

Engineering Management
Field Project

**How to Successfully Implement a Knowledge
Management System for the Mechanical Engineering
Department at Gating Incorporated**

By

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Executive Summary

Gating Incorporated is a leader in design and manufacturing of consumer products. What began as a brainstorming session around a card table by a handful of engineers has evolved into a collaborative effort of hundreds of associates. With this explosive growth, it has become imperative that Gating Incorporated instill a Knowledge Management System to retain the vast amount of tacit knowledge. New products are critical for consumer product companies, so finding ways to capture the knowledge of a corporation and make it readily available to everyone is paramount to promoting innovation and ensuring long-term success.

Knowledge Management (KM) experts have written much on the history of Knowledge Management Systems along with the most common reasons why they fail. Even though questions remain about the development of benchmarks for the implementation of Knowledge Management Systems, there are strategies that often coincide with successful implementations. This paper is comprised of a comprehensive plan, utilizing some of the strategies, for the implementation of a Knowledge Management System for the Mechanical Engineering Department at Gating Incorporated.

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Chapter 1 – Introduction

Knowledge is power, especially in today's technologically advanced world. With the current economic conditions, managing this knowledge is a critical component for a company to operate as efficiently as possible. For consumer product companies like Gating Incorporated, new products are the lifeblood of the future so finding ways to capture the knowledge of a corporation to promote innovation is paramount to continued profitability. However, merely implementing a Knowledge Management System does not guarantee an improvement in performance. A system can have the greatest intentions, but it must be in alignment with a company's long-term vision while funneling information to the right people at the right time. The system will be a failure if it does not add value to the people that use it every day. This paper outlines the steps necessary to successfully implement a Knowledge Management System for the Mechanical Engineering Department at Gating Incorporated.

Better documentation of previous lessons learned would prevent large amounts of time and resources from being wasted. Management was recently reviewing a new product concept when they raised a concern about a certain aspect of the design. At first, it appeared to be a concern that the design team would need to analyze further to determine the tradeoff of performance versus appearance. Only after a couple of weeks of doing mockups for testing and e-mailing around to the more experienced engineers to find more background information did the team truly understand the basis of Management's concerns. This small isolated incident appears rather insignificant by itself. However, multiply it by the total number of projects, disciplines, and remote design locations at Gating and there is a rather sizable source of inefficiency.

As of seven years ago, there were only three mechanical engineers in the company. Of those ten mechanical engineers on the team, all but two of them had been at Gating for over five years.

Now as of January 2009, there are currently twenty mechanical engineers with over half of them with tenures at Gating of less than two years. Along with this dramatic growth in the number of relatively inexperienced engineers, the most experienced design engineers have moved up into management roles. So now the engineers with the most design experience are spending most of their time outside of doing design work. With so many inexperienced engineers, it is imperative that information is readily accessible so as to create an environment in which learning on the job is simplified. In turn, this environment will promote a culture of collaboration.

Another common issue that many technology companies face is the loss of intellectual property when employees switch jobs. Gone are the days of employees staying with a company for their entire career. Gating has had minimal problems with retaining employees during its ten years of operation. This has allowed Gating to retain intellectual information that would otherwise be lost with high turnover rates. However, it would be shortsighted to think that this could never happen to Gating. Changes in the consumer market or larger scale job market changes could make it more difficult to retain employees.

Currently, all of Mechanical Engineering test data, project reports, design guidelines, and other pertinent design information are scattered across the company's networks and there is no efficient means of searching through it. Often, only the engineers directly related with a project or problem know where to find specific information. So the problem is often not whether the group has faced a similar design issue before, but trying to find the person that solved it or documentation of the solution. Having a database of information that was easily searchable would be extremely valuable to the entire group of engineers regardless of experience. It would

bridge the gap in knowledge between new hires and senior engineers. It would reduce the likelihood of repeat mistakes as well as the duplication of test efforts. New engineers would be able to get up to speed more quickly and not have to rely on asking questions as much. An information database would also protect the knowledge of the team by ensuring that people leaving the company did not take away information known only by them. By becoming more efficient with the design process, Gating would bring products to market more quickly and ultimately improve its bottom line since the profitability of the company is dependent on the timely release of new products. The implementation of a Knowledge Management System would help instill a culture where engineers willingly shared information, which in turn would promote innovation.

Chapter 2 - Literature Review

Karl Wiig coined the phrase “Knowledge Management” at a 1986 Swiss conference sponsored by the United Nation’s International Labor Organization. He defined it as the systematic, explicit, and deliberate building, renewal, and application of knowledge to maximize an enterprise’s knowledge-rated effectiveness and returns from its knowledge assets (Wiig, 1997).

Knowledge Management creates a working environment where employees share knowledge and experiences. It also assists in getting information to the right people at the right time so they can work more efficiently (Smith, 2001). An established discipline since 1995, Knowledge Management includes courses taught in the fields of business administration, information systems, management, and library and information sciences (Alavi and Leidner, 1999).

Knowledge Management efforts typically focus on organizational objectives such as improved performance, competitive advantage, innovation, the sharing of lessons learned, and continuous improvement of the organization. Knowledge Management efforts overlap with Organizational Learning, and may be distinguished from by a greater focus on the management of knowledge as a strategic asset and a focus on encouraging the exchange of knowledge. Knowledge Management efforts can help individuals and groups to share valuable organizational insights, to reduce redundant work, to avoid reinventing the wheel, to reduce training time for new employees, to retain intellectual capital as employees turnover in an organization, and to adapt to changing environments and markets (McAdam and McCreedy, 2000).

