services include

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customization of products to specific customer uses, product disposal, and even taking over customer operations that pertain to the use of the product.

In order to sustain in a business, Dell should adopting service innovation process in their business strategy, according to that, this study explores elements of the innovation process in Dell. New products and methods of service provision developed in Dell industry serve as the impetus for innovation and growth in other sectors of the economy.

The need for service innovations to fuel further economic growth and to raise the quality and productivity levels of services has never been greater. Services are moving to centre stage in the global arena, especially knowledge-intensive business services aimed at business performance transformation (Spohrer and Maglio, 2008). Innovating in services is fundamentally different from innovating in physical products, yet many companies simply apply their new product development frameworks to their service innovation efforts.

The Dell industry's challenge of innovating in real time sets up the distinction between service and product innovation. Although it's possible to run limited tests of service innovations, the fact remains that services are simultaneously produced and consumed. Since the development and delivery of a service innovation coincide, the testing of service innovations tends to occur in the actual marketplace, no matter how limited the test, while product innovations can often be tested in a technical room or in tightly controlled focus groups. As a result, challenges and failures for service innovations are viewed as being extremely costly and considered more risky than product innovations, a single person can develop a new product, but it takes a time to implement a new service and service innovation tends to follow a democratic process where a leader needs to create a culture that motivates employees to innovate (Cornell Hospitality roundtable Proceedings, 2008).

1.4 Research Objectives

1. To identify what is customer delivery system practiced by Dell

2. To identify what are the strengths, weaknesses, opportunities and threats of customer delivery system in Dell

1.5 Research Questions

1. What is customer delivery system currently practiced by Dell with implementation on the TPS in Lean Manufacturing?

2. What are the strengths, weaknesses, opportunities and threats of customer delivery systems in Dell

3. Why Dell needs to reforms of current system, and what kinds of reformation?

1.5 Significance of the Study

The importance of this study is that it can help to provide new perspectives on service delivery improvement for Dell. The points raised in this research point to ways to develop knowledge about improvement initiative service delivery. Service innovations face a number of challenges, given the complexity and intangibility of services, and also given the simultaneous occurrence of production and consumption (Verma et al., 2008). Through application initiative system delivery by Toyota will be able to generate more creative ideas, will help develop and promote the Toyota industry, then the best service can be offered to the community, to help generate the economy through the entry of foreign investment due to the

service's quality and thus generate employment opportunities to the community. In this study therefore, is expected to help the Toyota identify the key elements of the improvement in delivery system and can use the results from this study further to strengthen the service innovation and provide the best service to customers.

For at least 5 years, DAO (Dell Americas Operations) has been struggling with the question of how it might adopt the tools, concept and beliefs that make up the Toyota Production System. In 1998, the Vice President of Operations realized some expertise in Lean / TPS principles. It was in that year that he hired three managers, in part, because of their expertise or training in this area. In 1998 and 1999 there was a lot of informal discussion about TPS and Lean principles, but these discussion died down after a major reorganization in 2000.

All of this interest in TPS culminated in the decision to design and install two TPS-inspired server lines at the Austin manufacturing campus. During the excitement of the contribution of these production lines, some employees suggested that DAO (Dell Americas Operations) should start training its people in the principle of TPS. This idea met resistance, however, by some who thought that it would be risky for DAO (Dell Americas Operations) to adopt different operating philosophy when Dell's operation was already very successful. Furthermore there was speculation that Dell might already have its own operating philosophy, even if that philosophy had not been clearly articulated.

Lean Started at EMF when a new Vice President of Operations came on board in 1999. EMF leaders also decided to benchmark other companies that practiced Lean Manufacturing, so in 2001, five EMF senior managers visited Unipark, Kodak and Nokia to learn more about Lean practices at these companies. In early 2002 EMF engaged the consulting arm of Unipart to help it further improve its Kaizen or its lean training. In August and September, 2002 two

APCC employees participated in Kaizen training and Kaizen event at Kodak, which was led by Shingijutsu, a leading Japanese-based lean consultant.

