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WEB BASED PROJECT ADMINISTRATION

An Interactive Qualifying Project Report

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by

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1. project management
2. web
3. Internet

Abstract

The Capital Management Branch (CMB) of The Department of Human Services (DHS) of Victoria, Australia is investigating the use of Web Based Project Administration (WBPA) for their construction projects. This project has defined a set of guidelines on how WBPA can be best utilised by CMB while concentrating on stakeholder communication. In addition to the guidelines, this project presents a model WBPA system for CMB. The project goals were accomplished through interviews of previous users of WBPA, non-users of WBPA and WBPA consultants. In addition, software reviews of twelve project management Application Service Providers were conducted in order to help find a match suitable for CMB's needs.

Acknowledgements

Executive Summary

The objective of this project was to study the uses and implications of Web Based Project Administration (WBPA) and learn how this type of project management could be applied to the Capital Management Branch (CMB) of the Department of Human Services (DHS) in Victoria, Australia. WBPA is a way to use web technology in order to facilitate the flow of information in the project management process.

This project had two major phases. The first phase consisted of background research into the areas of construction project management and the WBPA industry. Case studies of different WBPA tools were researched and examined. The project methodology and deliverables were also defined during this phase of the project. Through this research the project team identified five categories of information related to the use and implementation of WBPA to gather for CMB: flow of information, information management, social issues, legal issues and finally how best to use a WBPA web site.

The second phase of the project consisted of applying the research to the specific situation of the Capital Management Branch of DHS. The project team interviewed various employees of DHS in order to gain an understanding of how the flow of information works throughout a project managed by CMB. This information flow was then mapped out so as to have a concrete documentation of this flow. The remaining four categories were also researched by means of interviews with people who have previously used WBPA or were in the process of researching it themselves. These people included architects, consultants, academic researchers and government employees in organisations other than DHS.

In order to complete this project, the project team studied different construction projects that used web based management tools. From these interviews and case studies, it appeared that most WBPA users were employing an Application Service Provider (ASP) in order to outsource their project management software over the Internet. The reason WBPA users are using an ASP is because this type of strategy is a fast and inexpensive solution to implementing WBPA.

The project team decided, therefore, to review different ASPs. This was done by first evaluating the company web sites of approximately 30 ASPs in order to determine if they were offering the tools that were deemed necessary for CMB to effectively deliver a WBPA solution. This original list was narrowed down to twelve ASPs, which were contacted for demonstrations. From these demonstrations the project team evaluated the ASPs within the following categories: usability, aesthetics, costs, configurability, security, expandability, feature set and training/support. From this evaluation the project team recommended three ASPs to CMB. The team then set up a demonstration of one of the top twelve ASP web sites and showed different CMB project managers what the ASP could do when set up for a typical CMB project.

The project team also recommended that CMB move into WBPA through four phases. The first phase would be to use the web site as a document management and revision control system on one project so that the major project parties could become accustomed to using the web site. The second phase is to incorporate the different correspondence tools that the ASP provides (these tools include task management, discussion boards, RFI management, etc.) while still using the site for a limited number of projects. The third phase will be to use the WBPA web site for all CMB

projects while introducing the user group to the web site. In this way, WBPA can be phased in to become a crucial part of conducting projects.

The fourth and final phase, taking place far after phase three, will be to introduce WBPA features presently not widely used in industry, such as tendering, contract administration and budget management. It is assumed that by the time CMB is ready to use these features, the technology will be sufficiently advanced so as to make these features feasible.

WBPA increases communication and accountability as well as a more controlled flow of information for a business. Most importantly, it allows an organisation to effectively take part in today's technological world of fast-paced business. This project is an important step towards the modernisation of the capital works management process. The specifications outlined within this document provide a valuable roadmap for shifting the way CMB manages projects from a largely paper-based method to an almost exclusively online approach.

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Authorship Statement

The following is a list of the major sections in this document and their respective original authors. The project team used the approach of dividing up the work by having one member write each major section. The other two team members then read and commented on each section before the original author submitted their final draft.

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1 Introduction

The sponsor of this project is the Department of Human Services (DHS) of Victoria, Australia. DHS was formed in 1996 by the assimilation of the former Department of Health and Community Services with the Office of Housing and the Office of Youth Affairs. The Department's mission is "to enhance and protect the health and well-being of all Victorians, emphasising vulnerable groups and those most in need." (Hemsworth, 2001)

The Capital Management Branch (CMB) of DHS was the direct contact for this project. CMB provides expertise in planning, design and construction for the buildings that support DHS. These buildings serve as the infrastructure for the following services: acute health, aged community and mental health, public health and development, disability services, youth and family services and housing services. The purpose statement of CMB is *"to provide strategic asset planning, project development coordination and contract management for the effective delivery and use of capital investments to achieve the service objectives of clients."* (Hemsworth, 2001)

The goal of this project is to show CMB the best strategy for them to implement Web Based Project Administration (WBPA). In order to achieve this goal, it is necessary to understand how Web Based Project Administration (WBPA) is used in the construction industry and determine how this can be applied to CMB.