Ask coworkers the question of “What is Knowledge Management?”, and there will likely be a large variety of responses. Phrase the question in a slightly different manner by asking whether Knowledge Management is important to the success of a company, and the response will likely be an overwhelmingly positive response. Lew Platt, an ex CEO of Hewlett Packard, said “If only HP knew what it knows it would make three times more profit tomorrow (I-N: Context, 2007).” A survey of Ernst and Young found that 87 percent of employees thought that knowledge was critical to competitiveness (Bock, 1998).

History of Knowledge Management Systems

It is difficult to pinpoint the origin of knowledge management as humans have been managing information for centuries. The emergence of the explicit knowledge focus and the introduction of the term Knowledge Management in the 1980’s was no accident, and it did not happen by chance as the phrase "knowledge management" became more prominent by the late 1980’s. Although it happened gradually and management often voiced their uncertainty, it was a natural change brought about by numerous factors (Wiig, 1997).

In Robert Villegas Jr.’s “Knowledge Management White Paper”, he discussed the origin and development of knowledge management.

In past eras, most employees had to fit into their organizational structures by means of performance standards based upon strictly defined job descriptions. Employment was secure as long as they performed assigned tasks and minded their own business. Out-of-the-box thinking was not likely and knowledge hoarding was the order of the day.

During the era of business process reengineering, cost accountants saw the most knowledgeable workers as an unnecessary expense. The solution was through downsizing or early retirement. Many organizations made the strategic mistake of pushing their intellectual assets out the door. Knowledge hiding then replaced the culture of knowledge hoarding.

During the 1990's, chief executives in the consulting trades realized that the foundation of our economy had been shifting from natural resources toward intellectual assets. They began evaluating how employees were using knowledge in their organizations. The biggest shock came with the discovery that the companies did not own 80 percent of corporate knowledge. The knowledge went home every night with the employees. As a result, questions such as how knowledge is acquired, used, and delivered became paramount.

These early pioneers knew that their organizations had to adapt quickly. They spent their time rethinking what they were doing, how they were doing it, and why. They tore down barriers and ancient processes and replaced them with a systematic approach to knowledge sharing based on the fluid dynamics of a networked economy.

As CEOs evaluated their knowledge management dynamics, it became apparent that the people who drove their enterprises were those who were creating and accumulating knowledge. As time went on, the value of these people and what they knew was exerting an increasing influence on the success of their organizations. The challenge then became how to create the information, organizational intelligence, business models,

communication tools, and learning systems around these extremely important people.

This goal had to become a central mission, a basic purpose for the existence of these consulting organizations – if they were to be successful.

The lessons learned by these early adopters of knowledge management indicated that though they knew what knowledge was, finding out who has it, reorganizing operations to nourish and manage it, changing the work culture to support it, and building knowledge networks around it were the real challenges of the future (Villegas, 2000).

Why Do Knowledge Management Systems Fail

Some industry estimates have pegged the failure rate of technology implementations for business process reengineering efforts at seventy percent. Recent industry data suggest a similar failure rate of Knowledge Management related technology implementations (Reichfeld, 2002). So, even though this seventy percent value might not consist of complete failures, this statistic illustrates that understanding the causes can help prevent repeating past mistakes.

Knowledge Management Systems can fail because of many different factors, but there are two general reasons. The first is that people define systems by inputs such as data, information technology, and best practices. The problem with this is that this information alone will not guarantee improved business performance since it does not account for variables like employee motivation, creativity, and innovation. The second reason is that business environments are dynamic, and people should not take the accuracy of the information contained within the system for granted (Malhotra, 2004). Through past case studies, one can also pinpoint many specific reasons why Knowledge Management Systems fail. Following is a comprehensive list of some of the most common causes of failure (Fontain and Lesser, 2002).

- Failure to align knowledge management efforts with the organization's strategic objectives.
- Stakeholders' considerations are not included during their development.
- Creation of data sharing systems without addressing the need to manage content.
- Failure to understand and connect knowledge management into individuals' daily work activities.
- An overemphasis on formal learning efforts as a mechanism for sharing knowledge.
- Focusing knowledge management efforts only within organizational boundaries.
- KM approaches may fail when they do not integrate humans, processes, and technology (Abecker, Decker and Maurer, 2000).
- Contributors may not know the level of generality that would make knowledge useful causing them to submit useless artifacts or not submit anything at all (Disterer, 2001).
- KM approaches may fail due to lack of leadership support (Disterer, 2001).
- Employees believe that withholding knowledge from others is a source of job security.
- Teams do not maintain sufficient oversight of system content. (Marshall, Prusak and Shpilberg, 1996).
- Approach does not promote collaboration.
- System fails to demonstrate their effectiveness, which is a requirement for any business (Ahn and Chang, 2002).
- Contributors may not perceive any value in contributing, to themselves or others (Disterer, 2001).

