Engineering Management
Field Project

# Empowering Employees to Design a Department Structure to Achieve Corporate Goals

By

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# EXECUTIVE SUMMARY

Organizational structural change can be used by today's companies as a method for improving performance. While reorganization may be beneficial, the new structural design needs to be effective and implementation may be difficult due to employee resistance to change. To overcome these issues, employee empowerment initiatives can be utilized, allowing those whose jobs are affected be directly involved in creating the solution. Allowing employees to define their own organizational structure and roles can result in an effective plan for change that can be successfully implemented.

Company X is an original equipment manufacturer of equipment for the food industry. The Engineering Department at Company X has grown over the years with little planning involving organizational structure. Company X management has challenged the department to improve its processes, leading to frustration among department members deriving from their inability to make improvements due to the current structure and job responsibilities.

The purpose of this field project is to attempt to create an organizational restructuring plan for the Company X Engineering Department using a bottom-up, employee empowered approach. This plan will include details for using current resource levels as well as a plan for adding personnel. This field project paper presents a literature review of key themes involved in the restructuring efforts and the current department structure is examined. The process of the plan creation is detailed, including identifying department issues, soliciting management for goals, and creation of a current organizational structure and growth plan. Plan results are shared as well as conclusions from conducting the field project.

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NOTE: Company specific information contained in this report has been altered for public posting.

# CHAPTER 1: INTRODUCTION

## 1.1 Topic Overview

Organizational structural change can and should be examined by today's businesses as a method of improving their performance. Often companies and departments are setup in a manner that was appropriate at their inception. The structure should periodically be reviewed to assure it remains appropriate when considering company growth, changing needs and improving technology. Organizational structure should also remain consistent with a company's values and long term goals. Continuing to maintain the status quo may not yield the best utilization of company resources and may be detrimental to helping a company execute their strategic plan.

Implementation of structural change typically encounters resistance from employees (Labianca, Gray et al. 2000). Successful implementation relies on the change actually being an improvement and the employees accepting the change. Including employees in the planning of the structural change can address both concerns. Employees understand their current job functions and processes better than upper management, and using their understanding can help to create an improved structure. Empowering employees to assist in the planning can also aid in their acceptance of the change. Employees can't accept change by proclamation (Labianca, Gray et al. 2000), but a change that they helped create has more potential for success.

Employee empowerment is becoming more important in business as the current management trend is to facilitate and empower, rather than command and control (Taborda 2000). In addition to the advantages in implementing structural change, allowing employees to define their own roles and processes while making them aware of and directly involved in a company's long term goals can have a positive effect on more far reaching areas such as morale

and company loyalty. These effects, while difficult to quantify, can have a positive impact on a company's success.

Organizational restructuring can be used to make improvements to company or departmental functions and processes. Incorporating employee empowerment in the modification of a company or department's organizational structure can have a positive impact on the success of the implementation and the company as a whole.

## 1.2 Purpose of Project

This Field Project will provide an organizational structure plan for the Engineering Department at Company X. This plan will include details regarding job responsibilities using current staffing levels as well as future growth. Company goals for the department will be considered in the creation of this plan.

The Engineering Department organizational plan will be created by the members of the Engineering Department. Upper management will be consulted for input. This input will be utilized, and the final plan will be the department's recommendation for an organizational structure, both now and in the future, that will allow Engineering to operate effectively. This Field Project will be presented to upper management at Company X upon its completion.

## 1.3 Specifics of Project

Company X is an original equipment manufacturer of equipment for the food industry. Previously a distributor of foreign equipment, Company X decided to become a manufacturer themselves in 1991. The Engineering Department was formed with one engineer, and the process began toward designing Equipment A, Equipment B, and Equipment C.

Since 1991 the Engineering Department has grown to include six members. These members consist of four Design Engineers, one Applications Engineer and a Drafting/Documentation Specialist. Each Design Engineer designs and performs all maintenance work for their specific equipment. This maintenance work includes design revisions as well as supporting other function areas including manufacturing, service, replacement parts, and sales with regard to the equipment. The Applications Engineer is responsible for supporting the Equipment B product line by ensuring our labeling equipment will mount to the customer's current packaging machines. The Drafting/Documentation Specialist supports the rest of Engineering by performing computer aided design software work and creating required documentation including operator's manuals. Over the last sixteen years engineers were added to the department as needed to design and support new products. Job responsibilities remain separated along product lines with little crossover.

The last few years the Engineering Department has been challenged by upper management to improve its processes. Time tracking procedures have been implemented to try and capture data regarding where Engineering time is spent. Company X management has also recognized how additional resources should be added, including a manufacturing engineer to support the manufacturing department, but specific job descriptions have not been created.

Company X management is dissatisfied with the amount of time the Engineering Department spends on new product development (NPD). The time it takes to bring a product to market is much longer than desired, with a situational analysis showing a major bottleneck occurring during the design phase in Engineering. Design Engineers have a difficult time doing design work without constant interruptions from support functions pertaining to existing equipment. Company X Design Engineers do have the appropriate skills and tools to perform

both NPD and support existing product lines. The constant interruption and "spin up" and "spin down" time involved in support functions inhibits the amount of time Design Engineers are allowed to spend on NPD, and leads to frustration among Engineering staff members. Company X management understands this problem and has agreed to allow the Engineering Department an opportunity to examine the organizational structure and create recommendations for improvement.

It is recognized that other management and marketing functions for NPD, including determining specifications for products to develop, also will require improvement. These functions will be addressed in future management efforts. The goal of this project is to better prepare the Engineering Department to perform NPD, and potentially improve performance in other desired functions that may be highlighted during the course of this project.

This Field Project will allow Company X Engineers to examine how things are currently done and create a refined structure that includes all current Engineering members. This bottom-up approach to organizational restructuring will give the Engineering Department an opportunity to improve things for themselves and for Company X. It will also provide upper management with a current and future staffing plan that is aligned with corporate goals.

# CHAPTER 2: LITERATURE REVIEW

## 2.1 Research Introduction

The concept of a restructuring plan created by employees on the lowest level for a department lacks extensive study and documentation. An evaluation of current literature on the topic of organizational restructuring shows that little information exists regarding a bottom-up, employee empowered approach. Additionally, organizational restructuring discussion studied revolved around the restructuring on a corporate level, as opposed to a single department. Due to the lack of specific information, research was broken into the main themes that comprise the overall goal of the project.

Information was obtained regarding reasons for a company to consider organizational restructuring. The argument exists that changes in the business world and the increasingly rapid pace of change have caused previous thinking and methods to become obsolete, making it appropriate to examine them for improvement.

After restructuring efforts are determined to be justified, any real results may not be achieved depending on how the restructuring is performed. Research was done examining why organizational change typically encounters resistance and what problems can occur during the restructuring process.

The topic of employee empowerment also factors heavily into this project. The creation of a bottom-up restructuring plan places major decision making, typically performed by upper management, into the hands of lower level employees. While a more recent management trend, much has been written arguing for the concept of allowing employees to become more involved in major decision making that directly affects their work.

## 2.2 Summary of Research

A literature search was performed of relevant journal articles, books, and academic papers relating to the three major themes that comprise the goal of this project. These three themes include:

- Reasons to consider organizational restructuring
- Problems encountered during organizational restructuring and change
- Employee empowerment

This literature search was done using the University of Kansas library system, Linda Hall Library, and the search engine Google Scholar.

### 2.2.1 Reasons to Consider Organizational Restructuring

The business world has changed, requiring organizations to become more flexible to stay competitive in a global environment. In *Designing Organizations: an Executive Briefing on Strategy, Structure, and Processes*, Galbraith states that "today's organizations must be responsive and flexible" and notes that while organization was never a previous priority, the topic has shot to the forefront of management's agenda (Galbraith 1995). He notes that competitive advantage can be gained from organizational designs that stress variety, change, and speed. Oxman and Smith add in *The Limits of Structural Change* that organizations are using flatter, more agile structures to adapt to the fast pace of change (Oxman and Smith 2003).

Whyte expands on the changing structural trend in *Social Theory for Action: How Individuals and Organizations Learn to Change*. He explains that organizations used to be structured in a vertical design, focusing on using chain of command to direct the work and maintain control of employees. The new design is horizontal, facilitating the work flow and

processes in accordance with the sequence in which the work actually gets done (Whyte 1991). This new design is more flexible and adaptive than the previous design.

Businesses should design their organizations based on the criteria they find most important. Oxman and Smith mention that no structure will provide everything – there are positives and negatives involved in every choice (Oxman and Smith 2003). The key is to highlight what elements should be stressed depending on the business strategy. Galbraith also points out that this is an iterative process that should be reviewed as business environments and strategies change (Galbraith 1995). What was most important previously may not be today.

Successful companies are never satisfied and always looking to improve themselves. In *The Agenda: What Every Business Must Do to Dominate the Decade,* Michael Hammer discusses how Hewlett-Packard has consistently stayed strong and continued to grow in the fast changing tech industry. Hammer says that in the late 1990s a division of Hewlett-Packard received feedback that its customers rated them as "worse or no better" than the competition. This feedback prompted enormous changes in how the division was organized (Hammer 2001). Hewlett-Packard acknowledged they needed to improve and did so to remain competitive.

### 2.2.2 Problems Encountered during Organizational Restructuring and Change

Organizational restructuring doesn't necessarily yield positive results. In *The Limits of Structural Change*, Oxman and Smith point out that often companies are quick to restructure to solve a business problem. While they admit that it has had positive effects on business performance, the cost of this performance has been disillusioned employees "showing demonstrable loss of loyalty and commitment to their employers" (Oxman and Smith 2003). Restructuring can lead to layoffs and a confusion of roles and ground rules for working that eventually alienate the employees.

Employee acceptance of operating within the new corporate structure is not guaranteed. Oxman and Smith discuss that regardless of how much money companies spend trying to identify an optimal hierarchy, these new structures will often be ignored and employees will continue to get things done within their own informal networks (Oxman and Smith 2003).

