

**An Effective Approach to Choosing Project, Program and Portfolio Management Software  
at a Large and Geographically Diverse Company**

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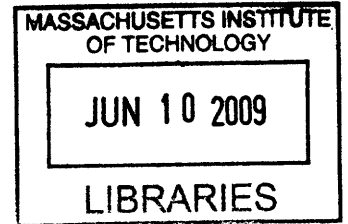
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**ABSTRACT**

Selecting and deploying an IT tool can be very complicated and expensive. This paper studies a particular approach to choosing project, program and portfolio management software at one large and geographically diverse company in the Electronics Manufacturing Services (EMS) industry, Voltaform. Though there are many ways to approach this task, significant thought should go into which one is chosen for each particular company and its situation. This document addresses the approach taken at VoltaForm as well as the reasoning behind it. It describes developing a business case focused on end user needs for the new software, including the detailed data analysis techniques used to evaluate the end user needs. It also describes certain aspects of the deployment of the software once chosen. The purpose of this paper is to provide guidance and examples for anyone faced with a similar task.

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## **Chapter 1: Introduction**

Communicating and sharing information may be one of the largest challenges facing businesses in the modern world. It becomes both more important and challenging as more companies have teams distributed throughout the world. A lack of face-to-face communication combined with significant time differences adds to the complexity. This document addresses choosing software to support project, program and portfolio management (typically referred to as PPM) in a large, geographically-dispersed company. It will include my personal experience at an Electronics Manufacturing Services (EMS) company that I will refer to as Voltaform for confidentiality purposes, as well as information found through interviews and literature widely available.

The problem as defined by Voltaform is that there is not a single project, program and portfolio management tool or database (something that assists the project or program manager with the tasks needed to manage their project or program) that is consistently used across the company, nor is there a defined set of requirements and checkpoints or strategy. The goal was to define, evaluate, and recommend a project, program and portfolio management data solution for deployment across the company in the next year based on a business case. The key was to focus on elements that are common, manageable and right-sized for initial deployment. We also wanted to ensure that the chosen tool can be successfully adopted and will provide solid business value justifying the expense of acquiring and implementing it in these difficult economic times.

### **Motivation**

There are a variety of tools available in the marketplace for both Project Lifecycle Management (PLM) and PPM. It is important to understand the different as well as common traits between the two. A PLM tool allows for the entire life of a product or program to be managed from one place: it starts with concept, continues through design, production, and service as well as disposal and end of life (CIM Data, 2003). A PPM tool can be thought of as merely one piece of the larger PLM tool. Figure 1 shows an example from AMR Research depicting the many aspects of PLM as well as some of the different individual components of those bigger pieces. It suggests that you look at PLM from the perspective of the processes used in an organization and how the elements of the tool can add value to the overall organization. In the system, many different parts of the company come together to affect the improvement of both quality and compliance.

While PPM is a large part of PLM, it doesn't deal with financial information, engineering tools, build data, commercial data, material data, design, quality reliability or engineering information. PPM is, nevertheless, a complex system that involves several different systems working together.

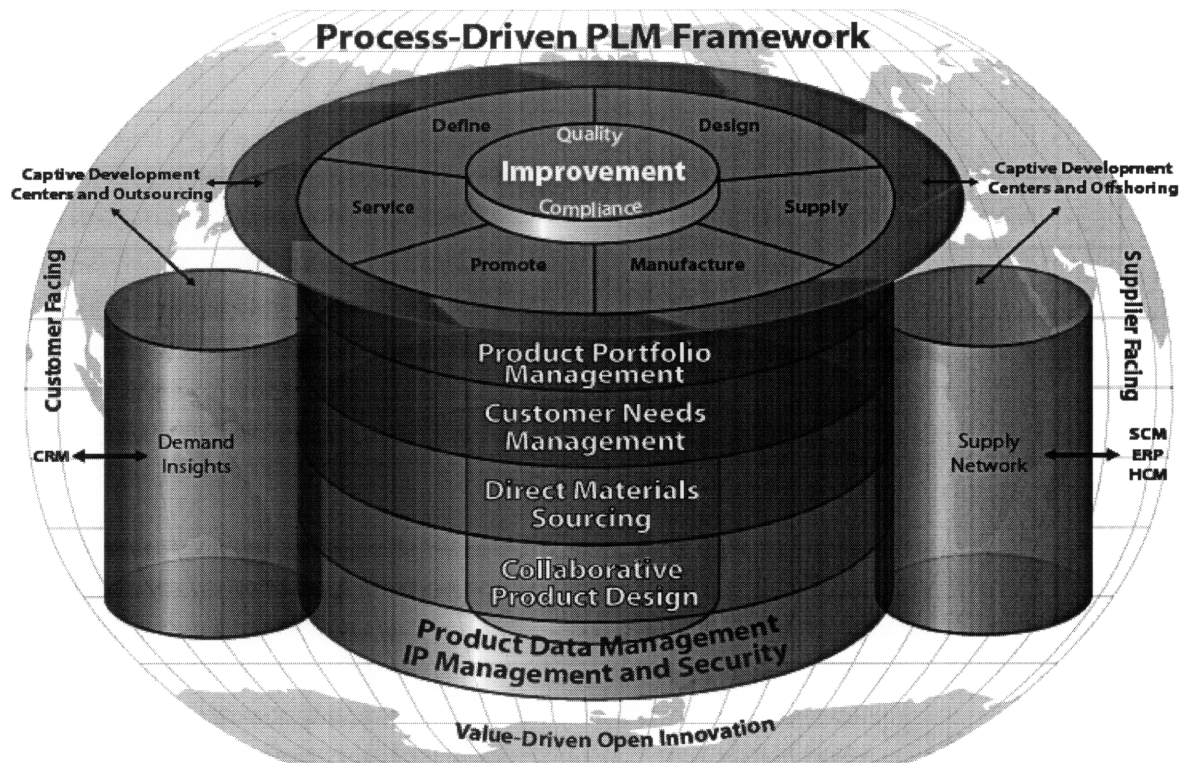


Figure 1: An Example of a PLM Framework This image doesn't show up at all on my version.

To be clear about the different components of a PLM tool, I now describe some of the characteristics of the building blocks.

- The quality data management portion captures customer satisfaction results as well as warranty and internal and external defect ratios and supports product and process approval, regulatory approvals, advanced quality planning, and problem solving.
- The reliability data management portion works with reliability libraries and forecasts.
- The material data management portion houses the master databases for all materials, as well as lists of all of the manufacturers, their part numbers and the Approved Manufacturers List (AML).
- The design data management portion serves as a repository for all design data including the Mechanical Computer Aided Design (MCAD) information and the Electrical Computer Aided Design (ECAD) information as well as a workflow system for engineering Work- In-Progress (WIP).
- The engineering data management is a master database for all engineering and contains Computer Aided Design (CAD) libraries, Computer Integrated Manufacturing (CIM) objects, testing libraries and testing results.
- The financial data management holds not only pricing and costing information, but also financial models, volume forecasts and project investments.
- The commercial data management deals with the quotes, the request for quotes, Purchase Orders (POs), contracts, customer relationship management data, account plans and bump sheets.

- The engineering tools portion contains the different design tools that the company uses (e.g., Pro-E, CAD, CATIA).
- Last but not least, the PPM portion contains the project, program or portfolio management methodology, including details on the gates, checkpoints, and program reviews. It serves as a virtual team workspace with resource management, routings, lessons learned and even approvals and workflow.

A PLM tool functions in a variety of different ways. The PLM can either perform all of the tasks described in the list above itself, or that it can serve to integrate other pieces of software that are performing those tasks. The second option can be complicated, but roll-out may be easier as the users don't have to learn as many new systems (assuming that systems are already in place) and it minimizes the added expense of transferring multiple systems over to one. The first option might be easier if you currently have multiple different systems dealing with the same information (at different sites for instance) and you want to standardize and make that information common. Choosing between these two options depends on the specific needs of the company or organization. These tools are to make work easier and allow for better information flow, but the choice of how to do that does not look the same for everyone.

Innotas (a leading provider of PPM tools and services) proposes that there are only two models for aligning PPM to your business, the engagement profitability model and the budget alignment model. The engagement profitability model assumes that projects and programs are where the company gets revenue, and therefore that the decisions and strategy the company uses are primarily influenced by the profitability of the customer engagements. This is usually true for a service company. Budget alignment models are used in more operational environments, where the primary costs of a project are overhead costs, and there is constant pressure to reduce them (Innotas). For both models, you can make a case for a PPM tool, however the requirements and business case will be different.

In this paper, I will address the budget alignment model due to the fact that Voltaform is an operations-centric company, constantly trying to reduce the amount of money that it costs to produce each and every product that goes out the door. Voltaform decided it was best to identify a tool that would work as a PPM and later on plan to expand to the larger PLM. Leadership became aware that there was a lack of continuity of information technology and process within the company. A PPM is focused on providing a tool that can help a project, program or portfolio manager do his or her job more effectively and efficiently. It can include resource allocation, budget tracking, schedule optimization, quality information, and risk assessment/management. Again, the requirements for performing these tasks will look different for different companies and organizations. My job was to determine the best arrangement for Voltaform. We will get into the details of my approach as well as some potential options later.

Implementing an effective PPM tool may yield several benefits. Voltaform was primarily motivated by five potential benefits of the software:

1. The first set of benefits derived from standardization of enterprise data and its related processes. Training can be standardized and simplified across the enterprise since every user inputs the same information in the same format in the same place. In addition it reduces the level of retraining required for Project or Program Managers (PMs) who transfer between programs, reducing Voltaform's start up costs. Finally the consistent reporting format saves the time of management and executives as the same information will always be present and in the same place no matter whose report they are looking at, what product or type of product it is for, what site they are at and even what language it is in. Great care must be taken, however, to ensure acceptance of the standard format across all of the different business units, functions and geographies at Voltaform.
2. The second major benefit Voltaform desires from a PPM tool is increased productivity through automation. A great deal of time and effort which is currently wasted collecting information from numerous people and systems could be eliminated. In addition, reports and dashboards for customers and management could be generated with far less effort.
3. The third major benefit Voltaform hopes a PPM tool will drive is information consistency. Two issues arise when an individual needs to consolidate information from multiple sources: time lag (due to time differences in working with people or update challenges when working with systems), and inconsistent or conflicting information. Through the interviews I discovered it was a fairly common occurrence for a PM to track down information from one source just to find that it conflicted with information found in another source. In such cases, additional time and effort was required to identify the reason for the difference and determine which one (if either) was correct.
4. The fourth major benefit Voltaform hopes a PPM tool will drive is the creation standard processes. The bulk of Voltaform's growth has come through acquisitions and as a result there are many different tools and processes in place. Using only one tool will force a standard process across the entire enterprise. This will yield benefits similar to standardization, and, in addition, the lack of alternative (work-around) processes will force employees to comply.
5. The final benefit is a single repository for all relevant project information. This minimizes the challenge of finding information and simplifies training. There is only one tool needed in order to get all the information you need. This will be a large time savings and a significant convenience to all those who use the tool.

All in all, the tool will help the company to manage the business and work toward the corporate goals and vision. As will be discussed later, this is imperative for a business case. The tool would enable standardization of the gates that a project, program or portfolio must pass through across the company. This standardization will then in turn allow for the many teams across the company to work toward one set of rules and use these tools to communicate across the barriers created by distance, time zones, languages and cultures. This would enable faster ramp up of a new employee, while increasing

employee mobility across projects, programs and portfolios. Finally, the groundwork that is laid while developing the PPM tool is a critical step toward a more advanced PLM solution.

Many Voltaform customers have requested that tools such as these be implemented in the past. Their motivation has been to obtain greater visibility of project status and to confirm that standard processes and procedures are in place that must be followed. It was such a customer request at Voltaform combined with an internal desire to standardize the gate process that initiated the search for a PPM tool.

Studies have shown the implementation of program, project and portfolio management software is highly correlated to increased performance (the Project Management Institute Website has a number of whitepapers showcasing different case studies where this was the case). In Voltaform's case, it would improve efficiency by eliminating redundant resources being dedicated to unique local solutions. Combining the tools will make a significant difference. Lewis Cardin stated, "Enterprises need to deal with the paradox of increased complexity in the stewardship of their technology dollars while responding to the desire for higher transparency – the essence of what modern governance is all about" (Cardin, November 6, 2007). The appropriate PPM tool will enable Voltaform to do just that.

### **Potential Concerns/Challenges**

Choosing a tool may seem like an easy task, but Voltaform and many others in the EMS industry have many challenges when approaching such a project. A company this large (200,000 people) with so many different projects, programs and even portfolios has many different invested parties, which can become an intractable problem. This tool has the potential to have a significant impact on each user's day-to-day job which means that many parties have strong vested interests in the outcome. Depending on their current use of similar tools or processes, multiple groups may lobby for a particular solution. If you are conducting a study from a position where this could affect you or your career, take great care. It is important to map out the stakeholders early on and to identify their interests and needs. In addition, ensure that you keep the stakeholders informed throughout the process, and allow them to raise their objections or concerns along the way, which will reduce the chance of surprises later.

Again, serious complications arise from the company's geographic reach and numerous languages. Ideally you would engage each of the stakeholders, but they are far apart, and interviews in an employee's second language can be challenging. Even those that are in the same country have different corporate cultures and understandings that can lead to miscommunication. It is important here to be able to understand the appropriate balance between getting enough information and spending too much time getting it. In the EMS industry things are constantly changing and business moves very rapidly. It is important to be able to gather the right information in a short period of time.

You must be aware that people are likely to have a bias toward the systems they know best. Each person may think that he or she knows the right answer. Though that answer may be right for them and their organization, it might not be the right answer for the company as a whole. "... an individual will need to sacrifice some of [his or her] individual style to conform to the portfolio work flow" (Davis PMP, date). When you come across this situation, try to find out what in particular they like about this tool.

Why does it work for their organization so well? Highlighting similar features in the new tool (once chosen) may pay significant dividends by gaining their buy-in. Alternatively, try to identify their most significant annoyances with the current tool and when possible, demonstrate the benefit of using the new tool. Such actions will make that group feel as though you are truly listening to their requirements and concerns, and they will be more likely to accept the final solution if they feel as though they were a part of determining it.

Some of the current tools are internally developed solutions, leading to a very large bias from that particular group. However, this too can be taken advantage of, as I will describe in more detail later. You can easily assess the needs of the group from looking at the features of the tools that they have developed. They took the time and effort to develop their own tool only because these were extreme needs for them. These tools might also be capable of being scaled up to address the needs of the rest of the company. Often this will take additional investment; however, it has the potential to be a better fit for the company and also could be less expensive overall (This will be addressed in more depth in the business case portion of this document).

As mentioned earlier, the company has primarily grown through acquisitions, which has led to unique tools in many of the different divisions, sites and even individual groups that serve essentially the same purpose. This again will make choosing a tool more complicated. For instance, one possible off-the-shelf tool might work particularly well with one shop floor system that is in use at site A, while it does not do well at all with the shop floor system in place at site B. This will come up often. The choice is then do you want to standardize the shop floor system across all the sites? If so how will the customers respond? Often these systems are put into place because they can communicate with the customer's system. In the EMS industry there is a great deal of attention paid to the customers' needs. (Again, this will be discussed in greater detail later).

It is always going to be challenging to implement a new solution. People will have to learn a new way of doing their job. There will be a decrease in productivity at least for a short time, no matter how well you plan and prepare. It is important to make sure that people know this upfront. (e.g. Carlson, 2007) That way, they will not expect a benefit up front. However, it is best to get that improvement as soon as possible because depending on the personality and culture of the group, they may give up before the benefit is realized. In many EMS companies, and definitely at Voltaform, the organization is flat and results-focused. People are empowered to do what they think is best for the bottom line; therefore if they don't see the benefit, they are perfectly capable of working around it or not using the system at all. The system needs to make sense to them and help them to work.

## **Business Case**

According to Jeff Monteforte (September 20, 2005), "Maybe the most essential component an IT Project Portfolio Management (PPM) practice is the project business case." There are multiple levels of a business case. The fundamental questions that must be answered when trying to make a decision in a company are: will it save me money and how will it support the company's goals and objectives? The first step in answering these questions is to quantify how much it will cost and how much it will save over the given time period. Here our decision was whether to buy a product off the shelf, to have one

customized, to design a system internally, or to do nothing. There should also be a component of the business case built around when to implement the new system. One additional tip for developing a business case is to remember that the measurements and comparisons that you will be making should make sense to those who are making the decision. In this case these are manufacturing terms, for example cost per unit, time to produce, number of units. You must also look at the environment in which you will be operating; this includes looking at how competition, suppliers, or customers might react to this change. Another concern that should be looked at initially is feasibility, in this case the feasibility was easy to determine and therefore will not be addressed in depth, but this may not always be the case. You may need to develop a plan to address or determine the feasibility of each potential outcome. If this is done up front it will save cost, as well as time in the overall business case determination, by ruling out items that will not make sense. Also like any project it is important to identify risks, issues and assumptions up front as well, and monitor them throughout the project, making changes as necessary.

A major concern is getting the approval to move ahead on a project like this requires executive approval. Leadership often requires an understanding of the business case and the time to break even when making such a large investment of capital and effort.

### **Time to Break Even**

Here we know that we have a very dynamic company that has to react quickly. We are also dealing in a very low period in the economy where money is tight. And finally, we are dealing with a software decision when software rapidly evolves, often with the providers making their own product obsolete. With these things in mind, we know that we want to look at a very short period of time for the new tool to pay off, perhaps one year. When making the comparison, compare this investment to how the company would otherwise invest the money, it is rare that a company has money just sitting, not making them more money. There are many ways to do break even quickly, just one of which is buying an out-of-the box solution that has functionality allowing the user to get to a point where they can use it to add value faster.

### **Cost**

Another consideration is cost. There are many aspects of cost. The easiest to identify is the price of the tool itself. However, without knowing the tool that we will choose, we do not have that number (there is a wide range based on the features of the system the high end can be over 100 times the cost of the low end). There are multiple schemes for pricing software tools: (1) Sometimes, the tool will have one flat fee, and you own it; no matter how much or how many people use the tool, it has the same cost. This is rare in business-to-business software sales, but it is the simplest cost model. (2) There is also a model where you pay a certain amount per user; no matter what part of the tool the user uses, you pay for a license. (3) There is a scheme where you pay by feature of the tool. In Voltaform's specific case, if you were to have a PPM tool, but only use the scheduling feature, it would be less expensive than if you were to use the scheduling feature and also the resources needed for each task feature and that resource's costs and capability. (4) Finally there are multiple combinations of hybrid forms of all of these.

Depending on how you are going to use the tool, it is important to select the license type carefully as it could cost or save a great deal of money. Support costs are also important. Some companies offer lifetime support of their tools, while others charge for the technical support. Again, keep in mind how long you are planning to use the tool. Will this company still be around to support it ten years down the road when you need help? Will it be able to provide upgrades, or are you going to have to find a completely different tool? These questions also come into consideration when you are trying to determine which vendor to choose.

Another important cost driver stems from the level of training required to prepare your people to use the tool. Even the most user-friendly tool will cost something in this area. The primary training costs include: development of the training program, deployment of it, any materials consumed, and the time of both those who teach and those who learn. Additional costs such as the overhead of the classrooms themselves and the cost of replacement labor that might be required to fill in for those taking the class need also be considered. Finally, there is the learning curve cost which stems from the fact that people tend to be far less productive when using a new process or tool. This can be minimized by developing an intuitive tool and focusing on the quality of the training and deployment of the tool. It is typically better to invest additional time and money up front in developing a deployment plan and training than to have that money spent in a shallower learning curve.

It is recommended to have an administrator for the deployment; this person (or administrative teams) will deal with the change control process as well as have a plan for the deployment itself (Davis PMP, Date). The number of people that you need to do this job and deal with the problems that will arise will depend on the size of the deployment as well as the maturity of the organization. It will also depend on the agreement with the tool provider; they may agree to deal with some of the deployment for you.

Plaza and Rohlf (2008) showed that for an ERP implementation (which has characteristics similar to those of a PPM) it is more cost effective to spend additional time and effort up front training the internal team, rather than attempt to implement rapidly using outside expertise. This is due to the fact that there is a great deal of cost in the external consulting (Plaza & Rohlf, 2008). If at all possible, I strongly recommend spending a great deal of time and effort up front on a project like this. A detailed plan with defined risks as well as mitigation plans will make for a much more successful launch.

### **Savings**

Savings can be broken into two broad segments: hard savings and soft savings. The hard savings are somewhat easy to identify.