From all these experiences, Dell APCC decided that it would use Kaizen events as the way to implement lean training and practice. These Kaizen events were done within the framework of Dell's Business Process Improvement (BPI) program, so these two programs became closely linked.

Dell APCC did its first Kaizen in March of 2001, and since then there have been several more Kaizen events to reduce cycle time variance, reduce inventory in the staging area, increase staffing flexibility in kitting of notebooks and desktops, standardized work in the build process, and relieve bottlenecks in the backend of the desktop line among others.

The results of this research will help Toyota in Malaysia to improve the service offered to customers. In this study therefore, is expected to help the Toyota to identify the key elements of improvement initiative program of customer delivery system. Dell can use the results from this study further to strengthen the service innovation and provide the best service to customers.

Literature Review

2.1 Introduction

Aligning service concept and service delivery system design where by the service design literature emphasizes the importance of conceptual models of strategic service alignment (Goldstein et al., 2002; Heskett, 1987; Roth and Menor, 2003).

The model broadly discusses the importance of aligning business strategy, the service concept, and the design of the service delivery system. Roth and Menor (2003) synthesize an integrated model of service design. The triad emphasizes that the service concept is developed to address the requirements of a target market, and that service concept specifications, in turn, influence the design of the service delivery system. The triad reconciles two distinct perspectives of marketing and operations and highlights the need for an integrated approach to service design. In a seminal article, Heskett (1987) explicates the relationship between strategy and service design: it consists of identifying the target market, developing a service concept for the targeted segment, determining an operations strategy to support the service concept, and designing a service delivery system to support the operating strategy.

In industrial services, firms move from manufacturing physical goods to delivering services by adding services as a key component of their business strategy. One of the first to discuss the change in operations under industrial service settings was Levitt (1972) who described how manufacturing firms should integrate services into their offerings and focus on nurturing their customer relationships, recommending a production-line approach to services. Sundbo (1994) presents the idea of modularized service as a category between pure manufacturing and pure services (Table I).This enables service operations to utilize the

efficiency characteristics of manufacturing processes. This change has later been designated as "servitisation" (Vandermerwe and Rada, 1988).

Below are the graphic of the House of Toyota (Table 1) that implemented by Dell. The two main interpretations of the Toyota Production System are the traditional interpretation and the DNA interpretation. The traditional TDS was first developed and articulated by Taichi Ohno and then later refined distilled into graphic and set of ideas called House of Toyota. In this graphic, there is a base or foundation of Standardized Work with two pillars representing the principles of just in time production (JIT) and JIDOKA (error proofing). These pillars support a roof of highest quality, lowest cost, and shortest lead time.
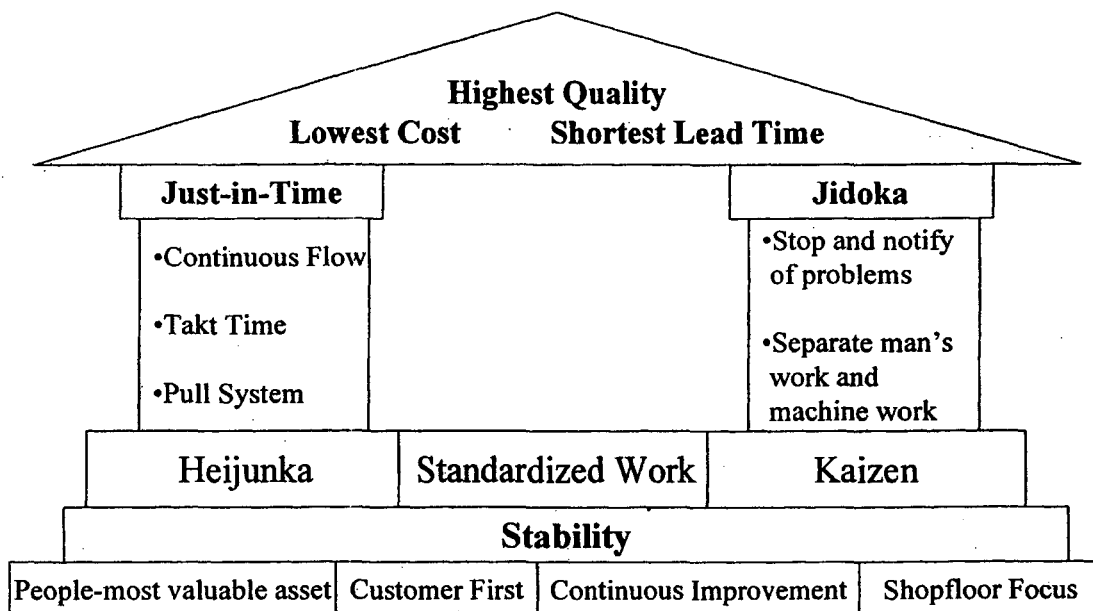

