Quick Response Tool and

Die Manufacturing

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ABSTRACT

This research studied the processes and capabilities of XYZ Company (XYZ) in Wisconsin in an effort to reduce lead times for the products the company designs and manufactures. The study provided company ownership key information related to the current lead times and process changes that can be made to improve the entire organization's response to the customer's orders. Lead times are significant because XYZ competes in the global marketplace with their products and the ownership has been evaluating organizational process changes to support a Quick Response Manufacturing (QRM) environment.

The researcher used data from the XYZ Company's Enterprise Resource Planning and XYZ's proprietary job tracker system to make evaluations and decisions.

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Chapter I: Introduction

This study is an evaluation of lead time reduction in an engineer-to-order tool and die manufacturing company in west central Wisconsin. The study will be conducted by evaluating data from the company in addition to common practices in lead time reduction. The best and most applicable portions of those practices will be applied to this study. This study was conducted at XYZ Manufacturing Company to assess the historical data on delivery lead times and determine the organizational process changes required to significantly reduce the delivery lead times.

XYZ Company was established in 1971 and has existed in Wisconsin since inception. The ownership of XYZ has changed four times in the past 12 years and the current ownership recognizes a need to make changes in the business to enable XYZ to respond more quickly to the needs of the customers. The ownership is local and the four owners are all in management positions within the company. The owners consist of the President, the Executive Vice President of Engineering, the Executive Vice President of Sales and Marketing, and the Executive Vice President of Finance. Each of the owners has been an employee of XYZ for a minimum of five years.

XYZ currently is the world's largest die manufacturer that serves the world with tools to extrude numerous types of plastic sheet and films. XYZ is an engineer-to-order company that uniquely designs and manufactures each customer's order. XYZ sells its products through a staff of direct sales people internally at XYZ and throughout North America. Globally, XYZ sells through a network of exclusive agents in 23 countries. XYZ is headquartered in Wisconsin where 183 people are employed. Two smaller plants are located in the UK and in Germany,

which have a staffing level of less than 12 people each. Plans are for XYZ to expand again in early 2006 into China. The World Headquarters in Wisconsin is the focus of this study. XYZ's mission statement is as follows:

> XYZ Company is well established as the world's leading manufacturer of extrusion die systems. Our dedication to excellence and our vast experience ensures unsurpassed product quality and performance. XYZ provides innovative solutions by applying sound engineering principles, state-of-the art design techniques, and world class manufacturing methods.

The company's mission is supported by a belief that the organization must provide the producers of cast film, sheet, coatings and laminates with value, quality and dependable service. Both statements are very global in nature and do not get down to the process of how jobs actually move through XYZ's system. The data taken from the study is being utilized by the ownership of XYZ to approach the changes required to reduce XYZ's lead time with their products they sell, design and manufacture.

XYZ enjoyed many years of having very little competition in the market and lead times were not an issue in product delivery. In the past three years XYZ has watched two new companies come in to the market and immediately drive down the delivery times. The business level in the die market has increased significantly since 2003 and XYZ has enjoyed a significant increase in business volume as a result. With the additional competition, the delivery lead time has become a selling point. XYZ has watched the delivery lead times grow longer in 2004 and 2005 and that is an area of concern for the ownership. QRM principles indicate that reduced lead times result in increased market share (Suri, 1998).

Statement of the Problem

XYZ needs to lower its lead times to sustain its share of the extrusion die market.

Goals of the Study

1. Analyze the product lead times from fiscal years 2004 and year to date in 2005 to determine opportunities for lead time reduction.
2. Provide recommendations to the XYZ ownership relative to approaching and implementing changes in the organization to reduce lead times of products sold by YXZ.

Purpose/Importance of the Study

The purpose of this study was to identify where in the XYZ process the lead times could be decreased and change or implement the processes needed to reduce the lead times. XYZ is a company that has watched their delivery lead times approach the longest in the history of the company. Historically at XYZ, longer lead times resulted in a significant drop in sales levels. There is a need to understand what the total delivery lead times are for products sold and then take the necessary steps to reduce them. The new ownership recognizes the need to understand how to approach process changes throughout the organization to implement QRM techniques. The purpose of this study is to identify where in the XYZ process the lead times could be decreased and change or implement the processes needed to reduce the lead times.

Assumptions of the Study

The last time XYZ studied and implemented a new program, cellular manufacturing, was in 1995 and the focus was on lead time reduction in manufacturing only. The researcher is assuming that the results of this research will demonstrate that there are significant lead time reductions to be found not only in manufacturing, but in the office operations as well. The

researcher also assumes that the information that is discovered in this study will be useable to other companies in similar situations.

Definition of Terms

Capacity. "The maximum or optimum amount that can be produced" (Merriam, 2005, para. 2).

Cellular manufacturing. A cell is a group of workstations, machines or equipment arranged such that a product can be processed progressively from one workstation to another without having to wait for a batch to be completed or requiring additional handling between operations (Suri, 1998).

Contact time. The amount of time an order is worked on or touched in manufacturing.

Cross training. "To train to perform different or multiple tasks" (Suri, 1998, p. 320)

Engineer-to-order. A manufacturing method in which each order is designed for the customer.

Enterprise resource planning (ERP). ERP systems typically handle the manufacturing, logistics, distribution, inventory, shipping, invoicing, and accounting for a company. ERP software can aid in the control of many business activities, like sales, delivery, billing, production, inventory management, and human resources management (Krajewski & Ritzman, 2004).

Just-in-time (JIT). The elimination of waste by cutting excess capacity or inventory and removing non-value added activities in operations (Krajewski & Ritzman, 2004).

Lead time. The time between the beginning of a process or project and the appearance of its results (Krajewski & Ritzman, 2004).

Lean. Operations systems that maximize the value added of each of their activities. Activities that do not add value are eliminated (Krajewski & Ritzman, 2004).

Materials: Raw materials or components used in the manufacturing of products or finished goods (Krajewski & Ritzman, 2004).

Mission statement. The organization's statement of purpose (Meyers & Stephens, 2003).

Non-value added. A term used to describe a process or operation that does not add value to a product or service (Meyers & Stephens, 2003).

Process mapping. Process mapping is a workflow diagram to bring forth a clearer understanding of a process or series of parallel processes (Tapping, 2003).

Quick response manufacturing (QRM): A company wide strategy that pursues the reduction of lead-time in all aspects of a companies operation. (Suri, 1998)

Queue Time. "A sequence of jobs held in auxiliary storage awaiting processing" (Tapping, 2003, p 148).

Supplier. "A company that furnishes or equips another company with materials, services or assemblies" (Krajewski & Ritzman, 2004, p.10).

Time-Based-Competition (TBC). "The use of speed to gain competitive advantage" (Suri, 1998, p. 3).

Toyota production system (TPS). Commonly referred to as operational systems that maximize the value added of of their activities. (Krajewski & Ritzman, 2004, p.483).

Value-added time. "Time spent to add value to a product or service" (Merriam, 2005, para. 1)

Value stream mapping (VSM). "A pictorial representation of a process that allows systematic assessment of each component or step in the process" (Meyers & Stephens, 2003, p.19).

Limitations of the Study

This study is limited to the operations at XYZ Companies in the Wisconsin headquarters. The study will assess the lead time data for 2004 and year to date 2005 only and make recommendations according to the data collected.

Methodology

The research methodology used for this study was a review of literature and collection of data related to delivery lead times at XYZ. The purpose of the study is to interpret the data collected and use the information to approach changes in the processes at XYZ to reduce the delivery lead times. The remainder of this paper is an in depth review of QRM techniques, a review the data collection methods, an analysis of the data collected, and a discussion of the findings.

Chapter II: Literature Review

Introduction

The literature review will define exactly what QRM means by comparing the strategies of QRM against lean, lean manufacturing systems, value stream mapping, TBC and JIT.

Quick Response Manufacturing (QRM)

QRM is a company wide strategy to pursues the reduction of lead-time in all aspects of a company's operations (Suri, 1998). Unlike many JIT programs which focus primarily on the manufacturing side of the operation, QRM starts at the time of order entry and is the relentless chase to reduce lead times at every step in the ordering, engineering, procurement and manufacturing operations. Because QRM is a process of lead-time reduction at each step in the process it is the belief of the researcher that only good can come out of evaluating the QRM techniques and implementing those that apply to XYZ's business.

QRM finds its roots in a strategy used by Japanese enterprises in the 1980s that became known in America as time-based-competition or TBC (Suri, 1998). In American manufacturing companies, the need to reduce lead times has never been greater and this strategy is applicable up and down the supply chain for every organization. Many have compared QRM to JIT and lean and there are similarities in all three programs. JIT and lean focus on the relentless pursuit of eliminating waste to improve quality and reduce cost, QRM focuses on the relentless pursuit of reducing lead times throughout the operation to improve quality, reduce cost and eliminate non-value-added waste (Suri, 1998). Very simply, QRM builds on the JIT and lean principles of waste reduction and incorporates lead time reduction as the driving strategy.

Lean Manufacturing Systems

Simply put, lean systems are operation systems that maximize the value added to each of their activities. Lean systems encompass a total systems view that incorporate operations strategy, process design, quality management, capacity planning, layout design, supply chain design and technology and inventory management to create efficient processes (Krajewski & Ritzman, 2004). Many people refer to lean systems as a concept in which the focus of every employee is to eliminate waste. The Japanese refer to waste as "muda" or an expense that does not produce value (Meyers & Stephens, 2003). Examples of "muda" include overproduction, waiting, transportation, processing, inventory, motion, rework and poor people utilization. The people side is very seldom discussed, but employee involvement is essential to the success of any lean system implementation.

Every lean system has several common characteristics which include the pull method of workflow, consistent quality, small lot sizes, uniform workstation loads, standardized components and work methods, close supplier ties, flexible workforce, line flows, automation and preventative maintenance (Krajewski & Ritzman, 2004).

The pull method or Kanban method of work flow can be best described as a system in which customer demand activates the production or movement of goods. Kanban is one of the most publicized aspects of lean systems. Kanban is a material replenishment method that manages JIT production via production control cards or containers (Suri, 1998). Kanban is a system of material movement between workstations in which a signal notifies the preceding workstation of a need for materials. When this workstation depletes in incoming inventory below a preset level, it sends a signal to its upstream workstation and so on. Thus no workstation will ever put more than a preset number of parts or containers in its output buffer and production is

always triggered by demand from the next workstation. The level of inventory between each pair of workstations is limited by the number of Kanban cards or containers.

The opposite of the pull method is the push method, which can be easily defined as a system of manufacturing or moving goods ahead of customer demand. The difference in the two methods is the amount of inventory each creates which in turn means cost; the more the inventory, the higher the cost.

Pull systems have two key advantages over push systems: First is ease of control, meaning the system is simplistic and the rules, combined with the visibility of Kanban cards and containers, result in a system that is easy to manage and control. The second advantage over a push system is the pull system's support for quality and reliability improvement. The low Work in Progress (WIP) levels and tight controls in a pull system require high product quality and machine reliability to prevent disruptions (Suri, 1998). The pull system also motivates continuous quality and reliability improvements by highlighting the source of disruptions when they do occur.

Consistent quality in a lean system seeks to eliminate process errors and rework in order to achieve a uniform flow of work. Many times companies incorporate what is called "quality at the source" which means the operators act as their own inspectors (Krajewski & Ritzman, 2004). The whole idea of consistent quality is very easy to understand in a lean system: the less bad product that is in the system, the less inventory, resulting in less cost. Consistent quality is another example of having less "muda" in the system.

Small lot sizes in a lean system have the advantage of reducing the average level of inventory relative to large lot sizes (Krajewski & Ritzman, 2004). The downside to small lot sizes is the increase in the number of setups or changeovers. The focus of many lean managers

then turns to setup time reduction to insure the small lot sizes remain a part of the organization's strategic objectives.

A lean system works the best if the daily load on an individual workstation is relatively uniform. Manufacturing usually achieves this through detailed capacity planning which recognizes capacity constraints and also strives for line balancing (Krajewski & Ritzman, 2004).

In manufacturing the standardization of components, called part commonality or modularity, increases repeatability (Krajewski & Ritzman, 2004). Productivity will increase as the employees will become more familiar with the standard components through repetition, resulting in higher efficiency of each employee. All of this fits in to the lean concept through having higher efficiency and lower inventory.

Because lean systems operate with very low levels of inventory, partnering with suppliers is critical to the success of the lean organization (Krajewski & Ritzman, 2004). During the implementation of a lean system, typical organizations pare down the number of suppliers and partner with a few key suppliers (Suri, 1998). Most companies using lean normally partner with local suppliers. This does several things for both organizations. The information concerning requirements is shared between the companies, the suppliers are generally involved in the early stages of product development to avoid production issues, and the supply chain is shortened which saves both companies money in having less inventory in the pipeline (Krajewski & Ritzman, 2004).

Flexible workforce is a lean term for having a workforce where the employees are cross-trained in multiple skills. This gives the organization flexibility in moving the employees where they are required when they are needed in many functional areas of the business. Examples of this concept include moving employees to relieve a bottleneck as it arises and vacation coverage.

An unknown benefit of a flexible workforce is the employees may be refreshed by moving around the organization (Krajewski & Ritzman, 2004).

Line flow is a concept of lean that is simple in wording but very difficult to achieve. Line flow is defined as a lean system that organizes the employees and equipment to provide uniform work flow through the process which results in the elimination of wasted employee time (Krajewski & Ritzman, 2004). It sounds great on paper, but in the real world this is probably the most sought after situation in manufacturing companies and most times the least achievable concept of lean.

Automation is just as it sounds in a lean system. In manufacturing automation often means robots, but that is not always the case. Automation can come in the form of floor control software and back office systems that one may not directly relate to automation. What automation does bring to lean systems is the ability to increase profits through increasing market share through delivering speed at a lower cost of labor and less inventory costs (Krajewski & Ritzman, 2004).

Preventative maintenance is key to a lean system. Any machine downtime is disruptive to the system and will reduce the system's capacity, thus decreasing efficiencies and increasing costs. Preventative maintenance can reduce the frequency and duration of machine downtime and reduce the cost of capital investment through some very simple training on preventative maintenance (Suri, 1998).

Lean systems come in the form of many different programs or acronyms. JIT and TBC both can be part of a lean system and many times all of the programs are blended to achieve the desired results for the organization implementing a lean system. The operational benefits of a lean system include the following (Krajewski & Ritzman, 2004):

-reduced space requirements

- reduced inventory requirements in purchased parts, raw materials, work-in-process and finished goods
- reduced lead times
- increased productivity of all employees
- increased equipment utilization
- reduced paperwork and the use of one simple planning system
- set valid priorities for scheduling
- encourage participation by the workforce
- increased product quality

Lean systems thrive on simplicity and the need for employee involvement for success. Many organizations have adopted the lean philosophy and have seen significant business results.

Value Stream Mapping

Many authors define value stream mapping differently. One author characterizes value stream mapping as a set of processes, including value-added and non-value-added activities, required to transform raw materials into finished goods that can be used to generate a return on investment (Womack & Jones, 1996). Another author defines a value stream mapping as a process for planning and linking lean initiatives through systematic data capture and analysis (Tapping & Shuker, 2003). In business today the global marketplace is very competitive and customers often set the prices and delivery. Under this scenario the only way to remain profitable is to eliminate waste in the value stream, increase efficiencies and reduce costs. Value stream mapping is a process that helps organizations systematically identify and eliminate the non-

value-added elements from the value stream and generate a design and a plan to change processes.

Value steam mapping is a visual representation of all the specific activities, including the flow of material and information, which occurs along the value stream for a product or process (Tapping, 2002). The value stream mapping process will very quickly identify non-value added activities in the value stream. These non-value-added activities consume financial and human resources which in turn increase the lead time of the activity. Some of these non-value added activities are necessary in the process; the goal is to minimize the financial and lead time impact. There are four steps to value stream mapping (Corner, 2001)

1. Product development: The company must identify customer requirements, quantity required, method of transportation and any other detail pertinent to the order.
2. Process design: All of the possible information for each process of the value stream selected including the cycle time, changeover times, number of operators, inventory in process, available time and any other detail relative to the process must be collected.
3. Preparation: Record as much information as possible and draw the current state map.
4. Planning: Develop a future state map.

Figure 1 shows examples of some of the symbols used in value stream mapping with short descriptions.