The first step I took in determining the business case was to take the information from the interviews (which will be explained in greater detail later in the paper). When determining the needs of the users, I asked, where appropriate, how much time a PM typically spent performing various tasks as well as how many people in the group did the same, and how much a PPM system would save them. Combining that information with the average cost of a PM across the company yields one component of the amount of savings we will obtain. Keep in mind that the cost of an employee is more than salary; it should include benefits, overhead, etc. Then depending on the amount of time, the frequency of the saving, and the number of people it affects, you can calculate the savings. This can be summed for a portion of the



expected savings. However, it is important to remember that there are several underlying assumptions. For instance, you are assuming that these people were working a certain number of hours, I assumed 40 hours a week. This is more than likely not the case. It also assumes that you will not need as many PMs to do the job, thereby saving their costs. It is often better to look at other ways these PMs could use their time to save additional costs, or to add more value. Adam Bowden, director of Six Sigma for First Data Corporation suggests “Retaining those people, reusing them, freeing up their capacity, can allow a company to ‘grow’ outward rather than inward” (Ruff, 2000).

There are also hard savings in the form of not having to maintain multiple different licenses for different products. Often when a company does not actively choose a single software to use, there will be a variety of tools in use that serve the same purpose, or different areas are using the same software but not leveraging the power of buying in bulk and purchasing multiple licenses. It will also save the cost of having to maintain the internal technical support for these multiple programs (Centeno-Gomez, Alexander, Anderson, Cook, Poole, & Findlay, 2000).

Some examples of soft savings are goodwill from the customer, and a continued good (or perhaps even improved) reputation, and there is also potential avoidance of litigation from particularly bad quality, or bad quality in a potentially dangerous product (Jacowski, 2008).

A savings that is hard to quantify is the ability for multiple stages in the cycle to have access to information in parallel. This allows them to work together and at the same time. If all the engineers have access to the same information at the same time, then the design engineers can design the product at the same time as the manufacturing engineers design the process. It will also ensure that they are all using the same information from the same source, so that when the manufacturing engineers actually get the design, the process they have designed will fit it. This information will also have less chance of getting changed (or lost or cancelled) without a person’s up- or down-stream knowledge. It will become even more important as the company moves toward more development of products themselves. All of this will reduce error and time-to-market while increasing the company’s efficiency and quality. Any changes that do need to be made will more than likely be caught early and therefore will cost less to change.

Finally there are soft savings that are hard to identify. Has not having a PPM tool harmed quality? Has there been a loss of business? Have there been warranty issues, rework or scrap due to a lack of a consistent system? These are hard to determine. “Only when an organization applies the quality concept to its processes and its entire management system will it be able to see an effect on its bottom line” (Heinloth, 2000). Heinloth also identifies multiple effects of quality on both income and expense as shown in Figure 2. A common tool allows for a standard platform for explaining the product life cycle as well as for developing a common model to use when dealing with any project across the company, enabling cooperation and communication. It allows for generic processes and drives best practice adoption, further improving quality.

<b>"good" quality</b>	<b>Income</b> <ul style="list-style-type: none"> <li>• More customers</li> <li>• Repeat business</li> <li>• Competitive advantages</li> </ul>	<b>Expense</b> <ul style="list-style-type: none"> <li>• Lower production cost</li> <li>• Lower inspection cost</li> <li>• Lower working capital through reduced inventory</li> </ul>
<b>"poor" quality</b>	<ul style="list-style-type: none"> <li>• Loss of business</li> <li>• Penalties for late delivery or service</li> <li>• Partial or late payments due to customer dissatisfaction</li> </ul>	<ul style="list-style-type: none"> <li>• Scrap and rework cost</li> <li>• Warranty cost</li> <li>• Sorting cost</li> <li>• Express shipping cost</li> </ul>

Figure 2: Quality's Effect on Income and Expense (Heinloth, 2000)

The cost of quality is only one of many ways to use an employee's newly found free time and it can be a very profitable one. Arne Buthmann (2000) defines the cost of quality as, "... any cost that would not have been expended if quality were perfect...". He also created Figure 3 to show that much of the gain that you can get from investing in quality lie below the surface.

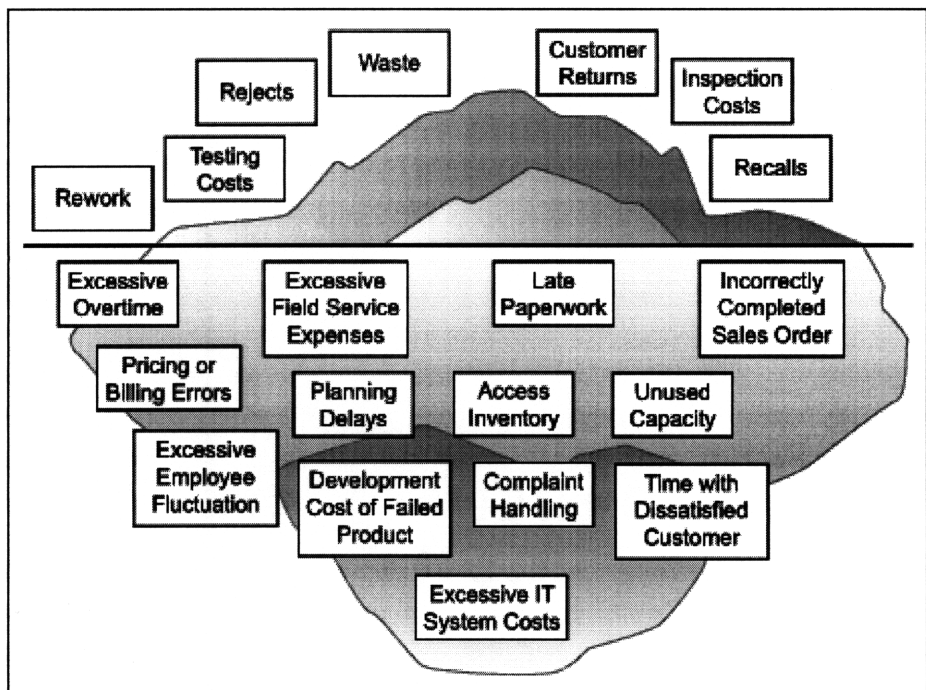


Figure 3: The Iceberg Model Cost of Quality (Buthmann, 2000)

When looking into the true cost of quality for your organization you might want to create a trend analysis to see what issues are systemic and determine the root causes. There are many tools that can help you do this from cause and effect diagrams and Pareto charts to a process map or house of quality. More information on these can be found in any Six Sigma documentation. These will be easier to quantify and guarantee for your business case.

One soft savings results from forced implementation of IT governance. This is something that is hard to implement without standardization across the company. Many companies are having challenges

implementing such governance. “The slow adoption rate of IT governance and project and portfolio management (PPM) solutions is especially surprising given high executive accountability surrounding financial statements and Sarbanes-Oxley compliance” (Manufacturing Business Technology, August 30, 2007). A PPM system would help with the documentation required and allow the company to avoid fines and other penalties.

When actual savings numbers are not known (which will always be the case prior to deployment), it is important to benchmark the effects of PPM tools on other, similar, companies. For instance, Voltaform believes it will be more efficient with this tool, and was able to obtain some numbers from the interviews conducted; however, these numbers are still not concrete and may not convince senior management of the need to invest in PPM systems. However, Raleigh Morgan, Documentation Control Manager for EMS Technologies, commented with a recent PLM deployment that, “on average, we have achieved more than a 50-percent reduction in process steps...” He also mentioned that it “helped us to easily transition to paperless operations and establish real-time data exchange among our product development teams” (Manufacturing Business Technology, August 1, 2007). A similar EMS company would be able to assume that a PPM tool would have similar results in its environment.

In the end, we need to create a critical mass of users at Voltaform to justify and rapidly repay the investment. This is particularly important in the current challenging economic environment. In order to do this the project must have efficiency improvements relative to the major metrics -- cost, quality, delivery and customer satisfaction, which will help the bottom line. Another imperative portion of this will be the increased communication within the company no matter where the different team members are physically located. Again, this will have additional impact as Voltaform continues to grow its footprint and travel costs increase. Virtual teams are becoming more and more important as well as common.

When attempting to determine the value of a PPM system, often one of the best ways to get an estimate is to benchmark. This exercise will not only help you to understand if you need the system, but will also allow you to compare your progress and savings to others' implementations after the fact. While benchmarking other companies you might also run across other helpful practices that will allow you to improve performance. It is helpful to benchmark companies in your industry as well as companies in a variety of others. You will find that some practices can be applied directly or slightly modified to apply to you. It is important to understand what you are trying to measure when you look at these other companies. Therefore, you must first develop the set of metrics that you want to compare (PMI, 2008).

One example of an effective PPM implementation comes from Pernoud, a mold making group located in France. It was able to cut the handling and quoting time of its business simply by implementing a PPM tool that allowed it to communicate and monitor the processes more efficiently. It went through the process of determining the criteria for its system and determined that there were four major things that it was looking for: The system had to be reliable with a high handling speed of CAD files, it had to be user friendly, it had to be flexible and affordable, and finally, the supplier had to be responsive to any needs. After making its choice and implementing, it discovered a time savings of 25-50% and a

improvement in data retrieval. In this case, one of the major challenges it faced was response time to its customer; implementing PPM allowed for great improvement (Bennett, 2008). This is a case that reflects the importance of understanding your needs from a PPM system up front.

MatrixOne, one PPM supplier, states that some of the expected improvements when implementing a PPM tool are improving the visibility of programs, improving the percentage of profitable programs and projects, increasing productivity, increasing customer satisfaction, reducing material cost and obsolete inventory, identifying unprofitable business, reducing product time to market, and improving on-time delivery (Hakanson, Golding & Gutheil, 2002). This of course assumes that the tool is implemented properly and embraced by the user. The results will vary based on the specific needs and culture of the organization.

### **Thesis Content:**

Now that you have a better understanding of the background of the industry and company as well as some of the issues at hand, I will move on to describing the bulk of the project. The following section will address the challenge of determining the most effective PPM tool from the perspective of the users. I will first explain the background of program management, then Voltaform, as well as the EMS industry. In this section I will allude to the needs of the company in terms of the potential support it would need from such a tool. Chapter three will discuss the initial approach and why it was determined that was ideal for Voltaform at the time. Chapter four will go into the implementation of that plan. Chapter five discusses how the data were analyzed and why the approach used was chosen. Chapter six looks at a particular aspect of a potential tool, knowledge capture. It discusses how a company can do this effectively and in what circumstances work best. Chapter seven then looks at an appropriate way to manage all this, with metrics and the associated dashboard for the PM. Finally, in chapter eight you will find a high level summary of the entire paper as well as a summary of the lessons learned throughout the experiment with Voltaform in finding an approach for determining an effective PPM tool.

## Chapter 2: Background and History

This chapter will discuss the history of Project Management as well as Voltaform and the EMS industry. It will help you to understand the context in which the study took place as well as some of the challenges conducting a study imposes on such a project. The background presented in these three areas will also help you to understand why a PPM tool is needed and how it can help in this particular context.

### Project and Program Management

For the purpose of this document we will define project management as the application of knowledge, skills, tools and techniques to project activities to meet project requirements. This is accomplished through the application and integration of the project management process of initiating, planning, executing, monitoring and controlling and closing (Project Management Institute, 2004). Projects are found across the company in all functions. Program management is the oversight of a group of projects or a single complex project made up of multiple sub-projects that all address a single business objective; this may be an ongoing set of projects. Program Management utilizes project and program management methodologies to accomplish business results. Program managers deal with specific products and services. They can also be in staff functions where they manage acquisitions or coordinate multiple products. Portfolio/Account Management is a level higher and achieves strategic goals by selecting, prioritizing, assessing, and managing projects, programs and other related work based upon their alignment and contributions to the organization's strategies and objectives. Portfolios occur at sites, in functions such as IT, at the customer level, at segments, and even at the corporate level. Figure 4 shows one example of how the aforementioned roles can roll up.

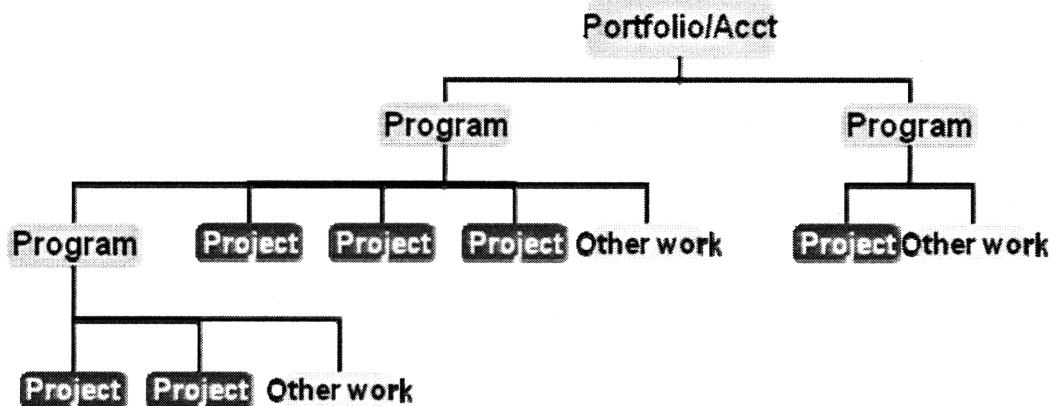


Figure 4: Example structure of project, programs and portfolios

Projects are best run by a single person, not by committee (Jenett, 1996). This opinion (some would call it a fact) is shared by many; as a result there is a single project manager for any given project in a company. This is because there is one person making the decisions and one person to go to for information. This further adds to the need for a tool to handle the information and the complexity associated with a project. Should that single project management resource leave, all the knowledge would be lost. However, if there is a tool where all of that knowledge is held, in addition to the sources of the knowledge, someone else can go in and pick up the pieces.

The undisputed expert on project and program management is the Project Management Institute (PMI). PMI was started in 1969 in Atlanta, Georgia. It is the leading professional association for PMs in the world. It has instituted a standard structure for project managers around the world. This includes publishing a Project Management Book of Knowledge (PMBOK) that has five process groups (initiating, planning, executing, monitoring and controlling, and closing). It also identifies nine knowledge areas (integration, scope, time, cost, quality, human resources, communications, risk management and procurement). These are some of the areas that would be addressed in a typical PPM tool.

## **IT Landscape**

PPM and PLM tools have been in existence for quite some time, but they are getting more and more popular and imperative in the market place. Companies are getting more diverse, expanding their footprints and moving operations to other countries. Also the response time demanded by customers is getting shorter, leading to the need for additional IT tools and ways to communicate. When one person needs information while the person who has that information is sleeping half a world away, technology can provide the answer. The tools that we use are becoming more complex with additional capability giving the professional more time to do his or her value-added work.

The EMS industry as a whole is somewhat new to implementing PPM tools, but the tools are particularly important due to the characteristics (short turn around, large footprint, and diverse culture). The fact that many of the companies in this industry have grown through acquisition makes it even more important to have a tool to share knowledge. The employees may not even know each other; after all they were formerly competing. Another aspect that the tools will deal with is governance, and monitoring. The lead author of the Butler Group (a research and advisory group)'s IT Governance report states, "Typically we see about 70 percent of the organizations using IT to run the business. Perhaps 20 percent are using it to change the business, and if you are lucky, 10 percent are using it for innovation." (Manufacturing Business Technology, July 16, 2007).

PPM tools have been evolving slowly. It all started with IT tools for materials and other resource planning. One very well known tool is SAP ERP (*Systeme, Anwendungen und Produkte in der Datenverarbeitung* ("Systems, Applications and Products in Data Processing")) Enterprise Resource Planning. ERP tools helped production to know when and where it would need what parts and what the status of those needed parts was. The next major area to be developed was engineering, where technical design could be managed in a large centrally-held database and system for all to access and use. This phase included major drafting tools like CAD and CATIA. Then the idea that IT could also help in the PM world arrived and tools started being created for that purpose. There were many limited tools that dealt only with schedule and later more complex tools that would deal with budget and risk evolved. Finally, someone came up with the idea that all of these "tin cans" need not stand alone and can work together, thus creating the relatively new PLM. This is a vision of managing the larger business and creating systems that can talk to one another allowing for one place for all information from finance to manufacturing to engineering and sometimes even to the customer and suppliers.

The growth of the IT tool industry leads to opportunity. There are many different tools out there all designed to meet a different set of needs. In the end, the purpose of a project like the one addressed

here is to define what exactly those needs are, to come up with a way to find the tool that meets them, and then to deploy it in such a way that it is useful. The software providers themselves have been through implementation many times, and I suggest you ask them for advice on deployment. It is in both of your best interests to have a successful implementation.

## **The EMS Industry**

The EMS industry's focus is increasing speed and flexibility as well as reducing costs for Original Equipment Manufacturers (OEMs). The EMS industry can be described in many ways. I will approach it systematically, looking first at how the customers shape it, then at the control that the suppliers have. Next I will look at the internal competition and how that is shaping the industry. I will then look at the substitutes to the industry as a whole and finally, I will address the barriers to entry into the market.

Companies are largely dependent on the success and health of their customers. As a result, hard times after the dot com bust as well as the current recession cause these companies to have to buckle down and make additional cost savings. Ryan Fuhrmann commented, "Investing in the Electronic Component Manufacturing (ECM) space -- as the EMS industry is also known -- has been filled with landmines, especially for those overly exposed to the putrid telecom sector." (Fuhrmann, 2006a). In a later article he also points out that in order to overcome the alignment with telecom, many EMS companies have been moving to diversify their portfolios away from the servicing part of the industry. In order to do this they are supplying automotive, medical devices, computers, storage, networking and communication products (Fuhrmann, 2006b). Retail and aerospace are other venues being added. Diversifying the portfolio also creates differentiation for what are often considered commodities (Manufacturing Business Technology, 2008). As EMS companies are offering more and more services, complexity and assembly to their customers, their supply chains and the visibility of the products is getting more difficult to handle and track. Often times work on a product is done at one factory; it then gets packed and shipped to another. This creates tremendous complexity that requires an effective system for tracking and coordination. Demand management is also another major issue that must be dealt with in this case, and again PLM software can help. Being able to respond to the customer's needs is critical and becomes a huge competitive advantage (Hill, 2007).

Other recent changes that are taking place in the market place are forcing EMS companies to be even more flexible. The instability of and recent major spikes in oil prices are driving a great deal of additional cost into their business, creating further shrinking of their already small margins. Some also believe that the customer's concern with their carbon footprint will also affect these companies. Many already have regional manufacturing to counter both of these challenges, but again this adds a level of complexity to managing the business (Thomson Financial News Limited, 2007 and 2008; Rayner, 2008).

## **Customers**

The biggest influence on the EMS industry as a whole is its customers, who have a great deal of power. The industry started because a few large companies decided that manufacturing was not their core competency, and that they would rather focus on design, marketing, customer service, etc. So they opted to allow someone else not only to supply parts, but also to provide a larger sub assembly, and at

times a final “turnkey” product. (Dictionary.com defines turn-key as “fully equipped, ready for operation.”)

The typical customer feels that there is a somewhat low switching cost. This may or may not be true. Often when switching an OEM does not have accurate cost or price information. There is also a great deal of risk when moving a successful line based on learning curves and unknowns that are introduced into the system. This is the case even when moving a line to a different site within the same company. The customer is very price-sensitive, driving the EMS company’s margins to be smaller and smaller. This is often done by reducing overhead and systems costs. When there are other savings, the OEMs rarely share this savings. (Note: this is customer and contract dependent). Finally, an additional source of customer power is the fact that companies often look for and name a second source supplier. This leads to the EMS companies’ performing in constant competition.

### **Suppliers**

The materials used by the EMS industry are mostly commodities, and therefore the suppliers have very little pricing power. There is little other than cost to distinguish between them. The parts that they supply are basic with minimal differentiation and a great deal of competition. In fact, more and more of the EMS companies are choosing to vertically integrate, meaning that they are adding even more value to the product that they turn out. Examples of products that are supplied to the EMS companies are blank circuit boards, sheet metal, screws, resistors, etc. These are very simple parts that are very easy to come by. Some of the OEM companies that serve as customers to the EMS companies have already chosen their suppliers, meaning that the EMS company has no choice in which one(s) is (are) used. In reality this gives the supplier a little more leverage; they have to be worked with, and this can be at a much higher price point. Due to the beneficial economy of scale the EMS company could apply when it comes to suppliers, this might not be the right decision for the OEM when it comes to keeping cost down.