Chapter 3 - Development

There are some concerns about the usefulness of a Knowledge Management System based on the department's experience with the existing information system. These include whether any additional engineers would use it when compared to today's system or how it would be any better than the current system. These are valid concerns as the team could design and implement a comprehensive system, but it would be a wasted effort if nobody used it. The Mechanical Engineering Department has a wealth of explicit knowledge, but the problem is that this information is located all over the company's computer network from individual project directories to the primary Engineering directory. This information includes, but is not limited to items such as:

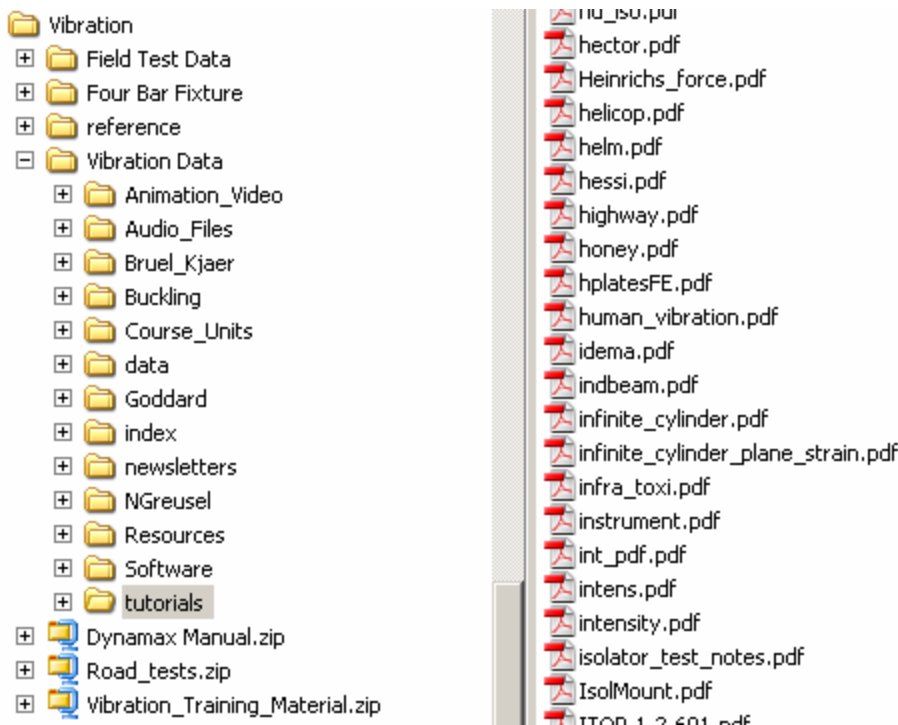
- Test results
- Tooling and part cost estimates
- Design guidelines
- Lessons learned

However, the department's explicit knowledge, or documented information, is small in scale compared to the amount of tacit knowledge in the group. Due to Gating's rapid growth, accelerated product development cycles, and lack of a formal Knowledge Management System; the department has not electronically documented all of their knowledge. Thus, much of it resides only in the minds of the engineering staff as tacit knowledge. This is a known problem

for many companies as some studies have shown that as much as 80 percent of the knowledge of any company is tacit (Oakes, 2002). The main risk is that tacit knowledge is known only by an individual and is difficult to communicate to the rest of the organization.

The most common challenge a mechanical engineer faces is when a design question arises is where to go for help. One option is to start by searching the Internet, but the most common method is to start with Windows Explorer and dig through a multitude of sub-directories that have been created in the primary Mechanical Engineering directory. As shown in Figure 1, non-descriptive naming conventions for files and folders make it very difficult to readily find information. Thus, the current system has rendered a relatively large portion of the department's information useless because employees do not have a way to easily search the contents of files or be able to identify the contents of a file from the naming convention.

Figure 1: Mechanical Engineering Directory



There is also the option of trying to track down senior engineers or the local resident expert of a specific subject matter to ask them a face-to-face question. The problem is that the availability of the information depends on the documentation practices of that particular engineer and the hope that they can dig up old e-mails or spreadsheets that contain the desired information. It is not that most of these engineers are trying to hoard this information. The fact is that there has never been a clear directive until recently on the information to store outside of a core group of project specific data. This has limited the amount of data readily available to the rest of the team as they are dependent on an individual engineer's documentation habits or memory. The lack of a formal system or recommended procedure has also allowed the proliferation of data all over the network, which makes it difficult to readily track down the desired information.

A Knowledge Management System went onto the department's wish list a couple of years ago as engineers continually searched the network for information during the design process and when mentoring new hires. Unfortunately, at that time there were insufficient resources to tackle a project of this scale as the focus was getting the products in development out the door. The mentality of "working harder" trumped "working smarter" as engineers had to focus on bringing products to market quickly rather than optimizing processes. This mentality has changed since then as the company started to focus on improving processes as growth started to stabilize. The problem is that there does not appear to be a companywide vision of what will comprise the online collaboration system. Thus, two main data collaboration systems, Confluence Enterprise Wiki Software and Microsoft SharePoint, have become the primary choices. Confluence is a simple, powerful wiki that lets you create and share pages, documents, and rich content with

your team. Microsoft Office SharePoint provides a single, integrated location where employees can efficiently collaborate with team members, find organizational resources, search for experts and corporate information, manage content and workflow, and leverage business insight to make better-informed decisions.

Different departments ranging from Human Resources to Marketing have all been working on their own systems. While there are good intentions with this movement, the problem is that the duplication of systems and inconsistent formatting confuses the average user on where to find the information they are looking for. It also requires the education of employees on the use of numerous systems, many of which employees do not currently use on a regular basis. With these current initiatives, most of the information is at a level higher than product development, and most employees have not been included in their development. Consequently, users have not readily adopted their use on a regular basis. It is critical that the Mechanical Engineering department be included during the initial layout of the new Knowledge Management System to ensure that it includes the correct information as well as improve the chances of its adoption. The goal is to learn from the successes and failures of others during the development of the Knowledge Management System and make sure that it fits within our overall departmental system. The Knowledge Management System should be a resource that engineers use on a daily basis during the product development process.