The concept of employee resistance to change is also examined by Labianca, Gray, and Brass in *A Grounded Model of Organizational Schema Change During Empowerment.* They state that all organizational change efforts are typically met with resistance, and that change cannot be made by proclamation. Explanations for this resistance can include organizational politics, social and cultural norms, poor timing, and lack of information (Labianca, Gray et al. 2000). In agreement with Oxman and Smith above, Labianca, Gray, and Brass note that with any change effort there will be a period of trial, after which the change is accepted or employees will try and revert back to old methods and processes (Labianca, Gray et al. 2000).

It is important to note that employees may resist change for reasons other than selfishness. In *Rethinking Resistance and Recognizing Ambivalence: A Multidimensional View of Attitudes Toward an Organizational Change*, Piderit points out that current literature suggests that employees may be opposed to proposed organizational change for positive reasons. Examples include ethical concerns and the employee's desire to point out to management issues they believe must be addressed to assure the organization maintains high performance. Piderit also cites a prominent consultant's statement that the resistance to change concept "has been transformed over the years into a not-so-disguised way of blaming the less powerful for unsatisfactory results of change efforts" (Piderit 2000).

Potential problems should be considered when proposing organizational change. Piderit notes that employees are coming to expect more involvement in decisions regarding these

changes. Successful organizational adaptation is becoming more focused on the generation of support and enthusiasm from employees for proposed changes, as opposed to plans for simply overcoming employee resistance (Piderit 2000).

### 2.2.3 Employee Empowerment

The idea of employee empowerment traces back several decades. It can be seen in the emergence of the concept of Total Quality Management (TQM) that was heavily promoted by quality guru Dr. W. Edwards Deming. While beginning to take shape as far back as the mid-20th century, TQM caught on in American businesses in the 1980s. A major principle of TQM is pushing responsibility for decisions down through the organization to the lowest possible level (Stamatis 1997). Haksever, when discussing TQM principles in *Total Quality Management in the Small Business Environment*, states that empowerment "entails giving employees the authority to make and implement decisions and change the environment that influences their work" (Haksever Mr/Ap 1996). Empowerment initiatives had caught on and were being experimented with by hundreds of businesses across all societal sectors by the mid to late nineties (Appelbaum and Honeggar 1998).

Employee empowerment initiatives are becoming increasingly prevalent in the current business world to better utilize a company's own people. Taborda discusses this relatively recent change in *Leadership, Teamwork, and Empowerment: Future Management Trends*. Taborda notes that changes in the business environment have forced companies to think of better ways of operating, and the current management trend is to facilitate and empower, not command and control. Introducing employee empowerment is the "key to unlock the energy and talents that reside within an organization and make it competitive" (Taborda 2000). Allowing people to

control their own destiny will bring out initiative and energy that was previously untapped throughout an organization.

Several known benefits exist when employees are empowered. In *Empowerment: a Contrasting Overview of Organizations in General and Nursing in Particular - an Examination of Organizational Factors, Managerial Behaviors, Job Design, and Structural Power*, Appelbaum and Honeggar cite several different studies performed in the mid nineties using nurses as their subjects. Using the results of these studies, Appelbaum and Honeggar concluded that empowerment leads to increased job commitment, job satisfaction, and feelings of personal accomplishment (Appelbaum and Honeggar 1998). Light echoes the effect of increased job commitment in the literature review for his dissertation titled *The Relationships and Effects of Employee Involvement, Employee Empowerment, and Employee Satisfaction by Job-type in a Large Manufacturing Environment*, finding that employees will be more committed to their work environment if they are involved the defining work processes. He also presents the argument that using employees to make decisions can yield the best results, as the employee performing the task should have the best understanding of what needs to be done. This puts that employee in the best position to make effective decisions. Light also notes that "empowered employees are frequently referenced and identified as valuable assets to organizations" (Light 2004).

An important aspect of employee empowerment is having leadership that successfully communicates a vision for the future. Appelbaum and Honeggar explain that a component of, and the organizing principle for, the idea of empowerment is having a shared vision (Appelbaum and Honeggar 1998). When employees are given more responsibility to make decisions they must have an understanding of what the organization is trying to achieve to properly make these decisions. Taborda expands on the benefits of a shared vision this by explaining that vision is

important for employees to understand where they fit in the organization and the organization's future. This understanding enhances motivation and feelings of empowerment (Taborda 2000). He also mentions that any changes made in organizational structure and/or processes need to be consistent with this vision to be successful. Light agrees on a broader scale noting that the communication of information throughout an organization, which would include the vision, is important. He explains that if employees are given the right information, those that are closest to the process would be able to make correct decisions and address any issues and concerns that arise (Light 2004).

Efforts for employee empowerment also encounter resistance and can be unsuccessful. What emerged from the research of Labianca, Gray, and Brass in *A Grounded Model of Organizational Schema Change During Empowerment* is that cognitive barriers to empowerment can exist. They believe that an employee's resistance to change also stems from their inability to revise the well-established, engrained decision making process already in place (Labianca, Gray et al. 2000). Kotter and Cohen agree in *The Heart of Change: Real-life Stories of How People Change Their Organizations*, stating that a good rule of thumb is "never underestimate the power of the mind to disempower". They felt that an employee's feelings would get in the way of action if the employee didn't feel he/she was capable of making change occur (Kotter and Cohen 2002). In Labianca, Gray, and Brass's study, a team containing management and employees was observed that was tasked to create a new organizational structure for their company. This team encountered problems and the effort almost failed. Initially, employees were very skeptical about their ability to inflict any real change. They were also suspicious as to why management was suddenly asking for their input, and were often hesitant to speak their opinions. The study

notes that true successful empowerment involves the development of a new process of shared decision making (Labianca, Gray et al. 2000).

## 2.3 Research Conclusions

The literature research encompassed the major themes surrounding the topic of an employee created, bottom-up restructuring plan. These themes included reasons to consider restructuring, problems that can be encountered when restructuring, and discussion surrounding employee empowerment.

The literature reviewed was not specific to organizational structure on a department level. All articles and books contained discussion of a company-wide restructuring, with themes that apply on a more global basis. Information regarding creating flatter organizational structure applies well to organizations, but it is difficult to flatten a small department. Other discussion about horizontal workflows is also difficult to apply to a departmental restructuring as the effort does not include other departments that affect the restructured department's workflows.

There are several important ideas in the case for restructuring that can be applied at a departmental level. These include the idea that as business and times change it is important to examine how the company (or department) is doing things and strive to constantly improve. Additionally, the understanding that there are positives and negative to every structure and companies (or departments) should design around the elements they deem most important.

Research into problems that are encountered during organizational restructuring showed that restructuring is not always the answer and should not be taken lightly. It is also important to remember the human element to any proposed change. There needs to be employee support

during organizational change or the change will be rejected and things will go back to old methods.

Employee empowerment literature shows that the concept has become increasingly prevalent in the business world and has many known benefits. The bottom line is that people understand their own jobs better than management. Giving them more leeway to make decisions regarding their jobs is beneficial to both the employee and the company. Empowerment allows companies to better utilize their employees by tapping into more of their talents. Empowerment also allows employees to be more free thinking and obtain increased job satisfaction.

Research also shows that employee empowerment efforts can also fail due to both the company and the employees. Companies must supply a clear vision to accompany empowerment, providing a map on which employees can base their decisions. Additionally, many people have a hard time removing the cognitive barriers to a new way of thinking. It is important for companies to assist employees to create this new way of thinking.

Overall, the literature research provides a compelling argument for the potential success of the creation a bottom-up departmental restructuring plan. The Company X Engineering Department should examine its current organizational structure and ensure it is still providing the best efficiency based on elements that are most important. The highlighted problems encountered in organizational restructuring can be attempted to be addressed by using employee empowerment efforts to ensure the restructuring makes sense and to solicit employee acceptance. A vision for these empowerment efforts will be gleaned from upper management, and the cognitive pitfalls that accompany employee empowerment will be kept in mind throughout the project.

# CHAPTER 3: EXAMINING THE EXISTING COMPANY X ENGINEERING DEPARTMENT'S ORGANIZATIONAL STRUCTURE

## 3.1 Company Background

Company X is an original equipment manufacturer of equipment for the food industry that began its own manufacturing operations in the 1990s. While the company was founded as in the late 1800s, Company X went through many changes throughout the years to become a distributor of goods and foreign made equipment previous to this 1990s venture. While Company X continues to maintain the distribution of some foreign equipment to complement its own product lines, the goods division of the company was sold. This has left a company containing approximately ninety employees.

Company X manufactures equipment residing in three major product lines. The largest product line is designated the Equipment A line, comprised of ten different models of Equipment A machines of various sizes and four models of auxiliary equipment. The second largest product line is the Equipment B line currently featuring four different Equipment Bs, two of which require custom applications work to be performed for each order as the Equipment Bs are designed to mount to existing equipment. The Equipment C line is the final product line made up of an Equipment C1 and Equipment C2.

## 3.2 Engineering Department Background

The Engineering Department at Company X began in the 1990s with one Design Engineer. The responsibilities of this engineer were to design and support the first equipment produced. Since the 1990s three additional Design Engineering positions were added as the equipment offering expanded. The Design engineers were put into different product groups to

perform all NPD and product support for their specific equipment. A full time Applications Engineering position was also created to perform all applications work required to support sales in the Equipment B line. Most recently, a Drafting/Documentation Specialist was hired to support the Design Engineers with drafting and create and maintain documentation such as operation manuals. The Drafting/Documentation Specialist is currently working thirty hour weeks.