The other major supplier to the EMS industry is labor. This particular piece is very dependent on where the factory is located. More often than not, the EMS company chooses to operate its factories in non-union countries with low wages.

### **Competition**

As mentioned in the customer section, EMS companies are in constant competition. The competition space is made up of many small competitors and a few very large ones. The large companies are constantly growing through acquisition. Thus they eliminate the small competitors and pose a larger threat to the other large ones. There has been a great deal of consolidation over the decades and it looks likely to continue. This extreme competition leads to a number of different strategic moves. The EMS companies are very focused on price competition, leading to shrinking margins. They are also offering more diverse product lines, in order to attract a variety of different customers. Another move has been toward vertical integration, when an OEM can obtain more of the value add from one source (This makes it easier on the customer because they only have to deal with one supplier, but it also allows the EMS company to increase its margins.) An extreme version of this is the move of many of



the larger EMS companies to offer design. More and more these companies offer Original Design Manufacturer (ODM) and Contract Design Manufacturer (CDM).

### **Substitutes**

The main substitute to the EMS industry is going back to the way that the company did business; that is to say having the customer return to producing the products themselves. They can do this through their current factories or by opening new ones. Often when an OEM decides to outsource to an EMS company, it will turn over the factory where it is currently producing the product and allow an EMS company to run it. Here it are completely relying on the fact that an EMS company's core competency is manufacturing efficiently. It is counting on an EMS company being able to do more with less. After all, an EMS company must also now turn a profit. Unless the cost of an EMS is less than the OEM itself, the OEM will not choose to substitute. Its other option is to start fresh with a brand new factory. It might chose to do this if it thought that somehow its old factory was less efficient and could not be helped. This might be the case if it were operating in a country that was more expensive for parts or labor or even logistics. It might be operating in an area with a very strong union where it could not control production. There are many reasons that a company might make a very expensive decision not to outsource its product, but rather to close down its current factory and start up again fresh somewhere else.

The final potential substitute is to drive down even further and have the EMS suppliers do more of the assembly work. Most of this potential is being driven out by the move of the EMS companies toward vertical integration as mentioned above. However, as the companies that are currently supplying the EMS industry see more and more of this happening, they too might choose to do the same and offer a more advanced product. This would result in merging of the two levels of the supply chain. The value would be captured at a lower level.

### **Barriers to Entry**

As mentioned above there are many small EMS companies. This is somewhat surprising due to the fact that the profit to be captured is so small. This is because there is also little barrier to entry. The customer also places a great deal of trust and its brand image in the company when allowing an EMS company to make its product. Therefore, an established name and reputation are also important. However, ultimately it is cost that the customer cares about, and so will often be willing to risk using a no-name supplier to save some money.

### **Company**

Voltaform is one of the largest EMS companies in the industry. It has been in business since the late 1960's and has grown to hundreds of thousands of employees on five continents primarily through acquisition; it has purchased almost 100 companies in the past 40 years. It is also one of the first companies to offer turn-key solutions. It is a leader in the EMS industry and has the desire to grow rapidly. In its strategy for growth, it has made the decision to pursue some less traditional EMS products including medical, automotive and aerospace. All of these fields have rigorous standardization, documentation and certification requirements. This is one pull for a PPM system. Voltaform's offerings are so diverse that it even offers after-market services. Also in its growth it has decided to enter the

ODM and CDM industries as well. Any entry into the design markets also drives the need for documentation and standardization, again pulling in the need for a PPM tool. It also spent significant time in developing an integrated solution product offering, and working on individual plants to apply Lean and Six Sigma methodologies.

Voltaform was making some revolutionary changes in structure, organization and processes. Leadership decided to have someone look at a Product Life Management (PLM) tool that would standardize the work done across the entire company and all of the life of its entire line of diverse products and customers. This had been attempted several times before; however these attempts were not successful, because of the approach taken. In the past research was done on the different tools available in the market and the one with the most capability was chosen. Once the choice was made there was an attempt to pilot the chosen product. This didn't work because these tools had more capability than the pilot organizations needed. This also made the PLM tools more expensive in two ways: the price of licenses, and also the cost of the deployment. As you would imagine, a more capable product costs more money, and also as you would imagine, the more capability the more complicated the tool, requiring more time to learn the tool and also more time to make all the required connections between the new tool and the existing systems. It was also discovered that many of the aspects of a PLM tool (see Figure 1) were not yet addressed. So, Voltaform decided to first focus on getting a consistent PPM solution across the company. This is the area that had the potential for the most impact due to a PPM's relationship with the schedule, budget and in the end the customer. The overall focus for Voltaform is the customer. In its business, you have to keep the customer happy, and with such a diverse customer base (product, country, culture and relationship) that means excelling in every aspect of the business.

Much like the rest of its industry, Voltaform is often challenged by a lack of goals alignment due to the massive growth through acquisition, and therefore traditionally it is focused on different goals in their different sites, product lines or even groups. Even if a purchasing company makes an attempt to make these goals common, it is often a challenge and there is usually an unconscious alignment to the previous goals. This is also the case with the overall functions as well, as they often operate independently resulting in "silos". There is awkward communication, if any at all. The silos don't really relate to the other silos and on an individual basis don't see the benefit of working together and learning from one another.

The company, in order to function well in the industry, must be flexible and Voltaform is very flexible. It often makes decisions to move production from one site and country to another. One of its core competencies is this ability to move production quickly, efficiently and at a relatively low cost. It is able to do this partially because of the flatness of the company as a whole. That is to say, there is not a lot of management. (This is also driven by the low margins that it, and the rest of the industry, must maintain.) This leads to a company and an organization where decisions must be made at extremely low levels. Again this allows for quick reaction to market, customer and even product changes. The challenge with this is to give the authority and encourage it to be used, but also make those individuals accountable for the actions. In this case there is often a lack of accountability for the decisions made.

A large EMS company has to be able to make its products in many different places. There is a balance between where it is less expensive to manufacture and where it makes sense to make the product due to the additional costs of logistics and transportation of both the supplies as well as the finished product. As a result there is often a desire to produce close to the customer for economic feasibility. This is becoming more and more the case as the costs of shipping and logistics increase due to the rising costs of fuel as well as the cost and time it takes to get a shipment across borders.

As was alluded to in the industry section, the industry is almost constantly in flux; so is Voltaform. The industry changes as the market that it serves changes and with the rapid growth that has been seen in the industry (and the company). The relative newness of the industry makes this even more the case. The new changes in the economy have forced even more restructuring as Voltaform tries to make its efficient production even more efficient. One of the moves to become more efficient is to arrive at a common tool or set of tools for the whole company. This is not a new idea.

Implementing a standardized solution had been attempted in the past at Voltaform. There were projects of studying an appropriate solution in both the heritage company as well as in some of the companies that were acquired. These were handled in many different ways and all failed; therefore a very detailed plan was developed to ensure that the correct approach was taken this time. I was told many times that this was the last attempt at evaluating PPM systems, and it had to be done correctly. It is helpful to have a little perspective on the past attempts to evaluate PPM options:

- One study in the past looked at high level user needs, but due to the lack of emphasis on implementation was never followed through. This attempt had a very well developed business case.
- Another case took a tool that was already in place at a customer and attempted to implement it. This implementation did not go smoothly and in the end it was halted resulting in only partial implementation at one site. When assessing this plan, it was determined that there was a lack of planning and need gathering. There was too little effort and money invested up front resulting in a great deal more time and money being spent during implementation.
- Another method utilized was AHP (Analytical Hierarchy Process). Here the multiple criteria for making a decision were ranked and weighed, allowing for a more analytical decision making process. This method was useful; in fact the information from this attempt was one input into determining the needs for the current study.
- Finally, there was also a movement to use many of the internally developed tools across the company, and though use at this point is somewhat limited, it is another way of determining the different needs within the company.

For this project, all discussions with software providers were put on hold, no matter the level. The focus was to increase the maturity of the framework for choosing the new system and processes that the system would deal with. A final PPM choice was expected within six months. At this point it was also determined that the project would first focus only on a PPM solution rather than the larger PLM. It was

felt that this smaller portion could have a very significant effect on the deployment and maturity speed of the other tools and processes.

I also had to identify what PPM tools were available in the market. Cardin of Forrester Research (December 18, 2007) listed the tools that are available in the market today as shown in Figure 5. All of these tools were able to be implemented across an entire enterprise and have been used in multiple and varied industries.

<b>Vendor</b>	<b>Tool Name</b>
Artemis	Artemis 7
CA	Clarity PPM
Cardinis	CARDINIS Suite
Compuware	Changepoint
Daptiv	PPM
HP	PPM Center
IBM	RPM
ITM	Software ITM PPM
Microsoft	EPM 2007
Oracle	PeopleSoft/E-Business Suite PPM
Planview	Enterprise
Primavera	Evolve/ProSight
SAP	xRPM
Serena	Mariner

Figure 5: Commercially-available PPM tools (Forrester, 2007)

PLM tools often have a portion dedicated to PPM. Note this list is a combination of multiple resources (Jeff Hojilo, 2007) (NASA, January 19, 2000). This list can be found in Figure 6. Note those listed above are not re-listed.

<b>Vendor</b>	<b>Tool Name</b>
Centric Software	
Deltek	
Emcien	
Jonova	
Powersteering	
SmartOrg	
Sopheon	
Symphony	
Metreo	
Telelogic	
Agile (formerly Oracle)	
Dassault Systemes	M1/Enovia
PTC	
SAP	
Siemens PLM Software	UGS
AEC Software	Fastrack
Primavera	SureTrak
Miscrosoft	Project 98, Project 2000
BaaN	
Aras	
Arena Solutions	
Infor	
Selerant	

**Figure 6: Commercially available PLM tools**

As you can see, there are too many tools to evaluate all of them, so an effort must be made to narrow the list down. Other parts of this document focus on that effort and various approaches that can be taken.

## Chapter 3: Initial Approach

The intent of this paper and project is to define and describe an effective approach to identifying an enterprise-wide Project, Program and Portfolio Management tool at a large and globally distributed manufacturing company. The purpose of the project as defined in the Project Scope and Charter was to: “Define a Voltaform-wide PPM solution and deployment plan that is cost effective and will meet the needs of the business and customers without negatively impacting other areas.” The product acceptance criteria, which define the process and criteria for accepting the final proposed solution, were that it meet critical common needs and be easy to use, rapidly deployable, and scalable across the entire company with low customization.

In order to determine the user needs, there several methods were employed. First, to get a better understanding of what a PM does, I shadowed some in different roles. Here I saw firsthand what they did, what tools they used and how often they had to perform different tasks. I also saw whether or not what they did matched the typical job description of a PM. Once I had a better understanding of some of the jobs, I conducted interviews. In a company with so large a footprint and so many employees, it was impossible for me to interview everyone, but I still needed the input of people across the company in different roles and in countries with different products and cultures. Here a delicate balance must be determined. You must talk to enough people, while not taking too much time to do it. Research by Griffin and Hauser showed that you can capture over 90% of the user’s needs with less than 20 interviews (Ulrich & Eppinger, 2004). As mentioned above, I had only six months for the entire project; this boundary helped me to determine how to approach gathering the information.

I chose to interview people in each of the three roles (project, program and portfolio management) across the major different departments in the company in a variety of different countries. I then had to determine who specifically to interview. Not having a history with Voltaform, I approached the Project and Program Management Steering Group (PPMSG) and asked them to give me a name or two to interview that would represent their portion of the business. This allowed me to gain their buy-in in addition to getting the names of the appropriate people. (Once I started interviewing, those recommended also suggested others and in the end I talked with over 120 people). In order to be consistent, I made sure to use the same format and same questions with each of those interviewed. Those questions can be found in Appendix B. At the same time as the interviews were being conducted, I also performed a review of the existing tools and surrogates within the company. I determined what was being used, what the characteristics of these tools were, what problems they had been developed to resolve, and how and why they had been revised since initial deployment. I also looked at how they had been deployed in an attempt to learn from their successes and challenges. Perhaps one of these solutions would have the appropriate characteristics for developing further and deploying across the company rather than looking outside the company for a suitable solution. I not only looked internally, but also benchmarked other companies to see what they were doing for a solution and why. Here I looked at companies that were similar to Voltaform as well as those that were very different. This gave me a broader understanding of solutions and why they were chosen. The idea here was not to make the same mistakes that had been made in the past. The companies that produce the different tools were also helpful in this literature search. They have produced many papers and presentations hailing the

features and the savings that they have made in the many different companies that they have worked with. These three portions of the project could be done concurrently. Finally, I also conducted a literature search of research publications. There is a great deal of literature out there on this topic. This information ranges from white papers to papers and conferences put out by the vendors themselves.

It is important to understand the potential outcomes of this research. I arrived at four broad options for solutions.

1. Voltaform could invest in expanding and deploying some of its internally developed solutions.
2. Voltaform could purchase a tool off the shelf, and implement, meaning it would have to take the processes that the software used and apply them to Voltaform (configurable).
3. Voltaform could contract for externally tailored software, hiring a company to come in and build a PPM tool, or perhaps use its framework and make it form to Voltaform's current process and procedures (customizable).
4. Finally, Voltaform could delay the decision. Perhaps Voltaform is not at a stage where it makes sense to deploy a PPM system. There might be some additional work needed to develop the maturity of the organization in order to develop a successful business case, so it would be better to put off the decision and deployment date.

Based on the recommendations and structure of the company, it was decided I would visit six sites in three different countries. This would give me an understanding of many different products as well as platforms. I would see multiple different parts of the business, but there would still be some cultural continuity with two sites in each of the three countries. There would be some that were acquired from the same country. This mix allowed for sufficient commonality, while still maintaining a great deal of diversity. I would also be dealing with new launches, sustaining ones, and also groups that did repair. There would be some engineering teams, some teams with internal customers and also some with external customers. In addition to the teams, various subject matter experts and business leaders would be interviewed in order to ensure the needs identified were in alignment with the larger company goals and objectives.

The objective of the interviews and shadowing experiences was to understand the challenges the company is facing, as well as what data and information is needed on a regular basis. I also wanted to understand where that data currently came from, how it was used and why. I attempted to learn from the users how they thought it might be done better, and how often they needed the data refreshed. I needed to know what other programs and tools the software solution would need to interact with and what information the users most needed to have on hand in such a solution. Finally, I tried to understand what savings a PPM solution would give the users, not only in terms of time and efforts, but also in terms of quality and access to information. This would help me to determine and develop the business case that would show leadership the payback of the tool, and the best time for implementation.

The major aspects of this initial plan were to first learn from the previous efforts made. It is imperative to make people feel as though they had been listened to. If they felt that the time and effort that they

had invested in the past had been completely disregarded, not only would they not give additional input this time, but they would also be much less likely to buy into the final solution. Another part of this was to understand the environment as it stands, internal and external. I needed to understand what the company, the industry, and the PM profession were going through, and how they were changing.

Once you feel that it is appropriate to go ahead with a project, it is important to further develop a plan, put together the details and get much needed buy-in. One additional lesson that I learned here is that even once you have buy-in, it is very important to revisit buy-in from high levels of management and ensure that you still have that buy-in from the right people. This is even more important in my particular case because of the changes and restructuring occurring in the company. In order to do this I highly recommend creating a project charter and scope. In addition, I recommend doing a complete assessment of who the stakeholders are, what their stance is on your project and what kind of power they have over it. This is a classic tool used in Six-Sigma and PPM, usually referred to as stakeholder analysis and a communication plan. This will help you to understand how you need to communicate with them and what information they need to have. This document should be for you, and need not be shared. This is especially true in a particularly political environment. The plan should then go through an official approval gate where you have the charter and scope signed off by the champion as well as any other relevant parties. Like any other large project, it is important to identify and track your project risks, assumptions and constraints.

Some examples of risks (often defined as any identifiable and significant potential problem that has the ability to affect project performance) in this case could include: There might not enough time to complete needed interviews, a business case that is too vague, and incorrect or missing data. The definition and finalization of PPM metrics might not be sufficient to allow proper tool selection. The recommended solution might not be compatible with the current tools in use. Funding for the recommended tool might not be approved. The tool might never be used because of “Not Invented Here” syndrome. The ability to convince people to change from unique embedded solutions to common solution might be limited or nonexistent. The selected solution might not have all the features of current embedded solution thereby impacting support from the users as well as leadership. Project and Program Management maturity might be so low that use of any tool is not possible. Many external software solution providers have strong in-house advocates due to synergy advantages with other PLM software in use making it difficult to get to a recommendation and control scope of project and time for evaluation. The cost of the quotation phase may limit the vendors. (This could be a constraint for internal costs as well as costs to the potential vendors as well.) The planned resources might not be available. The stakeholders might not be manageable; there is the potential of hidden agendas. Additional factors that we have no control of might dictate tool selection; that is to say factors other than the PM requirements and the business case. The governing board or executive leadership might not agree with the proposed requirements. It might not be possible to narrow the contenders for the focus group in the time allotted. The amount of time allotted for response to the RFQ might not be sufficient for all of the potential vendors (internal and external). The actions related to these risks will not be defined here as they will be different for every company depending on the structure, support and environment.



Some examples of project assumptions (often defined as any unverified suppositions on which the project plan is based) and the impact should they prove to be false in this case are as follows: a core set of requirements can be consistently established across the company. If this is not true, then we will not be able to arrive at a common solution. The individuals and teams that were selected to be interviewed and shadowed are representative of all groups. If this is not true, then the solution we chose may not be useful for parts of the company. Once the solution is defined with an acceptable business case, the solution will be approved and implemented. If this is false, there will not be a proper PPM solution. Cost of definition and selection is within budget and there are no added starters for external or internal solutions demos. If the budget is not sufficient, it will prevent the deployment of the PPM solution. There is executive support for the project. If this is false, the PPM solution cannot be deployed. Some examples of project constraints are: limited schedule, limited budget, potential limited resources for interviews.

The next step in the plan was to develop the requirements and business values. There were multiple aspects of this step. Due to the history and culture within the company, I chose to focus on user needs. There were also interviews of the subject matter experts and major business leaders. This approach was taken in order to ensure that the multiple perspectives were included. The users understand what they need on a day-to-day basis now. The subject matter experts have a better understanding of what will be needed as the organization matures. The business leaders have a more long term understanding of where the business is heading and what goals we are trying to achieve with this tool. It is also important to include IT representatives, as they have a better understanding of what the IT infrastructure looks like and what it can handle. A lesson that I learned through my implementation of this plan was to make sure that you worked very closely with IT. IT will ultimately be responsible for implementing as well as supporting this program once it has been selected, so should be a major part of the selection process.

Once I had developed a list of needs and characteristics, we once again wanted to gain the approval of some of the leaders in the PM community. Voltaform had a pre-established Program and Project Management Steering Group (PPMSG), so we used this body as a sounding board for the developed list. The PPMSG was to be sent the list and asked for comments, concerns and additions. While the group was looking over the list, I was to compile the business value assessment based off information I got in the interviews about time savings and resource savings should different characteristics be implemented. Once this was completed it too had to be reviewed and approved by the project sponsors to go forward to the next step of issuing a request for quote (RFQ). Often large companies have a specialized request for quote process for IT tools, which can be very helpful and save a lot of time. It will also help to ensure you are using a process understood by the leadership that will be approving the proposal in the end. I suggest coming up with your own process only if there is not one available.

Prior to issuing the RFQ, there should be a narrowing in number of companies based on those that meet the absolutely imperative characteristics. This will make the RFQ process more manageable. It does not make sense to entertain quotes from 40 different companies. I suggest narrowing your list to three to five companies prior to soliciting the offers. The quotes should also include an initial deployment plan. It is also important to pass the RFQ by some of the people who will be making the decision as you need to make sure that you get the information included in the response that these people need to make the

decision. This process may require multiple revisions. The RFQ will then be issued. You will want to allow for one to two weeks for the companies to put together their quote and response packages. During this time period, you can be developing your evaluation matrix; this is a list of the characteristics that you plan to use to judge the different quotes. The weighting of these characteristics will depend on the needs within your company. For instance, for some companies price will be the most important; for others it will be the support you receive, and still for others it will be the ease of use. Again this should be approved by those that will make the final decision.