System Focus

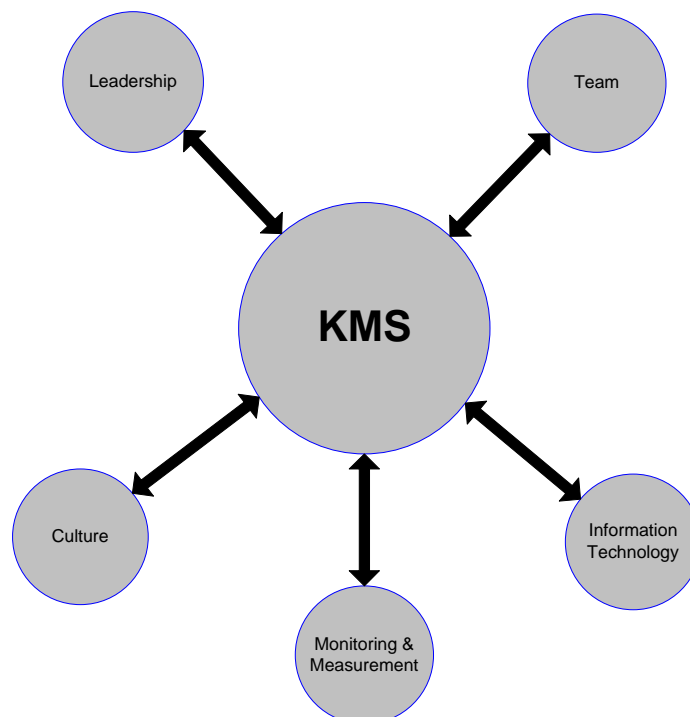
While there are many reasons that a Knowledge Management System can fail, there are also many factors that can increase the likelihood that it will succeed. There is an ongoing debate in the field of Knowledge Management about whether it is possible to set standards or benchmarks

for Knowledge Management practices, and what those standards might be. However, there are a number of practices that often coincide with successful implementations across a variety of organizations, and the implementation team will focus on the following:

- Integration of Knowledge Management into everyday working practices
- Providing sufficient time to learn how to use the system
- Simplifying the system
- Providing sufficient training
- Instilling a sense of personal benefit for the user

The plan that follows is an outline to help ensure that the exploration into the arena of Knowledge Management is a successful one. The plan addresses the above strategies through the five main areas shown in Figure 2.

Figure 2 – Knowledge Management System Focus



Leadership

The management team is supportive of a Knowledge Management System, but the implementation team must instill confidence in them that the department will readily adopt the system, and that it is an improvement from the current system. Getting management on board at the beginning of the project is critical to its potential success. Luckily, the work of other groups at Gating has paved the way for the Engineering department to get the green light on this project with the Manager of Engineering confirming that he is in support of online collaboration. The completion of a comprehensive implementation plan will help quell any concerns about whether the team can successfully install the system in a timely manner.

Leadership will always play a key role in the success of any new initiative. Because the members of the management team have the most design experience, the department will be much more receptive to a new system if the team leaders become role models in sharing information. The department should see an increased value in posting information if they see the management team actively entering data and logging knowledge. Management must also provide a clear vision of the information to archive, as well as a clear definition of the roles that the engineers will play. This will eliminate confusion and apprehension amongst the department when it comes to entering data.

Culture

The second area of focus is the culture of the Engineering department. The corporate culture has changed slightly from when Gating was founded. What was once a tight-knit family culture has been replaced by a larger corporate culture. However, the relatively small size of the Engineering department has allowed the retention of the close-knit family culture.

The older members of the team have extensive knowledge of the history of previous products, as they developed many of the first products in all of the markets that Gating serves. On the other side are the younger generations straight out of college with relatively little or no design experience, along with minimal knowledge of Gating's history. Many of the products that they design are derivatives of existing ones, and they do not have the knowledge base that the older engineers have developed over the years.

The Mechanical Engineering department is relatively small when compared to the Electrical and Software groups so this is the main reason why it has been easier to maintain a sense of family amongst the group. The group has also been able to hire both experienced engineers and students straight out of college, which has allowed a good range of personalities and backgrounds while maintaining an environment in which information flows freely. A Knowledge Management System would only enhance the sharing of information by simplifying the process. Many techies enjoy the notoriety that comes with being the expert in a certain field. This system will provide a place in which they can showcase their wares and earn the respect of their peers.

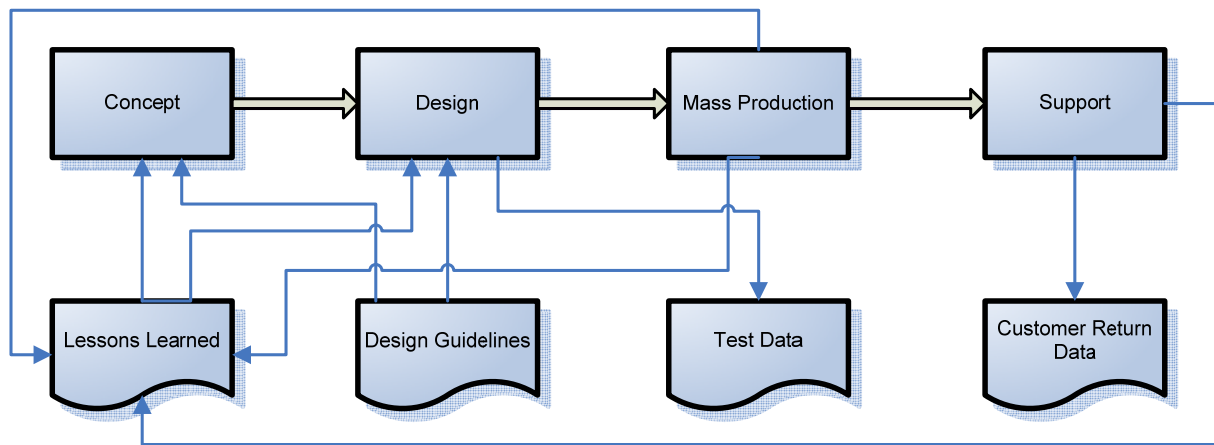
A lack of time and resistance to change are both going to be challenges with the implementation of this system. The pressure is high to release products on time as our company's profitability has a direct correlation with the release of new products. The demands of the job make it difficult to find the time for documentation to a level that our engineers would be proud to showcase to the rest of the group. Thus, it is critical that the system make the team's job easier and any increase in time required to enter data be more than offset by the savings in time that it takes to retrieve data.