A general overview of the current Engineering Department organizational structure is as follows:

1. Engineering Manager/Design Engineer (Manager)
    a. Manages department
    b. Creates and maintains controls software for all products
    c. Designs electrical systems for all products
    d. Mechanical design for all products

2. Design Engineer 1 (DE1)
    a. Mechanical design for Equipment B line and Equipment C line
    b. Product support for Equipment B line and Equipment C line
    c. Manages Applications Engineer

3. Design Engineer 2 (DE2)
    a. Mechanical design for Equipment A line
    b. Design electrical systems for Equipment A line
    c. Product support for Equipment A line

4. Design Engineer 3 (DE3)
    a. Mechanical design for Equipment A line
    b. Product support for Equipment A line
    c. Manages Drafting/Documentation Specialist

5. Applications Engineer (Apps)
    a. Applications design for Equipment B line
    b. Support applications design for Equipment B line

6. Drafting/Documentation Specialist (Doc)
    a. Drafting support for all engineers
    b. Creation and maintenance of documentation for all products

As new equipment is developed, a Design Engineer is assigned to it based on which product line it is in. That Design Engineer designs the equipment with support from the Engineering Manager for the electrical system and controls. The Design Engineer then transitions the equipment into manufacturing and provides all support for that equipment for its lifetime. All project management activities for the development of the equipment are performed by the assigned Design Engineer.

Very little crossover exists between Design Engineers that would expose them to the other equipment Company X produces other than the products for which they are responsible. An exception is the Engineering Manager who works on and oversees all product lines. Product support for each product includes design revisions, applications modifications for Equipment A and Equipment C lines, cost reduction activities, investigating quality problems, and supporting other functional areas (manufacturing, purchasing, service, sales, parts) by answering questions and/or solving problems.

## 3.3 Problems with the Existing Organizational Structure

Problems can be identified regarding the organizational structure of the Engineering Department at Company X, both now and as the department adds resources.

### 3.3.1 Current Organizational Structure

Several problems exist with the current organizational structure of the Engineering Department. For several years, criticism has been extended regarding the amount of time it takes for the NPD process. The Sales Department would prefer that Engineering deliver products to market at a much faster pace. As a result, Engineering has been trying to increase the amount of time its Design Engineers spend on NPD.

Within the Engineering Department, there exists frustration that it is difficult to get any NPD work done. A large portion of the time of Design Engineers is spent performing support activities for existing product lines. The amount of time spent putting out constant "fires" makes it difficult to design new products.

In an effort to put numbers to the above concerns, Company X implemented a time tracking process for the Engineering Department beginning in 2005. Table 1 shows data taken from time tracking from 2005, 2006 and the first three quarters of 2007.

**Table 3.1: Percentage of Engineering time spent by activity**

| Engineering Activity | Percentage of Time | | |
|---|---|---|---|
| | 2005 | 2006 | 2007* |
| New Product Development | 27% | 24% | 28% |
| Applications – Equipment B | 14% | 14% | 8% |
| Applications – Equipment A | 11% | 11% | 4% |
| General Product Support | 10% | 3% | 1% |
| Cost Reduction | 0% | 0% | 15% |
| Supporting other Functional Departments | 24% | 17% | 18% |
| Organizational Support – Cross-functional team, process development | 2% | 9% | 10% |
| Time off | 7% | 11% | 6% |
| Documentation | 5% | 11% | 10% |
| Totals | 100% | 100% | 100% |
| *2007 numbers through first 3 quarters | | | |

The table shows that less than thirty percent of Engineering time is spent on new product development. Activities that support current product lines, including supporting other functional departments, general product support, cost reduction and Equipment A applications, vary over the three years studied, taking an average of thirty eight percent of Engineering time.

Activities that support current product lines cannot be eliminated. The hope is that these functions can be performed more efficiently to allow more time to increase NPD. An additional

Engineering desire is to have less frequent distractions throughout the day, allowing the NPD work that is done be performed more effectively.

Lack of cross training in the department is also a weakness. Design Engineers are not able to efficiently perform support on product lines outside their standard assignment. Given the small size of the department, this can cause problems when department members are out of the office or unavailable. It also makes the event of a Design Engineer leaving the company much more serious. A large amount of knowledge is lost, and the remaining Engineers have a more difficult time picking up the slack and training replacements.

The function of Manufacturing Engineering is not currently performed. Assembly Technicians putting together equipment do not have proper work instructions to follow. This causes problems during training of Assembly Technicians and makes it more difficult to ensure and track quality of the manufactured equipment. Other opportunities exist for Manufacturing Engineering including work area layout and fixture design.

### 3.3.2 Organizational Structure Growth Plan

There is no existing growth plan for the Engineering Department. As discussed above, in addition to the desire to increase NPD resources, needs have been identified in areas currently not being addressed including Manufacturing Engineering and Quality Control. While these have been discussed, no plan exists for adding these resources and specific job descriptions have not been developed to clarify future job responsibilities.

## 3.4 Goal of Organizational Restructuring Effort

The purpose of this field project is to attempt to create an organizational restructuring plan for the Company X Engineering Department using a bottom-up, employee empowered approach. This plan will include details for using current resource levels as well as a plan for adding personnel.

The organizational restructuring plan will attempt to address and resolve known issues with the Engineering Department. Additional issues may be identified as the project progresses. The list of issues discussed above that were identified at project inception is included in Table 3.2. These departmental issues are presented in no particular order.

**Table 3.2: Identified Engineering Department Issues at Field Project inception**

| Engineering Department Issues |
|---|
| NPD time is not high enough |
| Engineers are constantly interrupted during the day |
| Little cross training exists across product lines |
| No growth plan exists |
| Manufacturing Engineering is not performed – work instructions for manufacturing do not exist |
| Quality Control needs improvement |

The component of the organizational restructuring plan pertaining to current resource levels will require obtaining information from management regarding performance goals for the department. The component will use the same Engineering personnel currently employed at Company X and must be acceptable to all members of the Engineering Department. It is possible, using current resources, that job responsibilities cannot be restructured in a manner that both improves Engineering output and is agreed upon by everyone.

The growth component of the organization restructuring plan will also require management input regarding future Engineering goals. This component must also be agreed upon by all members of the department. The success of this seems more obvious as the job responsibilities for future Engineering resources can be defined in any manner, requiring any desired skill set.

The bottom-up approach allows members of the Engineering Department to attempt to improve their own situation and minimize their frustration. Guidance solicited from company management regarding the vision and goals for the department will help ensure the plan fits into Company X's corporate strategy. The engineers performing the actual work, and thus containing a clear understanding of activities and processes involved, will have the opportunity to suggest a structure that will improve the efficiency and overall performance of the department. They will also be able to identify the desired way to add resources in the future.

# CHAPTER 4: METHOD OF CREATING THE DEPARTMENTAL ORGANIZATIONAL RESTRUCTURING PLAN

## 4.1 Procedure and Methodology Introduction

The process for creating the Departmental Restructuring Plan was performed in five stages. This process was not fully determined before meetings were held with the Engineering Department. These departmental meetings were used as the primary method for determining the course of the process. Work was performed between meetings to collect additional data and create options to work from during discussion.

The five stages for the process are discussed in the following sections. The presentation for each stage is organized into stage objectives, discussion and outputs.

It should be noted that during the first stage, one of the Design Engineers (DE2) resigned from his position. This created a more interesting scenario for the restructuring project. DE2's position did not have to be replaced with another primary Design Engineer. The open position could be filled with someone possessing a different skill set if that was determined most appropriate. This created some flexibility in the discussion of the current departmental structure.

## 4.2 Stage 1: Gathered Data on Current Job Responsibilities

Stage 1 Objectives:

I. Create a specific and comprehensive list of job responsibilities of all members of the Engineering Department

II. Sort list of job responsibilities by Engineering functions and distribute to the Engineering Department to aid in brainstorming restructuring ideas

Stage 1 Discussion:

For the first stage, data was collected on each engineer's specific job responsibilities. Every member of the department was asked to make a list of specific job responsibilities that comprise the work that they do. These responsibilities were broken down to specific tasks and specific product lines.

These lists were combined and then sorted into Engineering functions. The tasks were examined to see if they could be grouped in a more efficient manner. These lists, sorted by both resource and Engineering functions, were distributed to the Engineering Department for review prior to the first meetings. They were helpful in identifying potential areas that could be combined without spreading responsibility among multiple resources.

Stage 1 Outputs:

I. A specific and comprehensive list of all Engineering Department job responsibilities was created, sorted by Engineering function and distributed to the department for review

## 4.3 Stage 2: Initial Meetings Held with Engineering Department

Meetings were held with all members of the Engineering Department to get started on the restructuring project. Agendas were distributed before the meetings to the participants. These meetings were facilitated by the author but the format was an open discussion. All individuals were encouraged to participate and share any thoughts.

### 4.3.1 First Engineering Meeting

Stage 2 – Meeting 1 Objectives:

I. Introduce project including methods, objectives, and deliverables

II. Discuss previously recognized Engineering Department issues and recognize new ones

Stage 2 – Meeting 1 Discussion:

The purpose of the first Engineering meeting was to introduce the project and begin initial discussions. The methods, objectives, and final deliverables were shared with the group. After the project introduction, an open discussion began regarding changes for the department both now and in the future. The discussion was kept "blue sky", covering a wide range of topics. The following paragraphs summarize this discussion. The full meeting write-up, including agenda and discussion notes, is included in Appendix A: Engineering Notes From Stage 2 and titled Engineering Organizational Restructuring Meeting – 9/14/07.

The discussion began regarding desired skill sets for the open Engineering position. The initial response was that it would be helpful to replace the skill set DE2 had – someone that could do a lot of mechanical design but still handle the design and maintenance of electrical systems. It was noted that a more beneficial skill set could be determined as the project continued.

The way the Engineering Department handles projects was also discussed. Our Design Engineers have little crossover along product lines, which is a weakness when resources leave or are out of the office. Additionally, NPD projects are generally assigned to one Design Engineer. We have had success in the past assigning multiple resources to attack different subsystems of a design and speed up the time to market, but the use of this strategy has been minimal. Cross training among product lines would assist in the ability to do this more often.

Areas of focus to consider during this project were listed. The Engineering functions of Quality and Manufacturing Engineering were two that are not presently handled by the department. Adding another person to work on electrical systems and controls design would be

beneficial as the department and product offerings grow. Project Management is currently handled by the Design Engineer responsible for the project, but possibly could be centralized in the future. A Firefighter position to handle daily distractions that interrupt NPD was also mentioned. This position could be full-time or rotated among the Design Engineers.