Table 1

2.2 DNA/ Toyata System at Toyota

The DNA version interpretation was born from a two year ethnographic studies of how employees at Toyota actually work that consist of four rules. It guides the work at Toyota employees shall be highly specified as to content, sequence, timing and outcome. Every customer-supplier connection must be direct, and there must be an unambiguous yes- or –no way to send request and receive responses, the pathway for every product and service must be simple and direct and finally any improvement must be made in accordance with the Scientific Method, under the guidance of a teacher, at the lowest possible level in the organization.

Many articles have been written about the possible reason behind Dell's operation success. At the end of this thesis, an analysis is presented that shows that some of these perspectives are particularly congruent with the model developed. Many articles have tried to paint a richer picture of what makes Dell's operation tick. Some of these focuses just on operations and some of them focus on operations and the company, in general, at the same time. Articles were selected for this review if they claimed to explain, whole or in part, Dell's operation success. The diversity of opinions represented in these articles demonstrates the need for more holistic view of Dell's operation practices. Lawton and Michael (2001) mention that contrast companies that pursue vertical integration (owning and operating multiple steps in the value chain) to those pursue —virtual integration (owning one step but coordinating the action of many steps). They claim that as a company moves from vertical to virtual, traditional, organization structures need to be revised. They note the historical trend away from Henry Ford's completely vertically integrated firm to Toyota's physically close network of suppliers to the modern supply chains where there is —a growing physical

separation of activities. Lawton and Michaels (2001) go on to describe the relationship between Dell and its suppliers as a —uniquely configured network of alliances partnership. Therefore, they argue that Dell has perfect the art of strategies outsourcing and that this is —the essence of Dell's success.

The competitiveness of service businesses is contingent, at least in part, on the design and configuration of the service delivery system through which the service concept, and the value proposition inherent within it, is provided to target customers (Frei and Harker, 1999; Johnston and Clark, 2005; Verma et al., 2002). The notion of "alignment" transcends much of the extant literature on service design. Congruency between target market, service concept, and service delivery system design is often emphasized as a means to successfully deploy business strategy and attain levels of performance in customer satisfaction, retention, and overall profitability. The service strategy triad (Roth and Menor, 2003), synthesized from extant theory, provides a commonly cited framework for the conceptualization of this alignment issue, and provides a useful starting point for the exploration of service delivery system design characteristics and contingencies.

2.2. Toyota System at Dell

This research addresses the question of what design characteristics enable the Dell's customer delivery system to provide the service concept to the customer. Two studies provide empirical support for the service strategy triad and stress that it is necessary to align service concept and service delivery system design to achieve superior performance (Karwan and Markland, 2006; Silvestro and Silvestro, 2003). While valuable for emphasizing the need for alignment, these studies do not provide the specific design characteristics that enable service organizations to realize the alignment.