As is human nature, the group will be resistant to change especially if there is a perceived addition of work. Change is always occurring at Gating from a companywide perspective down to individual projects. So even though people are accustomed to change, the implementation team must still be careful how they present this change to the department as it will have huge implications on their response. One way to help mitigate any resistance is to ensure that the entire department is involved early on during the development of the system. Having a consensus of the Mechanical Engineering staff will instill a sense of ownership in the new system and aid in its adoption.

Team

The Mechanical Engineering Department has focused on improving procedures and the tracking of information over the past year due to the rapid growth of the group. This occurred at a critical point as the average experience of the group had decreased from five years to less than two years in a short amount of time. The main issue with the procedure changes is that this has increased the amount of documents and forms the group must fill out. While the rollout of a Knowledge Management System means that the group must learn to adopt another new system, they will now have the advantage of being able to access all of the day-to-day information from one central access point. An engineer's role will continue to be the same as it is today with only a change in the way that data is entered. However, the management team will ultimately be responsible for the quality and accuracy of the data as well as discerning which information should be included or not. The important item is that the implementation team marries the design process and the flow of information so that they run smoothly in parallel to each other as shown in Figure 3. The ultimate goal is to facilitate a learning environment by placing the necessary tools and learning aids in the designer's hands.

Figure 3 – Flow of Information in the Product Development Process



The Knowledge Management team will initially roll out the system with the goal of the entire department eventually taking ownership and accountability. Without the Mechanical Engineering staff taking ownership of knowledge and learning, it will be difficult to sustain a sharing environment.

Information Technology

The Information Technology department has already started the rollout of Microsoft SharePoint as Gating's online collaboration tool, which has both negative and positive aspects. On the positive side of things is that the entire company will be utilizing the same information system, which means that Mechanical Engineering will be consistent with the rest of the company. It reduces the amount of background work that must be done in the selection of a system, and it also means that the team will have the support of Information Technology for technical issues.

What is a positive is also a negative, in the fact that the department will not have any input on the system they will be using. However, the system appears to be a good fit based on the interface the group has had with the program to date and discussions that the implementation team has had with the Information Technology staff with regards to the functionality that the system can provide.

One of the main issues with the current information system is the inability to readily search files for content. SharePoint has the ability to do an indexed search of files contained within the system. Thus, it will be much easier to find information stored on the new system than before. A user can enter in keywords based on his desired search into the SharePoint site, and it will return all of the pages in the system that contain the keywords as well as pages with attachments containing the keywords. The Information Technology Department confirmed that SharePoint will accept all of the standard file types that the group typically uses to store information. SharePoint will also support revision control and selective permissions for read/write access, which is desirable considering the large amount of people that will be utilizing the system in various locations around the world. Read access will be provided to users that should only need access to information, and that will not be editing or providing new submissions. Revision control will protect the integrity and accuracy of information in the system, as mistakes can easily be corrected by rolling back to a previous revision. The total size of the database is also not a concern, as individual sites can contain 250 MB with total projects up to 10 GB of information. The entire Mechanical Engineering directory of information is well within both of these limits. A detailed summary of the questions and answers from Information Technology is included in Appendix C.

The implementation team must take the time to understand what information the Mechanical Engineering Department needs and format this information in a way that makes it readily available to them. The problem with the current system is that engineers have to dig down through multiple directories to try and find information, and then inconsistent and poor naming conventions make it hard to determine what is contained within individual files. Even though there is indexed search ability, the Knowledge Management System must be formatted in a way in which it makes information readily available and intuitive to search through.

To this point, there has been no formal training to anyone in the company on the use of SharePoint. It is a fairly intuitive program, but to achieve the desired level of interaction the department must be very comfortable with the program. The rollout plan will consist of training and teaching the department on how to use the system. The implementation team will provide best practices on how to interact on the discussion boards with other engineers and how to input the data. The implementation team will also develop best practices on formatting and archiving data in a consistent way that makes it easily discernible to the reader.

Monitoring and Measurement

The team must be careful during and after the implementation process to ensure that the system is meeting the needs and requirements of the department. It is difficult to place metrics on a data collaboration system, as many of the benefits would have an intrinsic impact on the bottom line of the company that is nearly impossible to measure. Instead, the team needs to look for the small victories of the system when applicable.

The implementation team will select a system administrator to help ensure that the quality of the information meets pre-determined standards. They must ensure that submissions to the system are complete and correct. They will contact contributors to make corrections if necessary as well as determining if further clarifications are required.

Information in the consumer electronics industry can change rapidly, as new technologies are continuously being developed and enhanced. The administrator will need to ensure that information remains relevant, but they do not have to be an expert in every subject matter. There are a couple of tools that the administrator can use to assist in this task. The first are clustering methods, which can automatically identify redundant knowledge. A second method is by evaluating the usage of data files to determine if information is becoming obsolete. Ultimately, the management team would be responsible for determining if a submission should be obsolete.