Figure 1: Value Stream Mapping Symbols

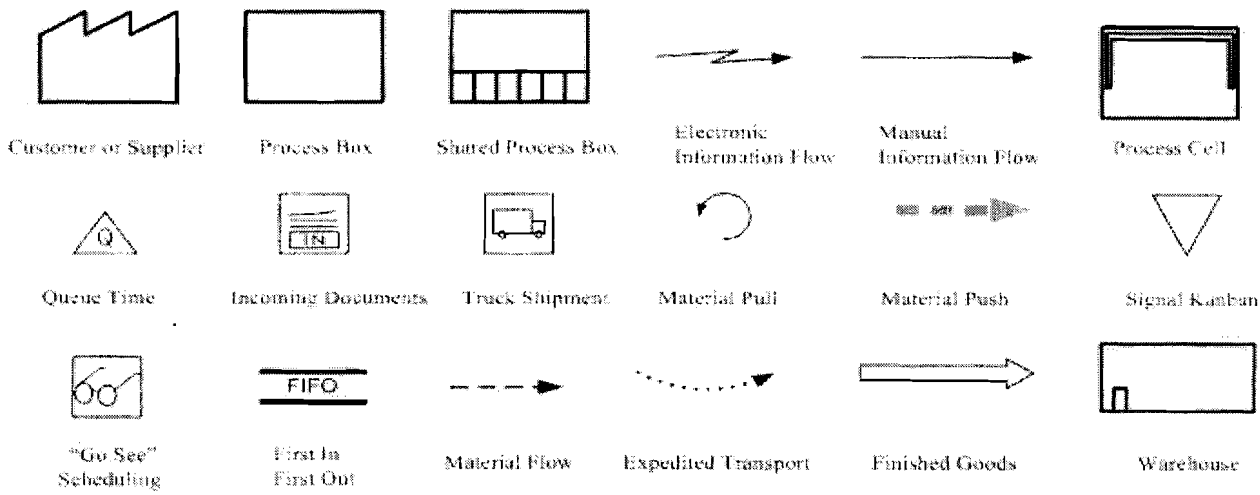


Figure 1. Examples of Value Stream Mapping Symbols

Figure 2 is an example of a value stream map of an office operation.

Figure 2: Example of a Value Stream Map

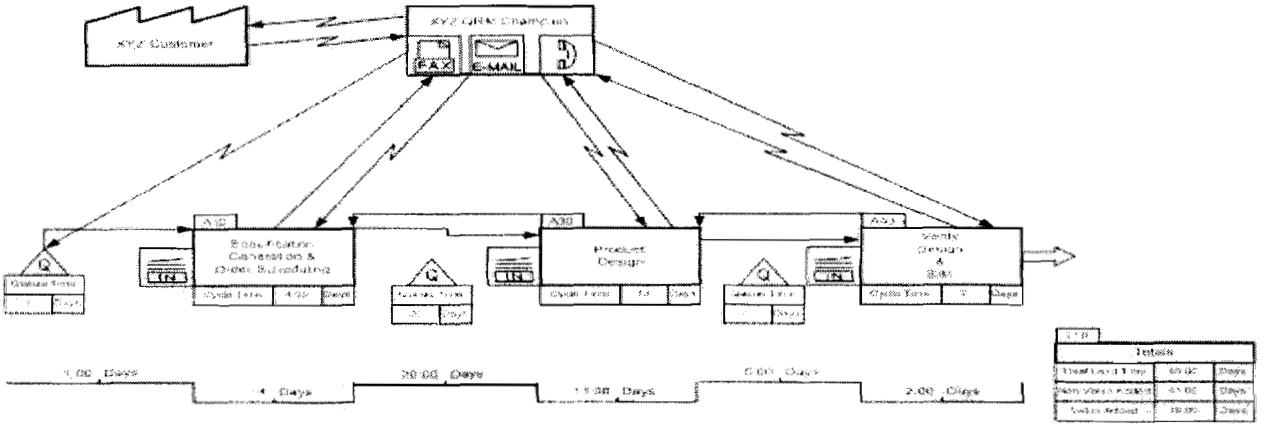


Figure 2. Value Stream Map Example

Time Based Competition (TBC)

TBC is a competitive priority of many companies which is based on the use of delivery speed and development speed for their processes to gain a competitive advantage on their competition (Krajewski & Ritzman, 2004). To implement the strategy, managers of the companies must carefully define the steps and the time needed to deliver a product then critically analyze each step to determine whether time can be saved without hurting the quality. TBC is a strategy that can be applied across any type of business, but for the purpose

of this research TBC will be related to office processes. QRM is an expansion of the TBC strategies that use speed as a competitive advantage in their business. What sets QRM apart from TBC is that fact that QRM is an approach for the entire organization from the front office to the shop floor, from purchasing to sales (Suri, 1998).

Just in Time (JIT)

Commonly referred to as the Toyota Production System, the principle of JIT is to eliminate sources of manufacturing waste by getting the right quantity of raw materials and producing the right quantity of products in the right place at the right time (Pascal, 2002). JIT was developed in the 1970's in Japan and adopted by Toyota manufacturing to meet the demands of customers. The driving reason for developing JIT and some other better production techniques was that after World War II, Japanese people had a very strong incentive to develop good manufacturing techniques to help them in rebuilding their economy. They also had a strong work ethic which was concentrated on work rather than leisure, they sought continuous improvement, they had a life commitment to work, and they were group conscious rather than individualistic, focusing on achieving the common goal. The Japanese were looking for a way to gain the most efficient use of the limited amount of resources available to them, so they worked on optimizing a cost/quality relationship.

Before the introduction of JIT, there were a lot of manufacturing defects for the existing systems, which included inventory problems, product defects, rising costs, large lot production and delivery delays. The inventory problems involved the unused accumulated inventory that was not only unproductive, but also required a lot of effort to store and manage. Other implied problems included parts storage, equipment breakdowns, and uneven production levels (Krajewski & Ritzman, 2004). For the product defects, manufacturers knew that only one single

product defect can destroy the producer's creditability. They must create a "defect-free" process. Instead of large lot production - producing one type of product, they concluded that they should produce more diversified goods. There was also a problem of rising cost; the existing system could not reduce cost any further but improvement always leads to cost reduction (Pascal, 2002).

Lastly, the existing systems did not manage well for fast delivery request, so, there was a need to have a faster and reliable delivery system in order to handle customers' needs. Thus, JIT manufacturing management was developed based on these problems. Because of the success of JIT management, Taiichi Ohno was named the father of JIT (Pascal, 2002). After the introduction of JIT in Japan, many companies followed suit and implemented various forms of JIT and tailored the concepts to meet the individual needs of their companies.

Conclusion

Based on the literature reviewed in this study, it is clear that the QRM strategy in which the entire organization is involved in the program is what is needed for XYZ Company. QRM is an extension of lean and TBC and has some JIT principles, but what XYZ needs is really a detailed focus on the process from the time the order is received until the order ships.

Chapter III: Research Methodology

Introduction

The research methodology used for this field problem involved a literature review and a detailed analysis of the lead-time data for XYZ orders from 2004 and year to date 2005. The data collected for this study was summarized and averaged by the month in which the orders shipped to the customer. The data was then put into scatter diagrams by the month in which the order shipped and a trend line was added to validate the trends in the raw data collected. The trend lines were a clear visual aid in understanding where the lead-times have changed over the study period. It was determined through the data collected that the office process at company XYZ was the area that had increased the lead-times during the study period. A value stream map was created of the current office process and a value stream map of the new office process then followed that. Recommendations and implementation of new processes were documented in Chapter IV.

Description of the Literature Review and Data Collection

The study began with a literature review of manufacturing systems and the characteristics of each. The review focused on traditional quality and process improvement programs such as lean manufacturing, time based competition, just in time manufacturing and quick response manufacturing techniques. Because this study was titled Quick Response Tool and Die Manufacturing, the literature review related lean, time based competition and just in time manufacturing to quick response manufacturing techniques.

Following the literature review, the study continued with an analysis of all the die orders shipped from XYZ for fiscal years 2004 and year to date 2005. The data was extracted from the XYZ ERP system and a propriety system at XYZ called "job tracker." Job tracker is a system

XYZ uses to track orders prior to their release to manufacturing. The data extracted included the order date, the release to manufacturing date and the shipment date. Lead times were determined by taking the number of weeks between each of the dates. The analysis was broken into two parts: the office lead time of orders and the manufacturing lead time of the orders. The research also included an analysis of the actual "touch" or contact time in manufacturing in which the total hours the job was in manufacturing was divided by the hours the job was actually worked on by employees.

Based on the data collected, the researcher had to determine why the lead-time had increased in the office operations over the time of the study. Had the orders become more complex or had the process become less efficient were two questions that had to be answered. Using the data combined with the value stream map, the researcher was able to determine the office lead times had increased while the manufacturing lead times had actually decreased during the study period. Because the office lead times had increased, the researcher determined the office was the area that required the detailed analysis for this study.

Lastly the information obtained through this research was presented to the ownership of XYZ. Recommendations were made and changes in the organization were undertaken in the office to make use of the research.

Limitations of the Study

The study was limited to the information extracted from the XYZ ERP and job tracker systems for fiscal years 2004 and year to date 2005. The study analyzes the raw data lead time, but did not take into consideration the time when a customer held up the order. The raw data at times could be skewed due to unforeseeable circumstances and situations that were not able to be taken into account by the dates taken to determine lead times. Many times there are

circumstances during the order process that cannot be quantitatively analyzed from the data available to the researcher.

Chapter IV: Results

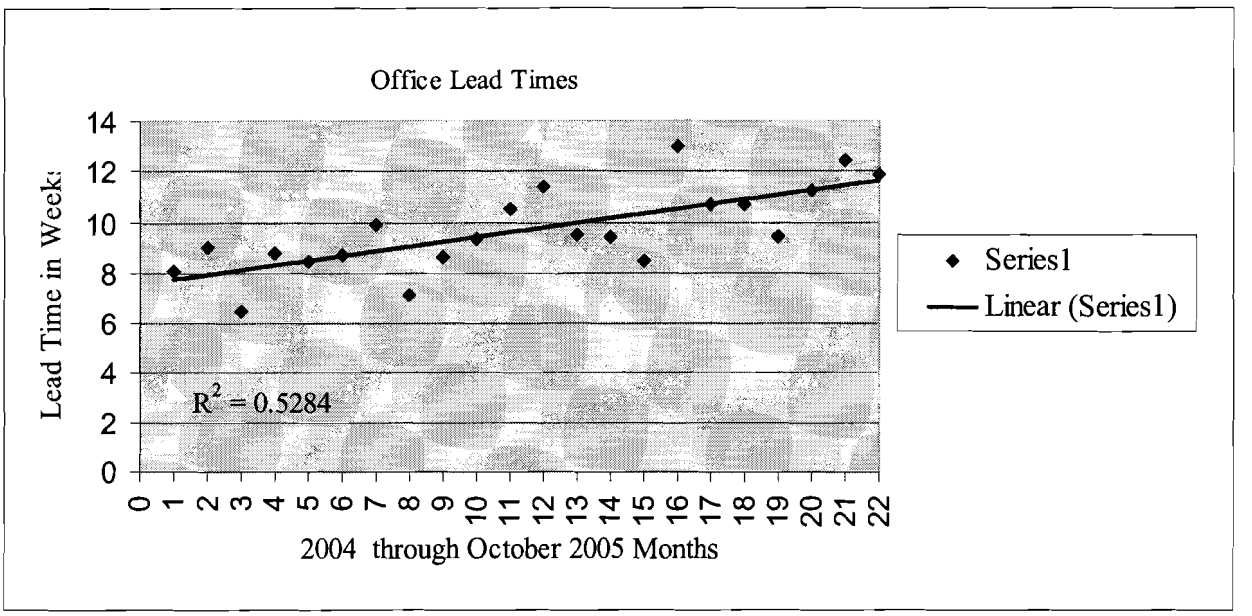
Introduction

This study began with a theme of Quick Response Die Manufacturing as it would apply to a small tool and die company in Wisconsin. The researcher believes that QRM is the answer to reducing the lead times at XYZ and implementation of the QRM concepts is the only method to reducing the lead times in the environment within XYZ.

The Study

The purpose of this study was to identify where in the XYZ process the lead times could be decreased and change or implement the processes needed to reduce the lead times. In order to achieve this goal, the data was retrieved from the XYZ ERP system and a value stream map was created and used to visually identify sources of lead time waste. The data show the dates the order moved between processes at XYZ and the amount of time the order resided at each process. Appendices A through D are snapshots of the excel spreadsheet for the actual orders shipped between January 2004 and October 2005. Appendix A is the raw lead time data. Appendix B is the data showing the average manufacturing hours per order in 2004 and 2005. Appendix C is the data showing the average amount of contact time manufacturing had with the product while it was on the manufacturing floor. Appendix D is the data showing the average lead times in the office, manufacturing and the total lead times for all orders in 2004 and 2005. The order date, the date the order moved between processes and the date the order shipped are shown in the appendices. The data were collected and consolidated by the month in which the order was shipped to the customer. If an order shipped to the customer in January of 2004, that is, the month in which the lead time was measured. Figure 3 shows a graphical representation of the office processes lead times from January 2004 through October of 2005.

Figure 3: Office Lead Times

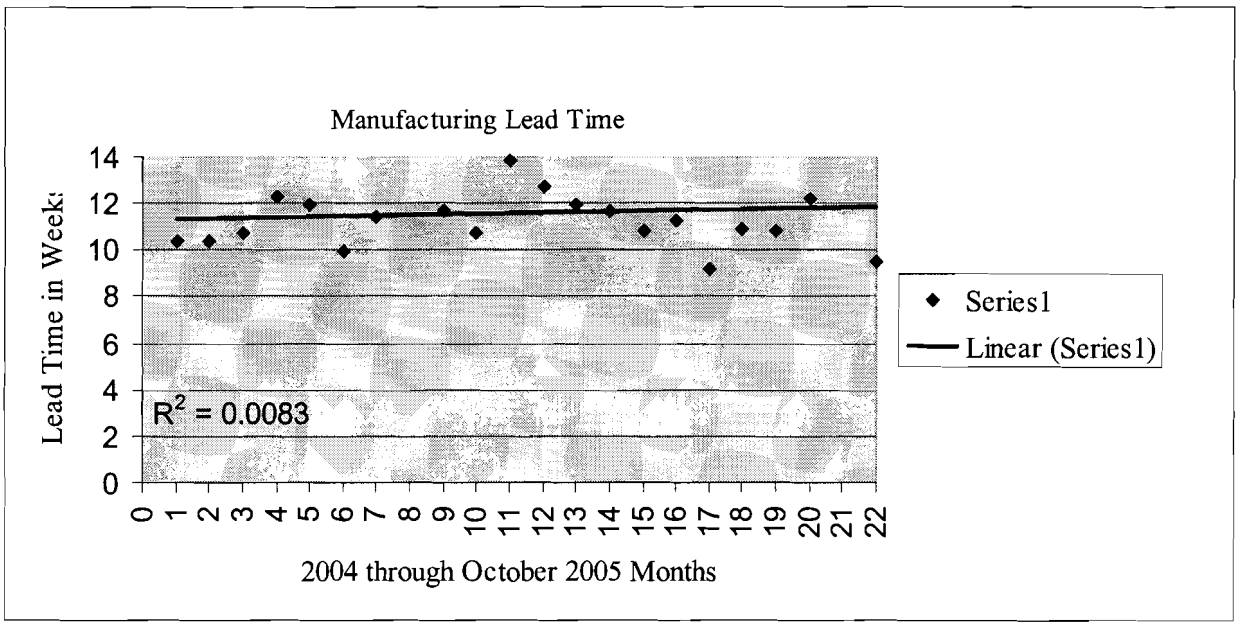


The data shows the lead times in the office on average have increased significantly in the past 20 months. In January of 2004 the office lead time averaged 8.9 weeks, in October of 2005 the office portion of the lead time has increased to 10.7 weeks, on average. The trend line used in this figure was a linear trend line which is typically used with simple data such as the lead times shown in the figure. In an ideal situation, the trend line will follow the data as close as possible which would give the trend line an R-squared value of nearly one. In this study, figure 3 shows the trend line has an r-squared value of .52 which represents the variation in the lead time data, shown by the data points being spread across the trend line and, in some instances, not being very close to the trend line. The fact still remains that lead times have increased in a market that

is demanding decreased lead times. This is significant to the growth of XYZ Company and is noticed by those in the organization that speak with customers on a regular basis.

In the same time period the manufacturing lead times have decreased on average from 11.6 weeks to 11.4 weeks. Figure 4 is a graphical representation of the manufacturing lead times during the same time period. Based on the findings the researcher had to evaluate where and why the lead times increased over that period of time.