WBPA is the use of a web application as a management tool. For this project in particular, WBPA is the use of a web application as a management tool for construction projects. There are two types of web applications. The first type is custom software usually hosted on computers owned by the company using it. The second type is commercial software, which is usually hosted by a third party, such as

an ASP. An ASP is a company that administers software applications over the web. For this project, ASPs will host the WBPA applications.

In today's high-tech world, the Internet provides many new tools for companies, one of these tools being WBPA. Australia is an early adopter of new technology, and for this reason the government branches of Australia are constantly striving to apply new technological tools. CMB is no exception to the rule. They are interested in learning how WBPA can improve the way they do business and deliver services to the people of Victoria (Hemsworth, 2001).

CMB is responsible for the construction projects initiated by DHS. CMB is therefore interested in learning how a web site can facilitate the management of such construction projects. CMB is particularly interested in using a web site to facilitate the flow of information among the project team members. These team members include people from DHS itself, the design team, the owner, the user groups, representatives from the controlling agency and the contractors. CMB is hoping that the use of WBPA will allow faster interactions between the project team members, especially team members that are geographically dispersed. They are also looking to reduce their costs and have better control over the construction quality.

The outcome of this project will help CMB determine the best way to use a web site to manage the flow of information among the various parties involved in a project, with particular emphasis on the key stakeholders.

This project has three major deliverables. The first one is a report detailing guidelines on how to use WBPA in construction, particularly for CMB. This report includes a summary of the roles of the different parties involved in a construction project and their experiences with and opinions of WBPA.

In addition to the report, the project team created a model for such a web site. This model shows how a WBPA web site should work for CMB, including what features it should have and what it might look like. The third deliverable to this project was a presentation to DHS and CMB highlighting the recommendations from this study.

This project focuses on a relatively new use of the Internet: the use of the Internet in project management. The recommendations produced from this project could change the way DHS and CMB do business in the future. CMB plans to implement this type of construction management on the Austin & Repatriation Medical Centre (A&RMC). If this is successful, WBPA will be applied to more CMB projects and will eventually spread to other construction projects in Australia.

2 Literature Review

2.1 Project Management

2.1.1 Introduction

The purpose of this section is to give the reader a better understanding of project management, which can later be applied to the uses of Web Based Project Administration. This will be achieved through a definition of the word project, emphasis on the importance of project management and finally the different key phases of project management.

2.1.2 Definition of Project

Before beginning the discussion, it is useful to define the word project. According to Meredith (1995), a project is usually a one-time activity with a well-defined set of desired end results. It can be divided into subtasks but the project must be accomplished in order to achieve the project goals.

2.1.3 Need for Project Management

For the last twenty years companies have been changing the way they work. Companies have been turning to project management to achieve their goals because it offers more advantages than traditional methods (Ahuja, 1984).

The majority of organisations using project management experience better control and better customer relations. Other advantages include shorter development times, lower costs, higher quality and reliability, as well as higher profit margins, a sharper orientation towards results, better interdepartmental coordination and higher worker morale (Meredith and Mantel, 1995).

2.1.4   Project Manager

After deciding to use project management, a company's first step consists of choosing a capable project manager. According to Ahuja (1984), a project manager should have full control over every aspect of the project.

In addition to being able to employ control, a project manager should be enthusiastic. The project manager must want to be a project manager but, more specifically, they must also want to manage the assigned project (Graham and Englund, 1997).

The choice of a project manager is extremely important for the success of a project. This selection process should be well thought out and should look for the following qualities in the interviewees: a sense of ownership and mission, political awareness, relationship development, strategic influence, interpersonal assessment and an action oriented work style (Graham and Englund, 1997).

2.1.5   Planning: A Key Point in Project Management

2.1.5.1   Why is It Necessary?

Prior to any project, it is important to think about the task. A project that has had the benefit of earlier planning and that is being carried out according to this plan has a better chance of achieving success than those projects that were not planned (Hamilton, 1997).

2.1.5.2   Estimating Resources

According to Posner (1988), it is necessary to determine the amount of time, money, people, equipment and other resources a project requires. This action should begin after the project has been clearly defined. The first step in planning involves setting up an estimated schedule for the job. From this schedule it is then possible to determine the total hourly, daily and weekly requirements for the resources (Hamilton, 1997).

2.1.6 Implementation and Completion

As the project progresses through its life cycle, the focus needs to change from intense planning to intense control (Hamilton, 1997). This suggests that when a project has completed the planning phase, control measures need to be put in place in order to monitor the progress.