The question arose about other Engineering functions in addition to NPD that Company X management would like us to improve. It was also reiterated that if we can successfully improve Engineering time spent on NPD, upper management and Marketing will need to be ready to provide specifications for new products to be developed by Engineering. They will need to be ready to support their aspect of the NPD process.

Stage 2 – Meeting 1 Outputs:

I. Need of a future resource for electrical systems and controls design identified

II. Idea of a Firefighter position to eliminate distraction from Design Engineers and boost NPD

III. Idea of centralizing Project Management in future growth

IV. Question about what other areas management would like to see improved currently in addition to NPD

V. Engineering Department Issues updated in Table 4.1

**Table 4.1: Identified Engineering Department Issues after Stage 2 – Meeting 1**

| Engineering Department Issues |
|---|
| NPD time is not high enough |
| Engineers are constantly interrupted during the day |
| Little cross training exists across product lines |
| No growth plan exists |
| Manufacturing Engineering is not performed – work instructions for manufacturing do not exist |
| Quality Control needs improvement |
| A resource for electrical systems and controls design will need to be added if product offerings increase |

### 4.3.2 Second Engineering Meeting

Stage 2 – Meeting 2 Objectives:

I. Determine specific Engineering functions that could be currently improved in addition to NPD

II. Create different structures that highlight improving these Engineering functions

Stage 2 – Meeting 2 Discussion:

Following the first meeting, it was thought that Company X management had not given much thought to Engineering functions that could be prioritized besides NPD. The agenda for the second Engineering meeting was to determine specific Engineering functions that could also be stressed, such as Quality and Manufacturing Engineering. After determining the list, the plan was to come up with different structures that would highlight these different Engineering functions. These structures would be shown to management to let help them determine what outcome they prefer. The full meeting write-up, including agenda and discussion notes, is included in Appendix A: Engineering Notes From Stage 2 and titled Engineering Organizational Restructuring Meeting – 9/21/07.

The meeting did not transpire according to the agenda. Early in the discussion it was determined that it was difficult to pursue any organizational structure without more input from management. A large number of potential structures existed, and it may prove difficult to find meaningful solutions for each scenario.

The department decided to create a comprehensive list of Engineering functions, both those that are currently handled by the department and those that are not, and present them to the Chief Operating Officer (COO). The COO would be asked to assign a percentage of time they would like to see allocated to each Engineering function. While exact percentages may only be estimated by management, this step would provide more detailed insight. It was still not clear how much Engineering time management would like the department to spend on NPD. This information would also allow us to compare the percentage goals with our current performance to determine what areas they would like to see increased and/or decreased. The list of organizational functions was compiled and can be viewed in the meeting notes.

It was also decided to ask management about future growth. General ideas regarding when future resources would be added to the department, either in years or total sales growth, will be requested.

<u>Stage 2 – Meeting 2 Outputs:</u>

I. Plan to determine structures to highlight improvement of different Engineering functions abandoned

II. Comprehensive list of current and potential Engineering functions created

III. List of Engineering functions will be presented to the COO to assign a percentage of time that would serve as a goal for the current departmental structure

IV. COO will be asked to provide timetable for adding future resources based in years or total sales

## 4.4 Stage 3: Solicited Management for Goals

Stage 3 – Objectives:

I. Acquire a more detailed vision from management regarding current Engineering output. This will be done by determining goals for how much time is spent performing each Engineering function.

II. Acquire the vision from management regarding the when resources will be added in the future.

Stage 3 – Discussion:

The COO was provided the list of Engineering functions created in Stage 2 and asked to allocate a percentage of time to each function to use as a goal for the restructuring project. He was also asked to provide estimates on when Engineering resources would be added, using a timeline consisting of either sales growth or time.

In creating the current time percentage goals for the Engineering Department, the COO modified the list of Engineering functions to match the categories from the time tracking data. This made it easier to make changes to current resource allocation to produce goals for restructuring. The response from the COO is shown in Table 4.2.

**Table 4.2: Current resource allocation goals for the Engineering Department**

| Engineering Activity | Percentage of Time | | | |
|---|---|---|---|---|
| | 2005 | 2006 | 2007* | Current Goal |
| New Product Development | 27% | 24% | 28% | 40% |
| Applications – Equipment B | 14% | 14% | 8% | 10% |
| Applications – Equipment A | 11% | 11% | 4% | 5% |
| General Product Support | 10% | 3% | 1% | |
| Manufacturing/Process Engineering | | | | 5% |
| Project Management | | | | |
| Quality | | | | 5% |
| Cost Reduction | | | 15% | |
| Supporting other Functional Departments | 24% | 17% | 18% | 10% |
| Organizational Support | 2% | 9% | 10% | 10% |
| Time off | 7% | 11% | 6% | 10% |
| Training/Assisting in Training other Departments | | | | |
| Documentation | 5% | 11% | 10% | 5% |
| Totals | 100% | 100% | 100% | 100% |
| *2007 numbers through first 3 quarters | | | | |

The numbers for current resource allocation goals use the following assumptions:

- Applications – Equipment A past data uses Existing Product Development numbers from engineers in the Equipment A Line
- General Product Support past data uses all Existing Product Design Revision numbers
- Project Management is handled by the Design Engineer responsible for the project and is not recorded separately

The feedback from the COO shows that the desired percentage of time spent on NPD as a department is forty percent. Additionally, it shows that management would like the Engineering Department to begin performing tasks in the areas of Manufacturing Engineering and Quality. Also important is that the resource allocation goals include reducing the time spent supporting other departments to ten percent. As was noted earlier, support functions cannot be eliminated. It is hoped that a method of handling the same tasks more efficiently can be developed.

The COO also gave his thoughts for future growth. No information was provided regarding length of time or sales growth for adding resources as this information was not available. Future resources will be added as market conditions and Engineering workload permit. Instead, the COO furnished his vision of how added resources would be utilized. Table 4.3 shows what percentage of time future full time engineers (FTEs) will devote to each Engineering function. These resource allocations are not part of any existing formal plan and open to discussion.

**Table 4.3: Future resource allocations for individual Engineering resources**

| Engineering Activity | Additional Full Time Engineers (FTEs) | | | |
|---|---|---|---|---|
| | FTE 1 | FTE 2 | FTE 3 | FTE 4 |
| New Product Development | | 80% | 80% | |
| Applications – Equipment B | | | | |
| Applications – Equipment A | | | | |
| General Product Support | | | | |
| Manufacturing/Process Engineering | 20% | | | 60% |
| Project Management | | | | |
| Quality | 50% | | | |
| Cost Reduction | | | | |
| Supporting other Functional Departments | | | | 20% |
| Organizational Support | 10% | 10% | 10% | 10% |
| Time off | 10% | 10% | 10% | 10% |
| Training/Assisting in Training other Departments | | | | |
| Documentation | 5% | | | |
| Totals | 100% | 100% | 100% | 100% |

The numbers for future resource allocations use the following assumptions:

- Project Management is handled by the Design Engineer responsible for the project and is not recorded separately

This information shows that the next Engineering resource will be primarily responsible for Quality, with some time devoted toward Manufacturing Engineering and Documentation. FTEs 2 and 3 are projected to be primarily Design Engineers, and FTE 4 will expand the time spent on Manufacturing Engineering and assist with Supporting other Functional Areas.

Stage 3 – Outputs:

I. Vision from management regarding current Engineering output obtained. The resource allocation goals will be used when attempting to determine an improved current structure.

II. Vision from management regarding the job responsibilities of future Engineering resources obtained. This information will be used in determining a departmental growth plan.

## 4.5 Stage 4: Analyzed Current Goals and Held Meeting with Engineering Department on Current Structure

Stage 4 – Objectives:

I. Analyze current resource allocation goals and create models that show different scenarios for departmental structure that meet these goals and address the Engineering Issues.

II. Create a plan for a new departmental organizational structure that is in line with management's vision, addressing as many Engineering Issues as possible. This plan will be applicable to current Engineering Department resources and agreed upon by all members of the department.

Stage 4 – Discussion:

The current resource allocation goals provided by the COO were analyzed to determine different methods of achieving them. The percentage goals were converted into weekly hours required for each Engineering function after factoring in time off work at ten percent. Models were created that explored varying departmental structures producing the desired weekly hours.

These models varied the desired skill sets for the open Engineering position. They also used the "rotating firefighter" concept to rotate different Engineering functions in an effort to minimize distraction from Design Engineers. The structural models were presented as Options 1, 2A, 2B and 3 to use as a basis for discussion during the next Engineering meeting. All options are fully detailed, including proposed specific time allocation goals for each position, in the Meeting Agenda section of Appendix B: Engineering Notes From Stage 4.

A third meeting was held with the Engineering Department. The purpose of the third meeting was to review the current resource allocation goals from the COO, review Options 1 through 3, and begin laying out a departmental organizational structure based on this information. The full meeting write-up, including agenda and discussion notes, is included in Appendix B: Engineering Notes From Stage 4.

The third meeting was more successful than anticipated. The result of the meeting was a plan for a recommended departmental organizational structure to present to management. All department members agreed on the structure. One member of the department was absent, and the plan was reviewed with them for their acceptance upon their return. This plan is discussed in Chapter 5: Results and Conclusions.

Stage 4 – Outputs:

I. A plan for a new current departmental organizational structure agreed upon by the entire department. This plan is in line with the vision provided by management and addresses Engineering Department issues. Table 4.4 shows how each issue was addressed.

**Table 4.4: Engineering Department Issues and how they are resolved in the Current Departmental Restructuring Plan**

| Engineering Department Issues | Resolution in Current Plan |
|---|---|
| NPD time is not high enough | Weekly goals for hours worked implemented in plan. Firefighter position greatly reduces interruption. |
| Engineers are constantly interrupted during the day | Rotating Firefighter position handles Engineering functions that cause interruptions |
| Little cross training exists across product lines | Rotating Firefighter position will force Design Engineers to work on all product lines |
| No growth plan exists | This will be created in Stage 5 |
| Manufacturing Engineering is not performed – work instructions for manufacturing do not exist | Work instructions will be created by the Drafting/Documentation Specialist |
| Quality Control needs improvement | This is not feasible to address using current resources and will be handled in Stage 5 |
| A resource for electrical systems and controls design will need to be added if product offerings increase | This is not feasible to address using current resources and will be handled in Stage 5 |

## 4.6 Stage 5: Held Meeting with Engineering Department on Growth Plan

Stage 5 – Objectives:

I. Create a departmental growth plan that is in line with management's vision, addressing as many remaining Engineering Issues as possible. This plan will be agreed upon by all members of the department.