Once the quote has been received we planned to have a focus group made up of volunteers from those people who had already provided input. At this point if you still have more than three companies under consideration, narrow it to three. Then the focus group will spend one day working with each company and tool, documenting its feedback so that the tools and decisions can be further refined. This feedback will also help you to develop the final deployment plan. The very last step will be presenting the final recommendation, the business case behind it and the deployment plan. After this it is out of your hands and up to executive leadership. Once executive leadership makes the decision, the negotiation with the vendors must take place. When going through this portion of the process keep in mind what you want from them. Do you want them to help you to deploy? Do you want continued support long into the future? Do you want them to handle all of the technical support, or to train your in-house IT to deal with it once the negotiation is complete? You must then gather your lessons learned from the process (as you will no doubt do this again), and finalize the deployment plan. The deployment will more than likely be revised slightly when you are going through it but it is important to identify up front what the initial plan is, as those that will be using the tool will want to know what is going to happen.

To remind the reader, at the end of the project, the objectives that are required for success are as follows: a defined, deployable and scalable PPM solution to support project and program teams across Voltaform in a variety of organizations and functions. This includes a creating a cost effective standardized framework for Project and Program data management factoring in internal and external needs and current and expected levels of Project, Program and Portfolio Management maturity. It also requires identifying a solution to meet the business needs of the company for the next two to three years consistent with the level of maturity of the organization. Another critical deliverable is to generate a project plan to cover design, piloting and deployment, and establishment of ongoing support system. The required deliverables in this case were a Project/Program and Portfolio Data infrastructure tool, definition of dashboard and reports to support Project/Program team needs, and definition of Portfolio Tracking Fields and Reports to support Program Review. Finally, full scale deployment should be possible within six months of selection with existing levels of Project and Program Management maturity.

To be clear, the scope of this project includes a PPM solution for all projects and programs, all business types, and potential outcomes include an in-house custom solution, software package solution, an externally developed custom solution or to do nothing at this time. The scope also includes selection of the solution based on the business case and the focus group feedback. Also included is gathering the information required for links to other systems needing the new PPM solution. Not included in the

scope are the development, testing, deployment, and training. Also the larger PLM strategy is not part of the scope of this project, nor are the new non- PPM databases for the PLM space.

Jeff Monteforte (President of Exential, a strategy consulting firm focused on IT governance, information security and business intelligence solutions) holds the opinion that, “a company's PPM practice must be a nearly perfect fit with regards to the organization's culture and priorities” and therefore believes that you should first have all of your processes and procedures in place before (if ever) you decide to implement a software solution. He feels it is important to survey your current tools to ensure that you have not already purchased an appropriate solution (Monteforte, 2005).

When companies approach making a decision about PPM tools, they often take one of three routes.

1. The first is doing as Monteforte mentioned, finding that one portion of the company has already made such a decision and take that decision and implement it across the company. This makes sense if you look into why this decision was made and ensure that the rationale applies across the rest of the company. However, this is usually not the case. Often the decision was made to be common with a particular customer, or because one of the decision makers was already familiar with the tool, or even because it completely met the needs of that organization. In many EMS companies, different organizations within the company will have different needs, and in the case of Voltaform, there were many different solutions in place across the company.
2. Another approach is letting IT make the decision, based on what tools are currently in place and seeing how the different options will interact with the systems they are already using. This approach makes sense to a certain degree, but it neglects the fact that internal systems are often revised, and then this choice will have been made based on something that is out of date. Also it does not ensure that the needs of the users and the end customers are being met.
3. The third major way of determining a solution is doing a customer needs assessment. This route ensures that those actually using the selected tool will be able to use it and get what they need from it. This is often a large part of the business case. However, once again this alone will not be enough for a successful deployment. Sometimes the individual users are looking at their needs now, and are not taking into consideration the future direction of the company. It may also be difficult for a user to understand the opportunities that a tool might afford. Finally, it would be difficult for a user to see the needs of the other users, and it might be difficult to assess and weigh the needs of the different users.

The approach that I used at Voltaform was defined when I arrived. It was determined that I would focus on the user needs so that we could better understand the business case around implementation. The user needs were also especially important in this case due to the need to show the users the value before they would actively use the tool. Finally, due to the repeated attempts to assess PPM options in the past, it was even more important to ensure that the users were involved; they had lost faith that such a tool would ever be deployed. I worked with IT to ensure that the system would support a tool, and the request for quote would use the IT process so that it would be consistent with the needs of the rest of the department. Business leaders were involved to ensure that we looked at the future needs of

the company, and a complete assessment of the current tools in place was made. Basically the approach taken was one that used many of the approaches that were used by other companies, and had been used internally in prior attempts. Voltaform learned from its previous studies and was improving its process as a result.

## **Communication Plan**

Communicating the plan as well as status and final solution of this project was imperative. The plan must be communicated well and to the right people in order to get initial buy-in as well as funding for the project. The status must be communicated in order to maintain buy-in and ensure that the project does not get duplicated or derailed. This also helps ensure that you get the right contacts (especially if the organization tends to have a lot of movement or turnover) and correct information. In the initial planning stages of this project we developed a communication plan to ensure awareness, scheduling, status as well as outcome reporting and updates. In our case, because of the large number of people to whom we needed to communicate frequently, we developed an internal web portal where updated documents were posted at least weekly. These documents included the Project Plan, Schedule, Charter, Dashboard and contacts. Weekly reports were also sent to the key decision makers as well as the those that worked with Program Management at a corporate level and my counterparts in IT. A communication plan was developed in which the different team members were held accountable for maintaining the documents, uploading them to the portal and sending them directly to certain individuals. In this plan, the frequency of the reports was also identified. The team was made up of individuals from both the corporate part of the company as well as the IT side. This was particularly important because the corporate site needed to be involved in order to ensure the company leadership was involved and that the business aspects were addressed, and the IT side of the team needed to be involved because it understood the infrastructure of the company's IT and how the technical aspects of the new tool needed to work.

A communication plan, and understanding your stakeholders becomes particularly important when dealing with any kind of changes to your plan, so it was also imperative to have a change management process that defined not only approval but also communication of any alterations to the initially approved and communicated plan. Of course updating and following the communication plan is essential as well. You need to ensure that assumptions that you are basing your analysis on are still reasonable and that you continue to head in the expected direction. If I were to do this project over, I would have had a meeting or debrief once a month with the decision makers. If this were not possible, I would make sure to send them an update and ask for written approval monthly. This may seem excessive, however not doing so can create a large waste of time and effort when time is of the essence. Also I would make sure that the person leading the effort is the one who has this exchange with the leadership. If that person is not senior enough to get time with the decision makers, perhaps he or she should not be leading the effort. Many times information can get lost or changed (unintentionally) in transfer.

Another change I would make is that I would have the lead of the project communicate monthly to the leaders of the sites that had been interviewed. Often this step is not taken for fear of wasting those people's time, but I believe it can help to ensure that changes have not been made at the sites. It also

keeps those sites and individuals apprised of the status of the project. After all, they will be very affected by the outcome. Finally, it creates an opportunity for those individuals to share additional information that may not have come up in the interviews or shadowing process.

## Chapter 4: Implementation of User Needs Gathering

### Literature

A recent survey by SearchSoftwareQuality.com of PMs showed that requirement gathering is the most difficult area for groups within the lifecycle of a product (31% of respondents identified gathering requirements as the most difficult as compared to 12% for process development, 12% for software testing and 8% for application performance management) (Vaughan, 2008). There are various ways that companies chose to obtain customer and user requirements. The most common way is through interviews with the customer and gathering complaints from prior use. This is a challenge as it is difficult to take a user's input and develop the technical requirements that will support those inputs. Customer and user needs information is gathered in a variety of ways: 40% of the companies surveyed used requirements models, 41% used focus groups, and 35% gathered information in spreadsheets. As you can see many companies use multiple sources, but overall 67% used a user interview (Vaughan, 2008).

Many groups that study gathering user needs choose to separate the needs gathering into use cases and user needs. "User requirements describe how a future product can help users achieve their goals effectively, efficiently and with satisfaction in their context of use... Technical requirements describe how the product will be implemented to meet user requirements... A use case describes the possible sequences of interactions between the system and one or more actors in response to some initial stimulus by one of the actors" (Kujala, Kauppinen, & Rekola, DATE). User needs are converted into yet another category of user requirements which is used to determine the technical requirements. User needs need to be further prioritized and analyzed before they can be considered as user requirements. User requirements differ from technical requirements in that user requirements are written from the users' point of view, and the technical requirements describe what is needed technically in the product to achieve the user requirements. Gathering customer and user needs early can increase customer satisfaction and motivate the organization (Kujala, 2002). It is widely believed that requirements must be related to business needs, and be detailed enough to be actionable, measurable and testable. In the end to a successful product must address a business need.

After gathering the initial needs, companies often put together a limited prototype to put in front of the user to allow them to gather additional needs. From this they can see how they did on the initial gathering and to see if the design solves the problems appropriately. Often those that are designing the product have a very hard time understanding the exact needs of the user. They have two different perspectives and truly feel they know what the customer want, when in reality they don't. The prototype helps to flush that out before final development is launched.

Simply observing the user can be a help. From this you can see what triggers the use of the product, or what would trigger the user to need the tool. It would also allow you to see what the environment would be like where the tool would be used. You can see how the user customizes the current tool and how they develop workarounds. You are able to see needs that the user didn't voice or perhaps didn't even realize. Finally, you might be able to see additional attributes that are intangible and can be included in the development. Some examples of observational methods are interviews, participant

observation, non-participant observation, intercepts, informant diaries, metaphor elicitation, virtual ethnography and “netnography” (Beckman, 2007).

Forrester has gathered a great deal of user needs through electronics surveys and customer interviews (Cardin, 2007). This data is widely used by other companies to determine what to use at their company. This is a quick and easy solution, but will not necessarily be effective. There are a number of things that make each and every organization or company unique, and without taking the time to find out what your organization specifically needs, you will not be able to meet its needs. Some examples of areas that might differ are how the tool will be deployed, what the goals or objective of the specific organization are, how the tool needs to react with the surrounding established infrastructure, how the tools will be specifically used, how effective these tools need to be in this position, how long the tool is expected to be used before retirement and even how often it will have to be used. The effort of determining the specific requirements will be rewarded. One of the major reasons products fail or go significantly over budget is because they get started before the user defines the needs. Defining user needs up front also increases the level of the user’s involvement and buy-in (Charvat, 2003).

Kevin Brennan Vice President of International Institute of Business Analysis summed it up well when he said, “There are pluses and minuses with all the techniques. No one technique is going to be perfect for all occasions” (Vaughan, 2008).

## **Shadow**

The first step I took in gathering the needs of the users of a PPM tool was to shadow different individuals in the user role around the company. This was an essential step as I had never been a PM and I had little knowledge of what the job entailed at any company, much less Voltaform. This step may not be necessary if you have held the role of PM or are very familiar with it at the company in question. However, you still might want to consider this step, as I found within Voltaform the job varied a great deal. In fact, PMs within the same group working on the same types of products often did the job differently. In this particular case there was not a consistent job description where you could get the exact details of what one was supposed to be doing in this role. Appendix A shows some of the information that I gathered through these shadowing experiences. It is also important to try to get as diverse a set of experiences as possible. This holds true for the interviews as well. You will find that even when there is a very standardized process and job description, each person still has his or her own way of doing things, and by seeing multiple ways you can take the best of each to put into the system. Before I go any further I want to recommend that before you conduct any research or involve anyone in an experiment, you go through a training course on the use of people as experimental subjects. In this case, I took MIT’s Committee on Use of Humans as Experimental Subjects (COUHES).

Dictionary.com defines shadowing as “to accompany or observe in a professional setting.” This is exactly what I did. I didn’t interfere. I didn’t sit people down and ask questions. I simply went along to meetings, on trips to the shop floor, etc. When my contacts were using a database or filling out a form, I did ask some clarifying questions, but for the majority of the time, I was a fly on the wall. This allowed me to see how they actually worked, and what had to be done on a daily basis. Due to time constraints, I never spent more than a day with a person, but when setting up the exchange, I would let them know

why I wanted to have the experience so that a “typical” day could be chosen. Occasionally I would have to follow up to get clarification on some of the things that I had seen in order to accurately represent them in the analysis. More often than not the individuals I shadowed were very open to follow-up conversations. I also asked to have copies of many of the different reports that had to be written and databases that were used for information. I even asked for copies of the dashboards that represented their performance and results. Sometimes this was acceptable and other times it was not. Keep in mind that the performance and results are often sensitive information to your company, and even at times to the customer or supplier as well.

In the end, from these experiences I learned about the tools that PMs use currently, their many daily frustrations, and the typical tasks performed by PMs. Scheduling, shortages and customer relationships were important aspects of each person’s job. At Voltaform, the majority of the organizations were more focused on fighting current fires, leaving them with little or no time to plan to prevent fires in the future. This is where a system could help.

## **Interview**

I spent a great deal of time interviewing people at Voltaform. I interviewed over 120 different people across the company in different countries, from different heritage companies and in different levels of the PM job function. Even the type of product or service varied. What I found was a variety of different levels of maturity and standards.

It is important to go into an interview understanding what you need to get out of it. Appendix B shows the specific questions I asked. It is also important to have an idea of how you will analyze this information once you have gathered it. This will help you to know what questions to ask and where you want to deviate from the script in order to get more clarification and details. This is something that I would spend more time on should I have it to do over again. You also need to be prepared to be asked many questions about what you are doing, why it is important, how it will be used and how it will benefit them. I used a communication deck for my site visits in which I described the previous attempts, the need, my plan and timeline, and who else I was going to be contacting for information. Finally, I left each and every person a list of people to contact with questions. I also made sure to send each person a thank you note to make sure that they knew they were heard and valued and that they had my contact information and could reach me whenever needed.

Because of time constraints, I had to narrow down who I contacted. A balance has to be reached between the amount of information that you obtain and the amount of time you can spend on gathering it. So it was decided that though I was going to make many site visits (six in three different countries), I would be reaching many others through phone interviews. The people who were identified for me to interview (again from the different leaders within the organizations) helped a great deal in setting up these visits, especially abroad. They were given information on why I was visiting and the type of information I was looking for, and they helped me to set up the schedules of the different people I needed to talk to. These visits were helpful because I was able to actually see what they were doing, how they were getting the information and how it was being used. It is also easier to see firsthand some of the things that are not being said. For instance, you can see from the posted metrics what is being



measured. You can see from the organization of the factory how standard things really are. You can see whether or not the customer is present and how that is treated. This is all in addition to the questions that you are asking.

Often there will be difficulty with language, though this becomes much more difficult when speaking with the person on the phone. In my site visits, some of the interviews were one-on-one, and others were in a group. There are benefits to each of these formats. I found in the one-on-one interviews I was able to get a lot more detail from the person and they felt as if they were being completely heard. However, it took a lot of time and there were probably things or ideas that were missed. In the group interviews, one or two leaders often emerged, but people were able to build off the ideas that others generated, and when people cheered an idea, you could see how many people agreed with what was said. It made assessing the impact of an issue much easier. This helped a great deal when weighing the magnitude of a challenge. However, some people didn't speak up at all, and only gave input when directly questioned. They may have been in agreement with what was being said, or they may have not agreed, but were not comfortable speaking up. When making the decision of how to gather needs, you might want to look at the culture of the company and the organization.

There are some challenges that come along with conducting interviews on the phone, but there are also benefits. In my case they were convenient as they didn't require travel, took far less time, and it was easier to guide them where I wanted them to go. The downside is that they can be difficult to arrange due to time differences and potential distractions. At times, I was even forgotten and left alone on a conference call. There are often more distractions. People tend to take these phone calls while in front of their computers, and get distracted when an email comes in. People also tend to have a shorter attention span when they are just dealing with a person on the phone. This is often not as much of a challenge if you have met or had previous interactions with this person. Finally, the biggest challenge that I dealt with was difficulty with language. All business at Voltaform is conducted in English, but when talking on the phone, accents often become more difficult to understand; this goes both ways. Many times I was asked to send my questions ahead of time, so that people would have the answers that they needed when I called. This can be helpful when dealing with half of that language barrier, but it causes the answers not to be as spontaneous, and thus leads to less discussion. I tried not to send the questions in advance, but if needed would send them at the beginning of the call itself.

Whether dealing with in-person interviews or conducting them on the phone, I recommend asking for representative documents from the interviewee. This allows you to actually see where the information ends up and how it is used. These documents can also help you to share the information with others. They can come in very handy when you have to build your business case to sell the idea to leadership.

## **Survey**

For my purposes, a survey was the least preferred way of gathering information. However, I was restricted on the amount of time that I had, and I wanted to be able to get as much information as possible. I also needed to make sure that the entire company felt heard. When I was interviewing a subject matter expert and leader on the phone in Asia, he requested that I do a site visit to get additional input. I was limited on time and money at this point, so I was not able to go. He suggested

the idea of the survey. This gave me the opportunity to contact many people within a short period of time. As the leader within this area, he identified the people that the survey should go to and sent it out. This gave it a great deal more importance to those individuals, and we received an unheard of 100% return. (In a typical survey a 30% response rate is good.) His targeting of different individuals ensured that I had the right names from a good distribution across the region. An example of the survey that was sent can be found in Appendix C. One suggestion that I make with a survey is to be sure to get the contact information for each of the people that respond. This way if something is unusual, you can follow up with that person to understand why. It also allows you to be sure that you didn't already contact that person, or allows you to get back with them if there are any other additional questions. When gathering information in an impersonal survey it is very important to make those providing information feel valued and a part of the process.

## **Chapter 5: User Needs Results**

The information that came from the needs gathering came in many different formats. This section will look at that initial data, how other companies have approached analysis and finally, how I turned the raw data into something more useable at Voltaform.

### **Raw Data**

The raw data in this case was simply information gathered through the interviews, shadows, surveys and tool reviews around what users felt they needed. There were notes from these interactions. The data I extracted was what needs are being met by tools, what needs are partially being met, and where the complete gaps lie. Organization of this data proved to be the key to determining the correct characteristics of the tool. There were many ways to approach it, the way I chose is described in the analysis portion of this document.

### **Literature Search**

This is not the first time a company has attempted to gather needs from the user perspective. So I performed a literature search to see in what ways it has been done, why and how it worked out. Many companies opt to bring in a third party who is not invested in the solution or outcome in any way, to conduct the survey. This is done because people within the company have no reason not to be open and honest with this person, as they will not have any bias toward a particular answer. In this way you can often get a good read from the people sharing their needs. The downfall in this method is that this third party does not have anything invested in the solution. He or she doesn't care if the answers are complete or correct and would be somewhat likely to just take answers that are given and not dive deeper. Also because there is no connection with the company, those being interviewed might also be less likely to share. They might be concerned about confidentiality or showing the company in a somewhat bad light. Obviously another approach would have the needs survey performed by someone internal to the company, someone who had more of a vested interest. Here you might run into challenges because this person might have a particular bias toward one solution, or toward one set of needs. There might be political pressures on this person to make a certain decision.

Another approach is to have the top companies bring in their solutions and simply allow the potential users to spend some time with them and rate them. This allows the users to really understand what they are getting into. They have a better understanding of the tool, how complicated it is to use, what information must be put into the system and what it gives you in return. The user has a better idea of how much time this is going to take in their everyday lives and it also shows them how much they will be able to save. The company also will know about how long it will take for the average user to get trained on the different systems. The downfalls in this method are that it may not get information from as many people; only a certain number can try out the systems. It might also be expensive, and the providers may not be as interested in investing the time and money it would take for this method. Finally this method will take a lot of time, especially if you want the users to be able to try out multiple methods. They will not be able to try out an internally-built solution without considerable investment on the company's part.

Some companies chose to determine the user's needs from previous complaints made. That is to say when a users need a tool, or need help with something technical, they usually make an official request to the IT department. In this case, the benefit is that you already have the information. There is significantly less time needed to acquire the needs, and they are usually fairly detailed, and if not, then you have the information to get back to the person. The negative side to this method is that you only hear from those that are the most vocal. Some people may have needs that they are not sharing with the IT department. Perhaps they are working around and finding solutions on their own, or perhaps they are just dealing with the problem themselves. This is the fastest, yet probably the least complete, user needs assessment. This information can be supplemented by an analysis of the tools currently in place. As mentioned above, people only go to the effort of developing a tool if it creates a resolution to a problem that they currently have.

The most complete approach, though also the most time consuming is a combination of all of the above. This is mostly what Voltaform chose to do. The decision was made to go this way because of the complexity of the situation, and also the fact that previous assessments had gathered parts of the needed information, yet still failed.