There are two primary ways of supervising a project: regular reports and meetings. Reports should inform the managers of the progress of the project as well as recent decisions made by other managers. Reports help people by keeping them up to date (Meredith and Mantel, 1995). Meetings will, on the other hand, allow people to act. For instance if a problem has occurred, the meeting is a good place to try and resolve the problem. These two types of control will allow the manager to see how the project is progressing but will also allow them to make decisions.

2.2 Construction Project Management

This section provides an explanation of the different construction management tools and an emphasis on the different phases of a construction project. This overview is important because it will allow the reader to understand how information is handled during the life of a construction process and how a web site might be helpful with the flow of information and data storing.

2.2.1 Evolution of Construction Management

Before today's construction management industry is discussed, it is important to learn how the construction industry has evolved. In the nineteenth century the architect was the master builder. He was responsible for the design of the project, the purchase of the material, hiring workmen and finally managing the project. As the construction industry evolved and became more complex, the need for a manager emerged and a new specialist was born: the general contractor. The general contractor was there to serve as a supervisor to all the people involved in the project, such as the design engineers, the electrical engineers, the mechanical engineers and finally the different contractors hired for the construction (Goldhaber, Jha and Macedo, 1977).

2.2.2 Today's Construction Management

In today's construction industry, there are three basic methods of project delivery: the design-bid-build method, the design-build method and construction management (Mulvey, 1997).

The design-bid-build method is the more traditional approach out of the three methods. In this case, the owner will usually hire an architect to work on the plans. When the designs are finished they are submitted to general contractors who prepare bids on the package. Based on the most attractive bid, the owner will decide who will be awarded the project. This process can become very lengthy because the bids

cannot be prepared until the designs are completed. Also, construction problems may be discovered when contractors look at the design. These problems can be avoided by using the design-build method because in this case the contractor and the designer work side by side (Rizzo, 1997).

The design-build method is emerging as a new popular alternative in delivery systems, particularly with government agencies (Rizzo, 1997). This type of management consists of having one entity responsible for both the design and construction of a project (Mulvey, 1997). This method is desirable to owners who want to transfer the responsibility of design and construction to one organisation. In addition, this method is helpful because the traditional tension between the architect and contractor is eliminated given that they are working as a team (Groton and Smith, 1997).

The final method of project delivery is construction management. There are many variations to this method but the key here is the construction manager. He serves as a liaison to the owner while he facilitates the project. In the design-bid-build method the owner deals directly with the architects and the contractors. This is again the case in the design-build method where the owners deal directly with the company they hired for the construction. In the construction management method, the owners will not be in direct communication with the companies they hired, instead the owners will choose to use a project manager that will serve as a liaison. The project manager can then choose between the design-bid-build method and the design-build method depending on which one is more appropriate. The key to the success of this type of construction is choosing a skilful construction manager. If the construction manager is capable, they will be able to track the schedule and costs of the contractors involved in the construction while coordinating team effort (Mulvey, 1997).

2.2.3 Planning

Before the construction of a project has begun it is important to plan the different stages that will influence the success of the project. Barrie and Paulson suggest "planning aims at a workable program that will achieve project goals and serve as a standard against which actual progress can be measured." (1984, p78) The different aspects of planning include schedule, costs, quality and the team.

2.2.3.1 Schedule

An important part of the planning process is creating a schedule. The scheduling for a project is established when the different milestones have been identified and located in calendar time (Anderson and Woodhead, 1987). There are different types of schedules. The master schedule encompasses the entire project from the design phase to the completion (Goldhaber, Jha and Macedo, 1977). In addition to the master schedule, there is the project schedule. This is a detailed schedule that allows managers to view more elements. Because this schedule contains more information, this is the schedule that the managers will use to track the progress of the project (Goldhaber, Jha and Macedo, 1977).

2.2.3.2 Cost

As the project is established, it is possible to estimate the budget. The cost of a project is the sum of the different elements that are required for a successful completion. As each aspect is estimated, it goes through approval with the owner. Once approved, the budget will represent an obligation from the owner (Goldhaber, Jha and Macedo, 1977).

During the life of the project, the cost will be monitored through a cost control system. This essentially consists of comparing the actual costs with the predetermined budget. This type of control keeps the owner informed and alerts him to potential problems (Goldhaber, Jha and Macedo, 1977).

2.2.3.3   Quality

Another important aspect of construction management is quality. Barrie (1984) explains that:

"Quality assurance involves economic studies to select the types of materials and methods to be included in design, making certain that the design is in accordance with all applicable building codes and other regulations, and controlling the construction on the project to be sure that the work is performed according to the standards specified in the contract document." (Barrie, 1984, p312)

This passage emphasises two important aspects: developing a design that follows applicable building codes and making sure that this design is maintained during the project. These two ideas are similar to what was found with regard to costs. In other words, it is important to plan a project element, but it is equally important to monitor this element during the construction life cycle.