Figure 4: Manufacturing Lead Times



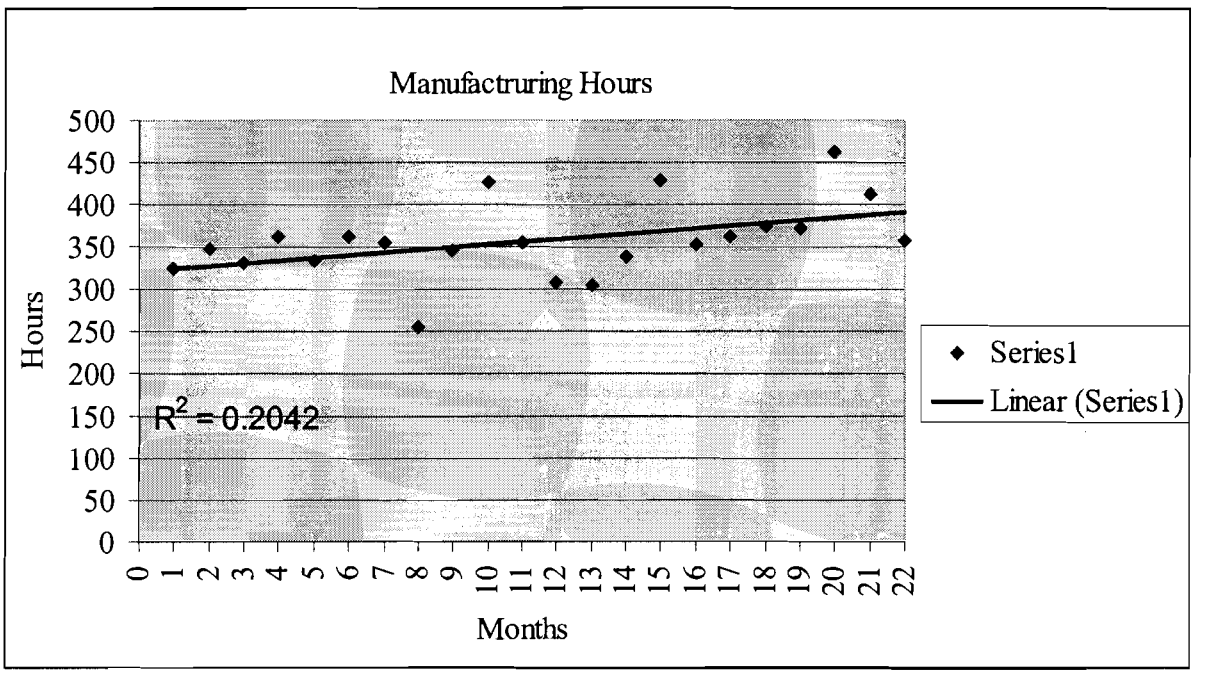
The trend line is this graph shows graphically that the lead times have increased slightly. The reality is the average manufacturing lead times have decreased and again, the R-squared value of this trend line shows the trend line does not follow the data very closely.

The raw data shown in the Appendices demonstrates that the office lead times have increased while the manufacturing lead times have, in fact, decreased. A factor that may increase lead times is the complexity of the orders in an engineer-to-order environment. Have the orders increased in complexity over the time period studied? Company XYZ does not collect data

relative to the operation or the lead time per operation or process in the sales area of the office. Data was collected relating to the design hours in engineering per order, but the data is inconclusive due to the inconsistency in the record keeping in engineering.

Since there may be a connection between the lead time increase and the complexity of the order the hours for each order were collected from the XYZ ERP system. Figure 5 shows the hours for manufacturing each order have increased on average just over 10% during the study period. This increase could either represent an increase in complexity or a decrease in efficiency in manufacturing. Figure 5 shows a graph of the average number of hours to manufacture each order from January 2004 through October 2005.

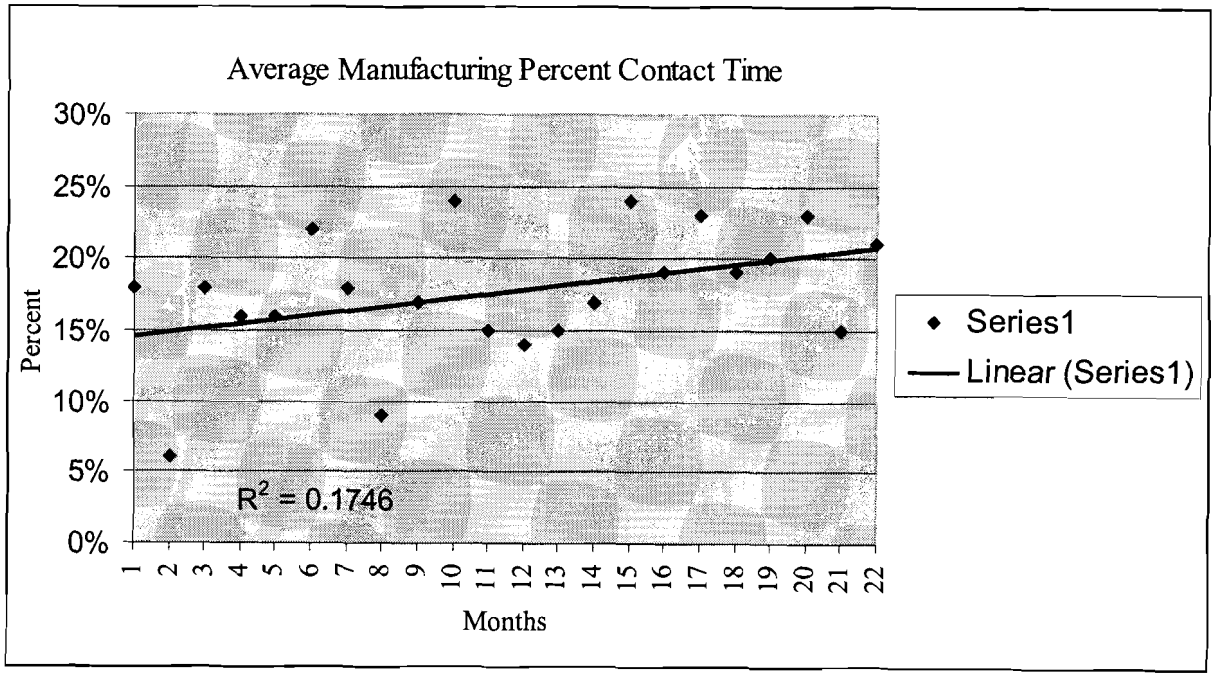
Figure 5: Manufacturing Hours Per Order



In Figure 5 the trend line does match the data points in demonstrating an increase in the average number of hours to manufacture each order. The R-squared value for this trend line is well below one at .20. This data leads into answering the second question: has the efficiency in the manufacturing area decreased? The only measure of efficiency XYZ has is the amount of contact

time with the order in manufacturing. The manufacturing contact time is the total manufacturing hours per order divided by the total lead time an order was in manufacturing. Figure 6 demonstrates that the contact time in manufacturing has increased from 2004 to 2005.

Figure 6: Manufacturing Contact Time



In Figure 6 the trend line does represent the data in that the percentage of contact time has increased over the study period. The R-squared value of the trend line is fairly low at .17, but it does represent the data. The fact that the average contact time has increased, the average number of hours required to manufacture each order has increased, and the average lead time has decreased can only lead to a conclusion that the efficiency in manufacturing is not causing lead time issues with the orders.

Until this study it was believed the only place lead times needed to be focused on was in the manufacturing area. The data shows that there is clearly room for improvement in manufacturing, but that is not the area that needs immediate focus to get lead times under

control. This study now turned to the office as the area that has the largest opportunity to reduce the lead time.

In order to map the current office process, the researcher collected information relative to the flow of orders through XYZ from the date the order was received in the Sales department until the time the order was shipped. This information along with the researcher's own experience within the company allowed the office process to be mapped. Figure 1 (located in chapter 2) shows the value stream map for the current office operation.

Current Order Process

The process of executing an order in the current system begins one of two ways in the XYZ system. The orders are acquired by the sales person and sent to the XYZ Sales department in electronic form on an XYZ Sales form or the order is received from the electronic receipt of a customer purchase order. Once an order is at XYZ, the order is then written up on internal sales forms to use in the specification collection process. The lead times allow for two weeks of time to collect and generate the specifications. Not until the specifications are complete is an order qualified to be scheduled for shipment. The orders are assigned three dates when they are scheduled. The dates include the date the prints will be sent to the customer for approval, the date the prints will be released to manufacturing and the last date assigned in the date the order will ship to the customer. After the order is scheduled for shipment the completed specifications and anything relevant to the order are then packaged in a job folder and passed to the Engineering department.

The Engineering design process on average consumes about 13 days of actual design time which is approximately 28% of the total time the order is in the design department. Inside of the 10 days the designers are working with the customers, the XYZ Sales department and

working to the XYZ design standards to provide the customer the very best tool for their process. Once the design is completed and approved by the customer the entire job packet is moved to design verification. Design verification validates the specifications against the design and insures the XYZ design standards are correct. The job packet along with the manufacturing prints is then moved to the Release Engineer who creates the bill of material for input to the XYZ ERP system. At this point the office process is complete and the job packet is moved to manufacturing.

Based on the result of the current office operations value stream map, the order is only having value added to it 16.5 out of 74.5 total days the order is in the office. That means that approximately 22% of the time the order is being worked on in the office. Figure 7 is a graphical value stream map if the current office process. There is opportunity to take significant queue time between operations in the office out of the process by consolidating some of the office operations in sales and in engineering.

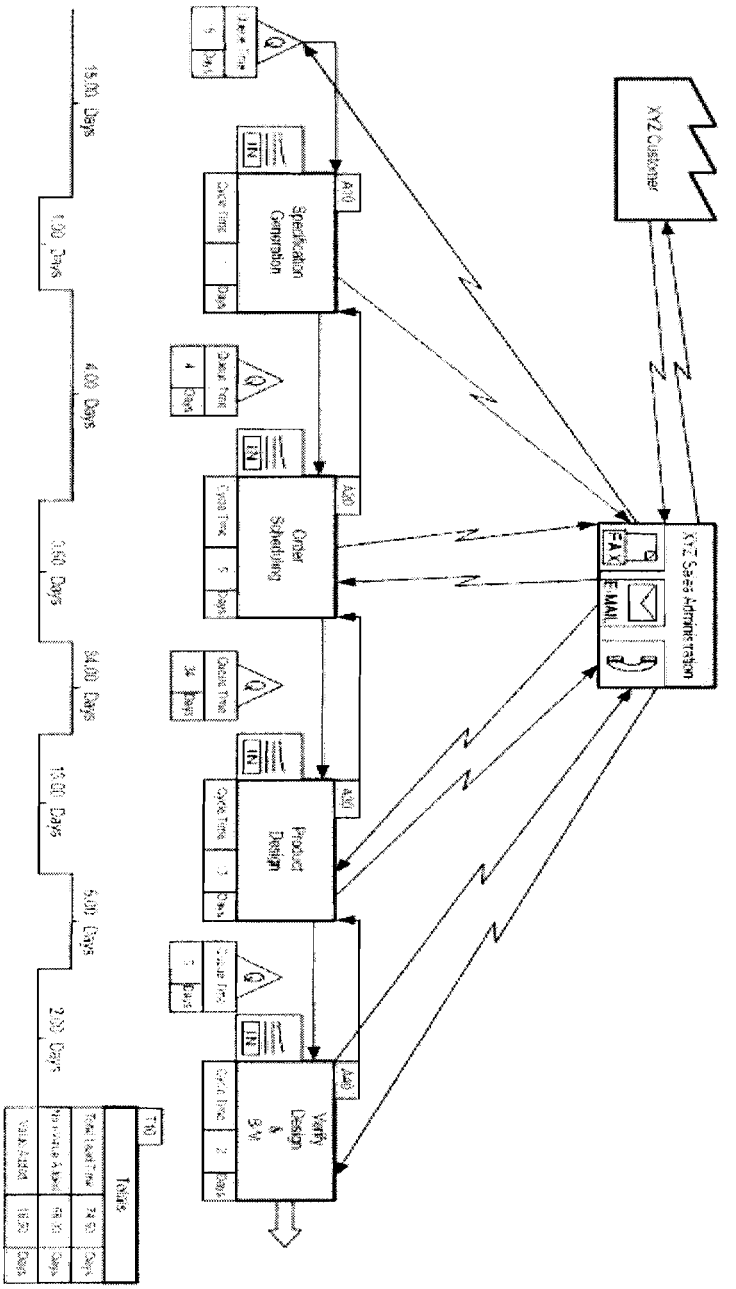


Figure 7. Value Stream Map for Current Office Operations

The QRM Office Process

On November 9th, 2005 the Center for QRM from the University of Wisconsin was at XYZ to introduce the concept of QRM to sales, engineering and manufacturing. On November 21st, 2005 XYZ started into the QRM process and identified select customers to be the beta customers for the implementation of QRM within XYZ. The orders identified to be processed in

this QRM environment were all domestic customers. This market segment makes up approximately 25% of XYZ's business worldwide.

The value stream map of the current office process, Figure 7, identified areas for lead time reduction. It is very clear that orders spend most of the time in the office in queues. After review of the office operations with the Vice President of Engineering it was decided that XYZ was to begin the process of implementing QRM into the office process. This seemed a logical place in the engineer-to-order environment at XYZ to begin down the QRM path. The office is an area that XYZ could take baby steps into full implementation of the QRM concepts.

Several operations in the office can be consolidated thus saving lead time in each process. The fact that orders are sitting in a queue on average 15 days prior to the specifications being generated is an obvious area for lead time reduction. The engineering department is the group that uses the specifications and many times knows what the specifications are for a particular type of order or a specific customer. Why not bring engineering into the specification generation process at the time the order is received in the sales department? Many companies call this process a contract review. XYZ chooses not to call it that, but essentially that is what it is. In what is considered the current process, the sales staff is allowed two full weeks minimum to submit the initial specifications to the sales department. In the QRM process, a QRM meeting is called the day the order is received at XYZ. The specification writing process begins that day with sales, engineering, and manufacturing all at the table eliminating all of the days the order previously sat waiting for specifications to be generated. Sales and engineering both agreed this was one area that could very quickly reduce the lead times in the office process by reducing the need for engineering to seek the specifications or change them once they begin the design process. The old way of executing an order in the office could allow six weeks to pass between

the time the order was received at XYZ and the start of the design. Bringing the QRM concept into the specification writing process immediately eliminated just over two weeks in the office process.

Approximately 20 days are eliminated by the designer being able to start the design once and complete it versus starting and stopping while waiting for complete specifications or making changes to incorrect specifications. Through just bringing the engineering department into the sales process the day the order is received has already paid dividends in lead time reduction in the office operations. It should be noted that the processes in the office were consolidated which saved actual process time by eliminating the order scheduling process, the queue times were reduced as well. The queue time prior to specification generation was reduced from 15 days to 1 and the queue time prior to order scheduling was completely eliminated. The queue time prior to product design was also reduced from 34 days to 20 by consolidating engineering into the sales specification generating. Figure 8 is the value stream map for the new office operations showing how XYZ has reduced the lead times by eliminating the queue time prior to specifications being written and then by involving the engineering department.