## **Analysis**

Due to the complexity of the problem and the way the surveys and research were conducted, it is important to state here that the information gathered is not necessarily representative of the entire company. There has been a great deal of effort put into attempting to get the majority of the company's input and to make it representative, but that is not necessarily the case from a statistical perspective. I would also like to once again state that it is important to understand the appropriate trade-off for your situation between getting enough information and taking too much time to do the study. The same is true for analyzing the data. You need to determine at what level you would like to do the analysis: Are you looking for trends on the surface, or deeper understanding of why people in different areas need the different things that they mention? When I was performing the analysis, I was unable to go back and ask additional questions. If I were to do this over again, I would like to have that opportunity, as my understanding of the needs and where they come from changed not only as I conducted more interviews, but also as I was going through the analysis.

The challenge with this analysis is that there are multiple different ways to look at it. When setting up the initial interviews I looked at different categories. These categories were derived from the different areas of project management as established by PMI. Using these as broad categories, I built a spreadsheet documenting the needs stated by the different groups of users. (The categories and types of information within them can be found in Figure 7. I defined the groups of users as different products, sites and services (NPI vs. Production). Another group was the analysis of the tools that they had already built and were in place. When looking at the tools, I documented the different characteristics that were present in order to understand what needs the tools met. This seemed appropriate because they would not build a tool unless they had a need that had to be satisfied. Also a tool that we chose would have to at least have the same capability as the tools that they were already using, or otherwise it would not be adapted. I grouped the answers to the interview questions within the categories based on content. For instance, if a person said they wanted scheduling capability and also wanted to be able to

make dependant tasks that created “what if?” capability, these are all grouped together because you can’t have the second without the first. The spreadsheet’s purpose was simply to summarize the information that I had gotten. From this one could read through and see where the commonalities lie, but it would take some time.

My next step was to find out how to weigh the information. If the tool was to be implemented across the entire company, there are many ways to approach the weighting. The organization with the most PMs could have the most weight, or the organization that makes the most profit, or the organization that is the most advanced, or even the organization that needs the most help. Perhaps the group that was the most vocal about their need would get the most weight. In the end, since all groups were to use it, I gave each group interviewed equal weighting, being careful to ensure that the groups were equally distributed. This way there was not any bias toward any organization, function, country or even maturity level. I developed a binary (overly simplified) yes/no matrix in response to the questions asked. The detail would come out in further development, but first I had to determine which characteristics were most desired. I created a tally of the number of groups interviewed who felt that each characteristic was needed. Those that were mentioned the most became the highest priority needs and those mentioned the least had the lowest priority.

It was interesting to look at the commonalities in needs across the organization. Some were based on the maturity of the organization, some on the country or region, some on the type of product, some on the customer served, some on whether the customer was internal or external, some based on the type of function (NPI or production), and some on the type of budget the organization had. But, the strongest correlation I found in what the stated needs were was the history of the organization. I found that the groups that were acquired from the same company, no matter how long ago, had the same needs. This makes sense as that is where the processes that they used stemmed from. Though there is not a standard process across Voltaform, often there is or was an official (or unofficial) standard used in the heritage company. The second strongest correlation was based on the maturity of the organization. Those that needed more advanced capabilities, like “what if” capability and an HR (Human Resources) systems linkage, were often those that were more advanced, while the groups that were still struggling were more focused on the present in getting help with the basic scheduling and shortages functions.

This study covered sites in North America, Europe and Asia. During the course of the interviews and tool reviews, 25 major groups were covered. There were 8 tools reviewed, 120 people interviewed as well as review of the previous studies. Based on the responses from the interviews and the content of the existing tools, the requirements were ranked according to how frequent the desire for the trait was. This information is summarized in the following sections (along with the potential business case that can be developed for each), and a summary can be seen in Figure 8. Note the needs are cross referenced to aid in finding the supporting details. For instance if you see (a) behind a specific item, you will also see (a) in the text paragraph with the supporting text. Specific current needs and challenges were also identified; these are described in limited detail as well.

## Project, Program and Portfolio Management Process Groups

Project, Program & Portfolio Management Process Groups						
Knowledge Area	Aligning	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Program Management integration	<ul style="list-style-type: none"> <li>• Identification</li> <li>• Categorization</li> <li>• Evaluation</li> <li>• Selection</li> <li>• Prioritization</li> <li>• Portfolio Balancing</li> <li>• Authorization</li> </ul>	<ul style="list-style-type: none"> <li>• Initiate Program</li> <li>• Authorize Projects</li> </ul>	<ul style="list-style-type: none"> <li>• Develop Program Management Plan                             <ul style="list-style-type: none"> <li>• Interface Planning</li> <li>• Transition Planning</li> <li>• Resource Planning</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Direct and Manage Program Execution</li> </ul>	<ul style="list-style-type: none"> <li>• Monitor and Control                             <ul style="list-style-type: none"> <li>• Integrated Change Control</li> <li>• Resource Control</li> <li>• Issues Mgt. &amp; Control</li> <li>• Portfolio Review &amp; Reporting</li> <li>• Strategic Change</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Close Program</li> <li>• Component Closure</li> </ul>
Scope Management			<ul style="list-style-type: none"> <li>• Scope Planning</li> <li>• Scope Definition</li> <li>• Create Program WBS</li> </ul>		<ul style="list-style-type: none"> <li>• Scope Control</li> </ul>	
Time Management			<ul style="list-style-type: none"> <li>• Schedule Development</li> </ul>		<ul style="list-style-type: none"> <li>• Schedule Control</li> </ul>	
Cost Management			<ul style="list-style-type: none"> <li>• Cost Estimating</li> <li>• Cost Budgeting</li> </ul>		<ul style="list-style-type: none"> <li>• Cost Control</li> </ul>	
Quality Management			<ul style="list-style-type: none"> <li>• Quality Planning</li> </ul>	<ul style="list-style-type: none"> <li>• Perform Quality Assurance</li> </ul>	<ul style="list-style-type: none"> <li>• Perform Quality control</li> </ul>	
Human Resource Management		<ul style="list-style-type: none"> <li>• Initiate Team</li> </ul>	<ul style="list-style-type: none"> <li>• Human Resource Planning</li> </ul>	<ul style="list-style-type: none"> <li>• Acquire Program team</li> <li>• Develop Program team</li> </ul>	<ul style="list-style-type: none"> <li>• Manage Program team</li> </ul>	
Communications Management			<ul style="list-style-type: none"> <li>• Communications Planning</li> </ul>	<ul style="list-style-type: none"> <li>• Information distribution</li> </ul>	<ul style="list-style-type: none"> <li>• Performance reporting</li> <li>• Communication Control</li> </ul>	
Risk Management			<ul style="list-style-type: none"> <li>• Risk Management Planning &amp; Analysis</li> </ul>		<ul style="list-style-type: none"> <li>• Risk Monitoring &amp; Control</li> </ul>	
Procurement Management			<ul style="list-style-type: none"> <li>• Plan Program Purchases and Acquisitions</li> <li>• Plan Program Contracting</li> </ul>	<ul style="list-style-type: none"> <li>• Request Sellers responses</li> <li>• Select Seller (s)</li> </ul>	<ul style="list-style-type: none"> <li>• Program Contract administration</li> </ul>	<ul style="list-style-type: none"> <li>• Contract Closure</li> </ul>

Figure 7: Program and Portfolio Knowledge Area Alignment - from the PMI Standards

During the course of the interviews, parties identified 52 different programs that they are currently using to manage their projects, programs and portfolios. The overwhelming majority uses Excel with Microsoft Project running a distant second. One of the challenges is that not everyone (even at the same site or in the same group) has the same version of Excel and every PM does not have MS Project. This makes commonality a large challenge. When this is the case, they cannot share information.

Function	Percent Positive Response
Unique project or program names (a)	100.00%
Dashboards and Metrics (mm)	100.00%
Accessible over the intranet (d)	92.00%
Define activities, their duration, sequence, document dependencies and manage milestones (s)	88.00%
Escalation routings (pp)	80.00%
Search capability for various fields (c)	76.00%
Searchable Lessons Learned (nn)	72.00%
Import and Export Capability (primarily Excel) (k)	68.00%
Risk Registers, Analysis, Monitoring and Control (tt)	68.00%
Internal and External Contact Lists (hh)	68.00%
Scope and Charter (assuming info in contract) (o)	64.00%
Allocate costs and link to accounting codes (z)	64.00%
Team Roster, Documented Roles and Responsibilities (ii)	64.00%
Accessible over the internet (e)	60.00%
Security Access Controls (h)	60.00%
Deliverable tracking list with status (oo)	60.00%
Communication Requirements (rr)	60.00%
Nested Projects (g)	56.00%
Dynamic Updates (i)	56.00%
Workflow Support (j)	56.00%
Automatic Email notification (qq)	56.00%
Tailorable Customer Access (ww)	56.00%
Revision Management and Document Control (l)	52.00%
WBS Capability and tracking (q)	52.00%
Track critical path (t)	52.00%
Roll-up, link & synchronize schedule activities to master (u)	52.00%
Visibility of Quality Status (ee)	52.00%
Automatic Connection with Baan 5	52.00%
Tracking and Approval of Document Changes (m)	48.00%
Forecast and track costs (bb)	48.00%
Corrective Action Tracker (dd)	48.00%
Tracking and Approving Schedule Change (v)	44.00%
Approve Budget and Changes (cc)	44.00%
Risk Escalation Path (uu)	44.00%
Ability to download, edit and re-sync info with the system (f)	40.00%
Automatic Connection with Outlooksoft	40.00%
Resource Calendars (jj)	36.00%
Customized Report Capability (ss)	36.00%
Reporting capability of Document Changes (n)	36.00%
Documented Customer Approval (xx)	36.00%
Integration with HR (kk)	28.00%
Stakeholder Analysis (p)	24.00%
Resource Estimation & staffing plans (w)	24.00%
Active Quality Tracking (ff)	24.00%
Timesheets (ll)	24.00%
Continuous re-forecasting ability (x)	20.00%
Visibility of Aging POs (aa)	16.00%
Unique identification numbers (b)	12.00%
What If Capability (r)	12.00%
Analyses and optimization of sub-projects (y)	12.00%
Quality Audit Capability (gg)	12.00%
Assumption Tracking (v v)	4.00%

Figure 8: Needs Identification

## Major Business Challenges

Multiple sites (though often a common type of product or customer) stated that the largest consumer of their time is report generation for customers. They currently get information from several different sources in several different formats. There are some individuals who spend four hours per day moving information from one Excel spreadsheet to another. Some groups have multiple dedicated people who are responsible for writing macros to do this merging. In one case there were two dedicated programmers for a materials group of 20. This is only helpful when the group and the reports are using the same version of Excel. There are also groups that are working with different generations of Office.

Many PMs interviewed commented that their biggest problem was chasing down the information to put into the reports. Again there were multiple systems, some of which were tracking the same information. Some would stop when they found the information once, but others would cross check this information. At times the information that they got did not match, and then they had to spend the time to determine which was accurate, and why they were different. This is all assuming the information is in a system and not on a person's desk in which case this becomes an even larger challenge. Then the PMs have to spend a large portion of their day calling people trying to get the information. If the person that has the information is in the same time zone they are in luck. But even then, it often takes days to get the information that they need. This is a problem because it is wasting the time of both the PM and the person with the information, costing the company money, and ultimately decreasing customer satisfaction, perhaps even causing a late delivery.

One interview revealed that customers often like to work with Voltaform, but their biggest complaint is late delivery. This is not acceptable when a late delivery causes a great loss to both Voltaform and the customer. Understanding and monitoring risk as well as the impact to the cost and schedule can keep that from happening. Ultimately dealing with this up front will allow Voltaform to be able to give an accurate estimate of the time that it will take to deliver, or if a slip must occur, be able to deal with it in a more proactive manner. Voltaform will be able to reduce expedite costs for both final delivery as well as the component parts ordered at the last minute. (Multiple interviewees expressed a pain point when it came to last minute part shortages.) This will increase customer satisfaction as well as Voltaform profits. This problem increases in magnitude as we take on more of an Original Design Manufacturer (ODM) or Contract Design Manufacturer (CDM) strategy in addition to our typical EMS strategy. Delays in ODM can be devastating; the only way to get the program back on schedule is to spend more in research and development (R&D) which results in higher costs and perhaps a loss of the business case. If we do not make the attempt to get back on schedule, then launch is delayed and there is a loss of credibility and volume again resulting in a negative business case. If there is a particularly large delay, often contracts give permission to cancel the program. (This is not unheard of in the industry.)

The customers (whether internal or external) needs to understand who they are to contact for information. Should they contact the wrong person they might get the wrong information or information that they are not supposed to have. (You don't want to give your customer cost information.) A system should be able to handle this information, and prevent this from happening.



Some of those interviewed mentioned that their customers tell them that they are spending too much time in meetings. This is for two reasons: the PMs have to give daily reports to leadership to ensure that their programs are under control, and they have meetings to fix what is not under control. They also said that they spend the majority of their time fighting fires; they are working on daily challenges, not planning to prevent the weekly or monthly ones. This again shows that there is a lack of risk planning and tracking. A tool that helped to relieve some of the communication challenges would give them more time to plan and deal with risks, and this would in turn make the time needed to support these fires less and less frequent.

It is also important to note that in the past those who needed tools went through complete approval for them on a group or organization basis, but were blocked by the local site controller. Microsoft Project is the tool that was requested the most and it seems that it is thought to be too expensive to approve. This study and company-wide implementation of a tool will keep this from happening, as it will be corporately funded and will be available without additional approval.

### **General**

There were many and varied general requirements. The number one thing that each group required was a project name that was unique and easily identifiable (a). (Again, these letters help the reader find the associated information and its ranking in Figure 8.) This is essential, as it is the only way to track and be able to search as well as audit the information. Therefore there is a great deal of value in this feature. Three of those interviewed also would like numbers to be associated with the names (b). If you can enforce the names to be unique, then there would not be additional value to the numbers, however due to the fact that the company is so varied and widely spread, just using unique names might be challenging. It is also imperative that the program be easy to use and create value to the user. If this does not happen the tool will not be used.

The next highest need is the ability to search the database of those programs and projects currently in progress as well as those that are closed (c). Nineteen groups desired the ability to search through the database using different requirements; also the desire for filtering and sorting for reporting purposes was requested. There is a great deal of value in this capability. One would be able to search for similar programs or projects and then be able to use the prior program or project as a template. This would save time, and also if there were lessons learned associated with the similar project, it would ensure that these similar mistakes were not made again. A new PM would have information on the person who had previously performed his or her job and would be able to contact that person for advice.

Seeing as the company has a very large footprint, the system should be accessible over the intranet (d). Fifteen groups also expressed the need to have the database accessible over the internet (e) largely because they wanted their customers or suppliers to have some level of access to the information in the system as well. Others thought it would be nice to be able to access the information (as long as it was secure) when they were not on their work laptops, or not behind the firewall. Though this access is nice to have and would add some value, it is not critical. Ten groups wanted the ability for offline editing (f). They wanted the ability to download the information from the system, make changes, and then re-sync it with the system. There is some concern with this as then there is also the chance that someone will

make changes and will be overridden. It would be important to have a way to check the item out or to have a notification about the status of the item. Again, this would be nice to have, but does not have a very large value to add at this point. These two features (access over the internet and the ability to download info, edit it and sync it at a later time) might be nice to add in future phases of the system.

Fourteen groups wanted the ability to nest projects (g), i.e., to have projects that feed up into a larger project. This would be important for managing larger projects or portfolios. The ability to drill down into the details is imperative for managing the portfolio. When dealing with nested projects it is important to understand who has access to what parts of the system. Fifteen groups felt it was important that they be able to manage the security access and controls for different areas of the system (h). Security access is also important when you link your PPM system with other systems. If we are truly to use a company-wide system, security is critical, and has a very large business case. Having information get out to the wrong people could cripple if not kill the company. However, if you want people other than the PM to be able to input information into the tool, you need to provide them access. This is the only way that such a tool makes sense. Otherwise, all it becomes is more work for the PM day to day. Fourteen of the groups felt it would be helpful to have dynamic update capability (i), which is to say they wanted to be able to get alerts via email when tasks they had assigned were completed and perhaps when they were delinquent as well. The capability to have the individuals responsible for a task to get a reminder email when their task is assigned and also delinquent was also requested. This adds a great deal of value as then the PM does not have to babysit the task, and can still be up to date as to the status at all times.

Workflow support is another aspect of a system that fourteen groups felt was important (j). (It is important to note here that workflow was defined as support and definition only, not automated routing as might be helpful for more mature processes.) They want the ability to define the process in the system for different business processes. This will help to standardize all the common processes used in the different areas across the company. If the workflow support is already used and documented elsewhere, perhaps it is not as critical; however it is important to have this information somewhere that is easily accessible. The ability to create templates for typical reports and deliverables was also independently expressed by four different groups. This would again help to standardize the work that is done and would enforce any necessary compliance.

The ability to import and export was also important (k). A number of tools were requested to have this ability; the most, by far, were Excel and the rest of The Microsoft Office Suite. Seventeen people wanted the ability to import from as well as export to Microsoft Office. The second most requests were six for Microsoft Project. Other tools also mentioned were Acrobat, Visio, Outlooksoft, Oracle, Agile, Quality Control, Baan, Doors, CSM, CSV, XML, DBS, Customer Relationship Manager (CRM), commercial tracker and email.

An additional requirement was often communicated of needing linkage to other systems. In many cases, linking to other systems significantly expands the scope of the PPM project, however, adding a few links in an initial PPM tool can add significant value. The most requested links were with the PMs'

shop floor systems, quality systems and finance or quoting systems. Adding this capability would reduce errors in transcribing information as well as save the PM's time and effort.

### **Configuration Management**

Due to specific regulations and certification requirements, there are many systems in place for Engineering Change Order (ECO) revision management. Interviewees mentioned Agile, sharing a common server, Doors, Windchill and Microsoft Office documents saved in Eroom (an online sharing tool). Six of the groups interviewed were perfectly happy with the way that they currently managed their documents. However, thirteen expressed the desire to have a portion of the PPM tool help with revision management (l). Twelve wanted the ability to have change control and approval as a part of the tool as well (m). One even wanted a new process for change control and approval (?). Nine wanted the ability to have a report on what change was made when and who approved it (n). Five said there was not a current way of doing document control; this is where the major added value in a system would come in. If there is currently no revision control, there is a major risk in acting on an out-of-date document. Having revision control capability in a PPM tool would have a great deal of savings in avoiding potential loss of dollars as well as entire customers and accounts should any problem arise.

### **Integration Management**

The main two items that were considered in this section were establishing and documenting a charter and scope and performing a stakeholder analysis. Three groups currently use Eroom to save Microsoft Office documents in order to document their charter and scope. One of these groups has very well established templates to do so. They find it beneficial as then there is access to the documented background on each and every project and program. This is where the value lies in a charter and scope. Once the main stakeholders have signed off on the charter and scope, the group needs to go through a specific process to make any changes. Sixteen groups expressed the desire to have a portion of the tool contain the charter and scope for the program or project (o), while nine said they would not like to have it as it is more work and the information is either understood or is contained within the contract. Here there is a balance. If the contract does indeed contain the information needed, then there is no reason to add more work for the PM to do. Three individuals wanted the ability to have approval and control of charter and scope documents within the system as well. Six people expressed the desire for stakeholder analysis within the tool (p), while 11 explicitly stated it was not needed and would not be completed. If the need is not there and the tool will not be used, there is no reason to spend the money to add the feature to the tool at this stage. As PMs within the company and the position mature, the feature might find added value. This would more than likely be something that is included in phase two or three of the software.

### **Scope Management**

Management of scope was not a challenge for most. Many of those interviewed are dedicated to a certain project or ongoing production program. As a result, in this category there was a lot of need for work breakdown structure (WBS). Thirteen of the 25 identified the need for work breakdown structure (q). This is surprising because many more identified the need for a schedule. As I explained the definition, there might have remained some confusion on this topic. A Work Breakdown Structure (WBS) is, "A deliverable-oriented hierarchical decomposition of the work to be executed by the project

team to accomplish the project objectives and create the required deliverables. It organizes and defines the total scope of the project. Each descending level represents an increasingly detailed definition of the project work. The WBS is decomposed into work packages. The deliverable orientation of the hierarchy includes both internal and external deliverables.” (Project Management Institute, 2004). Ten of the 13 parties that identified the need for WBS, also asked for the ability to monitor and track changes, where three needed only to see the current revision. Though change tracking was not in high demand, it would be a valuable feature. Having a complete WBS would allow the PM to understand the full scope of the project up front. It would allow for simplified planning, and reduce the chance of missing a part of the project. It would also help the project to run on schedule, ultimately leading to increased customer satisfaction. It is important to note that one complaint that customers often make is about late delivery. This is often a key metric monitored at multiple levels. Finally, three groups suggested that having the ability to do a “what if?” scenario with the WBS would be helpful (r). This was not a feature that I specifically asked about, so there may have been additional desire for this feature. Again another lesson learned. If I were to do it over again, I would ask whether or not “what if” capability is needed, as it could be valuable to understand the effect of different possible scenarios (and risks) and to be able to optimize production and make the entire process more efficient, effectively increasing capacity and profit. This lesson shows the importance of adapting and learning as you are going through the interviews. I will share other lessons I learned during the interviews, they may or may not apply to your interviews as well. What is important to remember is that though it is important to develop a plan and questions before you start your interviews, you can adapt and change the questions as you go along as long as there is a way to tie all of the information together in the end.