Many authors have recognized the importance of the design of service delivery systems and have also identified limited theoretical development in the area (Tax and Stuart, 1997; Goldstein et al., 2002; Gummesson, 1990; Hill et al., 2002; Johnston, 1994; Kwortnik and Thompson, 2009). Consequently, a greater intensity of research is repeatedly requested (Chase, 1996; Chopra et al., 2004; Nie and Kellogg, 1999).While an increasing intensity of research effort has been identified throughout the 1997-2002 period (Machuca et al., 2007), further calls for research, particularly from an operations management perspective, have been requested (Roth andMenor, 2003). Specifically, Zomerdijk and deVries (2007, p. 128) emphasise that "the impact of contingency variables, such as the service being delivered," on service delivery systemdesign is a primary candidate for future research. This view is echoed by Safizadeh et al. (2003) who argue that future research should explore the influence of the service concept on process design characteristics.

Chapter 3

Methodology

This chapter discusses the methods use to gather data on the case in this study. A method of collecting primary data through interviews and the secondary data were gathered from journals and website. This case study will be reviewed using the SWOT and TOWS and also strategic case.

3.1 Case Study

This research uses a case study method that generally answers one or more questions which begin with "how" or "why."(Source:http://www.gslis.utexas.edu/~ssoy/usesusers/l391d1b.ht m). This research uses case study method and will apply the usage of primary data interview of key personnel and secondary data. Research on Dell to drill down the improvement initiative program in the delivery system, due to designed from the ground up with remote locations in mind; Dell is a cloud-optimized solution for any business with remote IT systems, including servers, storage, network devices, printers and desktops. Unlike complex platforms designed for large data centers, Dell RIM is reasonably priced, fast to deploy and easy to use. And in contrast with many point solutions from small vendors, RIM is backed by Dell, has broad monitoring functionality and high scalability.

3.2 Primary Data

This study use primary data from semi-structured interviews at Dell Penang key personnel. The key personnel for the interview were key persons at Dell Penang. The interviews will conduct on six key persons as follow as well the department attached.

a. Datuk Ramon (Finance & Corporate)

b. Chen, Maxwell (Supply Chain Director)

c. Aweti Jalal (Senior Manager - Field Service Planning/ Project Management).

d. Noor Izani Ismail (Senior Manager – Spare Sales Planning)

e. Sim Khee Aik (Manager – Logistic)

f. Foo Chee Yee (Senior Manager / Supervisor / Contributor - Quality Engineering)

3.3 Diagnostic Tools

This study will use two types analysis. First analysis is by SWOT and followed by TOWS.

3.3.1 SWOT Analysis

For a data that collecting through interviews, SWOT Analysis and TOWS Matrix will use to analyze the data. SWOT is an abbreviation for Strengths, Weaknesses, Opportunities and Threats. The SWOT analysis covers External and Internal Factors. For the External factors, it consists of the Opportunities and Threats, whereas the Internal Factors are Strengths and Weaknesses. SWOT Analysis is one of the effective analytical tools to evaluate a situation. The situation may be strategic related or capabilities related. SWOT Analysis is often used

along with Strategic planning and it forms one of the key critical success factors in a Strategic Planning Process (Foong, 2007). TOWS Matrix proposed as a conceptual framework for a systematic analysis that facilities matching the external threats and opportunities with the internal weaknesses and strengths of the organization. It has been common to suggest that companies identify their strengths and weaknesses as well as the opportunities and threats in the external environment. More details will be explained in Chapter 5 as for SWOT Analysis.

Opportunities

- Customers' value convenience and online shopping.

- Customers know what they need to purchase.

- Marketing on the Internet.

- Need for additional equipment from World Trade Center Attack.

- US PC households with Internet access will increase 25% by 2012.

- Some challengers weak in PCs in all the world's major markets.

- Servers market can be nominated better.

Threats

- Global economic slump.

- Hostile pricing wars.

- Constantly changing consumer demands.

- Strong brand name of competitors (IBM, Hewlett-Packard).

- Speedy technological advancement.

- A long-term stoppage in global sales of PC's and servers.

- Commercial customers and other large consumers decide to rely increasingly heavily on the systems and service proficiencies that IBM and Hewlett-Packard can provide and that Dell cannot.

Strengths

- Increasing market share.

- Direct sales tactic.

- Build to order approach.

- Long term partnerships with trustworthy suppliers of name-brand parts and components.

- Status/image.