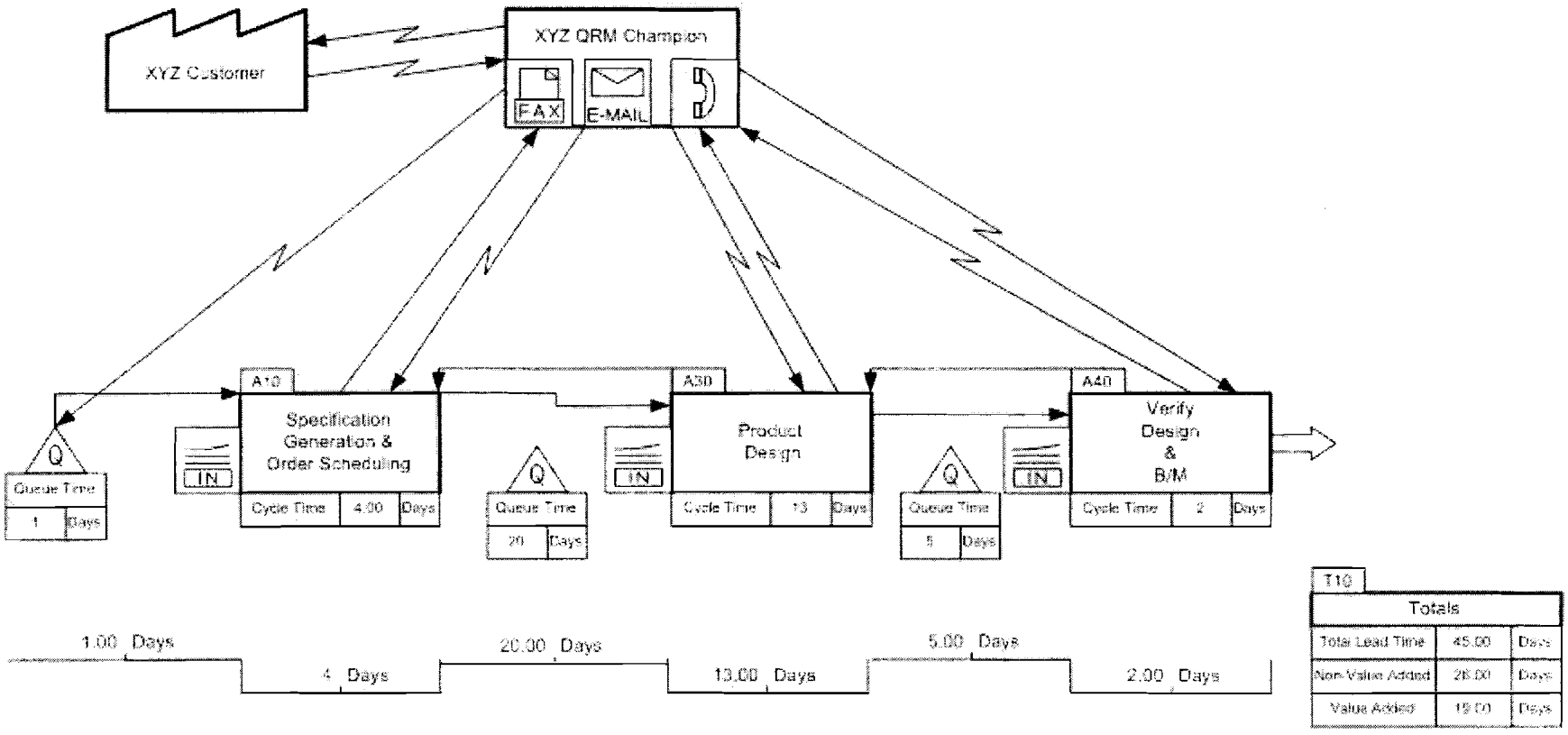


Figure 8. Value Stream Map for New Office Operations

QRM Implementation

The preceding description of data analysis along with the resulting changes in the office process has resulted in the elimination of over four weeks in office lead-time. The new value stream map demonstrates how the lead time was reduced in the queue prior to sales generating specifications and then again by having the right information in the specifications so the designer only draws the job once. Two jobs have now moved through the new office QRM process in less than four weeks lead-time total. The lead-time was reduced through the office process beginning the day the order was received. The order moved from sales to engineering in less than one week and engineering was able to design the order per the specifications generated from the QRM process. Previously, the average lead-time in the office was almost nine weeks. The orders that moved through the new process were low in complexity which may have been the reason for the four week lead-time, however the reality is that the jobs followed the new value stream mapped process and the results were extremely positive. The first jobs exceeded expectations relative to the new office operations value stream map and may not be representative of all future jobs, but the outlook is very positive.

To date the front end of the sales and engineering process has been focused on plans to take the QRM techniques to the remainder of the organization in the next year. The researcher has watched first hand the new process in place and the sales and engineering employees understand where the lead time was lost and have accepted the new processes very well. The XYZ customers will soon see the results in lead-time reduction efforts from XYZ and will return to XYZ the next time they have a need for a tool in their business.

Chapter V: Discussion

Introduction

The researcher's intention in performing this study was to evaluate the area of lead-time reduction in an engineer-to-order tool and die manufacturing company in west central Wisconsin. The study will be conducted by evaluating data from the company in addition to common practices in lead time reduction. The best and most applicable portions of those practices will be applied to this study. In the past two years company XYZ's delivery lead-times have increased. The business level in the XYZ's market has increased significantly since 2004 and XYZ has enjoyed a significant increase in business volume as a result. With the increased business level, new companies have started and now compete with company XYZ. With the additional competition, the delivery lead-time has become a selling point. This study was an evaluation of the QRM process and QRM principles indicate that reduced lead times result in increased market share (Suri, 1998).

Statement of the Problem

Company XYZ needs to lower its lead times to sustain its share of the die market.

Conclusions

The issue of on time delivery drove the need for this research. The ownership recognizes that XYZ has a significant issue with delivering products to its customers when the customer wants it. Knowing that delivery lead-time is an organizational measurement, not just a manufacturing measurement; the researcher had to convince the ownership that there was an issue with the office lead-time. The data now shows that the office was consuming nearly 50% of the total lead time. The Center for QRM at the University of Wisconsin states that most

companies incur 50 or more percent of their lead-time in the office (Suri, 1998). XYZ does experience almost 50% of the lead-time in the office.

Recommendations

XYZ has joined the center for QRM as a result of this research. Stating that XYZ is going to pursue implementation of QRM processes and techniques throughout the organization is the easy part. In November of 2005 XYZ ownership made the commitment to implement QRM starting with the office processes because during the study the office area was identified as an area where lead-time reduction could be achieved very quickly. The results of the first two orders executed through the new process demonstrate that the process works and as the process gains credibility within the organization the program can be expanded. The bottom line is XYZ cannot continue down the path they have taken the past 22 months and expect to sustain the market share they have. There has been early success with the QRM program and it is the recommendation of the researcher that the process be allowed to grow and mature in the office process before applying the QRM process further into the organization.

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Appendix A: The Raw Lead Time Data by Month

January 2004 Lead Time Data

Order Number	Order Date	Weeks Sales	Weeks Eng	To Mfg Date	Weeks Sales/Eng	Shipment Date	Weeks Mfg	Total Weeks
03-23232	28-Apr-03	2	17	13-Oct-03	19	08-Jan-04	13	32
03-23271	30-May-03	2	17	13-Oct-03	19	09-Jan-04	13	32
03-23272	30-May-03	2	19	22-Oct-03	21	09-Jan-04	11	32
03-23273	30-May-03	2	17	13-Oct-03	19	09-Jan-04	13	32
03-23274	30-May-03	2	19	22-Oct-03	21	09-Jan-04	11	32
03-23342	17-Jul-03	4	11	31-Oct-03	15	22-Jan-04	12	27
03-23363	13-Aug-03	2	7	15-Oct-03	9	09-Jan-04	12	21
03-23380	22-Aug-03	1	2	15-Sep-03	3	16-Jan-04	18	21
03-23384	26-Aug-03	3	4	16-Oct-03	7	13-Jan-04	13	20
03-23393	02-Sep-03	1	7	27-Oct-03	8	01-Jan-04	9	17
03-23394	02-Sep-03	3	5	28-Oct-03	8	19-Jan-04	12	20
03-23399	09-Sep-03	2	5	24-Oct-03	7	22-Jan-04	13	20
03-23424	22-Sep-03	1	6	12-Nov-03	7	07-Jan-04	8	15
03-23467	20-Oct-03	2	2	18-Nov-03	4	22-Jan-04	9	13
03-23468	20-Oct-03	2	2	18-Nov-03	4	22-Jan-04	9	13
03-23470	21-Oct-03	1	3	19-Nov-03	4	22-Jan-04	9	13
03-23471	21-Oct-03	1	5	01-Dec-03	6	22-Jan-04	8	14
03-23511	07-Nov-03	2	0	20-Nov-03	2	13-Jan-04	8	10
03-23512	10-Nov-03	1	3	09-Dec-03	4	21-Jan-04	6	10
03-23524	13-Nov-03	2	1	04-Dec-03	3	13-Jan-04	6	9
86-10262	01-Dec-03	1	0	05-Dec-03	1	08-Jan-04	5	6
03-23422	22-Sep-03	1	5	31-Oct-03	6	23-Jan-04	12	18
03-23489	04-Nov-03	1	1	14-Nov-03	2	20-Jan-04	10	12
03-23460	16-Oct-03	2	0	31-Oct-03	2	20-Jan-04	12	14
03-23472	21-Oct-03	3	1	19-Nov-03	4	22-Jan-04	9	13
03-23514	11-Nov-03	3	0	04-Dec-03	3	27-Jan-04	8	11
03-23513	10-Nov-03	2	1	01-Dec-03	3	20-Jan-04	7	10
03-23373	21-Aug-03	2	8	31-Oct-03	10	30-Jan-04	13	23
03-23374	21-Aug-03	2	9	07-Nov-03	11	30-Jan-04	12	23
03-23299	20-Jun-03	4	15	03-Nov-03	19	31-Jan-04	13	32
03-23301	20-Jun-03	4	23	24-Dec-03	27	31-Jan-04	5	32
03-23370	19-Aug-03	1	5	01-Oct-03	6	30-Jan-04	17	23
03-23371	19-Aug-03	1	5	01-Oct-03	6	30-Jan-04	17	23
03-23488	03-Nov-03	2	3	08-Dec-03	5	30-Jan-04	8	13
03-23538	25-Nov-03	2	0	08-Dec-03	2	02-Feb-04	8	10
03-23456	15-Oct-03	2	2	11-Nov-03	4	30-Jan-04	12	16
03-23429	01-Oct-03	3	2	07-Nov-03	5	27-Jan-04	12	17
January 2004 Totals		Sales	Eng		Office		Mfg	Total
Average Weeks:		2.0	6.3		8.3		10.6	18.9

February 2004 Lead Time Data

Order Number	Order Date	Weeks Sales	Weeks Eng	To Mfg Date	Weeks Sales/Eng	Shipment Date	Weeks Mfg	Total Weeks
03-23420	19-Sep-03	2	9	01-Dec-03	11	03-Feb-04	9	20
03-23457	16-Oct-03	2	5	02-Dec-03	7	04-Feb-04	9	16
03-23438	06-Oct-03	3	2	06-Nov-03	5	06-Feb-04	13	18
03-23432	01-Oct-03	4	5	02-Dec-03	9	06-Feb-04	9	18
03-23531	19-Nov-03	1	0	25-Nov-03	1	09-Feb-04	11	12
03-23458	16-Oct-03	2	3	19-Nov-03	5	11-Feb-04	12	17
03-23441	07-Oct-03	2	6	01-Dec-03	8	11-Feb-04	10	18
03-23395	09-Sep-03	1	5	20-Oct-03	6	17-Feb-04	17	23
03-23415	19-Sep-03	4	5	19-Nov-03	9	13-Feb-04	12	21
03-23416	19-Sep-03	4	5	19-Nov-03	9	13-Feb-04	12	21
03-23417	19-Sep-03	4	5	19-Nov-03	9	13-Feb-04	12	21
03-23418	19-Sep-03	4	5	19-Nov-03	9	13-Feb-04	12	21
03-23445	07-Oct-03	4	5	08-Dec-03	9	27-Feb-04	12	21
03-23461	17-Oct-03	4	6	24-Dec-03	10	25-Feb-04	9	19
03-23463	17-Oct-03	4	6	23-Dec-03	10	25-Feb-04	9	19
03-23464	17-Oct-03	4	6	24-Dec-03	10	25-Feb-04	9	19
03-23465	17-Oct-03	4	6	24-Dec-03	10	25-Feb-04	9	19
03-23466	17-Oct-03	4	6	24-Dec-03	10	25-Feb-04	9	19
03-23473	11-Jan-03	3	38	24-Oct-03	41	16-Feb-04	16	59
03-23480	01-Nov-03	2	4	12-Dec-03	6	19-Feb-04	10	16
03-23613	16-Dec-03	3	1	12-Jan-04	4	18-Feb-04	5	9
03-23525	17-Nov-03	2	3	24-Dec-03	5	27-Feb-04	9	14
03-23613	16-Dec-03	4	0	12-Jan-04	4	18-Feb-04	5	9
February 2004 Totals		Sales	Eng		Office		Mfg	Total
Average Weeks:		3.1	5.9		9.0		10.4	19.5

March 2004 Lead Time Data

Order Number	Order Date	Weeks Sales	Weeks Eng	To Mfg Date	Weeks Sales/Eng	Shipment Date	Weeks Mfg	Total Weeks
03-23290	13-Jun-03	3	13	03-Oct-03	16	12-Mar-04	23	39
03-23291	13-Jun-03	3	17	29-Oct-03	20	12-Mar-04	19	39
03-23486	01-Nov-03	2	4	15-Dec-03	6	04-Mar-04	12	18
03-23487	01-Nov-03	2	8	12-Jan-04	10	24-Mar-04	10	20
03-23490	31-Oct-03	1	4	02-Dec-03	5	05-Mar-04	13	18
03-23492	31-Oct-03	1	5	11-Dec-03	6	05-Mar-04	12	18
03-23494	31-Oct-03	1	4	02-Dec-03	5	17-Mar-04	15	20
03-23496	31-Oct-03	1	5	11-Dec-03	6	17-Mar-04	14	20
03-23515	11-Nov-03	2	7	13-Jan-04	9	17-Mar-04	9	18
03-23529	18-Nov-03	3	7	26-Jan-04	10	30-Mar-04	9	19
03-23532	20-Nov-03	1	4	22-Dec-03	5	26-Mar-04	14	19

03-23533	20-Nov-03	1	4	24-Dec-03	5	26-Mar-04	13	18
03-23534	20-Nov-03	2	8	26-Jan-04	10	18-Mar-04	8	18
03-23542	25-Nov-03	1	5	05-Jan-04	6	15-Mar-04	10	16
03-23545	02-Dec-03	1	0	10-Dec-03	1	23-Mar-04	15	16
03-23546	02-Dec-03	1	0	10-Dec-03	1	23-Mar-04	15	16
03-23547	02-Dec-03	1	0	11-Dec-03	1	23-Mar-04	15	16
03-23548	02-Dec-03	1	0	11-Dec-03	1	23-Mar-04	15	16
03-23556	03-Dec-03	1	5	13-Jan-04	6	11-Mar-04	8	14
03-23558	03-Dec-03	1	5	12-Jan-04	6	18-Mar-04	10	16
03-23559	05-Dec-03	1	7	26-Jan-04	8	16-Mar-04	7	15
03-23561	05-Dec-03	1	7	28-Jan-04	8	23-Mar-04	8	16
03-23564	05-Dec-03	1	7	02-Feb-04	8	31-Mar-04	8	16
03-23565	05-Dec-03	2	8	13-Feb-04	10	31-Mar-04	7	17
03-23590	10-Dec-03	1	4	12-Jan-04	5	24-Mar-04	10	15
03-23592	11-Dec-03	1	6	28-Jan-04	7	31-Mar-04	9	16
03-23597	15-Dec-03	2	6	11-Feb-04	8	30-Mar-04	7	15
03-23598	15-Dec-03	2	6	11-Feb-04	8	30-Mar-04	7	15
03-23599	15-Dec-03	2	6	11-Feb-04	8	30-Mar-04	7	15
03-23611	16-Dec-03	1	4	19-Jan-04	5	22-Mar-04	9	14
03-23612	16-Dec-03	1	3	12-Jan-04	4	22-Mar-04	10	14
03-23616	17-Dec-03	2	6	12-Feb-04	8	19-Mar-04	5	13
03-23631	24-Dec-03	1	3	23-Jan-04	4	15-Mar-04	7	11
03-23676	02-Feb-04	1	0	06-Feb-04	1	12-Mar-04	5	6
04-23654	09-Jan-04	1	0	14-Jan-04	1	19-Mar-04	9	10
March 2004 Totals		Sales	Eng		Office		Mfg	Total
Average Weeks:		1.4	5.1		6.5		10.7	17.2

April 2004 Lead Time Data

Order Number	Order Date	Weeks Sales	Weeks Eng	To Mfg Date	Weeks Sales/Eng	Shipment Date	Weeks Mfg	Total Weeks
03-23277	02-Jun-03	2	8	11-Aug-03	10	21-Apr-04	36	46
03-23279	02-Jun-03	1	6	18-Jul-03	7	21-Apr-04	39	46
03-23324	01-Jul-03	5	22	05-Jan-04	27	14-Apr-04	14	41
03-23325	01-Jul-03	5	22	08-Jan-04	27	14-Apr-04	14	41
03-23389	27-Aug-03	1	2	16-Sep-03	3	21-Apr-04	31	34
03-23447	09-Oct-03	3	12	23-Jan-04	15	08-Apr-04	11	26
03-23484	31-Oct-03	3	7	07-Jan-04	10	16-Apr-04	14	24
03-23485	31-Oct-03	3	7	07-Jan-04	10	16-Apr-04	14	24
03-23504	05-Nov-03	2	6	30-Dec-03	8	06-Apr-04	14	22
03-23530	18-Nov-03	2	6	15-Jan-04	8	08-Apr-04	12	20
03-23539	25-Nov-03	3	7	04-Feb-04	10	12-Apr-04	10	20
03-23540	25-Nov-03	2	11	26-Feb-04	13	12-Apr-04	7	20