### **Time Management**

Dealing with the schedule and delivery of activities related to the project or program is perhaps the most important as well as highest visibility aspect of a PM’s job. Twenty-two of the groups consulted needed the ability to define and sequence activities as well as document the duration and dependencies of those activities (s). All 22 also indicated the need for milestone management with 13 desiring the ability to define and monitor the critical path of the project or program (t). Thirteen also expressed the desire to be able to roll up, link and synchronize subprojects to the master project (u). Eleven wanted to be able to track and approve changes (v). All of these abilities would add significant value (assuming they are not already being provided?). Being able to document the schedule up front, understand what is most important and manage any changes keeps the PM in control and able to react faster, leading to more informed and timely decisions, ultimately saving money and improving customer satisfaction. For instance if a PM knows that a job on the critical path is in danger of being bumped he or she can use the information to negotiate with the PM in charge of the project that will be bumping them. If both PMs have full information, then a rational decision can be made saving Voltaform from potentially missing a delivery date, one of the top three things measured by customers.

It is interesting to note that only six groups interviewed needed resource estimation (w). This is due to the fact that these six were not usually the ones in control of resource estimation for their program or project. Also five wanted the ability to continuously track and reforecast milestones, so they would know, when changes happened, how the rest of the schedule would be affected (x). Finally, three

expressed the need for schedule and sub-project analyses and optimization (y). This could be a result of the fact that most of those surveyed were dealing with only one project or program at a time. Reporting was usually requested in the form of a Gantt chart, but waterfall, Network diagrams, flowcharts, Excel tables and PDFs in specific templates were also requested.

### **Cost Management**

Though many of those interviewed indicated that they were not responsible for budgeting, forecasting or otherwise dealing with costs, there was a desire to at least have visibility over costs. In any company, reward is ultimately dependent on the bottom line; this leads to all employees wanting to do what they can to increase profit. Sixteen groups wanted the ability to allocate costs and be able drill down and be able to see specific tasks and the associated accounting codes (z). This truly allows PMs to be able to manage their programs or projects. If cost management is a part of the PM's job description, the ability to do so within the tool is critical. Another major concern for some of those interviewed is the ability to track aging POs (aa). Four parties mentioned it, but it was not a specific question asked, so many more may be concerned. Again, this is an example of how you can learn and develop your questioning as you go along. Many PMs are responsible for tracking the money that they are owed; as a result the ability to see the outstanding and aging POs at any given time is important. They then would know what they need to go after and when. The ability to get money sooner is of additional value to the whole of any company.

Some groups are not tracking actual costs now, but most would like the ability to do so. Twelve groups expressed the desire to be able to forecast costs as well as track them (bb). Nine of those 12 also wanted the ability to see how much of their budget remained on any given day. Thirteen wanted the ability to roll up the budgets and be able to see the high level summary. This level of control is fairly basic and again, if the PMs are expected to manage and control the budget, it is critical. Eleven groups indicated that the ability to approve a budget and any changes within the system would be helpful (cc). This would allow for capturing budget performance history as well as accountability for budgets. There were many different ways this was done now. However, should there be instances when changes to the budget do not require signoffs and there is not much of a paper trail, it is of major concern in terms of compliance, therefore making it a very valuable feature of a system.

### **Quality Management**

Many of the people interviewed are currently using a self-created Corrective Action Tracker in Excel; 12 suggested that tracking might be more effective in a more formal tool (dd). Correction Actions often come from the customer through feedback. The PMs then need to track the problem, the action, who is the responsible party and the actual close out date. Many also track the percentage complete, a red yellow or green status as well as the targeted closeout date. The tracking matrix may vary in its accessibility by the customer; some might be aware of the status and others might not. This is as far as many PMs are involved in quality management, which is otherwise left to the quality department. Thirteen of the groups interviewed said that they get information from quality as an FYI only (ee). They need to be aware of what is going on so that they can address any concerns with their customers. Only six said that they wanted to track quality (ff) and eight wanted to be able to work with the metrics; a mere three felt they needed to work with quality to the extent that they would need audit capability in

this tool (gg). Six groups mentioned that they or quality already had a tool to deal with quality data?. To the end, this is a low priority to most, as it is currently being handled in one way or another. Due to this fact and that there were no concerns around this item; I would say there is also little business case for it. The only concern would be if an additional system were needed to track quality issues for certification purposes (should they be involved in areas that require additional certification, for instance Aerospace, Automotive or Medical); these areas already have a robust standalone and auditable quality system in place.

### **Human Resource Management**

Again many PMs are not required to deal with the human resource (HR) portion of their programs or projects. This is something that belongs often to the production manager, or team leader, sometimes even the general manager (GM). However, there are certain aspects that many of those interviewed thought would be helpful. For instance, 17 wanted an internal, and often external as well, contact list (hh). Right now many are using Outlook, which in many companies is often not up to date. This wastes time when they need to see who is working on the project. Sixteen wanted explicit roles and responsibilities defined within the system (ii). This helps to understand where responsibility lies, but also ensures that all aspects of the job are covered. Fifteen wanted to be able to do resource allocation to ensure that each task was assigned. Fourteen wanted to be able to set and change security access (h), and thirteen wanted to have the team roster contained within the tool (ii).

When it comes to managing the work and personnel, nine wanted to be able to have a resource calendar so that they would know who was working on what when and when people were on vacation (jj). Eight wanted the ability to develop staffing plans (w) around that calendar, so that they could balance their staffing. Seven wanted to be able to integrate the new tool with the HR tool (kk), so they could see exactly how much the staff was costing them. Finally, six wanted to have time sheets in the tool that could be filled out by the staff themselves (ll), making them accountable for the time that was spent on each project.

### **Communication Management**

Several aspects of managing a project, program and portfolio fall into the category of communication management. The interviewees as well as the tools in existence showed a great deal of need for communication tools. The number one communication need, expressed by all 25 sources reviewed in this study, was for a dashboard and metrics with the ability to drill down into the data (mm). There is also a very solid business case here; while some of the groups currently had a dashboard/metrics tool, not all did, and very few shared the same tool. Having a common tool would allow for leadership (and the customer where applicable) to be able to see a consistent view, one face of one company. No matter what part of the company or what part of the world, they would know where to look for the information that they needed. This would save time and complication as well as increase customer satisfaction. It would also increase collaboration as other sites or groups would be able to compare themselves internally and be able to seek advice from groups that are doing better than them in a particular area. This leads to another highly desirable feature, expressed by 18 of those interviewed, a searchable lessons learned database (nn). This again would be valuable as (if used) it would keep PMs from repeating mistakes. This is one item that might prove challenging. Historically at many different

companies, an effective lessons learned database and process has been difficult to implement (citation?).

There were 20 groups that needed action tracking lists and fifteen of those wanted the ability to see the amount of completion of each of those tasks (oo). This would allow the PMs to have a better idea of the health of their projects or programs. Escalation routings were needed by 20 groups (pp), and the ability to send automatic notifications on delinquencies and problems via email was desired by 14 (qq).

Finally, in terms of communication with the customer, 15 groups felt it would be helpful to document the communication requirements in a system (rr). This means they would record types of reports and meetings as well as responsibility and frequency. This would be helpful so that everyone is aware of the requirements, and expectations have a better chance of being met. Nine expressed the need for customized reports (ss). This is important because in the end Voltaform is in business to make its customers happy and if customers are not willing to change the way they are getting information from Voltaform, Voltaform needs to be able to continue to build unique reports for each customer. However, these groups wanted to have a template tool that could help to build these reports from the information already contained within the system.

### **Risk Management**

Risk management is a very important part of any project, program or portfolio. However, when asked about it, eight groups said that it was not a part of their job. Seventeen groups, however identified the need for risk registers, risk analysis (including who has responsibility), and the ability to monitor and control risk (tt). Five identified the fact that they deal with risk through corrective action plans built in PowerPoint or Excel and that are then tracked in either meetings or a weekly report. Risk identification, analysis and tracking has a high value, however if it is being tracked in another way that the PMs are comfortable with it is not of great need or high added value in a PPM tool. Eleven groups said that they do not currently have a good way of escalating risks, and that they would like an escalation path for the risks in the tool (uu). This would be valuable; having a defined escalation path up front saves time when it is critical to raise an issue to the appropriate level quickly. It is interesting to note that one tool and one group also track assumptions (vv). This is another important aspect of a project or program that is often overlooked and also of high value. If the PMs are unaware of the underlying assumptions in their projects or programs, they can't make good and informed decisions. This would be a high value item, as few are tracking assumptions and assumptions are critical. Again this was not asked explicitly, so other groups may be tracking this item as well, or may desire the capability.

### **Procurement Management**

Only 14 out of the 25 major resources gave or wanted to give access to their customer (ww), and the amount of access desired varied a great deal. Nine of those 14 wanted to be able to engage their customers in the approval process through a PPM tool (xx). This is an item that has the potential to have a very high impact to the customer as well as time savings. Allowing the customer to have visibility into the system, no matter at what level, has the potential to greatly increase customer satisfaction. Customers will not have to contact the PM when they have questions; they will have access to the information at all times, and will feel as though they are more a part of the process. Also if they trust

Voltaform to do its job, they do not have to be bothered by the frequent reports that are sent to them on status. This is a level that can be controlled based on the contract as well as the needs and desires of both the PM and the customer. The customer approval has the opportunity to be of very high value. Though right now PMs are able to get customer approval, much of this is done via email and on the phone. This leaves very little in the way of an auditable trail. Often times it is hard to track down an approval email, and there is no proof of the phone approval at all. This can be a legal issue in areas that are more restricted by regulations or a large financial challenge if the customer chooses to challenge the change and refuses to pay for it or accept the product.

The results from the interviews, shadows, tools assessments and surveys had some answers that were surprising and others that were not. Many of the answers could have been influenced by the way I asked the questions, or perhaps even by the fact that I did ask the question. Some characteristics that are desired and very important in such a tool might have been completely neglected simply because I didn't think to ask if it was needed. This was confirmed when one person being interviewed mentioned that when working with risks it was important to document assumptions. This was not mentioned by anyone else in the interviews, but this was because I didn't think to ask. There are also a tendency to ask for everything that you can get. Therefore we had a large amount of interest in items that may not have as much value to those individuals. For instance many were very surprised by the large desire for a lessons learned type of system. As I learned from my internal interviews and external benchmarking these systems are often cumbersome and tend to not be used. People may not have known what effort would go into feeding the information into such a system, or might not have understood the meaning at all. Learning from all of this, I recommend taking a great deal of time to not only think through what you ask but also think through what you don't want to ask. It is also important to think through the specific terms you are using and what meaning you put on them as well as the meaning that those being interviewed put in them. This is worth the effort and can shape the entire study and bias (or un-bias) the outcome.



## Chapter 6: Organizational Learning

Organizational learning and capturing knowledge and lessons learned is important in any company and industry. However, it is even more important in the EMS industry because of the rapid turnover and intense competition. As a result, one aspect of a PPM systems that is beneficial is some way to capture organizational learning. There are multiple types of knowledge capture; they are often segregated into three buckets: best practices, lessons learned, and alert systems. Best practices tend to have the broadest perspective, something that would apply to the entire industry. Lessons learned are often more focused, something that might be company- or organization-specific. With lessons learned you collect the information, verify that it is correct and accurate, and then must store the information somewhere, have the capability to distribute it and be effective in reusing the information. Alert systems are items that are safety or failure related (Weber & Aha, 2002).

The interviews revealed that not only did senior leadership desire a way to capture knowledge, but also the PPMs themselves did as well. There have been systems tried within Voltaform without much success. My goal was to attempt to identify the best methods for capturing knowledge and experience from the employees. After a great deal of benchmarking, two of the most effective systems for capturing knowledge across industry are management consulting and the military (particularly the Nuclear Navy). Both of these have particular structures or competencies that enable effective capture. The core competency of management consulting companies is taking learning and building PowerPoint presentations that can stand alone. Consulting firms are also particularly good at taking learning from one industry or company and applying it in another. They are able to pass knowledge within the firm by developing a standalone PowerPoint package that shows the key learning. They have a very standardized template for the input and the packages are all saved in a large easily searchable database. The military has the advantage of the command and control structure of the organization. It can force the sharing of the key learning. In the Nuclear Navy in particular this transfer of knowledge is important for safety.

The process for lessons learned in the Nuclear Navy is as follows: there is a very standardized way of doing everything. When something goes wrong, everyone must stop work not deemed essential immediately and an investigation is performed to determine what went wrong and why it happened. Then all the people who were involved are gathered in a room where they talk through what happened. An officer is then responsible for writing up a report summarizing the event as well as the discussion. This report is then taken given to the head of the ship (the equivalent of a C level executive) and also given to the equivalent person on all other ships. The ship where the incident occurred is required to do training; other ships do not necessarily have to do any training on the topic, but they are required to be up to date on all of the incidents. The ships are tested monthly, and information about the incident can be on the tests. There are also random quarterly audits where anyone on the ship can be tested on this and other safety as well as standard information. These audits happen fairly regularly, approximately every three months. People are required to know what happened on all ships back one year (because the procedures get updated every year), and they have to know the events that have happened on their ship for the past 5 years. The incident reports are then stored in binders located on the ships and can be looked up at any time. There are usually only about 10 events per year. However, any improvements

suggested that are not incident related need to be approved via a formal process and an approval form before any deviation can be made. Engineers review this form and provide feedback on acceptance or rejection and why. This is also the case for maintenance procedures, though those changes happen more often as the maintenance policies are updated every 6 months. Finally when any exercise is being conducted, there is an internal or sometimes external training team watching and at the end of the exercise a critique is made. If there are multiple ships involved, there has to be a formal written report that is then housed on all the ships involved (Conant, 2008).

Other than the required structure, there are not many downfalls to this approach. However of concern is that it "lacks effective methods for delivering lessons learned to potential users to support military decision making processes. This has been referred to as the lesson distribution gap." (Aha, Weber, Munoz-Avila, Breslow, & Gupta, 2001)

In the case of Voltaform, there are challenges with a lessons learned system. (These will be similar at most companies.) The first and most concerning to me, is that the users may not be convinced of the value of this information. If at any point they make an effort to gain previous company knowledge and come up empty handed, they might not try it again. This is particularly true if the process they have to go through to get the information (or in this case not get the information) is arduous. Even if the information that they acquire is valuable and applicable, they may not realize it as they have not yet gone through the process and seen that challenge pop up. Due to the lack of top-down commanding structure, the system that will have to be used at Voltaform is going to have to be pull oriented. This often proves to be a challenge due to the lack of time of those putting together a project, and also the typically passive human nature. Notice that the two processes that are extremely successful that are mentioned above are active reactive (Navy) and proactive (consulting). A final issue that becomes a problem is those that are inputting the information need to be able to anticipate what those that are pulling the information will need. They need to have an idea of what that user will query to find the information, and they need to have a way to explain it to them. This puts a lot of responsibility on that person who is inputting this information, and there is the question, "What is in it for him or her? How will the company reward the time spent?" If there is no reward, many will not take the time and thought that it takes to create a useful package of information and rather spend that time and effort on other activities that will be rewarded. Aamodt and Plaza (1994) suggest a case-based reasoning process for capturing the appropriate knowledge in your organization. This process includes retrieving, reusing, revising and training the information. Figure 9 shows a graphical representation of this cycle. This would indeed allow for less time to be spent in successive entries, and would lessen the number of entries that must be sorted and searched. It also allows for the best practice to be created and evolved slowly using multiple different parts of successful (or not successful) activities and projects.

After this research, I conclude that without significant process standardization and culture change, a knowledge capture system will be difficult to implement at Voltaform. However, if these changes could take place, the knowledge capture would prove to be very valuable to the company. The first step toward standardizing processes could be implementing a basic PPM system across the company.

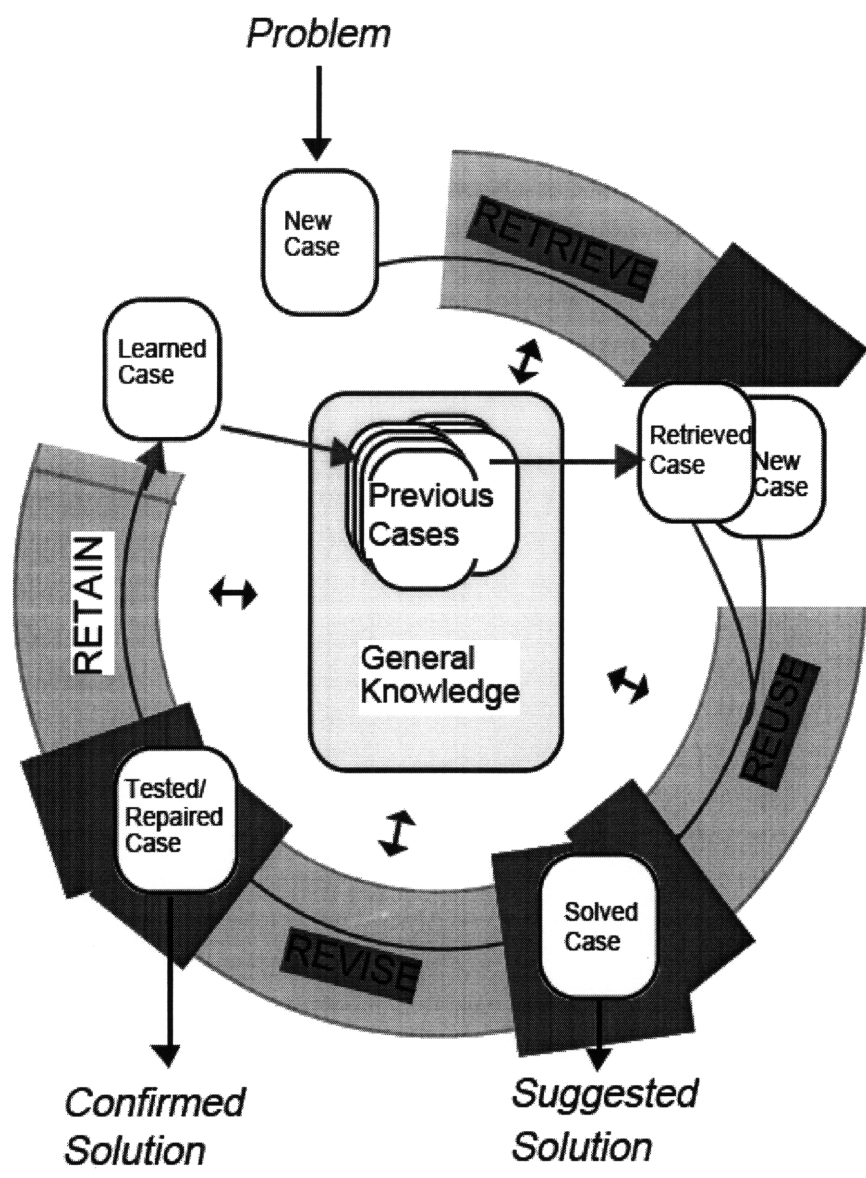


Figure 9: Case Based Reasoning Cycle (Aamodt and Plaza, 1994)

## Chapter 7: Appropriate Metrics/Dashboard

“A metric is a quantitative property of a process or product whose possible values are numbers” (Parth, R., & Gumz, December 14, 2003). The primary motivation behind collecting metrics is the desire to measure the current and potentially future health of a business. It is important to measure things that make a difference; as is often said, what gets measured gets done. There should be a goal behind measuring each thing that you chose to measure. It is also imperative to keep the measurements simple and balanced. The ability to create and track metrics was the number one requested item from the user needs perspective. Below I show the metrics I propose for New Project Introduction (NPI) at Voltaform as well as the rationale that went along with these choices. I also discuss how they should be reported as well as how often. Due to the fact that Voltaform’s employees as well as programs are assessed on a quarterly basis, I recommend reviewing these metrics frequently: the Project Manager (PM) should be looking at them daily, and they should be presented or at least reviewed at a higher level (by the Program Manager Manager (PMM) or General Manager (GM)) weekly. These metrics can also be applied across multiple parts of the company with minimal change; they are high-level and some frequently-used elements. Standardizing the metrics across the organization will aid in the higher level roll up of portfolio metrics. It is important to note that this is only one example and one opinion of a way to do it. When considering metrics it is important to look at your own company and business and do what make sense locally.