2.2.3.4   Crew Planning

Anderson and Woodhead (1987, p211) explain that crew planning focuses on "two key management problems: (1) crew sizing [...] and (2) crew scheduling." The contractor must evaluate the tasks to be performed in order to decide on how big a team he will need for the different phases of the project. The second important aspect of crew planning is scheduling. The contractor must establish the activities that are critical in terms of the project schedule. These activities will determine when more people should be brought in to finish the critical tasks on time without delaying the schedule (Anderson and Woodhead, 1987).

2.2.4   During Construction

2.2.4.1   Field Monitoring

As soon as a project is done with the planning phase it will begin the construction phase. During this second phase field monitoring is critical. Field

monitoring encompasses the day-to-day observation of the team performance as well as the response to daily problems (Anderson and Woodhead, 1987).

2.2.4.2 Project Status

The field monitoring should be recorded through a project status. This status is essentially a report put together by the construction supervisory staff. This report should communicate daily, weekly and monthly progress. It will serve as a tool to the managers that are not directly on the field. The status report allows them to follow the progress and know enough to make decisions when necessary (Anderson and Woodhead, 1987).

2.2.4.3 Control

As discussed, there are two keys to project success: planning and control. According to Meredith (1995) control is the act of reducing the difference between plan and reality. Control is focused on three elements of a project: performance, cost and time. Barrie (1984) suggests using graphs. These graphs should represent the actual progress of the project in terms of schedule, money and performance. These graphs should be compared to the plans in order to determine where the project stands: is it slipping relative to the schedule, is it ahead of schedule? All of this information is necessary in order to prevent possible problems.

2.2.5 Conclusion

From the discussion above, it has been determined that there are three different construction management methods. It was also emphasised that planning is an essential key in project management. If the planning phase is done correctly the project team should have a clear idea of their tasks during the project. Finally when the project has been undertaken, control is critical. During the life of the project it is important to monitor the progress in order to prevent any problems or delays.

Therefore, to achieve success in project management the first step is to choose an appropriate management method. Once this is chosen, the project team needs to map out their work and finally, when the construction is undertaken, control will most likely guarantee success.

2.3 The Flow of Information

2.3.1 Introduction

The previous discussion has focused on the construction world and the key points in managing a construction project. This section will focus on the flow of information between the various groups involved in the project.

From the discussion on construction management, it can be concluded that there are three main parties involved in the construction of a building: the owner and user groups, the design team and the contractor.

The first party consists of the owner and the user groups. The owner is defined as "the party at the instance of which the project is undertaken and the one that will take title to it when the project is completed." (Noble and Myers, 1990) For certain construction projects, in addition to the owner, this party also consists of user groups. It is important to note the difference between owners and user groups. As stated above the owner is the party that initiates and funds the project. For a public construction project, the owner could be a government branch, whereas the user groups consist of the people that will use the building. The user group therefore has a special interest in the layout of the building because it will affect their everyday life.

The second party consists of the design team. The design team will be in very close contact with the user groups and owners during the pre-construction phase of the project. Finally, when the project is ready to start, a third group will be involved. This group consists of the contractors that will be responsible for the actual construction of the building.

In the following section, the main goal will be to establish the types of information that are exchanged between these different groups.

2.3.2 For the Owners and User Groups

At the beginning of any project, owners and user groups will be very involved. As the project develops, having expressed their wants and needs, they will take a secondary position.

John Hale, project manager and head architect for Shelpey Bulfinch Richardson and Abbot (SBRA), outlines five distinct phases in pre-construction planning. The first phase consists of the pre-concept phase, where the owner and the architect sit down and discuss the project. After this stage comes the programming phase, which consists of analysing the needs the building will have to satisfy over the next 20 years. This phase will determine the size of the building.

When these two phases are complete it is necessary to move on to the conceptual phase. The owner and the designer will work together to determine the scope of the project. This means that they will decide how much the building will cost, where it should be located, what it should look like and contain. The architect will generally come up with a few concepts the owner can work with to determine exactly what he is looking for.

The next phase is the schematic phase. The designer will test the agreed upon concept to see if it fits all the criteria that were developed during the previous stages. When the designer is sure the building is adequate he will move into the design phase where all the details of the building will be developed.

Professor Guillermo Salazar, from Worcester Polytechnic Institute, explains that the first two phases can be accomplished by a consultant hired by the owner. This consultant will create building committees. Each group that will be using the building will be represented in these committees. The purpose of these committees is to gather as much information as possible from the user groups. Once this information

is gathered it will be analysed and the concepts that are brought up the most will be summarised (Richardson, 2001). This summary will be presented to more groups who will then react to the concepts. Based on the feedback from these groups, the consultant company will put together an architectural program. The architectural program is a list of specifications for the building. They include the needs for the building, the size of the building and the function the building will have.

Once this document is complete, it will usually be submitted to a few architectural companies for appraisal. The architectural company with the best designs, reputation and presentation will be awarded the design work. This firm will then prepare a document containing designs and specifications for the bidding processes with the contractors.