03-23541	25-Nov-03	2	8	04-Feb-04	10	12-Apr-04	10	20
03-23560	08-Dec-03	2	6	03-Feb-04	8	08-Apr-04	9	17
03-23566	05-Dec-03	2	7	04-Feb-04	9	27-Apr-04	12	21
03-23567	05-Dec-03	3	8	18-Feb-04	11	27-Apr-04	10	21
03-23568	10-Dec-03	2	7	09-Feb-04	9	14-Apr-04	9	18
03-23579	10-Dec-03	2	5	29-Jan-04	7	14-Apr-04	11	18
03-23584	10-Dec-03	2	6	02-Feb-04	8	14-Apr-04	10	18
03-23593	11-Dec-03	2	5	29-Jan-04	7	20-Apr-04	12	19
03-23594	11-Dec-03	2	5	29-Jan-04	7	20-Apr-04	12	19
03-23595	11-Dec-03	2	7	11-Feb-04	9	20-Apr-04	10	19
03-23603	15-Dec-03	1	7	11-Feb-04	8	27-Apr-04	11	19
03-23619	22-Dec-03	2	7	25-Feb-04	9	19-Apr-04	8	17
03-23632	01-Jan-04	1	1	12-Jan-04	2	27-Apr-04	15	17
04-23634	05-Jan-04	2	7	04-Mar-04	9	19-Apr-04	7	16
04-23635	05-Jan-04	1	6	23-Feb-04	7	19-Apr-04	8	15
04-23636	05-Jan-04	1	0	14-Jan-04	1	12-Apr-04	13	14
04-23637	05-Jan-04	1	0	14-Jan-04	1	12-Apr-04	13	14
04-23650	06-Jan-04	1	4	11-Feb-04	5	16-Apr-04	9	14
04-23655	10-Jan-04	2	6	08-Mar-04	8	19-Apr-04	6	14
04-23681	04-Feb-04	1	5	16-Mar-04	6	28-Apr-04	6	12
04-23714	17-Feb-04	1	2	04-Mar-04	3	02-Apr-04	4	7
04-23742	01-Mar-04	1	3	26-Mar-04	4	23-Apr-04	4	8
04-23743	01-Mar-04	1	3	26-Mar-04	4	23-Apr-04	4	8
03-23537	21-Nov-03	3	10	18-Feb-04	13	28-Apr-04	10	23
03-23523	10-Nov-03	2	7	13-Jan-04	9	29-Apr-04	15	24
03-23528	17-Nov-03	2	10	06-Feb-04	12	29-Apr-04	12	24
03-23527	14-Nov-03	2	7	19-Jan-04	9	29-Apr-04	14	23
April 2004 Totals		Sales	Eng		Office		Mfg	Total
Average Weeks:		2.0	6.8		8.8		12.3	21.1

May 2004 Lead Time Data

Order Number	Order Date	Weeks Sales	Weeks Eng	To Mfg Date	Weeks Sales/Eng	Shipment Date	Weeks Mfg	Total Weeks
04-23733	24-Feb-04	1	3	18-Mar-04	4	04-May-04	7	11
03-23591	19-Dec-03	2	10	09-Mar-04	12	05-May-04	8	20
04-23725	18-Feb-04	1	4	18-Mar-04	5	05-May-04	7	12
04-23674	01-Feb-04	1	2	24-Feb-04	3	06-May-04	11	14
04-23675	01-Feb-04	1	6	16-Mar-04	7	06-May-04	7	14
04-23618	01-Jan-04	2	10	22-Mar-04	12	07-May-04	7	19
04-23680	03-Feb-04	1	7	01-Apr-04	8	10-May-04	6	14
03-23596	14-Dec-03	3	11	19-Mar-04	14	11-May-04	8	22
04-23669	26-Jan-04	1	6	17-Mar-04	7	13-May-04	8	15

04-23682	04-Feb-04	2	6	26-Mar-04	8	10-May-04	7	15
04-23661	16-Jan-04	2	6	08-Mar-04	8	14-May-04	10	18
03-23607	16-Dec-03	3	8	03-Mar-04	11	14-May-04	10	21
03-23608	16-Dec-03	3	10	18-Mar-04	13	14-May-04	8	21
03-23609	16-Dec-03	3	10	18-Mar-04	13	14-May-04	8	21
04-23662	16-Jan-04	2	8	26-Mar-04	10	14-May-04	7	17
04-23644	06-Jan-04	1	1	22-Jan-04	2	19-May-04	17	19
03-23628	01-Jan-04	2	3	06-Feb-04	5	21-May-04	15	20
03-23605	15-Dec-03	2	7	18-Feb-04	9	18-May-04	13	22
03-23610	15-Dec-03	2	7	13-Feb-04	9	25-May-04	15	24
04-23651	05-Jan-04	2	7	04-Mar-04	9	24-May-04	12	21
04-23652	05-Jan-04	2	9	18-Mar-04	11	24-May-04	10	21
04-23671	24-Jan-04	2	6	18-Mar-04	8	24-May-04	10	18
04-23727	20-Feb-04	1	6	06-Apr-04	7	24-May-04	7	14
03-23412	19-Sep-03	2	7	19-Nov-03	9	24-May-04	27	36
03-23414	19-Sep-03	2	10	11-Dec-03	12	24-May-04	24	36
04-23711	17-Feb-04	1	4	19-Mar-04	5	21-May-04	9	14
04-23712	17-Feb-04	1	4	19-Mar-04	5	21-May-04	9	14
03-23509	06-Nov-03	3	8	19-Jan-04	11	26-May-04	19	30
03-23510	06-Nov-03	3	8	19-Jan-04	11	26-May-04	19	30
03-23409	19-Sep-03	3	14	13-Jan-04	17	27-May-04	20	37
03-23411	19-Sep-03	3	14	16-Jan-04	17	27-May-04	19	36
03-23500	31-Oct-03	1	5	11-Dec-03	6	27-May-04	24	30
03-23604	15-Dec-03	2	6	11-Feb-04	8	24-May-04	15	23
04-23695	09-Feb-04	1	5	19-Mar-04	6	26-May-04	10	16
04-23728	24-Feb-04	1	0	02-Mar-04	1	26-May-04	12	13
04-23729	24-Feb-04	1	0	02-Mar-04	1	26-May-04	12	13
04-23730	24-Feb-04	1	0	02-Mar-04	1	26-May-04	12	13
04-23657	13-Jan-04	2	10	01-Apr-04	12	28-May-04	8	20
04-23658	13-Jan-04	2	11	08-Apr-04	13	28-May-04	7	20
May 2004 Totals		Sales	Eng		Office		Mfg	Total
Average Weeks:		1.8	6.6		8.5		11.9	20.4

June 2004 Lead Time Data

Order Number	Order Date	Weeks Sales	Weeks Eng	To Mfg Date	Weeks Sales/Eng	Shipment Date	Weeks Mfg	Total Weeks
04-23734	24-Feb-04	1	6	08-Apr-04	7	01-Jun-04	8	15
03-23507	06-Nov-03	3	8	19-Jan-04	11	04-Jun-04	20	31
03-23508	06-Nov-03	3	8	19-Jan-04	11	04-Jun-04	20	31
04-23721	18-Feb-04	1	5	29-Mar-04	6	04-Jun-04	10	16
04-23722	18-Feb-04	2	7	16-Apr-04	9	08-Jun-04	8	17
03-23549	02-Dec-03	4	12	19-Mar-04	16	08-Jun-04	12	28
04-23679	02-Feb-04	3	7	12-Apr-04	10	08-Jun-04	8	18

04-23690	05-Feb-04	2	5	24-Mar-04	7	28-May-04	9	16
03-23522	10-Nov-03	4	12	02-Mar-04	16	10-Jun-04	14	30
03-23481	01-Nov-03	4	18	02-Apr-04	22	09-Jun-04	10	32
04-23778	19-Mar-04	1	1	29-Mar-04	2	09-Jun-04	10	12
04-23779	19-Mar-04	1	1	29-Mar-04	2	09-Jun-04	10	12
04-23701	11-Feb-04	2	6	07-Apr-04	8	11-Jun-04	9	17
04-23783	24-Mar-04	1	2	16-Apr-04	3	10-Jun-04	8	11
04-23688	05-Feb-04	2	6	31-Mar-04	8	17-Jun-04	11	19
04-23689	05-Feb-04	2	8	12-Apr-04	10	17-Jun-04	10	20
04-23697	09-Feb-04	1	6	24-Mar-04	7	16-Jun-04	12	19
04-23732	27-Feb-04	2	7	28-Apr-04	9	18-Jun-04	7	16
04-23775	19-Mar-04	1	5	29-Apr-04	6	18-Jun-04	7	13
04-23663	22-Jan-04	2	7	24-Mar-04	9	23-Jun-04	13	22
04-23704	11-Feb-04	2	7	14-Apr-04	9	25-Jun-04	10	19
04-23787	30-Mar-04	1	5	13-May-04	6	28-Jun-04	7	13
04-23788	30-Mar-04	1	5	11-May-04	6	28-Jun-04	7	13
04-23626	01-Jan-04	3	10	29-Mar-04	13	29-Jun-04	13	26
04-23627	01-Jan-04	3	10	01-Apr-04	13	29-Jun-04	13	26
04-23751	09-Mar-04	2	7	13-May-04	9	29-Jun-04	7	16
04-23752	09-Mar-04	2	8	17-May-04	10	29-Jun-04	6	16
04-23753	09-Mar-04	2	8	18-May-04	10	29-Jun-04	6	16
04-23768	12-Mar-04	2	6	07-May-04	8	28-Jun-04	7	15
04-23841	27-Apr-04	1	1	12-May-04	2	30-Jun-04	7	9
04-23720	17-Feb-04	3	9	07-May-04	12	30-Jun-04	8	20
04-23687	05-Feb-04	2	7	06-Apr-04	9	18-Jun-04	11	20
04-23748	03-Mar-04	2	3	06-Apr-04	5	08-Jun-04	9	14
04-23749	03-Mar-04	2	3	06-Apr-04	5	08-Jun-04	9	14
June 2004 Totals		Sales	Eng		Office		Mfg	Total
Average Weeks:		2.1	6.6		8.7		9.9	18.6

July 2004 Lead Time Data

Order Number	Order Date	Weeks Sales	Weeks Eng	To Mfg Date	Weeks Sales/Eng	Shipment Date	Weeks Mfg	Total Weeks
03-23552	01-Dec-03	4	16	21-Apr-04	20	12-Jul-04	12	32
03-23553	01-Dec-03	4	16	19-Apr-04	20	09-Jul-04	12	32
03-23554	01-Dec-03	4	16	20-Apr-04	20	09-Jul-04	12	32
04-23890	13-May-04	1	2	02-Jun-04	3	12-Jul-04	6	9
04-23815	06-Apr-04	1	4	07-May-04	5	08-Jul-04	9	14
04-23776	19-Mar-04	1	6	07-May-04	7	09-Jul-04	9	16
04-23693	05-Feb-04	2	6	02-Apr-04	8	22-Jul-04	13	21
04-23694	05-Feb-04	2	6	02-Apr-04	8	22-Jul-04	13	21
04-23878	07-May-04	1	4	08-Jun-04	5	21-Jul-04	6	11

04-23860	04-May-04	1	3	02-Jun-04	4	22-Jul-04	7	11
04-23709	19-Feb-04	2	7	21-Apr-04	9	26-Jul-04	14	23
04-23710	19-Feb-04	2	5	08-Apr-04	7	26-Jul-04	16	23
03-23425	22-Sep-03	6	23	12-Apr-04	29	27-Jul-04	15	44
03-23427	22-Sep-03	6	23	12-Apr-04	29	27-Jul-04	15	44
03-23625	30-Dec-03	6	8	08-Apr-04	14	27-Jul-04	16	30
04-23826	23-Apr-04	2	4	02-Jun-04	6	27-Jul-04	8	14
04-23827	23-Apr-04	2	4	01-Jun-04	6	27-Jul-04	8	14
04-23735	25-Feb-04	3	7	30-Apr-04	10	29-Jul-04	13	23
04-23736	25-Feb-04	3	7	30-Apr-04	10	30-Jul-04	13	23
04-23691	05-Feb-04	3	8	22-Apr-04	11	29-Jul-04	14	25
04-23692	05-Feb-04	3	8	22-Apr-04	11	29-Jul-04	14	25
04-23810	31-Mar-04	1	3	26-Apr-04	4	30-Jul-04	14	18
04-23811	31-Mar-04	1	2	21-Apr-04	3	30-Jul-04	14	17
04-23812	31-Mar-04	1	2	21-Apr-04	3	30-Jul-04	14	17
04-23818	06-Apr-04	2	5	21-May-04	7	30-Jul-04	10	17
04-23908	21-May-04	1	3	17-Jun-04	4	30-Jul-04	6	10
04-23909	21-May-04	1	4	23-Jun-04	5	30-Jul-04	5	10
04-23739	01-Mar-04	2	7	03-May-04	9	31-Jul-04	13	22
04-23740	01-Mar-04	3	8	17-May-04	11	31-Jul-04	11	22
July 2004 Totals		Sales	Eng		Office		Mfg	Total
Average Weeks:		2.4	7.5		9.9		11.4	21.4

August 2004 Lead Time Data

Order Number	Order Date	Weeks Sales	Weeks Eng	To Mfg Date	Weeks Sales/Eng	Shipment Date	Weeks Mfg	Total Weeks
03-23578	10-Dec-03	2	7	09-Feb-04	9	04-Aug-04	26	35
03-23580	10-Dec-03	2	6	02-Feb-04	8	04-Aug-04	27	35
03-23581	10-Dec-03	2	6	02-Feb-04	8	04-Aug-04	27	35
03-23582	10-Dec-03	2	6	02-Feb-04	8	04-Aug-04	27	35
03-23583	10-Dec-03	2	6	02-Feb-04	8	04-Aug-04	27	35
03-23585	10-Dec-03	2	6	02-Feb-04	8	04-Aug-04	27	35
03-23586	10-Dec-03	2	6	02-Feb-04	8	04-Aug-04	27	35
03-23587	10-Dec-03	2	6	02-Feb-04	8	04-Aug-04	27	35
03-23588	10-Dec-03	2	6	02-Feb-04	8	04-Aug-04	27	35
03-23589	10-Dec-03	2	13	19-Mar-04	15	04-Aug-04	20	35
04-23769	15-Mar-04	3	7	20-May-04	10	06-Aug-04	11	21
04-23780	22-Mar-04	2	7	20-May-04	9	10-Aug-04	12	21
04-23786	30-Mar-04	2	5	18-May-04	7	11-Aug-04	12	19
04-23895	14-May-04	1	5	22-Jun-04	6	10-Aug-04	7	13
04-23907	21-May-04	1	4	22-Jun-04	5	10-Aug-04	7	12
04-23696	09-Feb-04	3	11	11-May-04	14	23-Aug-04	15	29
04-23761	11-Mar-04	2	7	10-May-04	9	11-Aug-04	13	22

04-23762	11-Mar-04	2	5	30-Apr-04	7	11-Aug-04	15	22
04-23842	27-Apr-04	1	4	28-May-04	5	11-Aug-04	11	16
04-23857	30-Apr-04	2	5	15-Jun-04	7	12-Aug-04	8	15
04-23858	30-Apr-04	2	2	28-May-04	4	12-Aug-04	11	15
04-23849	29-Apr-04	1	2	17-May-04	3	13-Aug-04	13	16
04-23746	03-Mar-04	3	10	28-May-04	13	16-Aug-04	12	25
04-23781	22-Mar-04	1	4	26-Apr-04	5	16-Aug-04	16	21
04-23877	07-May-04	1	3	04-Jun-04	4	13-Aug-04	10	14
04-23866	04-May-04	1	5	16-Jun-04	6	17-Aug-04	9	15
04-23867	04-May-04	1	5	16-Jun-04	6	17-Aug-04	9	15
04-23784	26-Mar-04	3	5	21-May-04	8	19-Aug-04	13	21
04-23785	26-Mar-04	3	10	24-Jun-04	13	19-Aug-04	8	21
04-23824	13-Apr-04	1	5	26-May-04	6	13-Aug-04	11	17
04-23863	04-May-04	1	2	27-May-04	3	25-Aug-04	13	16
04-23864	04-May-04	1	2	27-May-04	3	25-Aug-04	13	16
04-23777	19-Mar-04	2	5	07-May-04	7	19-Aug-04	15	22
04-23865	04-May-04	2	6	28-Jun-04	8	18-Aug-04	7	15
04-23910	24-May-04	1	0	03-Jun-04	1	20-Aug-04	11	12
04-23911	24-May-04	1	4	24-Jun-04	5	20-Aug-04	8	13
04-23925	28-May-04	1	3	25-Jun-04	4	24-Aug-04	9	13
04-23832	19-Apr-04	2	8	24-Jun-04	10	30-Aug-04	10	20
04-23868	04-May-04	1	0	11-May-04	1	23-Aug-04	15	16
August 2004 Totals		Sales	Eng		Office		Mfg	Total
Average Weeks:		1.7	5.4		7.1		15.0	22.1