In order to ensure this tool will be used, it must be easy (with a relatively small number of items that allows it to be manageable) and adequately represent multiple parts of the business. This is what you will use to monitor the business transformation results. This is what you need to understand what you are trying to achieve and to drive the business. Here I categorize the metrics by People, Process and Product. I will also use aspects of the Leadership Team Performance Model developed by Passages Consulting seen in Figure 10 (Nettesheim, 2008). The model is representative of many stages within a project. By being aware of all of the sections of each individual phase of the Voltaform Project Life Cycle (a typical example from Piper Cove (2008) can be seen in Figure 11), you are able to better understand how each piece works with another. Measures of items that are in the Context Stage will give you a good idea of how the project will go (leading metrics). Every stage in the product life cycle can be better organized, understood and transitioned to the next stage of the cycle. Measures in the results stage show you how the projects performed and are lagging metrics. Trends of lagging metrics can also help you to forecast future performance. One additional aspect that is important in our case is the measurement of Risk. Figure 12 shows a Voltaform-specific version of the Leadership Team Performance Model that takes risk into account through the whole life of the project or program. The different characteristics in the original model have been tailored to make sense within Voltaform in order to assess and measure items that will help NPI at its current stage of maturity. I can’t stress enough, that it is important to tailor the model and the metrics to the goals and needs of the particular organization with which you are working. It is important to note that if sufficient time and attention is given to risk in the initial planning stages, it will require less effort in the later stages and will also have a much larger positive impact on the project as a whole.

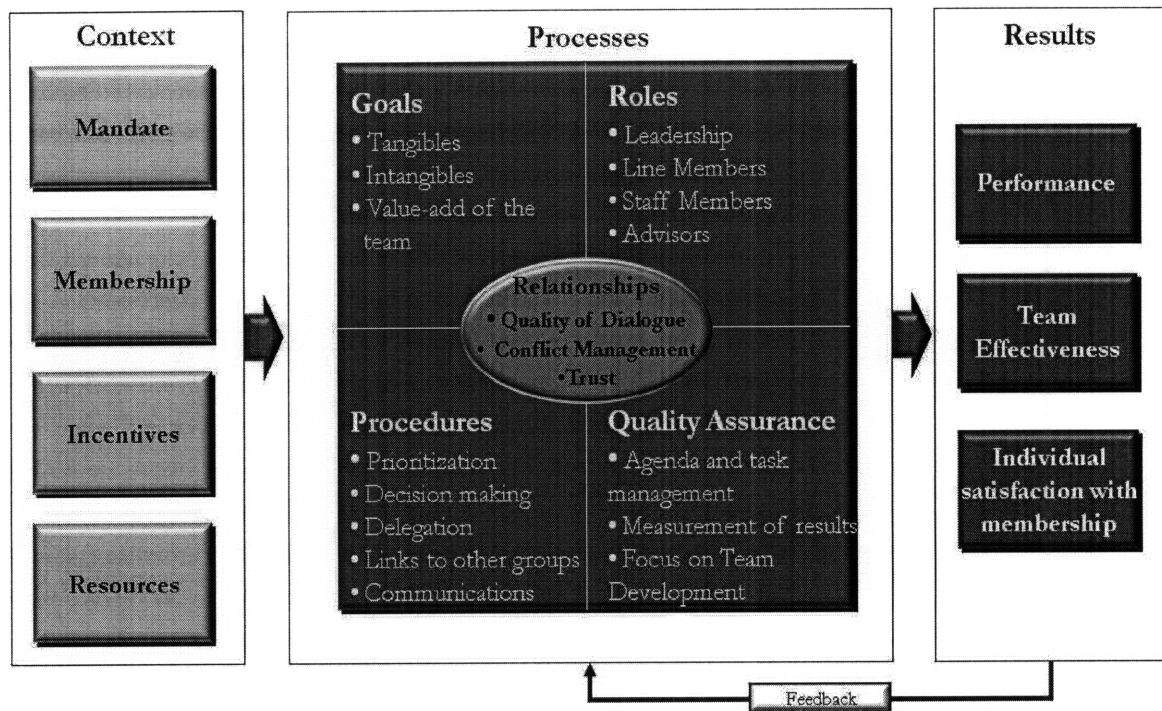


Figure 10: Leadership Team Performance Model (Nettesheim, 2008)

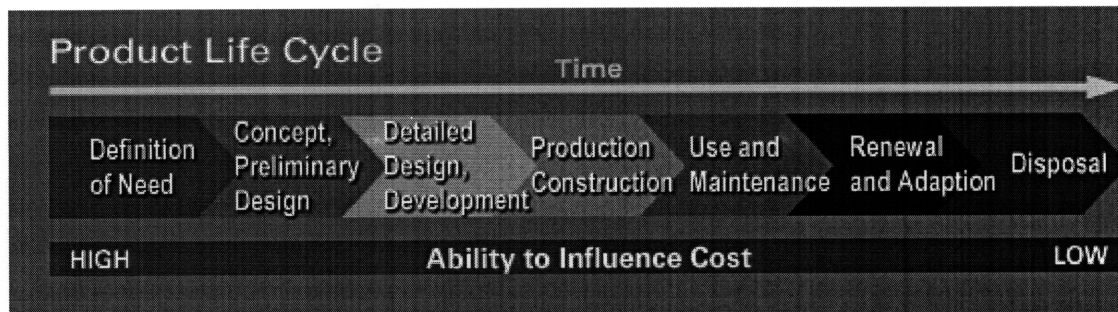


Figure 11: Example of a Product Life Cycle (Pipercove, 2008)

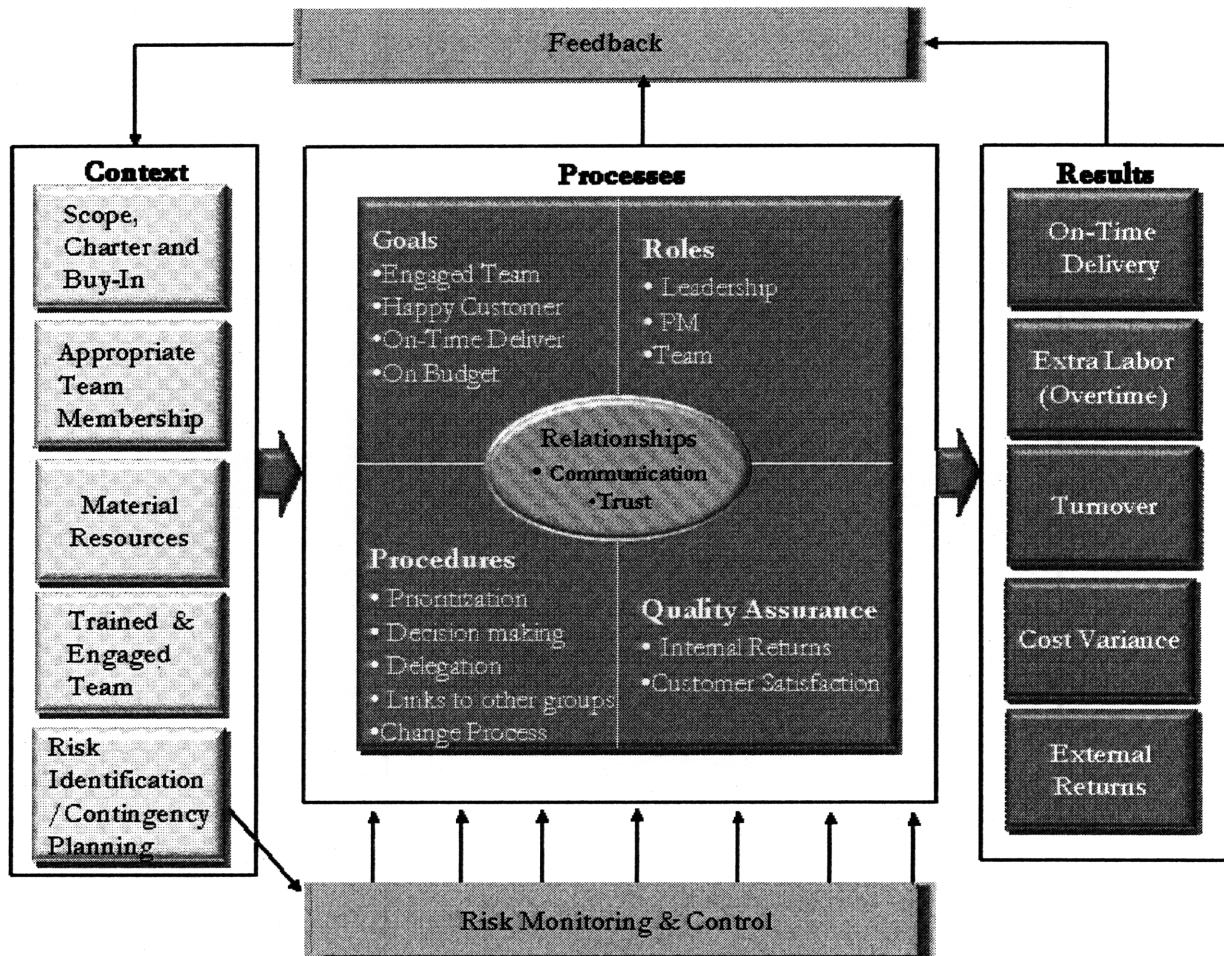


Figure 12: Leadership Team Performance Model Tailored to Voltaform (Adapted from Nettesheim, 2008)

Keeping this model in mind, I describe elements around People, Process and Product for a recommended dashboard in the following sections. It is important to remember that this recommended dashboard incorporates simple metrics to monitor multiple aspects of the project or program. It is important here to also include leading as well as lagging indicators of performance. Without leading indicators, you will not be able to predict trends and without lagging indicators, you will not know how you have done. It is also important when recommending a new dashboard to include items that are already being measured, so that it is not a completely new concept for those who will be using it. Finally, when recommending metrics, I suggest where the information to create them can be found. This will help when setting up, within a PPM tool, what other tools and information must be linked.

## People

Within the People aspect of the dashboard, it is important to measure the amount of overtime (here I use overtime to mean anything over 40 hours, but this could be expanded to 50 hours for example, as long as there is a defined standard) that is being worked. Measuring overtime can show you where additional resources are being used, but not necessarily recorded. Voltaform does not generally pay its PMs for casual overtime since they are viewed as professionals, so this may be difficult to capture. Being able to see all hours worked for themselves and all team members in one place could help the PM

to understand the amount of over or understaffing on his team. The total number of hours per week that each team member works should be tracked. It might also be helpful to track how that team member spends his time, and if he is working on multiple teams at once. Then if it is decided to add another person to deal with a portion of the workload, the PM will have the information as to where that person should spend his time. The need to understand the amount of time that a person or group is working will allow you to prevent employee burnout and reduction of efficiency. Henry Ford provided research prior to lobbying for the 40 hour work week that showed working more than 40 hours per week gives a small increase in efficiency, but this lasts only 3 to 4 weeks before becoming a decrease. Watching this measure will also help you to see when things are going wrong. When people have a sudden spike in overtime, you can ask why? If the overtime is consistent, then is that area understaffed? The concept of monitoring overtime fits into the results portion of Figure 10, under team effectiveness. It allows you to see how effective the team is working currently and to be able to predict how effective they will be in the future, using trend analysis.

In addition to having a team that is not overworked, it is essential that the team members be appropriately trained. This leads me to the next metric I suggest, training. There are two different kinds of training. There is the initial training the workers need to be able to do their jobs, and then there is ongoing training that they need to continue to grow and improve at their jobs. Typically the first of these two types is addressed, but all too often the ongoing training of the team is not tracked. Keeping the team members educated in their fields as well as in other areas is important. An engaged mind is more productive. In fact studies have shown that offices with engaged employees are up to 43% more effective (Watson Wyatt Worldwide, 2002). The Towers Perrin Global Workforce Study (2007) shows that engagement is linked with opportunities for learning as well as training. Figure 13 shows the top drivers of attraction, retention and engagement. These are also drivers of many of the items I later recommend for monitoring in the dashboard. This study also found that 78% of employees are looking to develop new knowledge and skills, and 83% enjoy taking part in work that challenges them and teaches them new skills (Towers Perrin, 2007). Training fits into the context portion of Figure 10, under membership. You need to make sure you have the right skills involved in the team and that the personnel that you have staffed continue to grow.

Top Attraction Drivers	Top Retention Drivers	Top Engagement Drivers
Competitive base pay	Organization's reputation as a great place to work	Senior management sincerely interested in employee well-being
Career advancement opportunities	Satisfaction with the organization's people decisions	Improved my skills and capabilities over the last year
Challenging work	Good relationship with supervisor	Organization's reputation for social responsibility
Convenient work location	Understand potential career track within organization	Input into decision making in my department
Flexible schedule	Ability to balance my work/personal life	Organization quickly resolves customer concerns
Learning and development opportunities	Fairly compensated compared to others doing similar work in my organization	Set high personal standards
Vacation/paid time off	Work in environment where new ideas are encouraged	Have excellent career advancement opportunities
Reputation of the organization as a good employer	Competitive training	Enjoy challenging work assignments that broaden skills
Reasonable workload	Input into decision making in my department	Good relationship with supervisor
Organization's financial health	Organization's reputation for social responsibility	Organization encourages innovative thinking

Source: Towers Perrin 2007-2008 *Global Workforce Study*

Figure 13: Top 10 Drivers of Attraction Retention and Engagement (Towers Perrin, 2008)

The final people metric that I propose to monitor is turnover within that program. If you monitor turnover and see a sharp increase you will know that your training needs will increase and your productivity will also decrease temporarily. You should also investigate the reason for this sudden increase in turnover. Perhaps this relates to the first people metric of overtime: Were these people working too hard or not being recognized sufficiently? There could be a deeper issue that has not been addressed. Turnover falls into the Results part of Figure 10, relating to Individual satisfaction with membership. If people are not happy with where they are or the people they are with, they will find a new place to work.

## Process

Monitoring a process is important as it can help to predict the results of the future products. When a process is out of control it becomes unreliable and there is often a significant increase in defects and therefore costs. Again I suggest three metrics and relate them to the Leadership Team Performance Model.



The first metric that I suggest is on time delivery (OTD) (even though it is a lagging indicator), this is a metric that all parts of the company are already measuring. It is something that they are used to performing to and they understand it. There is a large advantage to this. You don't want to introduce all new ways of being measured at once. I see this as an iterative process with developing metrics as the organization matures and develops. OTD is a good metric to see if things are going well or is something is amiss. If you are regularly missing deliveries, perhaps you have committed to too much or there is a part of the process that is a bottleneck that needs to be addressed. Chances are if you have a few weeks of poor performance with OTD and have not made any moves to correct it, you will continue to perform poorly. If you typically make your delivery commitments, but then some are missed, you can look into these one-time occurrences in order to do some root cause analysis and prevent them from happening again in the future. This is a good way to see overall health of the process, and commit to "Persistent Commitment to Continuous Improvement". The trend in this metric can be very important. This a measurement of Performance within the Results box of Figure 10.

Cost Variance is another important process metric. When you see the cost vary significantly in either direction from what you predicted in the budget, this could be an indicator of something much more significant. Many people monitor this due to the impact that it has on the bottom line, and that is an added benefit, but an under-running program can show that you are behind schedule and that extra time and effort will need to be expended to catch up. Perhaps you can't get the materials that you need or the machines have been down; there are many scenarios here. Cost overruns can show many things, some examples of which are unpredicted steps, an abnormally large amount of material scrap, additional required testing, additional staff, and late materials resulting in overtime and expedite fees, etc. This cost variance falls into the Goals section of the Processes box of Figure 10. You are able to look at what was budgeted for the program and how you are meeting those goals. When measured during the process (e.g., against budget to date), it can also be a predictor of Performance.

The last metric within this section that I propose is again one that is already being tracked across Voltaform; this is the Customer Satisfaction Metric (CSM) (again a lagging indicator). Currently each PM sends a request to his/her customer at a predetermined interval. The responses are then gathered in an online tool where performance can be tracked and monitored. CSM is a good metric for process because it assesses the trend of how the customer is seeing us. It is a form of quality assurance which is found in the Processes section of Figure 10. If we see an increase in customer satisfaction, we can interpret this to mean that we should continue to make whatever changes we have been making. This can be a confirmation that we are meeting the value of "Ardent Customer Focus". If we are not then we need to make changes. It may be due to something that we are doing; perhaps we have changed a process or supplier. Or it may be due to something that a competitor is providing that we are not. Either way, this is a good predictor of future business and can be a leading indicator of sales in the next few quarters.

## **Product**

The product metrics measure the health of the product itself. These metrics show immediate concerns with the product that can and should be quickly addressed to see almost instant results.

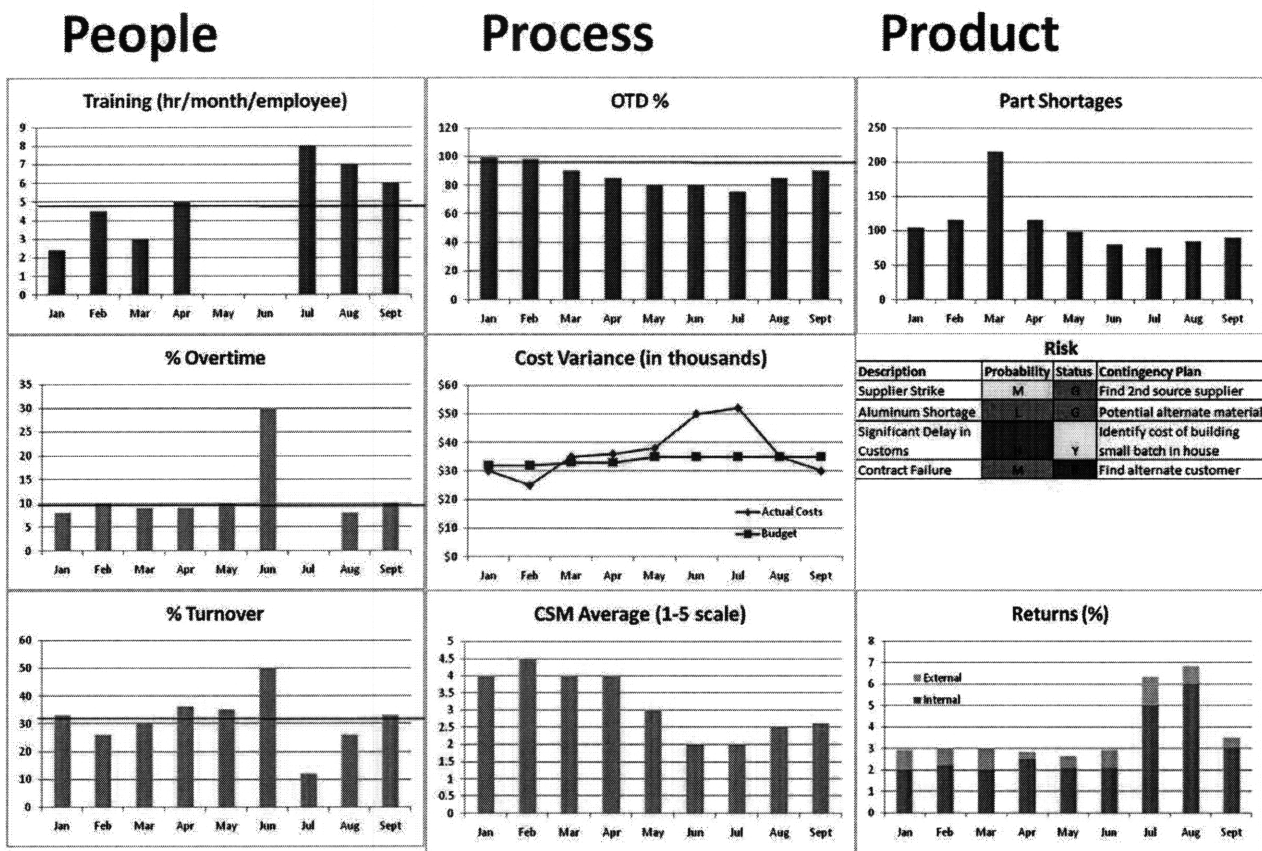
The most immediate metric that should be addressed is material shortages. If you see a spike in material shortages, you need to figure out what is causing it. Is this a long term problem, for instance is there a union strike at a supplier? Or is this a short term issue, i.e. we scrapped more than we expected and we can resolve it by expediting the part? Either way this will be a problem that will affect the bottom line and it needs immediate attention and resolution. Luckily, again this is something that is widely tracked, and will not be new to any PM. Also, it is only a concern when increasing. Shortages fall into the Context portion of Figure 10 under the Resources box. Shortages are a future predictor of some of our other metrics, OTD, Cost Variance and even CSM.