It is important to note that sometimes the process of setting up committees is done prior to hiring a consultant company. The owner of the project can set up the committees to get a better idea of what the project should incorporate. Once this view is achieved, the owner will then hire a consultant company to put all these ideas on paper as an architectural program.

From the information above, it is evident that there are different ways to initiate a construction project. Whatever the way, the owner and user groups are most involved in determining the type of building they desire and what the building should look like and contain. The information that will flow between the owner and the designer will be in the form of drawings to determine look of the building, but it will mostly consist of discussions that will establish what the building should contain and the functions it should fulfil.

As the project progresses out of the design stage, the type of information that should be provided to the special interest group consists of the final budget, the

schedule and final plans (Hermosa, 1998). Richardson (2001) also emphasises the importance of meetings during the construction projects. These meetings should be held on a regular basis, such as once a week. There are two types of meetings: meetings where each project team member is represented and meetings where each project team member is also represented but where the focus is more technical.

In the first type of meeting, the owner, contractors and design firms will gather to discuss details of the project such as colours and preferences for the building as well as current problems. These problems usually consist of a project team member running behind schedule on his work, which is preventing other team members from starting their own work. The group will then try to find a way to solve the problem. During this meeting the group will also discuss the schedule and costs of the project (unless the project is being built on a fixed cost). The team members will track the progress of the project against the schedule and cost estimates that were put together at the beginning of the project (Richardson, 2001).

The second type of meeting will consist of the same groups of people but the owner will have less involvement, he will usually be there as a presence. In these meetings, specific construction problems will be discussed and resolved.

2.3.3   Web Based Project Administration

Today, web sites are starting to serve as information providers. A good example is the web site for the Tweed Heads hospital. This web site offers various information such as the plans of the existing hospital, development plans, virtual reality panoramas of the finished hospital and all past versions of drawings to the special interest groups (Niazmand, 2000).

When comparing Hermosa and Niazmand's opinions, it seems that they do not agree on the type of information that should be provided to the user groups and

owners. Niazmand (2000) suggests that owners and user groups should have access to plans and drawings, while Hermosa (1998), in addition to discussing plans, proposes that the owner have access to the budget, the scope of the project and the schedule.

2.4 World Wide Web Technology

The discussion of Web Based Project Administration (WBPA) revolves around the central technology of the World Wide Web (WWW). In this discussion, a variety of terminology is used that can confuse the uninitiated reader. The purpose of this chapter is to introduce and explain the many concepts and terms used when talking about the WWW and related technologies. First, the discussion will briefly describe how the web works and some of the associated technologies. After that, a specific web site model called the web portal will be presented. Finally, the topic of Application Service Providers will be introduced along with some of the offerings available today.

2.4.1 World Wide Web Terminology

There are several key technologies, most completely invisible to the user that are involved in delivering the WWW to the desktop. This section will explain what happens within the World Wide Web, which will enable the reader to understand some of the issues that arise when designing sites such as those used for WBPA.

2.4.1.1 The Client-Server Model

The fundamental principle underlying the operation of the WWW is the client-server model. As the name indicates, there are two parts in this model -- the client and the server. The client typically indicates the user end and the server references the infrastructure that allows content to be delivered to the user. In the client-server model, communication generally takes the form of a message passed from the client to the server. The server receives this message, does some sort of processing and returns its reply. Usually, the number of clients is much larger than the number of servers (Tannenbaum, 1996).

2.4.1.2 Mechanics of the World Wide Web

When somebody wants to view a web page, they run an application called a browser, which is a piece of software capable of displaying web pages. The browser acts as the client side of the client-server relationship that is the World Wide Web. When a user requests a web page, the browser sends a request to the web server. The web server then finds the page that the browser requested and serves it back to the browser. Finally, the browser interprets what is contained in the page's text and displays it on the screen.

Every page on the web has a unique identifier, known as its Uniform Resource Locator (URL). By using the URL, the browser knows where to find the server that contains the page being requested. Once the browser knows what server the page is on, it can then ask the server to send that page over to the client. The way in which this communication takes place is called the Hypertext Transfer Protocol (HTTP). HTTP is a standard for data exchange between a web server and a web client (Tannenbaum, 1996). Because of this standard, the type of computer or operating system of the server or client does not matter. As long as both computers utilise HTTP, they can communicate. This capability is known as cross platform operation.

When a server fulfils an HTTP request, it returns the web page indicated by the URL to the client computer. Typically, web pages are written in a language called Hypertext Markup Language, or HTML. HTML is a language that describes how the text on a web page is displayed and laid out. Once the server returns the HTML page, its job is done. It is then up to the browser on the client side to interpret the HTML and display the page to the user. This is how the web works in its simplest form.