Stage 5 – Discussion:

The first three Engineering meetings provided discussion regarding multiple skill sets and specialties that should be considered as the department grows. A fourth meeting was held with the Engineering Department to review the future resource allocations provided by the COO, review the skill sets and specialties previously mentioned, and begin discussions about the department growth plan. The full meeting write-up, including agenda and discussion notes, is included in Appendix C: Engineering Notes From Stage 5.

The department agreed with the plan of adding a FTE to perform Quality and Manufacturing Engineering. The next three FTEs induced more discussion. Further expansion of the Engineering Department would require major strategic events such as the addition of a large new product line or a move toward vertical integration. Different resources would be required for each event.

The future resource allocations provided by the COO were educated guesses due to the lack of existing growth plan. Taking this into consideration, the Engineering Department found it appropriate to lay out plans that include descriptions of future required resources based on the two strategic events it identified. The result of the meeting was a plan for a recommended future resource skill sets and characteristics, based on two strategic events, to present to management. All department members agreed on the plan. This plan is discussed in Chapter 5: Results and Conclusions.

Stage 5 – Outputs:

I. A plan for adding Engineering resources agreed upon by the entire department. This growth plan is split into two separate plans, depending on which strategic decision is made by management. Table 4.5 shows how each remaining issue was addressed.

**Table 4.5: Engineering Department Issues and how they are resolved in the Growth Plan**

| Engineering Department Issues | Resolution in Current Plan |
|---|---|
| NPD time is not high enough | Addressed in Stage 4. Additional NPD time gained with FTEs added in Growth Plan. |
| Engineers are constantly interrupted during the day | Addressed in Stage 4 - Rotating Firefighter position handles Engineering functions that cause interruptions |
| Little cross training exists across product lines | Addressed in Stage 4 - Rotating Firefighter position will force Design Engineers to work on all product lines |
| No growth plan exists | Growth plan created |
| Manufacturing Engineering is not performed – work instructions for manufacturing do not exist | Work instructions will be created by the Drafting/Documentation Specialist for now. First FTE added will be responsible for this function |
| Quality Control needs improvement | First FTE added will be responsible for this function |
| A resource for electrical systems and controls design will need to be added if product offerings increase | FTE added to handle this function, assuming the strategic decision to add a product line |

# CHAPTER 5: RESULTS AND CONCLUSIONS

## 5.1 Results of Current Restructuring Plan

A restructuring plan was decided upon for the current Engineering Department Structure. This plan was agreed to by all members of the department and is recommended to Company X upper management. The following paragraphs detail the recommendations of the plan.

**Recommendation 1: The open Engineering position should be filled with a mechanical Design Engineer with ten or more years of experience.**

This level of experience will better balance the skill set of the department. Other skills including the ability to perform electrical systems layout and finite element analysis are preferred but not required.

**Recommendation 2: The desired increase in current time spent on Manufacturing Engineering will be handled primarily by the Drafting/Documentation Specialist.**

The amount of work relating to operator's manuals has declined, and this Engineering function will be put in that void at the beginning of 2008. The directive will be to create work instructions that document current processes for putting together assemblies. The work instructions can then be reviewed by a Design Engineer and the Service Manager to look for potential improvements to these processes.

**Recommendation 3: The desired increase in current time spent on Quality should not be addressed until the addition of resources.**

The current goal of increasing the percentage of time spent on the Quality Engineering function will not be addressed with this plan. It is unrealistic for an engineer to act as a Quality Manager using that small a time commitment. All Engineering personnel already perform work pertaining to quality, but the work is tracked in other Engineering functions. A significant increase in this Engineering function will be included in the growth plan.

**Recommendation 4: A rotating Firefighter position should be implemented in the department.**

This position will be rotated on a weekly basis among the three Design Engineers and the Engineering Manager. The Firefighter will be responsible for Equipment A Applications and all Support Activities that arise during the week.

The purpose of the Firefighter position is to allow the other Design Engineers to focus on NPD. Engineers performing the Firefighter role will also perform NPD as time permits. In addition to decreasing daily distractions for the rest of the department, this position will provide cross training across all product lines. It is expected that a learning curve exists when Design Engineers are performing support activities outside their primary product line. Initially this may cause activities to be performed less efficiently, but the previously mentioned positives outweigh this negative. Design Engineers responsible for the specific product lines may be consulted by the Firefighter as appropriate for the issue, but the Firefighter will perform the majority of the legwork and communication required.

An important component of the success of the Firefighter position is its implementation plan. Introducing the concept to the company will need to be carefully planned, with clear communication to all other departments regarding the goals and processes involved. The

Engineer acting as the Firefighter will need to welcome any issues brought to his attention, and there must be an easy way for other departments to determine which Engineer is acting as the current Firefighter.

A weekly work breakdown showing the recommended departmental structure is shown in Tables 5.1 and 5.2. This structure is presented by the number of hours each Engineering resource spends on each Engineering function. Two different scenarios are provided showing the Engineering Manager and a Design Engineer acting as the rotating Firefighter. All three Design Engineers will have the same weekly breakdown as the Firefighter position is rotated around.

**Table 5.1: Weekly work breakdown with Engineering Manager as Firefighter**

| Engineering Function | Hours Spent By Resource | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Manager | DE1 | DE2 | DE3 | Apps | Doc | Total | Goal |
| New Product Development | 15 | 32 | 32 | 32 | 4 | | 115 | 101 |
| Applications– Equipment B | | | | | 25 | | 25 | 25 |
| Applications– Equipment A | 13 | | | | | | 13 | 13 |
| Manufacturing/Process Eng. | | | | | | 13 | 13 | 13 |
| Support | 12 | 2 | 2 | 2 | 5 | 3 | 26 | 25 |
| Quality | | | | | | | 0 | 13 |
| Documentation | | | | | | 13 | 13 | 13 |
| Organizational Support | | 6 | 6 | 6 | 6 | | 24 | 25 |
| Totals | 40 | 40 | 40 | 40 | 40 | 29 | 229 | 228 |

**Table 5.2: Weekly work breakdown with Design Engineer as Firefighter**

| Engineering Function | Hours Spent By Resource | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Manager | DE1 | DE2 | DE3 | Apps | Doc | Total | Goal |
| New Product Development | 32 | 14 | 32 | 32 | 4 | | 114 | 101 |
| Applications– Equipment B | | | | | 25 | | 25 | 25 |
| Applications– Equipment A | 3 | 10 | | | | | 13 | 13 |
| Manufacturing/Process Eng. | | | | | | 13 | 13 | 13 |
| Support | 5 | 10 | 2 | 2 | 5 | 3 | 27 | 25 |
| Quality | | | | | | | 0 | 13 |
| Documentation | | | | | | 13 | 13 | 13 |
| Organizational Support | | 6 | 6 | 6 | 6 | | 24 | 25 |
| Totals | 40 | 40 | 40 | 40 | 40 | 29 | 229 | 228 |

These weekly breakdowns will serve as a general guide. The amount of Support activity and Equipment A Applications work will vary from week to week. After implementation of the Firefighter position, actual time tracking numbers can be compared to the desired weekly breakdowns to determine if the position is effective in meeting current goals or if any modification of the plan is required.

## 5.2 Results of Future Growth Plan

A growth plan was decided upon for adding future Engineering resources. This plan was agreed to by all members of the department and is recommended to Company X upper management. The following paragraphs detail the recommendations included in the plan.

**Recommendation 5: The first full time Engineer added should have a heavy background in Manufacturing Engineering and Quality Control.**

This Manufacturing/Quality Engineer will be responsible for overseeing and participating in the creation, improvement and maintaining of work instructions. They will also work to improve Assembly Technician efficiency by auditing work area layouts, tool needs, fixture needs, etc.

Acting as the Quality Manager will be another aspect of the Manufacturing/Quality Engineer position. Current quality processes can be improved and devoting a resource to help develop and manage the entire quality program will be beneficial.

Following the addition of one full time Engineering resource, it was determined by the Engineering Department that adding more resources would take one of two potential strategic decisions by Company X management. Without executing one or both of these decisions,

current resources will be able to handle the workload. Each of these strategic decisions requires a different growth plan. The plans for each strategic decision are outlined in the following subsections.

### 5.2.1 Strategic Decision One: New Large Design Project

The first potential strategic decision involves adding a large new design project. This project would consist of developing a large machine that would increase our internally manufactured equipment offering by adding a product line. Adding a product line would take much longer than desired using current resource levels. Recommendations 6 and 7 assume this strategic decision is implemented.

**Recommendation 6: Two Mechanical Design Engineers should be added to the Engineering Department.**

These Design Engineers will be expected to perform at least eighty percent NPD, and will be isolated from any support or applications functions. One of the added Design Engineers should possess at least ten years of mechanical design experience to lead the design phase of the project. It is anticipated that more equipment will be developed within the new product line, leading to many years of design projects from this strategic decision.

Upon completion of the project, one of these Design Engineers will transition into a role similar to current Design Engineers – providing support and applications functions while performing NPD. The other Design Engineer will remain isolated from support roles and continue to expand the product line.

**Recommendation 7: A recently graduated Electrical Engineer should be added to the Engineering Department.**

The Electrical Engineer should have interest in mechanical design in addition to electrical design. The Engineering Department will need an additional Electrical Engineering resource, but will not have enough workload to require that role full time. A young Electrical Engineer could be taught SolidWorks, the mechanical design software, to provide help with mechanical aspects of NPD.

Responsibilities of this position would include learning and supporting current controls and electrical systems to provide support for current product lines. The Electrical Engineer would also help design controls and electrical systems for future equipment. This position will be important both to handle the electrical workload and ensure the position is still covered if Engineering Manager were to no longer work at Company X.