Chapter 4 - Implementation Plan

The following is an implementation plan for the Knowledge Management System with brief summaries of the work done to date. The plan was developed utilizing information gathered during the literature review with regards to critical success factors. It also takes into account Gating's current information system along with input from the Mechanical Engineering Department.

Step One: Research Knowledge Management Systems and Gating's Current Information System

It seems elementary that a team should first have a common understanding of the terms "knowledge management" and "knowledge sharing", and how they apply to their situation. The team has researched Knowledge Management Systems with regards to critical success factors, recommendations on implementation, and layout. The team has also researched how information flows to the Mechanical Engineers at Gating, along with the information systems that are currently in place to look for sources of inefficiency.

Step Two: Review Existing Available Systems

Gating already has groups utilizing Confluence and SharePoint as the two primary information sharing systems. After some initial meetings with the Information Technology department and Gating's Intranet Software team, it was very apparent that SharePoint best met the requirements of the application. Some of the key areas that the team has confirmed are listed below.

- Ability to search attached files for keywords
- File size limitation well outside of our requirements

- Ability to limit user access and read/write capability
- Formatting limitations

Step Three: Interview Mechanical Team on Desired Content

From the literature review, it is imperative that the implementation team listen to the engineers, the customer, when developing the system so as to improve the chances of the group adopting it. The implementation team e-mailed a questionnaire out to the entire Mechanical Engineering department to discuss various areas of a knowledge system with topics including the current system to their vision of a new one. A copy of the questionnaire is located in Appendix A while a summary of the results is shown in Table 1.

Table 1: Mechanical Engineering Survey Results

1. Do you utilize any of the design guidelines currently in the Mech_Eng Reference Data directory?	
<i>Yes</i>	69%
<i>No</i>	31%
2. Why would you not use this as a source?	
<i>Too hard to find anything.</i>	60%
<i>Didn't know it was out there.</i>	0%
<i>Information is out of date.</i>	0%
<i>All of the above</i>	40%
3. What specific areas would you like information more readily available?	
<i>Design</i>	15%
<i>Materials</i>	31%
<i>Processes</i>	15%
<i>All of the above</i>	38%
4. Where do you usually start your search when a design question arises?	
<i>Internet</i>	31%
<i>Team member</i>	69%
<i>Mech Eng directory</i>	0%
5. Would you find a searchable central database of information useful?	
<i>Yes</i>	85%
<i>No</i>	0%
<i>Maybe</i>	15%

There has never been a lack of information in the system, just no efficient means for an engineer to be able to easily find it. The response of the department was encouraging in the fact that they appear to be on the same page with regards to the need for a new system, but it was disconcerting in that only two-thirds of the engineers responded to the survey. This accentuates the fact that the implementation team must educate the users on the benefits of the system if there is going to be any chance of success.

Around two-thirds of the department currently uses the information contained within the existing database of information. However, it was never the first place that anyone in the group used when looking for an answer to a question. Two-thirds of the group started their search for information by talking to team members while the remainder looked on the Internet. The top reason that engineers did not start their search in our information database is because it was too hard to find anything. The staff also responded that they didn't know the information existed on the network, and that they worried that the information was out of date.

There was an 85 percent positive response that people in the group would like to have a new information system implemented that would consolidate everything into one location, while being easily searchable. The remaining 15 percent of the staff was interested in a new system, but only if it proved to be more useful than the current system.

The final question of the survey is arguably the most important as it asked for input on what information should be included in the new system. There are many fields of information that the implementation team will carry over from the current database of information, but the rest of the group was able to provide valuable input on the new information that should be included as well as updated. A summary of the feedback is included in the Appendix B.

Step Four: Interview Other Departments

Some of the other engineering departments have already been working with their own Knowledge Management Systems. The team received feedback from the system administrators on the lessons that they have learned from their implementations, and whether they would have done anything differently.

Step Five: Select Knowledge Management System Team

A common mistake is selecting an inexperienced person for leading a Knowledge Management team. The team selected an engineer to assist with the project based on his design experience as well as his experience with information systems from his previous employer.

Step Six: Layout Initial System

This is the current phase of the project. The team is currently laying out a structure for the system based on feedback from the rest of the department. The initial system will not be fully intact upon its initial release as the massive amount of data would be too great to try and roll out at one time. The implementation team hopes to avoid a common mistake of tackling a project too large in scale. The initial system will allow better access to project and process information. It will also likely start out as a way to capture tacit knowledge for use within the department and will eventually grow into a system that promotes knowledge sharing.

Step Seven: Review Existing Information

Future plans will require the review of all existing information. The Knowledge Management System implementation team will determine which files should be rolled over to the new system. This will be an iterative process as information is refined, updated, or deleted.

Step Eight: Compile Data

The implementation team will recruit engineers to fill in the holes of the information system through new research as well as transfer over of information from private directories along with tacit knowledge.

Step Eight: Release Alpha Version of System

The implementation team will roll out an alpha version of the system to a small subset of the department after some preliminary training.

Step Nine: Role out to Department

The Knowledge Management team will release the system to the rest of the department after an iterative process of refining and improving.