2.4.2 Intranets and Extranets

The terms intranet and extranet both refer to the same set of technologies. An intranet is a private network that is contained within an enterprise (Thing, 2001). Inside this network reside servers that may employ a variety of Internet protocols, such as HTTP. In many cases an intranet may be described as a miniature, private version of the Internet. Usually, most of the computers on a company's intranet are almost completely shielded from outside traffic by a security filter known as a firewall. A firewall is a device or computer program designed to either accept or reject network connections based on various criteria, such as from whom the request originates.

Where the prefix intra- in *intranet* implies an internal, private network, the term *extranet* implies a public, external network. An extranet is a privately owned network that uses the Internet to securely share part of a business's information or operations with the public. An extranet can be viewed as part of a company's intranet that is extended to users outside the company (Thing, 2001). By definition, a web page on a corporate extranet is accessible on the other side of the firewall from the pages on the intranet.

One of the major issues in a company's decisions involving WBPA is whether or not to host the site from a server on an intranet, on an extranet or maybe even completely off site on someone else's extranet. All of these choices have their advantages and disadvantages. One advantage of hosting a project management tool from servers internal to a company's intranet is the enjoyment of complete security from the outside world. With the proper firewall configuration, nobody on the Internet can access any of the information on the project web site. This could also be a disadvantage, however. The nature of the WWW implies global access, and

prohibiting access to the project web site from users on the Internet may limit the usefulness of the site.

Complete control over the data and interface of the site is just one advantage of hosting a WBPA site on a private intranet or extranet. This allows the users and maintainers of the web site to change its appearance and content at a moment's notice. However, one disadvantage of this scheme is the system and software maintenance costs.

2.4.3   Web Applications

A standard, simple web page consists mostly of "static" HTML that is written once and then displayed to the user. In contrast, a web application consists of "dynamic" pages that are generated by the web server as they are requested. A web application is an interactive web page that allows the user to utilise an application that is running on the web server and not the client's computer. The web server keeps track of the state of the application, while the user sends commands and data via HTTP to the running application. As the user updates data and submits it to the server, the server processes the data and returns a new web page representing the application's interface. Combining web technologies such as HTML, Java, JavaScript and others enables developers to create complex, robust web applications.

A web application is usually based on what is known as the three-tier model. This model, or architecture, which allows for the simple and flexible organisation of applications, lends itself quite well to the organisation of web applications. The three-tier architecture is made up of three distinct components, or tiers. The first tier is the front-end, or the user interface. The second tier is called the middleware. The final tier is called the back-end. All of these tiers work together to build a complete application. In a web application, the front-end is the interface displayed on the user's

browser, the middle tier is the web server and the back-end is the data manipulation program, such as a database. By using this model, web applications are powerful and flexible. Any of the tiers can be replaced without affecting the other ones. This allows for such benefits as cross-platform operation.

2.4.4   Web Portals

A portal web site is typically defined as an "anchor site" (Thing, 2001) that a user first visits when he or she starts up their browser. A web portal is a place on the web that intends to build a community for a user group around a core set of services and information offerings. One of the most common characteristics of a web portal is its arrangement and organisation of content into easy to navigate sub-categories. Web portals offer their users a variety of information and services. Some of the most common services offered on web portals include email, news, stock quotes and organised links to external sites. Some portal sites allow the user to use web applications that help complete tasks, such as maintaining schedules or to-do lists. The best portals offer varying levels of customisation to the user (Caroll, 1998).

Portal sites exist for the general web user, such as excite.com and yahoo.com. These sites offer a wide range of services to the user including free web based email. However, there exist many niche web portals that target a specific demographic of web users. These include sites such as garden.com (for gardeners) and cnet.com (for PC enthusiasts). These sites create tight communities of users by offering information and service that appeal to users in the target demographic. These niche portal sites are of interest in the area of WBPA because a site for project management can be modelled after the portal concept. By using this model, the site would have organised content and services that aid communication and create working communities for project participants.

2.4.5 Application Service Providers

An Application Service Provider (ASP) is a company that offers individuals or enterprises access over the Internet to applications and related services that would otherwise have to be located in their own personal or enterprise computers (Thing, 2001). There are a wide variety of applications that ASPs offer to business and personal customers. These include everything from accounting tools to web-based email systems to shared calendaring.

ASPs are a way of outsourcing software and services to another company in order to save a business money. By using an ASP, a company does not have to worry about internally updating and supporting software. The software used (web applications) is stored remotely on the servers of the ASP. Centralised software means that there is only one place in which upgrades need to take place, thus assuring that everybody is using the same, newest version of the software. Software hosted by an ASP also gives accountability to the company that owns it. A final advantage of using ASPs is that a company may not have to pay for the software when it is not using it, for example by only paying for project management applications while a project is in progress.

ASPs have disadvantages as well. There are many people who are used to working offline and will find functionality sharply limited or nonexistent when they're not connected to the Internet (Kraker, 2000). Another serious downside in relying on an ASP to host software is the extremely volatile nature of the software industry. There has been more than one documented case of a project team waking up to find that their ASP ceased operations overnight (Kraker, 2000).