### 5.2.2 Strategic Decision Two: Expanded Vertical Integration

The second potential strategic decision involves increasing our level of vertical integration to include sheet metal fabrication. Recommendation 8 assumes this strategic decision is implemented.

**Recommendation 8: A Manufacturing Engineer with sheet metal fabrication experience should be added to the Engineering Department.**

This Manufacturing Engineer will be responsible for overseeing the fabrication of sheet metal components. These components would be both for production of current equipment as well as project work concerning NPD.

Sheet metal fabrication experience at Company X is limited. The Manufacturing Engineer would perform all tasks required to setup this manufacturing process, including equipment selection and staffing. After initial setup, this position would maintain sheet metal processes and assist Design Engineers in future sheet metal designs.

## 5.3 Conclusions

This field project provides an example of empowered employees successfully creating departmental restructuring plan with the goal of operating more effectively. Several conclusions can be drawn from the details of the project process.

Employee empowerment can be an effective tool, but as discussed in the Literature Review, an adequate understanding of management's vision is required. The project process began with the idea that Company X management wanted the Engineering Department to increase the time spent on NPD and that other issues could be improved. The other department issues were identified by department members, but it was recognized early that more specific information was required from the COO to continue. Once information pertaining to more specific goals regarding resource time allocation was collected, the group was able to create a solution that attempts to better meet those goals.

In the case of this project, it is possible that management also needed a vision from the Engineering Department to provide the specific goal information. The vision Engineering provided to the COO was comprised of a list of Engineering functions that are both currently performed and that would be possible to perform, either currently or with additional resources. From this information the COO was able to deliver appropriate goals for the department relating

to each function. It is believed by the author that the work performed in Stage 2 provided better results in Stage 3.

It was found that open discussions were appropriate for Stage 2, while Stages 4 and 5 were helped using models from which to base the discussion. The first two Engineering meetings (Stage 2) were successful for brainstorming and determining department issues and potential aspects to the restructuring plan. After more information was gathered, the Stage 4 meeting consisted of discussion centered on four specific modeled options for restructuring. While the chosen plan was different than the present options, these options helped speed the process. Basing discussion on raw data from the COO would not have allowed a solution to be developed in one meeting. The meeting in Stage 5 also used a specific model provided from the COO from which to start discussion. It was more effective to modify plans previously laid out than build them from scratch.

During the Engineering meetings, the department members that had the least amount of input were the same employees whose jobs were not as affected by the restructuring efforts. The Applications Engineer had little to add to discussions as his job responsibilities would not change. The Drafting/Documentation Specialist position was affected by shifting some Manufacturing Engineering duties, but this was already anticipated as a future possibility. These two members of the department also have the least amount of seniority and are the youngest. As discussed in the Literature Review, a cognitive barrier could have existed that prevented their participation. It is possible any or all of these factors – jobs not affected, lack of seniority, and lack of age – could have led to a feeling that their opinions couldn't create change.

## 5.4 Recommendations for Additional Work

The recommended departmental structure determined in this plan contains implementing a rotating Firefighter position in the department. As previously discussed, it will be important to create an effective plan for implementing this position. The success of this implementation depends successfully communicating the goals and processes involved to other functional departments. This plan should be designed by the COO, Engineering Manager, and Design Engineers, with consultation from other departments.

Increasing the NPD time for the Engineering Department will allow new products to be developed more efficiently. Company X management is aware that the entire NPD process leading up to the design phase also needs to be improved. Currently, the process to determine the design specifications for new products is slow. If the Engineering Department can fix the bottleneck that lies during the design phase, the rest of Company X will need to improve their NPD processes to assure more efficient and effective NPD as a whole.

## 5.5 Recommendations for Additional Research

The empowered group of employees participating in this field project was a small one, consisting of five employees. Discussion found during the Literature Review did not contain information regarding success in employee empowerment as a function of the size of the group involved. It would be interesting to attempt this field project using a much larger department.

Literature suggests that using employees to make decisions will yield the best results (Light 2004). It is possible that the departmental restructuring plan determined in this field project will not meet the goals set forth by the COO. More research could be done to explore the effectiveness of empowerment initiatives to reach preset objectives provided in the vision aspect

of the initiatives. The effectiveness of the empowerment initiatives would need to be compared with the effectiveness of non-empowered approaches to obtain results comparing the output of both methods.

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# APPENDIX A: ENGINEERING MEETING NOTES FROM STAGE 2

**Engineering Organizational Restructuring Meeting – 9/14/07**
Present: Engineering Manager, DE1, DE3, Drafting/Documentation Specialist
Absent: Applications Engineer

## MEETING AGENDA

- Introduce the project to the department by discussing the methods, objectives, and final deliverables
- Begin brainstorming ideas for improvement

## MEETING NOTES

The following were the thoughts and ideas generated.

Vacant Design Engineer position

- DE2's job has been posted as a Design Engineer with 10 years experience with electrical skills preferred. It is possible that in doing this project the desired job description will change.
- Do we want to handle a heavy ME design engineer, or someone who has more EE background? DE2 was able to handle a lot of the electrical issues for Equipment A due to his EE Technology degree.
- We have been increasing our potential for using plastics. Should we get someone who specializes in plastics design?

Department Handling of Projects

- Right now we have little crossover in product lines for Engineering. Is it better to be more general and less specialized? Engineering Manager felt specialization is good to some degree, but more generalization would be positive.
- Do we attack one project at a time with multiple resources to speed up time to market? Generally, we assign a project to one individual and have several projects going on simultaneously. Using multiple resources was successful on a past project – Engineering Manager, DE1 and DE2 all worked on different subsystems.

Current Company wants

- We need to ask what the company officers and board want us to prioritize to. Do we prioritize to just full NPD? How about Quality? Cost Reduction?
- Company officers have stressed improving NPD time. If we restructure to focus more on NPD, we will need to have a constant stream of new products that the company wants to build. We must not forget that we will need a clear vision and plan for what products we want to produce, or we will have Design Engineers with free time and nothing to design.
- Bottom line: If Engineering fixes our end, we need to make sure management fixes their end so the change is successful
- How do we get to full-time R&D engineers? Engineering Manager would like to see some engineers at 90% NPD

Positions of Focus for Restructuring and Future Growth

- "Firefighter"
  - This position would handle the noise that constantly interrupts New Product Development (NPD). Design Engineers would not be able to be interrupted without going through the Firefighter first
  - This position has been discussed by Engineering Manager and COO. This would allow us to isolate Design Engineers – creating a "skunkworks" to kick out new designs.
  - It was felt that this position would be able to handle manufacturing issues, but service emergencies and sales calls would be difficult to handle
  - Initially this would cause problems to be handled less efficiently due to the learning curve of all our products, but over time it would get better. This would also provide excellent cross training across product lines.
  - Could we make this position rotate? A design engineer would be "on call" one week a month to do the firefighting.

- Manufacturing Engineer
  - This position is needed to create work instructions, make fixtures, etc.
  - This position could also handle fires coming out of manufacturing

- Quality Individual
  - This has potential to be a full time job.
  - To what level do we take this position? Is it eventually a full time Quality Engineer?
  - This is also going to help as we grow

- Project Management
  - Do we isolate all PM and assign to one individual? Current method is for everyone to handle their own projects.
  - This would create consistency among project plans and improve time to market
  - Currently project plans are created and then not maintained. Isolating would mandate maintenance of project plans.
  - Maintaining project plans would help create historical data that we currently do not have, allowing us to get better at our project planning
  - This would allow someone to make sure other functional areas are scheduled and ready when required (example: manufacturing to help build pilot builds) during a project. Currently this is not worried about.

- Controls
  - Engineering Manager is the only controls guy. As we grow, we will need another controls engineer both to handle the load and in case Engineering Manager is no longer at Company X. Right now our size does not warrant that. Most of the current controls work is maintaining existing code.

**Engineering Organizational Restructuring Meeting – 9/21/07**
Present: Engineering Manager, DE1, DE3, Applications Engineer,
Drafting/Documentation Specialist
Absent: None

**MEETING AGENDA**

- Discuss the list of Engineering functions that can be areas of emphasis. Is this list complete? Can things be combined? Should some on the list not be emphasized? The Engineering functions highlighted at the last meeting are as follows:
  - New Product Development
  - Existing Product Maintenance
  - Quality
  - Cost Reduction
- Begin to determine a structure to emphasize each Engineering function

**MEETING NOTES**

The following were the thoughts and ideas generated.

- Cost Reduction and Quality can be considered functions of New Product Development and Existing Product Maintenance
- We should not be setting priorities to present to upper management. Management should be telling us what to prioritize. Find what percentage of time to apply to each Engineering function.
- Engineering Functions list is expanded
  - New Product Development
  - Applications – Equipment B and Equipment A
  - Manufacturing/Process Engineering (layouts, fixtures, processes, work instructions, tools)
  - Project Management
  - Quality (Data, Inspection, Procedures)
  - Cost Reduction
  - Support – Sales (Questions, Talking to customers, Trade shows)
  - Support – Manufacturing (NPD Handoffs, Troubleshooting)
  - Support – Purchasing (New vendors/models of parts, Using parts not to spec)
  - Support – Service
  - Support – Parts
  - Support – Organizational (Cross Functional Team, process creation)
  - Training/Assisting in training of other Departments
  - Documentation
- For planning future growth, ask upper management at what level of sales could we add resources. For example, at $XX million, we would add 2 members to the Engineering Department, etc.