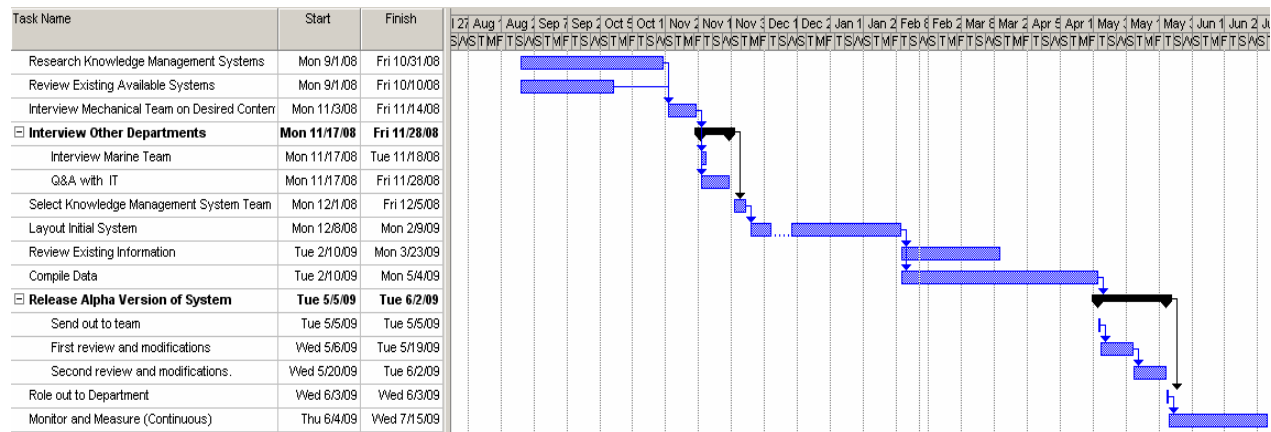
Step Ten: Monitor and Measure

The Knowledge Management team will monitor the information within the system for accuracy after submission by engineers. The administrator will make improvements to the system when applicable.

Schedule

Work formally started on the Knowledge Management System in early September, and the projected initial roll out to the department will be in early June. The schedule shown in Figure 4 shows the top level tasks along with their associated start and end dates to meet this proposed date.

Figure 4: Knowledge Management System Implementation Gantt Chart



Risks to Success

There are numerous risks to implementing this system as there are with any other new initiatives. By identifying some of the riskiest items with the department's current situation will help mitigate their potential impact. A plan will assist in this implementation, but long-term success could prove to be challenging. The management team faced some of the issues listed below during the implementation of a recent training program:

- How to keep information current and up to date.
- Lack of a long term strategy.

- Proliferation and/or duplication of data.
- Dead links on the system.
- Difficulty in finding information due to poor indexing and information being held on private servers.
- Access to official company resources is difficult due to poor awareness of its availability.
- Huge diversity in the formatting of information.

Chapter 5 - Summary

Managing knowledge in today's world is critical to a company's long-term success, as the single greatest asset that a company owns is the expertise and knowledge of their employees. Without a central system in place to facilitate the transfer and sharing of this knowledge, efforts will be duplicated and mistakes will be repeated. In tumultuous economic times like those that the country is facing today, companies cannot afford to be operating inefficiently. This is especially true for companies like Gating Incorporated, that compete in the consumer industry where knowledge is power and competition is fierce.

Knowledge Management Systems must be implemented in the right way or they will end with varying degrees of failure. If done correctly, they will create a culture where employees willingly and freely share information. In turn, this will promote collaboration and ultimately innovation. In the end, this will optimize the output of employees as they work as a cohesive group.

Leveraging the work to date of other groups at Gating and garnering the input of the Mechanical Engineering Department will both improve the chances of success for the Knowledge Management System. Ultimately, it will be up to management to provide a leadership role in the implementation of the system. This must include providing sufficient time and proper training for the department to learn how to use the system. A sense of personal benefit must also be instilled into the users of the system so as to promote its use.

Chapter 6 - Conclusion

The time is right to implement a Knowledge Management System in the Mechanical Engineering Department at Gating Incorporated. The entire group has shown an interest in the implementation of a new information system, with some voicing concerns on whether it would be an improvement over the current one. The department has learned vast amounts of information over the years and continues to do so on a daily basis during the development of numerous innovative products. So, even though approximately two-thirds of the group utilizes data from our current information network, not one engineer starts their search for information there mainly because it is too hard to find anything. The new system will address this problem by keeping a simple user interface and through the ability of indexed searching of files inside of SharePoint. Being able to search for keywords will greatly simplify the process of finding desired information and entice users back to the system again.

The goal of a new information system is not to eliminate the personal interaction between engineers in the department, but it is intended to spur them to better document information that could be useful to the remainder of the team. The main issue with relying on personal interaction between mechanical engineers is that the group is getting too large and it would be impossible to stay current with who is the expert on a particular subject matter. The Internet can also be a useful source of information, but many times the group has faced similar issues before. Some questions are also very market specific, so it would be very difficult to find a source that fully answers it.

The most intriguing aspect of the responses by the department was to the question about the desired content of the system. Many of the answers were right in line with the vision of the implementation team, but there were numerous new ideas and enhancements to the current system that would be very beneficial to the department. One idea was the creation of team experts where engineers would volunteer to become the expert on a specific subject matter. They would then be responsible for presenting information to the rest of the team as well as documenting it within the system. These team experts would then be the primary contact on their particular subject for the rest of the department.

Implementing a Knowledge Management System does not guarantee that the department will become more efficient. However, steps are being taken that should improve the likelihood of success, such as simplification of the system, providing sufficient training, and gathering input from the department on desired content. Getting information to the right person at the right time, while being easy and straightforward to use will be a vast improvement from the current system.