September 2004 Lead Time Data

Order Number	Order Date	Weeks Sales	Weeks Eng	To Mfg Date	Weeks Sales/Eng	Shipment Date	Weeks Mfg	Total Weeks
04-23731	25-Feb-04	2	4	02-Apr-04	6	01-Sep-04	22	28
04-23853	30-Apr-04	2	6	24-Jun-04	8	01-Sep-04	10	18
04-23929	07-Jun-04	2	5	23-Jul-04	7	14-Sep-04	7	14
04-23823	13-Apr-04	1	5	21-May-04	6	08-Sep-04	16	22
04-23817	07-Apr-04	2	8	15-Jun-04	10	21-Sep-04	14	24
04-23828	16-Apr-04	2	10	07-Jul-04	12	21-Sep-04	11	23
04-23915	25-May-04	2	6	20-Jul-04	8	13-Sep-04	8	16
04-23914	26-May-04	1	4	29-Jun-04	5	10-Sep-04	10	15
04-23946	15-Jun-04	1	4	19-Jul-04	5	14-Sep-04	8	13
04-23805	31-Mar-04	1	3	26-Apr-04	4	23-Sep-04	22	26
04-23806	31-Mar-04	1	3	26-Apr-04	4	23-Sep-04	22	26
04-23808	31-Mar-04	1	2	21-Apr-04	3	23-Sep-04	22	25
04-23870	04-May-04	3	12	17-Aug-04	15	23-Sep-04	5	20
04-23924	28-May-04	1	3	28-Jun-04	4	15-Sep-04	11	15

04-23944	15-Jun-04	1	2	08-Jul-04	3	13-Sep-04	10	13
04-23854	30-Apr-04	2	8	09-Jul-04	10	22-Sep-04	11	21
04-23906	20-May-04	3	9	11-Aug-04	12	23-Sep-04	6	18
04-23903	19-May-04	2	6	14-Jul-04	8	10-Sep-04	8	16
03-23555	02-Dec-03	10	20	30-Jun-04	30	29-Sep-04	13	43
04-23945	15-Jun-04	2	6	09-Aug-04	8	29-Sep-04	7	15
04-23898	18-May-04	2	8	27-Jul-04	10	30-Sep-04	9	19
04-23893	13-May-04	2	8	23-Jul-04	10	30-Sep-04	10	20
04-23904	24-May-04	2	8	04-Aug-04	10	29-Sep-04	8	18
September 2004 Totals		Sales	Eng		Office		Mfg	Total
Average Weeks:		2.1	6.5		8.6		11.7	20.3

October 2004 Lead Time Data

Order Number	Order Date	Weeks Sales	Weeks Eng	To Mfg Date	Weeks Sales/Eng	Shipment Date	Weeks Mfg	Total Weeks
04-23833	20-Apr-04	2	8	30-Jun-04	10	08-Oct-04	14	24
04-23960	30-Jun-04	2	6	23-Aug-04	8	08-Oct-04	7	15
04-23943	15-Jun-04	2	6	06-Aug-04	8	12-Oct-04	10	18
04-23913	26-May-04	3	7	06-Aug-04	10	11-Oct-04	10	20
04-23816	07-Apr-04	3	7	15-Jun-04	10	11-Oct-04	17	27
04-23820	13-Apr-04	3	13	29-Jul-04	16	08-Oct-04	10	26
04-23896	18-May-04	3	8	30-Jul-04	11	25-Oct-04	13	24
04-23897	18-May-04	3	8	05-Aug-04	11	25-Oct-04	12	23
04-23899	18-May-04	3	7	29-Jul-04	10	25-Oct-04	13	23
04-23921	28-May-04	3	10	27-Aug-04	13	25-Oct-04	8	21
04-23933	14-Jun-04	2	8	20-Aug-04	10	29-Oct-04	10	20
04-23961	30-Jun-04	2	5	20-Aug-04	7	19-Oct-04	9	16
04-23962	30-Jun-04	1	5	12-Aug-04	6	19-Oct-04	10	16
04-23964	30-Jun-04	2	5	19-Aug-04	7	26-Oct-04	10	17
04-23965	30-Jun-04	2	5	19-Aug-04	7	26-Oct-04	10	17
04-23956	22-Jun-04	2	6	19-Aug-04	8	28-Oct-04	10	18
04-23957	23-Jun-04	2	7	23-Aug-04	9	29-Oct-04	10	19
04-23959	29-Jun-04	2	8	07-Sep-04	10	29-Oct-04	8	18
04-23973	08-Jul-04	2	6	02-Sep-04	8	27-Oct-04	8	16
04-23966	30-Jun-04	1	5	12-Aug-04	6	22-Oct-04	10	16
04-23821	13-Apr-04	2	8	23-Jun-04	10	12-Oct-04	16	26
October 2004 Totals		Sales	Eng		Office		Mfg	Total
Average Weeks:		2.2	7.0		9.3		10.7	20.0

November 2004 Lead Time Data

Order Number	Order Date	Weeks Sales	Weeks Eng	To Mfg Date	Weeks Sales/Eng	Shipment Date	Weeks Mfg	Total Weeks
04-23932	07-Jun-04	2	8	16-Aug-04	10	03-Nov-04	11	21
04-23789	31-Mar-04	3	8	16-Jun-04	11	10-Nov-04	21	32
04-23790	31-Mar-04	3	8	16-Jun-04	11	10-Nov-04	21	32
04-23791	31-Mar-04	3	10	30-Jun-04	13	10-Nov-04	19	32
04-23792	31-Mar-04	3	10	30-Jun-04	13	10-Nov-04	19	32
04-23793	31-Mar-04	3	7	07-Jun-04	10	10-Nov-04	22	32
04-23871	05-May-04	3	5	01-Jul-04	8	10-Nov-04	19	27
04-23872	05-May-04	3	5	01-Jul-04	8	10-Nov-04	19	27
04-23981	13-Jul-04	2	5	03-Sep-04	7	23-Nov-04	12	19
04-23844	28-Apr-04	3	6	29-Jun-04	9	11-Nov-04	19	28
04-23845	28-Apr-04	3	9	22-Jul-04	12	11-Nov-04	16	28
04-23846	28-Apr-04	3	7	08-Jul-04	10	11-Nov-04	18	28
04-24066	17-Aug-04	1	5	28-Sep-04	6	11-Nov-04	6	12
04-23938	14-Jun-04	2	9	01-Sep-04	11	16-Nov-04	11	22
04-23939	14-Jun-04	2	9	01-Sep-04	11	16-Nov-04	11	22
04-23954	24-Jun-04	2	8	31-Aug-04	10	18-Nov-04	11	21
04-23955	24-Jun-04	2	9	10-Sep-04	11	18-Nov-04	10	21
04-23930	07-Jun-04	4	10	10-Sep-04	14	15-Nov-04	10	24
04-23931	07-Jun-04	4	13	30-Sep-04	17	15-Nov-04	7	24
04-23974	12-Jul-04	3	6	15-Sep-04	9	17-Nov-04	9	18
04-23935	14-Jun-04	4	7	30-Aug-04	11	16-Nov-04	11	22
04-23936	14-Jun-04	4	7	27-Aug-04	11	16-Nov-04	12	23
04-23953	18-Jun-04	4	7	02-Sep-04	11	16-Nov-04	11	22
04-24048	05-Aug-04	2	4	17-Sep-04	6	18-Nov-04	9	15
04-23861	04-May-04	3	10	03-Aug-04	13	18-Nov-04	15	28
04-23862	04-May-04	3	11	06-Aug-04	14	18-Nov-04	15	29
04-23958	28-Jun-04	2	8	08-Sep-04	10	29-Nov-04	12	22
04-24008	22-Jul-04	1	0	28-Jul-04	1	22-Nov-04	17	18
04-23737	25-Feb-04	3	9	13-May-04	12	29-Nov-04	29	41
04-23738	25-Feb-04	6	18	11-Aug-04	24	29-Nov-04	16	40
04-23980	13-Jul-04	2	7	14-Sep-04	9	29-Nov-04	11	20
04-23934	14-Jun-04	2	9	30-Aug-04	11	29-Nov-04	13	24
04-24011	23-Jul-04	2	9	07-Oct-04	11	30-Nov-04	8	19
04-24063	05-Aug-04	1	5	16-Sep-04	6	30-Nov-04	11	17
04-24030	04-Aug-04	2	6	29-Sep-04	8	30-Nov-04	9	17
04-24031	04-Aug-04	2	7	06-Oct-04	9	30-Nov-04	8	17
November 2004 Totals		Sales	Eng		Office		Mfg	Total
Average Weeks:		2.7	7.8		10.5		13.8	24.3

December 2004 Lead Time Data

Order Number	Order Date	Weeks Sales	Weeks Eng	To Mfg Date	Weeks Sales/Eng	Shipment Date	Weeks Mfg	Total Weeks
04-23831	19-Apr-04	2	13	03-Aug-04	15	01-Dec-04	17	32
04-23927	08-Jun-04	5	8	09-Sep-04	13	02-Dec-04	12	25
04-24016	28-Jul-04	2	6	20-Sep-04	8	03-Dec-04	11	19
04-24017	28-Jul-04	1	1	13-Aug-04	2	03-Dec-04	16	18
04-24169	30-Sep-04	1	0	05-Oct-04	1	03-Dec-04	9	10
04-24060	10-Aug-04	2	5	28-Sep-04	7	03-Dec-04	10	17
04-24022	30-Jul-04	2	9	12-Oct-04	11	07-Dec-04	8	19
04-24023	30-Jul-04	2	8	08-Oct-04	10	07-Dec-04	9	19
04-24113	10-Sep-04	1	5	20-Oct-04	6	07-Dec-04	7	13
04-24084	23-Aug-04	1	2	16-Sep-04	3	07-Dec-04	12	15
04-24085	23-Aug-04	1	0	31-Aug-04	1	07-Dec-04	14	15
04-23672	01-Feb-04	7	19	26-Jul-04	26	07-Dec-04	19	45
04-23673	01-Feb-04	7	23	23-Aug-04	30	07-Dec-04	15	45
04-23884	12-May-04	6	16	11-Oct-04	22	08-Dec-04	8	30
04-23885	12-May-04	6	17	18-Oct-04	23	08-Dec-04	7	30
04-23886	12-May-04	6	17	18-Oct-04	23	08-Dec-04	7	30
04-23869	04-May-04	5	14	10-Sep-04	19	13-Dec-04	14	33
04-24108	09-Sep-04	1	5	18-Oct-04	6	10-Dec-04	8	14
04-24109	09-Sep-04	1	5	18-Oct-04	6	10-Dec-04	8	14
04-24110	09-Sep-04	1	5	18-Oct-04	6	10-Dec-04	8	14
04-24000	20-Jul-04	3	8	05-Oct-04	11	16-Dec-04	10	21
04-23997	19-Jul-04	4	8	08-Oct-04	12	17-Dec-04	10	22
04-24155	23-Sep-04	1	3	21-Oct-04	4	16-Dec-04	8	12
04-24156	23-Sep-04	1	3	20-Oct-04	4	17-Dec-04	8	12
04-24065	10-Aug-04	2	6	04-Oct-04	8	17-Dec-04	11	19
04-23782	23-Mar-04	1	6	12-May-04	7	23-Dec-04	32	39
04-24015	28-Jul-04	4	12	19-Nov-04	16	22-Dec-04	5	21
04-24034	04-Aug-04	2	6	27-Sep-04	8	22-Dec-04	12	20
04-24134	15-Sep-04	2	6	11-Nov-04	8	21-Dec-04	6	14
04-24135	15-Sep-04	2	5	02-Nov-04	7	21-Dec-04	7	14
04-24158	27-Sep-04	1	4	01-Nov-04	5	28-Dec-04	8	13
04-24028	03-Aug-04	4	10	09-Nov-04	14	28-Dec-04	7	21
04-24103	30-Aug-04	1	4	04-Oct-04	5	28-Dec-04	12	17
04-23801	01-Apr-04	6	18	14-Sep-04	24	30-Dec-04	15	39
04-23802	01-Apr-04	6	22	11-Oct-04	28	30-Dec-04	12	40
04-23803	01-Apr-04	6	22	11-Oct-04	28	30-Dec-04	12	40
04-24086	18-Aug-04	2	5	05-Oct-04	7	30-Dec-04	12	19
04-24087	18-Aug-04	1	3	17-Sep-04	4	30-Dec-04	15	19
04-24112	10-Sep-04	1	5	24-Oct-04	6	30-Dec-04	10	16
December 2004 Totals		Sales	Eng		Office		Mfg	Total

Average Weeks:	2.8	8.6		11.4		11.1	22.4

January 2005 Lead Time Data

Order Number	Order Date	Weeks Sales	Weeks Eng	To Mfg Date	Weeks Sales/Eng	Shipment Date	Weeks Mfg	Total Weeks
04-23998	20-Jul-04	1	0	30-Jul-04	1	03-Jan-05	15	16
04-23999	20-Jul-04	2	7	21-Sep-04	9	03-Jan-05	15	24
04-24106	01-Sep-04	2	8	08-Nov-04	10	04-Jan-05	8	18
04-24100	25-Aug-04	2	5	12-Oct-04	7	04-Jan-05	12	19
04-24105	01-Sep-04	3	11	07-Dec-04	14	06-Jan-05	4	18
04-24059	09-Aug-04	2	6	06-Oct-04	8	07-Jan-05	13	21
04-24152	16-Sep-04	2	8	29-Nov-04	10	05-Jan-05	5	15
04-24032	04-Aug-04	2	6	29-Sep-04	8	10-Jan-05	15	23
04-24033	04-Aug-04	3	8	14-Oct-04	11	10-Jan-05	12	23
04-24143	20-Sep-04	1	3	13-Oct-04	4	12-Jan-05	13	17
04-23804	31-Mar-04	2	7	03-Jun-04	9	07-Jan-05	12	21
04-24124	16-Sep-04	2	7	16-Nov-04	9	11-Jan-05	8	17
04-24187	11-Oct-04	1	3	12-Nov-04	4	14-Jan-05	9	13
04-24144	20-Sep-04	1	3	20-Oct-04	4	12-Jan-05	12	16
04-24145	20-Sep-04	1	4	27-Oct-04	5	12-Jan-05	11	16
04-24111	10-Sep-04	1	5	29-Oct-04	6	05-Jan-05	10	16
04-24215	04-Oct-04	1	0	26-Oct-04	1	11-Jan-05	11	12
04-24167	24-Sep-04	2	5	15-Nov-04	7	17-Jan-05	9	16
04-24074	13-Aug-04	3	9	08-Nov-04	12	14-Jan-05	9	21
04-24178	05-Oct-04	2	8	13-Dec-04	10	19-Jan-05	5	15
04-24179	05-Oct-04	2	8	13-Dec-04	10	19-Jan-05	5	15
04-24227	22-Oct-04	1	2	10-Nov-04	3	19-Jan-05	10	13
04-23968	30-Jun-04	4	10	07-Oct-04	14	26-Jan-05	16	30
04-23969	30-Jun-04	4	10	07-Oct-04	14	26-Jan-05	16	30
04-24024	02-Aug-04	5	14	16-Dec-04	19	26-Jan-05	5	24
04-24025	02-Aug-04	5	14	16-Dec-04	19	26-Jan-05	5	24
04-24026	02-Aug-04	5	14	16-Dec-04	19	26-Jan-05	5	24
04-23646	06-Jan-04	6	11	03-May-04	17	19-Jan-05	38	55
04-23647	06-Jan-04	6	11	03-May-04	17	19-Jan-05	38	55
04-24053	06-Aug-04	2	8	18-Oct-04	10	26-Jan-05	14	24
04-24007	21-Jul-04	3	10	18-Oct-04	13	27-Jan-05	14	27
04-24035	04-Aug-04	2	8	13-Oct-04	10	31-Jan-05	15	25
04-24283	24-Nov-04	1	4	03-Jan-05	5	31-Jan-05	4	9
04-24226	22-Oct-04	1	2	10-Nov-04	3	31-Jan-05	11	14
January 2005 Totals		Sales	Eng		Office		Mfg	Total
Average Weeks:		2.4	7.0		9.5		11.9	21.4