Bob Shulz, chief of architecture and engineering for the California State University system, says, "I'm not 100% sure that people won't end up buying

software in the long run." (Kraker, 2000). Indeed, some companies are essentially providing their own ASP service in-house, moving applications off personal computers and putting them on a special kind of application server (Thing, 2001). This can save money by allowing for less powerful workstations that don't need to have the processing power to run applications themselves. By controlling access to information from the outside, possibly via a company portal site, these companies can reap the benefits of ASPs without having to worry about being abandoned by a failed company. Of course, only companies with significant monetary resources and server power can afford to use this method.

2.4.6 ASP-Provided Tools

Application Service Providers offer their customers a large variety of services and applications, from general services to very industry-specific ones. Of course, the choice of which tool set to use depends on how heavily a company relies on WBPA and what the company's chosen ASP is willing to provide. This section will provide a brief overview of some of the most common WBPA tools available.

One common category of web-based tools is collaboration tools. These tools usually include one or more of the following: email, threaded discussion boards, instant messaging, chat and document sharing (Cutter, 2000). With email services, an ASP provides email addresses for each project team member. From there, users are able to email the entire group or individual members of the group. Often the email is available for browsing on the web when a team member logs in.

Aside from email, another common form of collaboration is threaded discussion boards. With this tool, users can start discussions and view them by organised topics. Project team members with the proper privileges can add topics and post messages under these topics. Usually, when a person is browsing the discussion

boards, the application alerts him or her to how many new messages have been posted. The messages are listed by thread, or topic, and the user can then read and reply to them at will.

Document sharing and management is another key offering of project-focused ASPs. Usually, document management features are similar to the file management metaphor desktop operating systems use (Cutter, 2000). Users can create folders and subfolders where they can then upload documents. Users with the proper access permissions can then download and view those documents. Some systems even let users attach comments to the documents.

Some ASPs for project management provide facilities for shared scheduling (Cutter, 2000). With tools like these, project team members and leaders can post their schedules so as to better facilitate the resolving of schedule conflicts. Some tools provide Gantt-chart type views, which allow members and user groups to view the entire project schedule and task breakdown. This allows team members to view important data, such as task dependencies, from anywhere in the world with an Internet connection.

Some ASPs with a specific focus on construction projects offer tools that industry professionals will find useful. One of the most novel tools offered is a server-based file conversion service. By using this service, a file that was created in one program, such as AutoCAD or WordPerfect may be viewed through a browser on a computer that does not have those programs installed (Doherty, 1999). This type of service has the advantages of maintaining cross-platform operation as well as protecting intellectual property.

Another service geared towards the construction industry is shared CAD drawings. By using a browser plug-in, members of a team can all view the same

CAD document and use their browsers to make comments and even drawings on top of that CAD document.

2.4.7 Evaluating Web Sites

There are several criteria used by reviewers to judge how well a user interface is designed. Aside from judging computer programs in general, these criteria are very well suited for determining the effectiveness of a web site. The set of criteria that people use to judge interfaces is known as the "Seven Deadly Temptations" (Thrower, 1999). The following list, taken from Thrower (1999), explains what these temptations are.

1. <u>Design for Technology</u>: Instead of designing with the user in mind, web site designers often design their sites keeping in mind the technology they will be using to implement them. This can be quite a pitfall because emphasis is not placed on the user experience.

2. <u>Cool or Sexy Design</u>: Sometimes a web site designer will focus less on the functionality of the site and more on the actual look of the site. By placing particular focus on a "cool" looking colour scheme or a particularly slick looking interface, intuitiveness in the user interface may be ignored.

3. <u>Logical vs. Visual Design</u>: The designer of a site is the person who best knows the layout and organisation of its content. A user may feel lost if he or she doesn't know the structure of the information in the site. If the design centres on the organisation of information instead of using graphical cues to direct the user, confusion may result.

4. <u>User Input Regarded as Right or Wrong</u>: Many sites, when requiring user input of some kind, return messages that may seem to the user as

condescending. Telling a user that input is invalid may dishearten the user to abandon the site.

5.   Featurism and Over-Extending Basics: One problem with many computer programs and web sites is the overwhelming number of features presented to the user. The designer is tempted to put as many features into a site as possible, in order to make it seem more sophisticated. The result, however, is confusion for the user. Another related problem is over-extending the basics by taking something simple and adding too many variations to it. Again, this results in a confused user.

6.   Assume Interface Problems are Resolved in Documentation: Users rarely read the manuals to software programs, and web sites are no exception. If there is an inconsistency in the interface or there is simply a bug in the interface, it is not appropriate for designers to assume that users will read the documentation in order to be aware of it.