- Managing product End of Life Program/Dell Exchange Just-in-Time inventory, know-how and capabilities.

- Agreements with resident service providers to handle customer requests for repairs.

- Ecological policy.

Weaknesses

- Shortages the product line and service breadth of Hewlett-Packard and IBM.

- The straight sales approach is not the preferred distribution channel in Europe.

- No in-house repair service capabilities.

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3.3.2 TOWS Analysis

TOWS are the logical order for a business that wants to win in the marketplace, for this simple reason: "Strength" and "Weakness" only have meaning in the context of what trying to accomplish in the marketplace. So for companies trying to win, looking first at threats and opportunities, then evaluating strengths and weaknesses in that context, provides a way to decide what to focus on that's more intelligent than throwing a bunch of stuff onto a flipchart and choosing the favorites (which in all likelihood will be the ones most easily dealt with).

	Strengths	Weaknesses
	1. Increasing market share. 2. Straight sales approach. 3. Build to Order approach. 4. Long term partnerships with trustworthy suppliers of name-brand parts and components. 5. Status/image. 6. JIT, know-how and capabilities. 7. Agreements with local service providers to handle	1. Shortages the product line and service breadth of Hewlett Packard and IBM. 2. The direct sales approach is not the preferred distribution channel in Europe. 3. No in-house repair service capabilities.

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	customer requests for repairs. 8. Ecological policy	
Opportunities	S-O Strategies	**W-O Strategies**
1. Customers value convenience and online shopping. 2. Customers know what they need to purchase. 3. Marketing on the Internet 4. Need for additional equipment from World Trade Center Attack. 5. US PC households with Internet access will increase 25% by 2012 6. Some challengers weak in PCs in all the world's major markets. 7. Servers market can be nominated.	1. Conduct aggressive domestic advertising campaign. (S1, S2, S3, S5, O1, O2, O3, O5, O6, O7)	1. Joint Venture with EMC (Gold company) to offer storage services. (W1, O1, O4, O6, O7) 2. Open two Dell outlet stores in Europe (W2, W3, O6)

Threats	S-T Strategies	W-T Strategies
1. Global economic slump. 2. Hostile pricing wars 3. Constantly changing consumer demands. 4. Strong brand name of opponents (IBM, HP). 5. Speedy technological advancement. 6. A long-term stoppage in global sales of PC's and servers. 7. Commercial customers relying increasingly heavily on the systems and service capabilities that IBM and HP provide.	1. Create low price standardized PC. (T2, S1, S2, S4, S5, S7) 2. Decrease workforce by 1700 employees to cut costs (T1, T2, S2, S3, S4, S7, T6)	1. Deportment destructive European ad campaign to promote Dell Direct Selling (W2, T3, T2)

CHAPTER 4

CASE WRITE UP

4.1   Manufacturing Industry Background

The premise of TPS was developed by Toyota Motor Corporation in the early 1980's.

Initially, it was used to describe how parts and materials should be utilized within the plant to

maximize efficiency. In more recent times the term has been appropriated by the

manufacturing industry in general, and has come to describe relationships not only within a

plant, but between suppliers and manufacturers as well. (Strategos, Inc.)

4.2   Origin of TPS

TPS in Lean Manufacturing as it's more commonly known today was perfected by Toyota,

but has its roots based in the American concept of mass production.

The first well-known instance of mass-production was when Eli Whitney received a contract

from the U.S. Army to manufacture muskets. (Strategos, Inc.) Whitney was to build 10000

muskets in two years' time. At the time, he had no factory, no workers and after taking a

financial beating on the invention of the cotton gin, he had very little money. But out of this

arose the beginnings of the American Industrial Revolution. He created machinery that

would make the work of creating the muskets more suitable for unskilled labor as opposed to

needing specially trained gunsmiths. (The Eli Whitney Museum & Workshop) The parts

would be interchangeable, making it easier to repair the weapons in the field. It took ten

years for Whitney to fill the order for the Army, but by doing so proved that the concept of

mass-production would change the face of manufacturing forever.