February 2005 Lead Time Data

Order Number	Order Date	Weeks Sales	Weeks Eng	To Mfg Date	Weeks Sales/Eng	Shipment Date	Weeks Mfg	Total Weeks
04-24146	14-Sep-04	2	6	15-Nov-04	8	04-Feb-05	11	19
04-24147	14-Sep-04	2	6	15-Nov-04	8	04-Feb-05	11	19
04-24148	14-Sep-04	2	6	15-Nov-04	8	04-Feb-05	11	19
04-24340	03-Dec-04	1	1	06-Jan-05	2	04-Feb-05	4	6
04-24159	28-Sep-04	1	6	17-Nov-04	7	04-Feb-05	11	18
04-24136	15-Sep-04	1	4	28-Oct-04	5	07-Feb-05	14	19
04-24137	15-Sep-04	1	4	28-Oct-04	5	07-Feb-05	14	19
04-24170	30-Sep-04	2	6	29-Nov-04	8	07-Feb-05	9	17
04-24171	30-Sep-04	2	6	29-Nov-04	8	07-Feb-05	9	17
04-24114	10-Sep-04	3	8	01-Dec-04	11	07-Feb-05	9	20
04-24115	10-Sep-04	3	8	01-Dec-04	11	07-Feb-05	9	20
04-23856	30-Apr-04	7	14	21-Sep-04	21	11-Feb-05	19	40
04-24210	15-Oct-04	1	1	01-Nov-04	2	07-Feb-05	14	16
04-24186	07-Oct-04	2	8	22-Dec-04	10	18-Feb-05	8	18
04-24253	08-Nov-04	2	7	10-Jan-05	9	11-Feb-05	4	13
04-24098	23-Aug-04	3	8	08-Nov-04	11	11-Feb-05	14	25
04-24172	05-Oct-04	3	4	22-Nov-04	7	11-Feb-05	12	19
04-24173	05-Oct-04	3	4	22-Nov-04	7	11-Feb-05	12	19
04-24174	23-Aug-04	3	9	27-Dec-04	12	11-Feb-05	7	19
04-24175	23-Aug-04	3	9	27-Dec-04	12	11-Feb-05	7	19
04-24081	18-Aug-04	4	9	22-Nov-04	13	11-Feb-05	13	26
04-24083	18-Aug-04	4	10	30-Nov-04	14	11-Feb-05	12	26
04-24082	18-Aug-04	4	10	29-Nov-04	14	11-Feb-05	12	26
04-24004	21-Jul-04	4	12	11-Nov-04	16	11-Feb-05	14	30
04-24005	21-Jul-04	4	15	01-Dec-05	19	11-Feb-05	11	30
04-24006	21-Jul-04	4	15	29-Nov-05	19	11-Feb-05	11	30
04-24088	17-Aug-04	2	5	15-Oct-04	7	18-Feb-05	18	25
04-24091	17-Aug-04	2	7	02-Nov-04	9	18-Feb-05	16	25
04-24018	02-Aug-04	2	3	08-Sep-04	5	23-Feb-05	24	29
04-24019	02-Aug-04	2	3	08-Sep-04	5	23-Feb-05	24	29
04-24254	08-Nov-04	1	3	06-Dec-04	4	23-Feb-05	11	15
04-24229	26-Oct-04	1	6	14-Dec-04	7	21-Feb-05	10	17
04-24257	10-Nov-04	1	4	14-Dec-04	5	21-Feb-05	10	15
04-24250	02-Nov-04	2	5	22-Dec-04	7	21-Feb-05	9	16
04-24125	09-Sep-04	3	8	02-Dec-05	11	23-Feb-05	12	23
04-24126	09-Sep-04	3	8	02-Dec-04	11	23-Feb-05	12	23
04-24247	09-Sep-04	1	4	10-Dec-04	5	23-Feb-05	10	15

04-24248	04-Nov-04	2	7	06-Jan-05	9	28-Feb-05	7	16
04-24127	09-Sep-04	3	10	17-Dec-04	13	28-Feb-05	10	23
February 2005 Totals		Sales	Eng		Office		Mfg	Total
Average Weeks:		2.5	6.9		9.4		11.7	21.0

March 2005 Lead Time Data

Order Number	Order Date	Weeks Sales	Weeks Eng	To Mfg Date	Weeks Sales/Eng	Shipment Date	Weeks Mfg	Total Weeks
04-23940	20-Jun-04	4	13	12-Oct-04	17	04-Mar-05	20	37
04-23941	20-Jun-04	4	13	05-Oct-04	17	04-Mar-05	20	37
04-24208	20-Oct-04	2	0	01-Nov-04	2	04-Mar-05	14	16
04-24209	20-Oct-04	2	0	29-Oct-04	2	04-Mar-05	14	16
04-24182	27-Oct-04	3	6	14-Dec-04	9	11-Mar-05	12	21
04-24296	04-Dec-04	2	5	21-Jan-05	7	11-Mar-05	7	14
04-24259	10-Nov-04	1	5	23-Dec-04	6	08-Mar-05	11	17
04-24260	04-Dec-04	2	7	11-Jan-05	9	08-Mar-05	8	17
04-24303	04-Dec-04	1	4	19-Jan-05	5	08-Mar-05	7	12
04-24304	10-Dec-04	1	4	17-Jan-05	5	08-Mar-05	7	12
04-24305	10-Dec-04	1	4	17-Jan-05	5	08-Mar-05	7	12
04-24102	08-Sep-04	2	5	28-Oct-04	7	04-Mar-05	11	18
05-24371	11-Jan-05	1	1	25-Jan-05	2	04-Mar-05	6	8
04-23855	05-May-04	7	22	19-Nov-04	29	11-Mar-05	16	45
04-24212	12-Oct-04	2	6	10-Dec-04	8	11-Mar-05	13	21
04-24128	09-Sep-04	2	7	22-Nov-04	9	04-Mar-05	11	20
03-23135	12-Oct-04	2	7	17-Dec-04	9	04-Mar-05	11	20
04-24129	16-Sep-04	2	8	30-Nov-04	10	04-Mar-05	10	20
04-24317	27-Dec-04	1	4	19-Jan-05	5	11-Mar-05	5	10
04-24318	27-Dec-04	1	4	19-Jan-05	5	11-Mar-05	5	10
04-24255	10-Nov-04	3	8	28-Jan-05	11	11-Mar-05	6	17
04-24242	10-Nov-04	4	7	21-Jan-05	11	18-Mar-05	8	19
04-24243	10-Nov-04	4	13	11-Feb-05	17	18-Mar-05	6	23
04-24188	12-Oct-04	3	4	16-Dec-04	7	18-Mar-05	14	21
04-24189	12-Oct-04	3	4	16-Dec-04	7	18-Mar-05	14	21
04-24190	12-Oct-04	3	4	16-Dec-04	7	18-Mar-05	14	21
04-24191	12-Oct-04	3	6	27-Dec-05	9	18-Mar-05	12	21
04-24197	12-Oct-04	3	4	16-Dec-04	7	18-Mar-05	14	21
04-24258	10-Nov-04	2	4	23-Dec-04	6	21-Mar-05	13	19
04-24138	01-Oct-04	4	7	10-Dec-04	11	24-Mar-05	15	26
04-24342	27-Dec-04	1	2	13-Jan-05	3	11-Mar-05	7	10
04-24236	28-Oct-04	3	8	13-Jan-05	11	30-Mar-05	11	22
04-24240	01-Oct-04	3	7	11-Jan-05	10	04-Mar-05	7	17
04-24345	20-Dec-04	1	2	11-Jan-05	3	30-Mar-05	11	14
March 2005 Totals		Sales	Eng		Office		Mfg	Total

Average Weeks:	2.4	6.0		8.5		10.8	19.3

April 2005 Lead Time Data

Order Number	Order Date	Weeks Sales	Weeks Eng	To Mfg Date	Weeks Sales/Eng	Shipment Date	Weeks Mfg	Total Weeks
04-24061	12-Aug-04	5	10	17-Nov-04	15	01-Apr-05	19	34
04-24062	12-Aug-04	5	17	11-Jan-05	22	01-Apr-05	10	32
04-24183	09-Oct-04	4	12	24-Jan-05	16	04-Apr-05	9	25
04-24184	09-Oct-04	4	12	24-Jan-05	16	04-Apr-05	9	25
04-24249	28-Oct-04	4	9	01-Feb-05	13	04-Apr-05	9	22
05-24441	18-Feb-05	2	1	09-Mar-05	3	08-Apr-05	4	7
04-24282	23-Nov-04	3	5	21-Jan-05	8	08-Apr-05	11	19
04-24288	28-Nov-04	3	4	19-Jan-05	7	08-Apr-05	11	18
04-24289	28-Nov-04	3	9	22-Feb-05	12	08-Apr-05	7	19
04-24237	03-Nov-04	3	11	09-Feb-05	14	15-Apr-05	8	22
04-24233	28-Oct-04	4	8	21-Jan-05	12	15-Apr-05	12	24
04-24312	05-Dec-04	3	7	16-Feb-05	10	15-Apr-05	8	18
04-24313	05-Dec-04	3	7	16-Feb-05	10	15-Apr-05	8	18
04-24222	25-Oct-04	4	9	25-Jan-05	13	22-Apr-05	13	26
04-24223	25-Oct-04	4	9	25-Jan-05	13	22-Apr-05	13	26
05-24428	11-Feb-05	1	0	16-Feb-05	1	22-Apr-05	10	11
05-24475	11-Feb-05	1	1	23-Mar-05	2	22-Apr-05	5	7
04-24101	25-Aug-04	2	7	28-Oct-04	9	29-Apr-05	26	35
04-24130	25-Aug-04	5	14	28-Jan-05	19	25-Apr-05	13	32
04-24131	25-Aug-04	5	14	28-Jan-05	19	25-Apr-05	13	32
04-24132	25-Aug-04	5	16	07-Feb-05	21	25-Apr-05	11	32
04-24133	25-Aug-04	5	16	09-Feb-05	21	25-Apr-05	11	32
04-24140	15-Sep-04	5	16	11-Feb-05	21	22-Apr-05	11	32
04-24141	15-Sep-04	5	20	09-Mar-05	25	22-Apr-05	7	32
04-24333	23-Dec-04	2	8	02-Mar-05	10	25-Apr-05	8	18
04-24334	21-Dec-04	2	6	15-Feb-05	8	22-Apr-05	10	18
04-23833	02-Mar-05	1	0	04-Mar-05	1	29-Apr-05	8	9
04-23850	30-Apr-04	6	17	04-Oct-04	23	29-Apr-05	30	53
April 2005 Totals		Sales	Eng		Office		Mfg	Total
Average Weeks:		3.5	9.5		13.0		11.2	24.2

May 2005 Lead Time Data

Order Number	Order Date	Weeks Sales	Weeks Eng	To Mfg Date	Weeks Sales/Eng	Shipment Date	Weeks Mfg	Total Weeks
04-24321	18-Dec-04	3	8	04-Mar-05	11	06-May-05	8	19
04-24322	18-Dec-04	3	8	04-Mar-05	11	06-May-05	8	19
05-24380	28-Jan-05	1	1	11-Feb-05	2	09-May-05	13	15
04-24332	28-Dec-04	2	8	02-Mar-05	10	06-May-05	8	18
04-24338	18-Dec-04	2	8	28-Feb-05	10	06-May-05	9	19
05-24402	04-Feb-05	2	6	30-Mar-05	8	06-May-05	5	13
05-24404	04-Feb-05	2	6	28-Mar-05	8	06-May-05	5	13
04-24263	28-Nov-04	4	11	11-Mar-05	15	06-May-05	7	22
04-24264	28-Nov-04	4	8	16-Feb-05	12	06-May-05	11	23
04-24294	28-Nov-04	2	9	21-Feb-05	11	13-May-05	11	22
04-24324	15-Dec-04	2	9	02-Mar-05	11	13-May-05	11	22
04-24251	11-Nov-04	3	13	04-Mar-05	16	06-May-05	9	25
05-24477	11-Mar-05	1	4	11-Apr-05	5	13-May-05	5	10
05-24406	04-Feb-05	2	6	30-Mar-05	8	06-May-05	5	13
04-24287	28-Nov-04	4	12	18-Mar-05	16	13-May-05	7	23
04-24315	14-Dec-04	2	8	22-Feb-05	10	13-May-05	9	19
04-24241	03-Nov-04	2	8	11-Jan-05	10	13-May-05	14	24
04-24244	03-Nov-04	2	15	04-Mar-05	17	13-May-05	10	27
04-24284	28-Nov-04	2	8	09-Feb-05	10	19-May-05	13	23
04-24285	28-Nov-04	2	6	20-Jan-05	8	11-May-05	14	22
05-24386	21-Jan-05	2	6	21-Mar-05	8	20-May-05	9	17
04-24314	07-Dec-04	3	9	04-Mar-05	12	16-May-05	4	16
04-24330	07-Dec-04	3	9	14-Mar-05	12	24-May-05	9	21
04-24341	21-Dec-04	2	4	02-Feb-05	6	16-May-05	12	18
04-24192	20-Oct-04	2	8	03-Jan-05	10	16-May-05	11	21
04-24193	20-Oct-04	2	8	03-Jan-05	10	16-May-05	11	21
05-24389	21-Jan-05	2	5	18-Mar-05	7	26-May-05	10	17
04-24339	23-Dec-04	2	8	01-Mar-05	10	16-May-05	9	19
05-24364	07-Jan-05	3	10	01-Apr-05	13	27-May-05	8	21
04-24349	07-Jan-05	3	9	29-Mar-05	12	31-May-05	9	21
04-24292	01-Dec-04	3	10	01-Mar-05	13	06-May-05	8	21
05-24397	14-Jan-05	2	7	29-Mar-05	9	31-May-05	9	18
05-24396	14-Jan-05	2	7	29-Mar-05	9	31-May-05	9	18
05-24401	14-Jan-05	2	7	29-Mar-05	9	31-May-05	9	18
04-24290	03-Dec-04	3	11	07-Mar-05	14	26-May-05	9	23
05-24365	07-Jan-05	3	10	01-Apr-05	13	31-May-05	9	22
04-24336	18-Dec-04	3	11	28-Mar-05	14	16-May-05	7	21
04-24204	16-Oct-04	4	14	22-Feb-05	18	31-May-05	14	32
May 2005 Totals		Sales	Eng		Office		Mfg	Total
Average Weeks:		2.4	8.3		10.7		9.2	19.9

June 2005 Lead Time Data

Order Number	Order Date	Weeks Sales	Weeks Eng	To Mfg Date	Weeks Sales/Eng	Shipment Date	Weeks Mfg	Total Weeks
04-24352	14-Jan-05	3	10	08-Apr-05	13	01-Jun-05	8	21
05-24363	14-Jan-05	3	10	08-Apr-05	13	01-Jun-05	8	21
04-24307	05-Dec-04	4	13	01-Apr-05	17	03-Jun-05	9	26
04-24351	07-Jan-05	4	10	12-Apr-05	14	08-Jun-05	8	22
05-24504	18-Mar-05	2	1	30-Mar-05	3	09-Jun-05	10	13
04-24344	28-Dec-04	3	9	17-Mar-05	12	10-Jun-05	12	24
04-24343	28-Dec-04	3	9	14-Mar-05	12	10-Jun-05	13	25
05-24356	14-Jan-05	2	8	17-Mar-05	10	10-Jun-05	12	22
04-24266	29-Nov-04	4	10	02-Mar-05	14	10-Jun-05	14	28
04-24267	29-Nov-04	4	8	17-Feb-05	12	10-Jun-05	16	28
04-24295	29-Nov-04	3	6	02-Feb-05	9	13-Jun-05	19	28
05-24394	28-Jan-05	2	7	01-Apr-05	9	15-Jun-05	11	20
05-24395	28-Jan-05	2	7	01-Apr-05	9	15-Jun-05	11	20
05-24400	28-Jan-05	3	9	22-Apr-05	12	15-Jun-05	8	20
05-24393	28-Jan-05	3	8	11-Apr-05	11	16-Jun-05	10	21
05-24415	11-Feb-05	2	6	08-Apr-05	8	15-Jun-05	10	18
05-24458	18-Feb-05	1	1	04-Mar-05	2	15-Jun-05	15	17
05-24384	21-Jan-05	1	6	11-Mar-05	7	17-Jun-05	14	21
04-24202	20-Oct-04	6	11	15-Feb-05	17	17-Jun-05	18	35
04-24203	20-Oct-04	6	18	04-Apr-05	24	17-Jun-05	11	35
05-24416	04-Feb-05	2	9	22-Apr-05	11	17-Jun-05	8	19
05-24417	11-Feb-05	1	1	28-Feb-05	2	24-Jun-05	17	19
04-24205	12-Oct-04	6	14	04-Mar-05	20	23-Jun-05	16	36
05-24418	18-Feb-05	2	6	07-Apr-05	8	20-Jun-05	11	19
05-24434	18-Feb-05	2	6	07-Apr-05	8	20-Jun-05	11	19
05-24461	25-Feb-05	2	7	29-Apr-05	9	22-Jun-05	8	17
05-24462	25-Feb-05	2	7	29-Apr-05	9	22-Jun-05	8	17
05-24385	14-Jan-05	2	10	13-Apr-05	12	28-Jun-05	11	23
05-24433	11-Feb-05	2	8	25-Apr-05	10	24-Jun-05	9	19
05-24436	11-Feb-05	2	8	21-Apr-05	10	24-Jun-05	9	19
05-24437	11-Feb-05	1	2	10-Mar-05	3	24-Jun-05	15	18
05-24481	18-Mar-05	1	6	02-May-05	7	29-Jun-05	8	15
05-24460	11-Mar-05	1	8	02-May-05	9	29-Jun-05	8	17
05-24445	11-Feb-05	2	9	04-May-05	11	29-Jun-05	8	19
04-24316	20-Dec-04	3	12	29-Mar-05	15	30-Jun-05	13	28
05-24482	11-Mar-05	1	5	22-Apr-05	6	29-Jun-05	10	16
05-24412	04-Feb-05	4	10	10-May-05	14	30-Jun-05	7	21
05-24413	04-Feb-05	4	12	03-Jun-05	16	30-Jun-05	4	20
05-24440	18-Feb-05	2	9	02-May-05	11	30-Jun-05	9	20