# APPENDIX B: ENGINEERING MEETING NOTES FROM STAGE 4

**Engineering Organizational Restructuring Meeting – 10/17/07**
Present: Engineering Manager, DE1, DE3, Applications Engineer
Absent: Drafting/Documentation Specialist

## MEETING AGENDA

*1. Goals from Chief Operating Officer*

Present feedback from COO regarding goals for percentages of time devoted to Engineering functions. This feedback was provided using data from the last 3 years (2007 through 3 quarters) to compare current percentages:

| | 2005 | 2006 | 2007 | Current Goal - % |
|---|---|---|---|---|
| New Product Development | 26.9% | 24.3% | 28.2% | 40.0% |
| Applications – Equipment B | 14.1% | 14.2% | 8.0% | 10.0% |
| Applications – Equipment A | 10.6% | 11.4% | 3.9% | 5.0% |
| General Product Support | 9.8% | 2.8% | 1.3% | |
| Manufacturing/Process Engineering | | | | 5.0% |
| Project Management | | | | |
| Quality (Data, Inspection, Procedures) | | | | 5.0% |
| Cost Reduction | 0.0% | 0.0% | 14.9% | |
| Support - Other Functional Areas | 24.1% | 17.1% | 18.0% | 10.0% |
| Support – Sales | | | | |
| Support – Manufacturing | | | | |
| Support – Purchasing | | | | |
| Support – Service | | | | |
| Support – Parts | | | | |
| Support – Organizational | 2.3% | 8.9% | 9.6% | 10.0% |
| Time off - Vacations, Holiday's, PTO | 7.0% | 10.6% | 6.1% | 10.0% |
| Training/Assisting in training of other Depts | | | | |
| Documentation | 5.2% | 10.7% | 10.0% | 5.0% |
| **TOTAL** | 100.0% | 100.0% | 100.0% | 100.0% |

This above table uses the following assumptions:

- Applications – Equipment A function past data uses Existing Product Development numbers from engineers in the Equipment A Line
- General Product Support function past data uses all Existing Product Design Revision numbers
- Project Management is handled by the Design Engineer responsible for the project and is not recorded separately

*2. Restructuring Options for Meeting Goals*

Present four options for organizational restructuring to meet goals. These options redefine the job responsibilities for the open position and other existing positions. The concept of a rotating "firefighter" type position to alleviate distractions from the rest of the department is also utilized. The four options are named Options 1, 2A, 2B and 3 due to similarities in Options 2A and 2B. Key areas COO wanted to increase are highlighted in yellow.

**OPTION 1 – Hire an Engineer to handle primarily Equipment A Apps, Quality and Manufacturing (Manuf. Utility)**

Job Responsibilities of Manuf. Utility:

- Perform Equipment A applications
- Act as Quality Manager
- Manufacturing Engineering including fixture design and creation of work instructions
- Assist Engineering Manager with Support activities

Positives:

- Handles Quality and Manufacturing Engineering functions currently lacking
- Design Engineers focus on NPD

Negatives:

- Engineering Manager heavily relied on to perform support activities
- Little cross training among Design Engineers

Other Notes:

- Drafting/Documentation Specialist will assist with creation of work instructions and perform some support activities

Weekly Breakdown of Hours:

| | Manager | DE1 | DE3 | Manuf. Utility | Apps | Doc | Total | Goal |
|---|---|---|---|---|---|---|---|---|
| NPD | 29 | 33 | 33 | | 4 | | 99 | 101 |
| Equipment B Applications | | | | | 25 | | 25 | 25 |
| | | | | | | | | |
| Equipment A Applications | 3 | | | 10 | | | 13 | 13 |
| Manufacturing | | | | 8 | | 5 | 13 | 13 |
| Support | 8 | 2 | 2 | 4 | 6 | 3 | 25 | 25 |
| Quality | | | | 13 | | | 13 | 13 |
| | | | | | | | | |
| Documentation | | | | | | 13 | 13 | 13 |
| | | | | | | | | |
| Organizational Support | | 5 | 5 | 5 | 5 | 5 | 25 | 25 |
| | 40 | 40 | 40 | 40 | 40 | 26 | 226 | 228 |

**OPTION 2A– Hire a Design Engineer and rotate the Equipment A Apps, Quality and Manufacturing (Rotating Utility)**

Job Responsibilities of Rotating Utility:

- Perform some Equipment A Applications
- Act as Quality Manager
- Manufacturing Engineering including fixture design and creation of work instructions
- Assist Engineering Manager with Support activities
- Perform NPD when not doing other responsibilities

Positives:

- Handles Quality and Manufacturing Engineering functions currently lacking
- Design Engineers focus on NPD
- Cross training among Design Engineers while doing Rotating Utility

Negatives:

- Engineering Manager heavily relied on to perform Support activities
- Quality Manager and Manufacturing Engineering functions are rotated. This could lead to inconsistency in work instructions and quality information to fall through the cracks

Other Notes:

- Drafting/Documentation Specialist will assist with creation of work instructions and perform some Support activities
- Engineering Manager relied heavily to perform Equipment A Applications
- Option 2 is similar to Option 1 with the differences being a Rotating Utility position and more reliance on Engineering Manager for Equipment A Apps.

Weekly Breakdown of Hours:

| | Manager | DE1 | DE2 | Rotating Utility | Apps | Doc | Total | Goal |
|---|---|---|---|---|---|---|---|---|
| NPD | 22 | 34 | 34 | 10 | | | 100 | 101 |
| Equipment B Applications | | | | | 29 | | 29 | 25 |
| | | | | | | | | |
| Equipment A Applications | 10 | | | 3 | | | 13 | 13 |
| Manufacturing | | | | 6 | | 7 | 13 | 13 |
| Support | 8 | 1 | 1 | 4 | 6 | 3 | 23 | 25 |
| Quality | | | | 13 | | | 13 | 13 |
| | | | | | | | | |
| Documentation | | | | | | 13 | 13 | 13 |
| | | | | | | | | |
| Organizational Support | | 5 | 5 | 5 | 5 | 5 | 25 | 25 |
| | 40 | 40 | 40 | 41 | 40 | 28 | 229 | 228 |

**OPTION 2B– Hire a Design Engineer and rotate the Equipment A Apps, Quality and Manufacturing (Rotating Utility)**

Job Responsibilities of Rotating Utility:

- Perform some Equipment A Applications
- Act as Quality Manager
- Manufacturing Engineering including fixture design, creation of work instructions
- Act as primary Support person
- Perform NPD only if time permits

Positives:

- Handles Quality and Manufacturing Engineering functions currently lacking
- Quality and Manufacturing Engineering functions are being handled by the same person every week
- Design Engineers focus on NPD
- Cross training among Design Engineers while doing Rotating Utility

Negatives:

- Rotating Utility position has no time for NPD that week – creating a lull in project progress

Other Notes:

- Drafting/Documentation Specialist will assist with creation of work instructions and perform some Support activities
- Engineering Manager relied heavily to perform Equipment A Applications
- Option 2B is similar to Option 2A with the difference being making the Rotating Utility position responsible for the majority of Support activities, sacrificing his NPD time

Weekly Breakdown of Hours:

| | Manager | DE1 | DE2 | Rotating Utility | Apps | Doc | Total | Goal |
|---|---|---|---|---|---|---|---|---|
| NPD | 26 | 34 | 34 | 2 | | | 96 | 101 |
| Equipment B Applications | | | | | 29 | | 29 | 25 |
| | | | | | | | | |
| Equipment A Applications | 10 | | | 3 | | | 13 | 13 |
| Manufacturing | | | | 6 | | 7 | 13 | 13 |
| Support | 4 | 1 | 1 | 12 | 6 | 1 | 25 | 25 |
| Quality | | | | 13 | | | 13 | 13 |
| | | | | | | | | |
| Documentation | | | | | | 13 | 13 | 13 |
| | | | | | | | | |
| Organizational Support | | 5 | 5 | 5 | 5 | 5 | 25 | 25 |
| | 40 | 40 | 40 | 41 | 40 | 26 | 227 | 228 |

**OPTION 3– Hire an Engineer to perform Quality, Manufacturing and some NPD (Manuf. Utility). Rotate the Support and Equipment A Apps. (Rotating Firefighter)**

Job Responsibilities of Manufacturing Utility:

- Act as Quality Manager
- Work as Manufacturing Engineer including fixture design and creation of work instructions
- Perform some NPD

Job Responsibilities of Rotating Utility:

- Perform some Equipment A Applications
- Act as primary Support person

Positives:

- Quality and Manufacturing functions currently lacking are taken care of
- Design Engineers focus on NPD
- Cross training among Design Engineers while doing Rotating Utility
- Rotating Utility position still has time for NPD to assist project progress

Negatives:

- New hire will not be experienced design engineer with the 10+ years that the previous engineer had

Other Notes:

- Drafting/Documentation Specialist will assist with creation of work instructions and perform some Support activities
- Engineering Manager relied heavily to perform Equipment A Applications
- Engineering Manager still maintains fair Support role
- When any position is Rotating Utility, design work will be sacrificed for that week

**OPTION 3– CONTINUED**

Weekly Breakdown of Hours:

**DE as Rotating Utility**

| | Manager | DE1 – Rot. Utility | DE2 | Manuf. Utility | Apps | Doc | Total | Goal |
|---|---|---|---|---|---|---|---|---|
| NPD | 26 | 22 | 34 | 15 | 4 | | 101 | 101 |
| Equipment B Applications | | | | | 25 | | 25 | 25 |
| | | | | | | | | |
| Equipment A Applications | 10 | 3 | | | | | 13 | 13 |
| Manufacturing | | | | 6 | | 7 | 13 | 13 |
| Support | 4 | 10 | 1 | 1 | 6 | 3 | 25 | 25 |
| Quality | | | | 13 | | | 13 | 13 |
| | | | | | | | | |
| Documentation | | | | | | 13 | 13 | 13 |
| | | | | | | | | |
| Organizational Support | | 5 | 5 | 5 | 5 | 5 | 25 | 25 |
| | 40 | 40 | 40 | 40 | 40 | 28 | 228 | 228 |

**Manuf. Utility as Rotating Utility**

| | Manager | DE1 | DE2 | Manuf. Utility – Rot. Utility | Apps | Doc | Total | Goal |
|---|---|---|---|---|---|---|---|---|
| NPD | 26 | 34 | 34 | 3 | 4 | | 101 | 101 |
| Equipment B Applications | | | | | 25 | | 25 | 25 |
| | | | | | | | | |
| Equipment A Applications | 10 | | | 3 | | | 13 | 13 |
| Manufacturing | | | | 6 | | 7 | 13 | 13 |
| Support | 4 | 1 | 1 | 10 | 6 | 3 | 25 | 25 |
| Quality | | | | 13 | | | 13 | 13 |
| | | | | | | | | |
| Documentation | | | | | | 13 | 13 | 13 |
| | | | | | | | | |
| Organizational Support | | 5 | 5 | 5 | 5 | 5 | 25 | 25 |
| | 40 | 40 | 40 | 40 | 40 | 28 | 228 | 228 |