Risk is something that needs to be addressed in any and every project. This is truly a predictor of how the entire program will run. Up front development and frequent revisiting of a Risk Assessment can keep a project or program in line when events occur. You must attempt to prevent issues, but also keep revisiting the potential issues and see if any new issues arise. Russ Westcott (2004) states, "there are three places when a risk assessment is called for: 1. In determining the feasibility of launching a product... 2. As an integral part of the project planning stage. 3. Continuing assessment of risk during an ongoing project...". There should be contingency plans associated with any risks that are identified to ensure that you can act should they occur. Keeping this list up to date and understanding the status of the different risks will help you to understand the health of the program. This metric could be associated with the Procedures portion of Process of Figure 10. It is a way of communicating and prioritizing the different scenarios and priorities within a project or program. Measuring risk and quantifying it on a dashboard can be somewhat tricky. The most common and standard way of doing this is by assigning a high, medium or low value to the probability of risk as well as a high, medium or low value to the impact on the project should the event occur. These are often shown as red for high, yellow for medium and green for low. Items that are red should always be considered when making decisions and should be reviewed regularly. Items that are green, however, are less important to discuss regularly, but should be revisited occasionally to ensure that they need not be elevated.

The final metric that I recommend is measuring the number (or perhaps the percentage is more valuable) of returns. This would be a measure of internal as well as external returns. This gives the PMs a good idea of where they stand on quality. High first pass quality is always the goal, however, the ability to find an issue before it passes to the customer is still a positive attribute. Identifying defects is the first step. This metric will ensure you investigate where the defects are occurring as well as where they are found. With investigation this too will often cause you to find a deeper issue and make some very helpful improvements. This would be a measure of Performance within the Results box of Figure 10.

## **Dashboard**

In summary, I see the nine simple metrics that should be tracked by the PM as: Training, Overtime, Turnover, OTD, Cost Variance, CSM, Shortages, Risk and Returns (see Figure 14). This is a very basic example. There are impressive dashboards on the internet at websites like [idashboards.com](http://idashboards.com)



Red line denotes target

Figure 14: Proposed Dashboard

These metrics fit into the larger picture of a program, project and portfolio management tool. To make this set of metrics stick, it must not require much if any additional effort from the PMs.

These metrics are basic and should be revised as the maturity of the organization increases. Bryan (2007) suggests a metric of profit per employee which focuses the company on the “returns on talent rather than returns on capital alone”. This is the direction that I see these metrics growing as the organization develops and matures.

## Chapter 8: Conclusion

All in all the project and process were successful. We developed an approach, gathered user and future business needs, put together a business case, identified a potential approach to metrics, and looked at characteristics that are important for a knowledge sharing system. The next steps are to shorten the list of desired system features under consideration, and send out a request for quote. From there the system tool vendors will be asked to come in and spend a day each with some of the potential users, who will then provide their opinions of how each tool meets their needs. The deployment plan and specific business case for each tool will then be developed. Finally, senior management will make the decision as to which tool Voltaform will move forward with. Then this tool will be piloted and slowly implemented across the company.

The purpose of this document was to provide a suggested process and then share information learned from an actual implementation of the process at Voltaform, as well as research from other's experiences. From what occurred at Voltaform, if I were to do this again, I would indeed make some changes. I summarize those that have been revealed in the previous pages here.

In the early stages of the project I would make sure to develop early buy-in at high levels. I would also make sure to keep senior management in the loop with information throughout. If there were any changes within this high level of leadership, I would immediately meet with the newcomers to understand how they would affect the direction of my project, revisiting my scope and charter. It is also important to do this to ensure that senior management knows that the project exists and can provide any additional knowledge that they might have. It is also important to engage those with political power (these may not be the decision makers themselves, but they tend to influence them). If you can get these people's support, especially if they are willing to be vocal about this support, early, it will save you a great deal of time as well as battles later on in the project.

The selection of those who were to be interviewed was very good. This strategy allowed the leaders and representatives of the different parts of the company to make recommendations. This keeps them involved and ensures that you are getting the right people (especially if it is a highly political company). The political aspect here can be very important when you are implementing something of this magnitude across a large company. Then you must take advantage of their thoughts and influence. When speaking with people, it is important to think about the value of site visits versus phone interviews. Are you speaking the same language? This is meant literally and figuratively. Communication can often be difficult over the phone, especially if you have not met the person before. But it requires time to go to all those site visits, so you will have to choose. It is important to ensure that when choosing the sites that you visit there are no implications of favoritism (again politics can be very important).

I also recommend pulsing IT early in the process to determine what software is currently in use across the company. This will help you to understand what the company already owns and what the users know how to use. This will more than likely vary a great deal across sites, so if there is not a centralized IT department, getting this information can be challenging. In that case, the only way to discover what is actually in use, is to contact each and every site.

Another important factor of this process is the time that you take to completely understand the organizational maturity level of the different groups that you are dealing with, this is in addition to the maturity of the company as a whole. The different levels of the individual organizations can help you to understand which one needs which type of support. Sometimes a group with a very low level of maturity may not know what type of tool it actually needs to get the job done. The group is too busy with day to day challenges to be able to plan and really use the capability of a PPM tool. The groups that are more mature will tend to have completely different needs focusing more on planning and risk prevention. When working with all of these different people and organizations across the company, it is important to be sure not to promise anything. You cannot promise any features, time savings or dates at this stage. Make sure that it is known and understood that you are just gathering information, and that their input and information is valued and will be used later on when making final decisions. For this reason it was helpful in my case to be an outsider, as they saw me as a non-biased party, and by not knowing the processes, I was able to be walked through it. This allowed me to be able to see the many different ways that these PMs saw their jobs and how they interpreted the process as well as how it fit into the larger picture of the company.

At least on the initial passes, and with a less mature company or organization, it is helpful to remain at a high level when gathering information. It is very easy to get bogged down in all of the details. If you do this, then it will be very difficult to understand where the similarities and differences between the groups lie. If there is more continuity within the company that you are working with, this might not be the case. Also when working at this higher level, it is important to leave the door open, to make sure that you can come back at a later time to ask questions when you are working through the analysis. Due to time constraints as well as internal changes and churn, I was not able to do this to the extent that I would have liked, so I highly recommend leaving each person with that expectation. If they have this expectation, I would also recommend a monthly report to leadership as well as each of those that are interviewed, shadowed or surveyed. This report can be short, but would maintain an open channel of communication. This communication should come from the lead of the project, so that there is understanding of what the current state is. My personal opinion is that in some cases a web report is sufficient, but often it is not, most of these people are too busy to go and pull this information; it must come to them.

Finally, if I were to do this again and knew what I knew now, I would take the time up front to understand and develop an initial plan for the analysis; doing this prior to the interviews will help you to know what follow up questions to ask. For instance, I would have asked if “what if?” capability was needed. I would have asked if they needed the ability to track aging POs, or document their assumptions in addition to their risks. This does not mean that you have to stick with this initial plan. It is perfectly acceptable to change your plan as you find out that it is not optimal, but this time up front is still well spent. Hopefully anyone performing a similar experiment can incorporate my learning from the beginning.

## **Glossary**

AHP – Analytical Hierarchy Process

AML – Approved Manufacturer List

AVL – Approved Vendor List

BOM – Bill of Materials

BVA – Business Value Assessment

CAD - Computer Aided Design

CAPEX – Capital Expenditures

CATIA - Computer Aided Three Dimensional Interactive Application

CDM – Contract Design Manufacturer

CIM – Computer Integrated Manufacturing

COUHES – Course on Use of Humans as Experimental Subjects

CSM – Customer Satisfaction Metric

ECAD – Electrical Computer Aided Design

ECO – Engineering Change Order

EMS - Electronics Manufacturing Services

ERP – Enterprise Resource Planning

FYI – For Your Information

GM – General Manager

HR – Human Resources

IT – Information Technology

KOI – Key Operating Indicators

KPI – Key Performance Indicators

MCAD – Mechanical Computer Aided Design

NPI – New Product Introduction

NRE – Non-Reoccurring Engineering

ODM – Original Design Manufacturer

OEM – Original Equipment Manufacturer

OTD – On Time Delivery

PLM – Project Lifecycle Management

PM – Project, Program or Portfolio Manager

PMBOK – Program Management Book of Knowledge

PMI – Program Management Institute

PMP – Project Management Professional

PMO – Program Management Office

PO – Purchase Order

PPM – Project Portfolio Management

PPMSG – Project Portfolio Management Steering Group

QMS – Quality Management System

RFQ – Request for Quote

RMA – Return Material Authorization

SAP - *Systeme, Anwendungen und Produkte in der Datenverarbeitung* ("Systems, Applications and Products in Data Processing").

SAR – Service Agreement Review

Turnkey – a product that is delivered ready to use

VI – Vertical Integration

WBS – Work Breakdown Structure

WIP – Work in progress

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## **Appendix A: Question for understanding the PM role – Job Shadow**

What do you activities do you on a daily basis? Weekly? Monthly?

What do you spend the majority of your time doing?

What is your current process? How long does the process take?

What information do you track, and how? How does that information get into the system that you use to track it? Where does that person get the information? Can that information be queried from another database? Is this information input into multiple locations?

Do our suppliers and/or customers need access to this information in this location as well?

What do you feel are your limitations now?

What would your ideal process look like? Why? How much time would it save you? Would it save others time? Would it reduce miscommunication and errors?

What information do you have in a database? How do you get it?

What software do you currently use to manage your project or program? What information do you input? How is it input? Numbers? Text? How many characters do you need? How many fields do you require? Are there standard options? How often does that change? How do you ensure that this information is still current? What information always needs to be input together? How often does that change? Do you always need to know that? Why?

What is done with that information?

If that field were not there what would happen?

What is your biggest problem with the software right now? What would make your job easier?

What would you like to do but do have time to do? Why would you want to do these items? What would enable you to do it? How do you do each of these activities?

How do you communicate with your suppliers? With your customer? With your team?

What metrics do you use? Who do you work with to get this information? How do you get it?

What information do you need to communicate to your management? The customer? Supplier? Factory? Engineering? How do you communicate that today?

What information is standard in terms of commonality within your group? What is done with that information?

How do you manage and approve the gates and checklists?

Show me examples of what you use to track these things currently.

How do you currently manage:

- Change control
- Team - Internal and external team as well as stakeholders rosters, escalations rosters, organization charts
- Internal Meetings/Communication - Team meetings, program meetings (multiple projects), stakeholder meetings, operating reviews, gate reviews, checkpoints, sign off sheets
- Master Schedules for reoccurring meetings and communications (internal/external)
- Team Files - Deliverables, communications, customer documents, internal documents
- Demand/Forecast - Tracking, latest status, forecasts
- Customer Relationship - Communications, expectations setting, satisfaction measurement, quarterly business reviews,
- Performance Appraisals Goals and Performance to Goals (individuals and teams)
- Schedules (do you use Excel or MS Project) covering process steps to complete deliverables & all deliverables customer, project, product (who, what, when, status, completion)
- Issues (for instance using Action Tracker)
- Risks/Opportunity and Risk Mitigation Plans and Status – Business resumption planning
- Quality Documents – Return material authorization, problem solving (5S or 8S), advance quality planning documents, regulatory and/or customer signoffs, equipment/tooling/part/product tryout and qualification records
- Negotiations Tracking - Customer set of cost structure books, contract (kept in a separate system), service agreement reviews (commercial and non-commercial), contract summary, customer RFQ's and responses, tracking of negotiations, open negotiations, bump sheets
- Financial tracking (hours spent, current to business case status, CAPEX project, NRE (non-reoccurring engineering) and tooling PO's details/spending/invoicing/payments, BOM (bill of material) costs, claims status,...)
- Roadmaps (quality, profitability- price and costs, KOI (key operating indicators) roadmaps )
- Integrated Change Control (request through macros implementation tracking of all aspects including ECO's (engineering change orders), PO's (customer & AVL (approved vendor list)/AML /VI (vertical integration)); Quoting process and approved costs, incremental price and walk away price, releases, controlled document updating, price/cost changes, bump sheets, recognized price tracking,
- Dashboard/Cockpit reporting internal and customers covering KOI, KPI (key performance indicators), customer metrics, project status

## Appendix B: Enterprise Program and Project Management Customer Needs – Interview Questions

### General

1. **Project Identification** – How would you like to have projects identified? Ex: Unique Project Numbers. Do you have any specific requirement for your team?
2. **Nested Projects** - Do you have a master project that contains multiple sub-projects that needs to be handled in an integral manner?
3. **Security** – Do you need access controls for managing your project activities? Ex: Customer needs access to high level plan and certain specific set of activities. Voltaform members can have access to all the activities.
4. **Project Updates** - Do you intend to get dynamic updates from team members when a task is completed?
5. **Process Workflow** – Do you need workflow support? Ex: Capability to define your work flow for different business processes.
6. **Access to Project Information** – Do you require access capability of project information over the internet?
7. **Editing Capability** – Do you need capability to edit the projects off-line and then be able to synchronize with the master project data?
8. **Searching Capability** – Do you require capability to search for a particular project based on certain criteria? Ex: Find project based on customer name.
9. **Import/Export Capability** – Do you need importing and exporting capability to other tools? If yes, what are the tools to which you would like to import from and export to?
10. **Other** – State any other requirements that you might need.

### Configuration Management

1. **Document Control** – Do you need revision management of documents?
2. **Change Control** – Do you require a process for change control and approval?
3. **Reporting** – Do you need reporting capability about the project? Ex: Number of changes made to the project, approvers of the changes, etc.
4. **Other** – State any other requirements that you might need.

### Planning Management

1. **Project Definition** – Do you need capabilities to define project charter, business benefits, deployment scope, etc?
2. **Stake Holder Analysis** – Do you need ability to perform a stake holder analysis based on project definition?
3. **Other** – State any other requirements that you might need.

### Scope Management

1. **Creation of WBS** – Do you need ability to create work break down structures?



2. **Baseline Management** – Do you need ability to manage baseline changes and be able to monitor/track changes?
3. **Other** – State any other requirements that you might need.

### **Schedule Management**

1. **Defining Schedules** – What type of schedule information would you like to capture? Ex: days to complete a task, etc.
2. **Resource Estimation** – Do you need capabilities to estimate resource requirements for activities in the project? What type of capabilities will you need?
3. **Dependency Management** – Do you need capability to manage dependent tasks?
4. **Milestone Management** – Do you need capabilities to create and manage milestones?
5. **Track Delivery** – Do you need ability to track the completion of activities at any given instance?
6. **Reporting Capability** – Do you need ability to generate reports in multiple different formats? Ex: Gantt chart, etc.
7. **Other** – State any other requirements that you might need.

### **Cost Management**

1. **Cost Definition** – Do you need ability to define cost parameters for a project? Ex: Hardware cost, Software cost, resource cost, etc.
2. **Estimated Cost** – Do you need the ability to track estimated and actual cost of each activity?
3. **Actual Cost** – Do you need ability to capture actual effort spent on a task and the associated cost? What are your specific needs?
4. **Reporting Capability** – Ability to report cost differences between actual and budgeted, variance analysis, actual hours spent on the different tasks, sub-projects?
5. **Other** – State any other requirements that you might need.

### **Human Resource Management**

1. **R&R Definition** – Need ability to define the project team members and their roles and responsibilities?
2. **Resource Allocation** – Ability to manage resource allocation and balancing.
3. **Time Sheet** – Ability to record efforts spent by resources.
4. **Integration with HR systems** – Do you need integration with HR systems to obtain the resource cost?
5. **Resource Calendar** – Establish and manage resource calendar?
6. **Other** – State any other requirements that you might need.

### **Quality Management**

1. **Issue/Defects Management** – Ability to manage issues/defects.
2. **Audit Management** – Do you need capabilities to perform audits and documenting the results?
3. **Metrics** – Do you need ability to track Project Quality Metrics?
4. **Other** – State any other requirements that you might need.

## **Risk Management**

1. **Risk Definition** – Do you need ability to define risks for project/project tasks?
2. **Escalation** – Do you need ability to escalate risks to a set of members, next level managers?
3. **Risk Analysis** – Do you need ability to perform risk analysis?
4. **Monitoring and Control** – Do you need ability to monitor and control risks?
5. **Other** – State any other requirements that you might need.

## **Communications Management**

1. **Definition of Communications Plan** – Ability to define communications plan for the team.
2. **Tracking Lessons Learned Implementation** – Ability to track the implementation of lessons learnt in existing processes.
3. **Escalation Methods** – Ability to define escalation route.
4. **Project Completion and Tracking Dashboard** – Ability to get a view of Project Completion status.
5. **Other** – State any other requirements that you might need.

## **Collaborations Management**

1. **Customer Collaboration** – How do you want to collaborate with your customer? Ex: At task or project level?
2. **Customer Approval** – Do you want to engage customer in the approval process?
3. **Customer Acceptance** – Do you need capabilities to record Customer Acceptance of a project?
4. **Data Sharing** – Do you need capabilities to share data with customers?
5. **Other** – State any other requirements that you might need.

# Appendix C: Survey Format

P3M Interview Questions

Site : \_\_\_\_\_

Questions	Is this process currently available / applied at your site?	Is so, how is it applied? Manually / Automatically?	What tool / system / is currently used?	Comments
<b>General</b>				
Project Identification – How would you like to have projects identified? Ex: Unique Project Numbers. Do you have any specific requirement for your team?				
Nested Projects - Do you have a master project that contains multiple sub-projects that needs to be handled in an integral manner?				
Security – Do you need access controls for managing your project activities? Ex: Customer needs access to high level plan and certain specific set of activities. Flex members can have access to all the activities.				
Project Updates - Do you intend to get dynamic updates from team members when a task is completed?				
Process Workflow – Do you need workflow support? Ex: Capability to define your work flow for different business processes.				
Access to Project Information – Do you require access capability of project information over the internet?				
Editing Capability – Do you need capability to edit the projects off-line and then be able to synchronize with the master project data?				
Searching Capability – Do you require capability to search for a particular project based on certain criteria? Ex: Find project based on customer name.				
Import/Export Capability – Do you need importing and exporting capability to other tools? If yes, what are the tools to which you would like to import from and export to?				
Other – State any other requirements that you might need				
<b>Configuration Management</b>				
Document Control – Do you need revision management of documents?				
Change Control – Do you require a process for change control and approval?				
Reporting – Do you need reporting capability about the project? Ex: Number of changes made to the project, approvers of the changes, etc.				
Other – State any other requirements that you might need				
<b>Planning Management</b>				
Project Definition – Do you need capabilities to define project charter, business benefits, deployment scope, etc?				
Stake Holder Analysis – Do you need ability to perform a stake holder analysis based on project definition?				
Other – State any other requirements that you might need				
<b>Scope Management</b>				
Creation of WBS – Do you need ability to create work break down structures?				
Baseline Management – Do you need ability to manage baseline changes and be able to monitor/track changes?				
Other – State any other requirements that you might need				
<b>Schedule Management</b>				
Defining Schedules – What type of schedule information would you like to capture? Ex: days to complete a task, etc.				
Resource Estimation – Do you need capabilities to estimate resource requirements for activities in the project? What type of capabilities will you need?				
Dependency Management – Do you need capability to manage dependent tasks?				
Milestone Management – Do you need capabilities to create and manage milestones?				
Track Delivery – Do you need ability to track the completion of activities at any given instance?				
Reporting Capability – Do you need ability to generate reports in multiple different formats? Ex: Gantt chart, etc.				
Other – State any other requirements that you might need				
<b>Cost Management</b>				
Cost Definition – Do you need ability to define cost parameters for a project? Ex: Hardware cost, Software cost, resource cost, etc.				
Estimated Cost – Do you need the ability to track estimated and actual cost of each activity?				
Actual Cost – Do you need ability to capture actual effort spent on a task and the associated cost? What are your specific needs?				