June 2005 Totals	Sales	Eng		Office		Mfg	Total
Average Weeks:	2.6	8.1		10.7		10.9	21.7

July 2005 Lead Time Data

Order Number	Order Date	Weeks Sales	Weeks Eng	To Mfg Date	Weeks Sales/Eng	Shipment Date	Weeks Mfg	Total Weeks
04-24262	10-Nov-04	5	18	28-Apr-05	23	08-Jul-05	10	33
05-24387	21-Jan-05	3	9	20-Apr-05	12	08-Jul-05	12	24
05-24388	21-Jan-05	3	9	21-Apr-05	12	08-Jul-05	11	23
05-24391	28-Jan-05	4	11	12-May-05	15	08-Jul-05	8	23
05-24392	28-Jan-05	3	8	11-Apr-05	11	08-Jul-05	13	24
05-24467	04-Mar-05	2	6	29-Apr-05	8	08-Jul-05	10	18
05-24432	18-Feb-05	3	8	28-Apr-05	11	12-Jul-05	11	22
05-24489	18-Apr-05	2	5	09-May-05	7	13-Jul-05	9	16
04-24311	15-Dec-04	5	13	12-Apr-05	18	14-Jul-05	14	32
05-24423	11-Feb-05	2	8	29-Apr-05	10	14-Jul-05	11	21
05-24424	04-Feb-05	1	5	24-Mar-05	6	14-Jul-05	16	22
05-24390	21-Jan-05	2	9	12-Apr-05	11	20-Jul-05	14	25
05-24556	22-Apr-05	1	4	24-May-05	5	22-Jul-05	9	14
05-24487	18-Mar-05	1	0	29-Mar-05	1	22-Jul-05	17	18
05-24488	18-Mar-05	1	0	29-Mar-05	1	22-Jul-05	17	18
05-24498	11-Mar-05	2	6	13-May-05	8	26-Jul-05	11	19
05-24562	22-Apr-05	2	6	13-Jun-05	8	27-Jul-05	7	15
05-24495	11-Mar-05	2	7	17-May-05	9	27-Jul-05	10	19
05-24569	22-Apr-05	1	6	13-Jun-05	7	28-Jul-05	7	14
05-24515	25-Mar-05	1	6	16-May-05	7	28-Jul-05	11	18
05-24492	11-Mar-05	3	8	02-Jun-05	11	29-Jul-05	8	19
05-24528	08-Apr-05	2	7	09-Jun-05	9	29-Jul-05	7	16
05-24529	08-Apr-05	2	7	08-Jun-05	9	29-Jul-05	8	17
05-24530	08-Apr-05	2	6	25-May-05	8	29-Jul-05	9	17
05-24526	01-Apr-05	2	5	19-May-05	7	31-Jul-05	11	18
July 2005 Totals		Sales	Eng		Office		Mfg	Total
Average Weeks:		2.3	7.1		9.4		10.8	20.2

August 2005 Lead Time Data

Order Number	Order Date	Weeks Sales	Weeks Eng	To Mfg Date	Weeks Sales/Eng	Shipment Date	Weeks Mfg	Total Weeks
04-24293	04-Dec-04	6	18	19-May-05	24	04-Aug-05	11	35
05-24551	18-Apr-05	1	1	03-May-05	2	10-Aug-05	14	16
04-23825	18-May-05	1	1	25-May-05	1	09-Aug-05	11	12

05-24549	29-Apr-05	1	4	26-May-05	5	10-Aug-05	11	16
05-24463	04-Mar-05	2	8	10-May-05	10	12-Aug-05	14	24
05-24604	12-May-05	1	1	26-May-05	2	12-Aug-05	11	13
05-24605	12-May-05	1	4	14-Jun-05	5	12-Aug-05	9	14
05-24643	27-May-05	1	2	24-Jun-05	3	12-Aug-05	7	10
05-24702	17-Jun-05	1	2	12-Jul-05	3	16-Aug-05	5	8
05-24703	17-Jun-05	1	2	12-Jul-05	3	16-Aug-05	5	8
05-24624	20-May-05	1	1	02-Jun-05	2	17-Aug-05	11	13
05-24525	01-Apr-05	1	5	13-May-05	6	18-Aug-05	14	20
05-24571	15-Apr-05	1	6	10-Jun-05	7	19-Aug-05	10	17
05-24490	18-Mar-05	1	4	19-Apr-05	5	22-Aug-05	18	23
05-24669	27-May-05	1	2	17-Jun-05	3	23-Aug-05	10	13
05-24670	27-May-05	1	2	17-Jun-05	3	23-Aug-05	10	13
05-24516	01-Apr-05	1	3	03-May-05	4	22-Aug-05	16	20
05-24510	25-Mar-05	1	7	26-May-05	8	24-Aug-05	13	21
05-24509	25-Mar-05	3	10	28-Jun-05	13	25-Aug-05	8	21
05-24577	06-May-05	2	6	28-Jun-05	8	25-Aug-05	8	16
05-24625	17-May-05	1	2	14-Jun-05	3	26-Aug-05	11	14
05-24592	06-May-05	2	6	29-Jun-05	8	26-Aug-05	8	16
05-24559	29-Apr-05	2	6	22-Jun-05	8	29-Aug-05	10	18
05-24491	11-Mar-05	2	8	26-May-05	10	31-Aug-05	14	24
04-24117	15-Sep-04	9	23	28-Apr-05	32	30-Aug-05	18	50
04-24119	15-Sep-04	9	23	28-Apr-05	32	30-Aug-05	18	50
04-24120	15-Sep-04	9	23	28-Apr-05	32	30-Aug-05	18	50
04-24122	15-Sep-04	9	23	28-Apr-05	32	30-Aug-05	18	50
04-24121	15-Sep-04	9.00	23	28-Apr-05	32	30-Aug-05	18	50
04-24123	15-Sep-04	9	23	16-May-05	32	30-Aug-05	15	47
05-24524	01-Apr-05	9	0	01-Jun-05	9	31-Aug-05	13	22
August 2005 Totals		Sales	Eng		Office		Mfg	Total
Average Weeks:		3.2	8.0		11.2		12.2	23.4

September 2005 Lead Time Data

Order Number	Order Date	Weeks Sales	Weeks Eng	To Mfg Date	Weeks Sales/Eng	Shipment Date	Weeks Mfg	Total Weeks
04-24269	30-Nov-04	8	10	24-Mar-05	18	14-Sep-05	25	43
04-24270	30-Nov-04	8	10	24-Mar-05	18	14-Sep-05	25	43
04-24273	30-Nov-04	8	10	29-Mar-05	18	14-Sep-05	24	42
04-24272	30-Nov-04	8	10	24-Mar-05	18	14-Sep-05	25	43
04-24274	30-Nov-04	8	9	24-Mar-05	17	14-Sep-05	25	42
04-24275	30-Nov-04	8	9	18-Mar-05	17	14-Sep-05	26	43
04-24276	30-Nov-04	8	9	18-Mar-05	17	14-Sep-05	26	43

04-24277	30-Nov-04	8	9	18-Mar-05	17	14-Sep-05	26	43
04-24278	30-Nov-04	8	9	24-Mar-05	17	14-Sep-05	25	42
04-24279	30-Nov-04	8	9	18-Mar-05	17	14-Sep-05	26	43
04-24280	30-Nov-04	8	9	18-Mar-05	17	14-Sep-05	26	43
04-24281	30-Nov-04	8	9	18-Mar-05	17	14-Sep-05	26	43
05-24629	27-May-05	1	3	22-Jun-05	4	12-Sep-05	12	16
05-24600	20-May-05	2	7	08-Jul-05	9	15-Sep-05	10	19
05-24644	20-May-05	2	5	08-Jul-05	7	12-Sep-05	9	16
05-24614	13-May-05	2	6	07-Jul-05	8	14-Sep-05	10	18
05-24615	13-May-05	2	7	12-Jul-05	9	14-Sep-05	9	18
05-24616	13-May-05	2	3	15-Jun-05	5	13-Sep-05	13	18
05-24420	11-Feb-05	4	11	24-May-05	15	14-Sep-05	16	31
05-24421	11-Feb-05	3	9	03-May-05	12	14-Sep-05	19	31
05-24538	15-Apr-05	2	7	15-Jun-05	9	15-Sep-05	13	22
05-24540	25-Mar-05	3	9	08-Jul-05	12	15-Sep-05	10	22
05-24619	15-Apr-05	2	7	13-Jul-05	9	20-Sep-05	10	19
05-24673	10-Jun-05	1	1	23-Jun-05	2	20-Sep-05	13	15
04-24319	07-Dec-04	9	19	20-Jun-05	28	26-Sep-05	14	42
04-24320	07-Dec-04	9	21	07-Jul-05	30	26-Sep-05	12	42
05-24696	28-Jun-05	1	2	13-Jul-05	3	29-Sep-05	11	14
04-24582	27-May-05	7	8	09-Aug-05	15	30-Sep-05	8	23
04-24583	27-May-05	7	8	09-Aug-05	15	30-Sep-05	8	23
05-24425	11-Feb-05	7	10	02-Jun-05	17	30-Sep-05	17	34
05-24508	11-Feb-05	3	8	14-Jun-05	11	30-Sep-05	16	27
05-24610	20-May-05	2	7	14-Jul-05	9	28-Sep-05	11	20
05-24622	20-May-05	2	7	12-Jul-05	9	29-Sep-05	11	20
05-24701	24-Jun-05	1	2	12-Jul-05	3	29-Sep-05	11	14
05-24686	03-Jun-05	2	5	22-Jul-05	7	30-Sep-05	10	17
05-24661	26-May-05	2	7	03-Aug-05	9	29-Sep-05	8	17
05-24697	17-Jun-05	1	2	13-Jul-05	3	29-Sep-05	11	14
05-24734	11-Jul-05	1	1	25-Jul-05	2	30-Sep-05	10	12
September 2005 Totals		Sales	Eng		Office		Mfg	Total
Average Weeks:		4.6	7.7		12.4		16.0	28.3

October 2005 Lead Time Data

Order Number	Order Date	Weeks Sales	Weeks Eng	To Mfg Date	Weeks Sales/Eng	Shipment Date	Weeks Mfg	Total Weeks
05-24665	03-Jun-05	1	4	11-Jul-05	5	03-Oct-05	12	17
05-24469	04-Mar-05	6	13	12-Jul-05	19	04-Oct-05	12	31
05-24470	04-Mar-05	6	14	15-Jul-05	20	04-Oct-05	12	32
05-24471	04-Mar-05	6	14	15-Jul-05	20	04-Oct-05	12	32
05-24687	17-Jun-05	6	1	04-Aug-05	7	04-Oct-05	9	16

05-24608	13-May-05	2	8	19-Jul-05	10	04-Oct-05	11	21
05-24692	17-Jun-05	2	7	19-Aug-05	9	06-Oct-05	7	16
05-24620	13-May-05	2	8	19-Jul-05	10	06-Oct-05	11	21
05-24741	08-Jul-05	1	4	10-Aug-05	5	07-Oct-05	8	13
05-24684	10-Jun-05	2	9	19-Aug-05	11	05-Oct-05	7	18
05-24679	10-Jun-05	2	8	10-Aug-05	10	07-Oct-05	8	18
05-24680	10-Jun-05	2	8	10-Aug-05	10	07-Oct-05	8	18
05-24567	29-Apr-05	7	10	15-Aug-05	17	10-Oct-05	8	25
05-24698	22-Jun-05	1	2	13-Jul-05	3	12-Oct-05	13	16
05-24500	18-Mar-05	8	11	29-Jul-05	19	14-Oct-05	11	30
05-24501	18-Mar-05	8	11	29-Jul-05	19	14-Oct-05	11	30
05-24502	18-Mar-05	8	11	29-Jul-05	19	14-Oct-05	11	30
05-24705	30-Jun-05	2	5	15-Aug-05	7	14-Oct-05	9	16
05-24706	30-Jun-05	2	5	15-Aug-05	7	14-Oct-05	9	16
05-24631	27-May-05	2	9	10-Aug-05	11	14-Oct-05	9	20
05-24575	06-May-05	8	9	23-Aug-05	17	18-Oct-05	8	25
05-24573	06-May-05	6	10	11-Aug-05	16	18-Oct-05	10	26
05-24723	06-May-05	1	4	11-Aug-05	5	18-Oct-05	10	15
05-24626	13-May-05	4	11	24-Aug-05	15	18-Oct-05	8	23
05-24740	08-Jul-05	2	4	24-Aug-05	6	18-Oct-05	8	14
05-24632	20-May-05	3	9	10-Aug-05	12	20-Oct-05	10	22
05-24728	08-Jul-05	2	7	02-Sep-05	9	21-Oct-05	7	16
05-24780	05-Aug-05	2	5	16-Sep-05	7	20-Oct-05	5	12
05-24715	17-Jun-05	1	5	08-Aug-05	6	25-Oct-05	11	17
05-24650	03-Jun-05	4	8	23-Aug-05	12	21-Oct-05	9	21
05-24662	27-May-05	4	9	24-Aug-05	13	26-Oct-05	9	22
05-24664	27-May-05	4	8	23-Aug-05	12	26-Oct-05	9	21
05-24730	17-Jun-05	3	9	16-Sep-05	12	31-Oct-05	7	19
05-24732	17-Jun-05	3	8	07-Sep-05	11	31-Oct-05	8	19
05-24744	15-Jul-05	1	5	25-Aug-05	6	31-Oct-05	10	16
05-24520	18-Mar-05	9	12	18-Aug-05	21	31-Oct-05	11	32
05-24522	18-Mar-05	9	12	18-Aug-05	21	31-Oct-05	11	32
05-24518	18-Mar-05	9	12	18-Aug-05	21	31-Oct-05	11	32
05-24725	08-Jul-05	1	5	17-Aug-05	6	31-Oct-05	11	17
October 2005 Totals		Sales	Eng		Office		Mfg	Total
Average Weeks:		3.9	8.1		11.9		9.5	21.5

Appendix B: Manufacturing Hours Data

Average Manufacturing Hours per Order

	2004 Average Hours	2005 Average Hours
January:	323.5	304.1
February	347	338.8
March	330.9	428.7
April	362.1	352.1
May	332.5	363
June	362.1	372.7
July	353.7	370.8
August	253.9	461.7
September	344.5	412.7
October	425.4	356.9
November	354.4	
December	306.3	
Average Hours	341.4	376.2

Appendix C: Percent of Manufacturing Contact Time Data

Average Manufacturing Contact Time Per Order

	2004 Average Contact Time	2005 Average Contact Time
January:	18%	15%
February	6%	17%
March	18%	24%
April	16%	19%
May	16%	23%
June	22%	19%
July	18%	20%
August	9%	23%
September	17%	15%
October	24%	21%
November	15%	
December	14%	
Percent Contact Time	16%	20%

Note: Percentage shown indicates manufacturing hours required to produce the order as compared to the total hours the order was in manufacturing.

Appendix D: Average Lead Time Data

2004 Lead Time Summary

	Office	Manufacturing	Total Lead Time
January:	8.1	10.4	18.4
February	9	10.4	19.5
March	6.5	10.7	17.2
April	8.8	12.3	21.1
May	8.5	11.9	20.4
June	8.7	9.9	18.6
July	9.9	11.4	21.4
August	7.1	15	22.1
September	8.6	11.7	20.3
October	9.3	10.7	20
November	10.5	13.8	24.3
December	11.4	11.1	22.4
2004 Averages	8.9	11.6	20.5

2005 Lead Time Summary

	Office	Manufacturing	Total Lead Time
January:	9.5	11.9	21.4
February	9.4	11.7	21
March	8.5	10.8	19.3
April	13	11.2	24.2
May	10.7	9.2	19.9
June	10.7	10.9	21.7
July	9.4	10.8	20.2
August	11.2	12.2	23.3
September	12.4	16	28.3
October	11.9	9.5	21.5
2005 Averages	10.7	11.4	22.1

Note: lead times are expressed in weeks