Chapter 7 - Suggestions for Future Work

The scope of this project was limited to the Mechanical Engineering Department at Gating Incorporated. If this project proves to be successful, there would be many benefits to expanding this to other groups that the department collaborates with on new products as well as improving old ones including Industrial Design, Electrical Engineering, and Customer Service.

Industrial Design

During the early phases of a project, Mechanical Engineering works with the Industrial Design team on a daily basis. The teams are located in separate buildings, which can impair collaboration efforts. The Knowledge Management team needs to research how the Knowledge Management System could be expanded to include Industrial Design so that it improves the current level of collaboration. Finding a way to improve the communication and speed up the flow of information would help reduce the time that it takes to go from an initial concept to a working prototype. Easy access to information would also allow Mechanical Engineering to educate Industrial Design on the challenges that they face during design.

Electrical Engineering

We work closely with the Electrical Engineering Department from original concept all of the way to the end of life for a product. Again, there is a constant flow of information between groups on projects with data spread out all over the company network. Research should be done into consolidating this information with collaboration being driven from our central SharePoint system.

Customer Service

There is currently not a streamlined method in which design engineers are able to get timely feedback on issues from the field. The customer support group does a good job of forwarding problems that they are receiving calls on, but there is not a formal process in which this is accomplished. Some groups have employed various means of tracking the top return issues, but there is no consistency amongst the major markets that Gating serves. It would be extremely beneficial to the company if the Knowledge Management System were expanded, so that it could provide data and knowledge to the customer service department in a timely and consistent format. They are a major link in the product improvement process, so a direct link to transfer information would be mutually beneficial. The real-time access to “top call” items would allow Mechanical Engineering to resolve issues with the greatest impact on the bottom line. It would also aid in the identification of trends in customer returns and potentially head off quality issues before they spread in excessive quantities to Gating customers. The benefit to the customer support group is that they would have access to the information that they needed to answer customer questions in a more timely and efficient manner.

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Appendices

Appendix A - Consumer Mechanical Engineering KMS Survey

It is our goal to consolidate all of our reference material into one central location that is easily searchable. This new central database, or Knowledge Management System, is intended to simplify the process of accessing information and thus make it easier to perform your daily functions. Below are some questions that I would appreciate some feedback on to help us cater this system to match your needs.

1. Do you utilize any of the design guidelines currently in the Mech_Eng Reference Data directory?
 - a. Yes
 - b. No
2. If not, why?
 - a. Too hard to find anything.
 - b. Didn't know it was out there.
 - c. Information is out of date.
 - d. All of the above
3. What specific areas would you like information more readily available?
 - a. Design
 - b. Materials
 - c. Processes
 - d. All of the above
4. Where do you usually start your search when a design question arises?
 - a. Internet
 - b. Team member
 - c. Mech Eng directory
5. Would you find a searchable central database of information useful?
 - a. Yes
 - b. No
 - c. Maybe
6. What specific information would you like to see included in the KMS?
See summary on next page.

Appendix B - Summary of Survey Wish List

1. A common/preferred GATING materials list.
2. Standards, ASTM, SAE, UL, IEEE.
3. Plating specs for various types of parts (materials, thicknesses).
4. Painting Specs for various types of paint/base materials.
5. Stainless Steel specifications of various grades and when to use what where.
6. Preferred material thicknesses available in Taiwan.
7. Elastomer selection guide.
8. Draft required for various textures.
9. Lessons learned on: lenses, gaskets, bike mounts, keypads.
10. Preferred plastic resins for various applications (fuel, high stress, high temp, etc)
11. Customer return/repair data, broken down by projects (would be good to have in the same location as the project experience info).
12. Materials used on previous designs (like if there was a way to do a “Where Used” type search on materials)
13. General recommendations on common resins. Also, resins may have multiple names/trade names, so it would be nice to have all that info in one place to reduce confusion.
14. Info on commonly used types of connectors. For example, if I’m looking for a ZIF connector in Findpart they could be listed as “ZIF”, or “FFC”, or “Flex”; it would be nice if there was one list of all of them.
15. Information on processes (silk screening, fill-and-wipe, etc.)

Appendix C: Summary of Meetings with IT

Will the SharePoint site search engine include the text in text searchable pdf's that are added to the site?

I will be installing the PDF iFilter later today (Adobe only recently released a 64-bit version). Once that is in, all PDFs in SharePoint should be included in the search index.

What is the file size limitation?

The current single file size maximum is set to 100 MB. This is in line with standard SharePoint best practices to prevent things such as HTTP time outs when uploading/downloading files. Also, there are some file types that are blocked due to security considerations. These are file types such as .bat, .config, .dll, .exe, and .reg that contain code that could be executed on a server at the file level.

What is the allowable storage size for a site, including sub-sites?

By default, a standard project site that will have one level (i.e., no significant sub sites) is set to 250 MB, but that is a configurable limit. We will change that limit based on demonstrated business need. There is also a recommended best practice that no single content database (the content DB is all the content and documents on the SharePoint sites for a given SharePoint application) grow to over 100 GB. That's probably not an issue that comes into play here, but if you think you have a storage need of about 10 GB or more, we probably need to at least give that issue some thought.

Is there a limit to the number of document revisions a site can save?

There is no hard limit. There is a configurable limit for each document library within a site. Since each version of a document increases the storage needs of that document by the file size of the document (storage need = fileSize * numberOfVersions), we do like to have a versioned library set with a reasonable limitation to prevent the storage from growing out of control. The configuration allows for a maximum number of both minor and major versions. When the maximum for a limit is reached, then the oldest version (minor if the minor limit, major if the major limit) is dropped off in favor of the newest version.

Appendix D - Mechanical Engineering KMS Content