**MEETING NOTES**
The following were the thoughts and ideas generated:

*For the Current Structure:*

- COO increased the amount spent on Quality from 0% to 5%. It is not realistic for one engineer to start acting as a Quality Manager as a small part of their job description. This can be added as a more official Engineering function as more resources are added. For now a small piece of all of our jobs deals with quality, although it is tracked in other support areas.
- The Manufacturing Engineering function that needs to be done first is the creation of work instructions. This can be put on Drafting/Documentation Specialist's plate as the manual work load has lightened. We really need to document how we currently are assembling things, even if it's not the best way to assemble, just to capture what we know now. Then the Design Engineer and Service Manager can review them and look for improvements to the processes.
- We would prefer to hire a Design Engineer with 10+ years of design experience. This will be more valuable to the department as we try and balance our collective skill sets.
- The Rotating Utility (Firefighter) position is worth trying to attempt to better isolate the Design Engineers.
    - This position should be rotated between the three Design Engineers and the Engineering Manager
    - The cross training across product lines, while making the firefighting less efficient, would be beneficial to the department as a whole
    - It will be difficult to roll this out to the company. Communication is the key to its success. The implementation must be done appropriately and the person in the Rotating Utility position must welcome any issues that are brought to his attention. The launch of this will need to be carefully planned.

*For the Future:*

- Long term, we should be thinking about developing specialties among the Design Engineers. This would be beyond the scope of this project, but we need to start thinking about what areas would be appropriate to specialize in: plastic design, conveying systems, FEA, fluid flow, project management are just a few possibilities.
- Specialties would allow us to more efficiently attack a design project with multiple resources.

*Recommended Current Organizational Structure*

**Hire a Design Engineer and rotate the Equipment A Apps and Support (Rotating Firefighter)**

Job Responsibilities of Rotating Utility:

- Perform most Equipment A Applications
- Act as primary Support person

Positives:

- Design Engineers focus on NPD
- Cross training among Design Engineers while doing Rotating Utility
- Rotating Utility position still has time for NPD to assist project progress
- New hire will have 10+ years design experience

Other Notes:

- Quality function will not be addressed specifically at this time
- Drafting/Documentation Specialist will act as Manufacturing Engineer and create work instructions
- When any position is Rotating Utility, design work will be sacrificed for that week

Weekly Breakdown of Hours:

**WEEK 1 - Engineering Manager as Firefighter**

| | Manager - Firefighter | DE1 | DE2 | DE3 | Apps | Doc | Total | Goal |
|---|---|---|---|---|---|---|---|---|
| NPD | 15 | 32 | 32 | 32 | 4 | | 115 | 101 |
| Equipment B Applications | | | | | 25 | | 25 | 25 |
| | | | | | | | | |
| Equipment A Applications | 13 | | | | | | 13 | 13 |
| Manufacturing | | | | | | 13 | 13 | 13 |
| Support | 12 | 2 | 2 | 2 | 5 | 3 | 26 | 25 |
| Quality | | | | | | | 0 | 13 |
| | | | | | | | | |
| Documentation | | | | | | 13 | 13 | 13 |
| | | | | | | | | |
| Organizational Support | | 6 | 6 | 6 | 6 | | 24 | 25 |
| | 40 | 40 | 40 | 40 | 40 | 29 | 229 | 228 |

**WEEKS 2-4 - Design Engineer as Firefighter**

| | Manager | DE1 - Firefighter | DE2 | DE3 | Apps | Doc | Total | Goal |
|---|---|---|---|---|---|---|---|---|
| NPD | 32 | 14 | 32 | 32 | 4 | | 114 | 101 |
| Equipment B Applications | | | | | 25 | | 25 | 25 |
| | | | | | | | | |
| Equipment A Applications | 3 | 10 | | | | | 13 | 13 |
| Manufacturing | | | | | | 13 | 13 | 13 |
| Support | 5 | 10 | 2 | 2 | 5 | 3 | 27 | 25 |
| Quality | | | | | | | 0 | 13 |
| | | | | | | | | |
| Documentation | | | | | | 13 | 13 | 13 |
| | | | | | | | | |
| Organizational Support | | 6 | 6 | 6 | 6 | | 24 | 25 |
| | 40 | 40 | 40 | 40 | 40 | 29 | 229 | 228 |

# APPENDIX C: ENGINEERING MEETING NOTES FROM STAGE 5

**Engineering Organizational Restructuring Meeting – 10/23/07**
Present: Engineering Manager, DE1, DE3, Applications Engineer,
Drafting/Documentation Specialist
Absent: None

## MEETING AGENDA

*1. Goals from Chief Operating Officer*

Present feedback from COO regarding his thoughts for adding future Engineering resources. The chart below shows what percentage of time each additional full time engineer (FTE) above current staffing would spend on each Engineering function:

| | FTE 1 | FTE 2 | FTE 3 | FTE 4 |
|---|---|---|---|---|
| New Product Development | | 80.0% | 80.0% | |
| Applications – Equipment B | | | | |
| Applications – Equipment A (EPD) | | | | |
| General Product Support (REV) | | | | |
| Manufacturing/Process Engineering | 20.0% | | | 60.0% |
| Project Management | | | | |
| Quality (Data, Inspection, Procedures) | 50.0% | | | |
| Cost Reduction | | | | |
| Support – ALL | | | | 20.0% |
| Support – Sales | | | | |
| Support – Manufacturing | | | | |
| Support – Purchasing | | | | |
| Support – Service | | | | |
| Support – Parts | | | | |
| Support – Organizational | 10.0% | 10.0% | 10.0% | 10.0% |
| Other - Vacations, Holiday's, PTO | 10.0% | 10.0% | 10.0% | 10.0% |
| Training/Assisting in training of other Depts | | | | |
| Documentation | 10.0% | | | |
| **TOTAL** | 100.0% | 100.0% | 100.0% | 100.0% |

This above table uses the following assumptions:

- Applications – Equipment A function past data uses Existing Product Development numbers from engineers in the Equipment A Line
- General Product Support function past data uses all Existing Product Design Revision numbers
- Project Management is handled by the Design Engineer responsible for the project and is not recorded separately

*2. Discuss Future Growth Plan*

Discuss specific skill sets desired for future hires. Many have been discussed during the meetings, as well as the desire to develop specialties to help us work more efficiently and make it easier to attack a project with multiple resources.

The following is a list of skill sets and/or specialties we have discussed.

- Manufacturing
  - Creates and maintains work instructions for all Company X manufactured parts and equipment
  - Designs fixtures for assembling components
  - Audits work layouts and tools for manufacturing personnel
- Quality
  - Oversees, and creates when necessary, processes ensuring quality of both parts purchased for use in manufacturing and parts and equipment sold to customers
  - Collects data regarding part and assembly defects
  - Maintains QC processes for all Company X manufactured parts and equipment
- Plastic Design
  - Designs all molded plastic parts
  - Understands different molding process to select the most appropriate and cost effective
  - Understands plastic materials to select the most appropriate and cost effective
- Project Management
  - Creates project charters and timelines for all Engineering projects
  - Maintains project charters and timelines for all Engineering projects
  - Manages communication with other functional departments to ensure their availability when required during project timelines
  - Communicates project progress to management
- Controls
  - Designs controls and electrical systems for new designs
  - Handle modifications to controls and electrical systems for existing designs
  - Supports other functional areas by answering questions regarding controls and electrical systems relating to function, performance, and alternate part selection
  - Supports other functional areas by performing problem solving for controls and electrical systems issues
- Analysis
  - Perform FEA analysis, both linear and non-linear
  - Correlate FEA to real world results
  - Analyze and optimize designs to ensure appropriate performance using the most cost effective design

**MEETING NOTES**
The following were the thoughts and ideas generated:

*Specialties*
- DE3 will be sent to training to begin building FEA knowledge, and the applicants applying for the open Design Engineer position also have FEA backgrounds.
- Experience with plastics is being sought in the open Design Engineer position. We will most benefit from plastic design experience now due to the Z-Line project
- Project management should continue to be performed by the Design Engineer running the project until the department grows much larger (beyond 4 additional resources)

*First FTE Addition*
- It is agreed that the first FTE should possess a Quality and Manufacturing skill set as COO proposed. They would have an immediate impact on our operations.
- This FTE would act as the Quality Manager and get more heavy into the creation and maintenance of work instructions, as well as assist manufacturing with fixtures and work layouts, as noted in the specialties set above
- It was understood that this position has already been budgeted for and will hopefully be realized in the near future

*Other FTE Additions*
- There are two strategic decisions the company could make that would require us to expand our department:
    - Take on a new large design project that would expand our offering and consist of a piece of equipment containing over 500 parts
    - Vertically integrate to bring more part fabrication in house
- The two decisions will require separate growth plans

*Decision 1: New Large Design Project*
- Adding a new line of equipment would require new Engineering resources to develop the equipment. Without adding resources the NPD would take much more time and be difficult to maintain.
- Two Mechanical Design Engineers should be added.
    - These Engineers would be at least 80% NPD, and would be isolated from any support functions
    - One of which should have ten plus years experience to lead the mechanical design
    - One of these engineers would roll into a product support role upon completion of the project
- One Electrical Engineer should be added
    - This EE could be a new graduate that we could train in SolidWorks CAD software to do some mechanical design. This is because we do not have enough controls and electrical systems work to support another full time EE.

    - This EE would be trained in our current controls and electrical systems, and would help support current equipment lines as well as work in NPD
    - This EE would also be a backup to Engineering Manager as no one else could take over his work if he were no longer at Company X

*Decision 2: Vertical Integration of Fab. Work*

- Bringing sheet metal work in house would require finding a Manufacturing Engineer experienced in sheet metal
- This would only require adding one resource