7.   Assume Problems will be Fixed in the Next Release: Many software products and web sites ship with known bugs in them. The assumption here is that these bugs will be fixed in the next release of the software. Following this practice comes across as unprofessional and careless and may result in the loss of site users.

2.4.8   Evaluating ASPs

Shulz (1997) provides a set of requires for project management web sites that help researchers to quantify the features of these sites and therefore produce a standardised evaluation process. In his study, Shulz identifies the following seven criteria for rating ASPs.

1. Common Access to Project Files & Documents: One of the most common features of sites providing project management tools is the ability to share and access team files online. If the site has this facility, it is much more desirable than sites that do not.

2. Develop a Database of Project Correspondence: Since accountability in project management is greatly enhanced by the use of the web, a site's ability for correspondence tracking is essential. Whether it is by message boards or email lists, it is important to note how an ASP's site achieves this.

3. Project Workflow Management: Tools such as scheduling and the Request for Information/response cycle are critical for maintaining control over the project workflow. Therefore, one criterion for evaluating an ASP would be to examine what tools it provides for doing this.

4. Secure Communications: Information needs to be verifiably immune to being changed or deleted upon being entered into the project database. This should go beyond simple user level controls, because some participants are sure to doubt the unbiased status of any system manager, regardless of who he or she works for.

5. Universal availability through the World Wide Web: As discussed above, the cross-platform nature of the World Wide Web is of vital importance for universal access to information such as in WBPA. If an ASP uses platform-specific tools and software to run the site, it may alienate a certain population of users, thus diminishing the site's usefulness.

6. Off-Line Access to the Project Databases: The ability to save information off-line to be worked with when an Internet connection is unavailable may be

important for project team members who frequently travel and still need to work with project management information.

7. <u>Support Messaging Outside the System</u>: If messaging and correspondence are limited to inside of the system only, this may be a serious drawback. Systems can be set up to provide fax, Internet email, or even voice mail/pager notification of off-line participants.

This list of ASP requirements, although not completely exhaustive, has been identified in previous studies to be a good starting point for evaluating the usefulness of sites in a project management environment (Shulz, 1997).

2.5 Case Studies

This section compares the findings of different case studies. The case studies that are reviewed throughout this section concentrate on the study of a specific use of Web Based Project Management (WBPA). In this project there are two types of case studies reviewed. The first one is the study of the effects of Web Based Project Administration and the second is the study of the development of custom WBPA software or web sites.

Throughout the rest of the literature review five main case studies that be looked at extensively. These are: the construction of Worcester Polytechnic Institute's Campus Centre, an overview on Cutler Associates Inc.'s use of web based project management, the construction of the Zotolli School, the construction of the Bullard St. Site School and the construction of the Tweeds Head Hospital.

2.5.1 Design Decisions

This section reviews the different approaches of implementing a WBPA web site. While comparing and contrasting the different case studies there were different types of web sites being used. These web sites differ in three main areas: content, layout, and security.

2.5.1.1 Content

In previous attempts to use WBPA there has been a large variety of different features available to the users. This is where the case studies differ the most. Every company-owner combination is going to have a different idea of what should be accessible to designers, owner and user groups, and the general public over the Internet. This section focuses on the different tools for sharing information and communication within a project.

During the construction of the Worcester Polytechnic Institute's Campus Centre there were many valuable pieces of information on the project administration web site. There were several categories of information on the site. A web cam was used that automatically updated the photographs every 15 minutes allowing for an accurate view of the current state of the construction as well as a good record of the progress being made. These pictures were organised in categories by month, week, and day. In addition to the photographs, progress reports and meeting minutes were posted on the site to show the viewers a written form of progress. This site also included information about each subcontractor that participated in the design and construction of the Campus Centre. This information is helpful for users to get a feel for the complexity of such a large project. In addition, the Campus Centre project administration site included a detailed budget and schedule information. Among this information were comparisons between the projected budget and the current budget as well as comparisons between the projected schedule and the current schedule with a two-week look ahead (Roix, 2000).

At Cutler Associates Inc., the use of WBPA is slightly different than the site used in the construction of the Worcester Polytechnic Institute Campus Centre. Theirs has a record keeping function and is geared towards the engineers more than the general public. Records of the design process with CAD drawings, sketches, specifications, addenda, Request For Information (RFI) logs, and submittals are contained in the design logs section of their site. All this information serves as a useful record of the entire design process. In addition to the design log section there is also a construction log section, consisting of construction records. Similar to the design log it has records of change order logs, RFI logs, event logs, and procurement logs. This site also includes a field log section consisting of daily reports, a 2-week

look ahead, and meeting notes. Lastly, this site includes links to the web pages of the subcontractors and other project affiliates (Cela and Perea, 1998).

Throughout the construction of the Tweeds Head Hospital, WBPA was used as a main communication channel between all the parties involved in the project. This site is probably the best of all the sites because it includes information that is an excellent record of the project and information that is immediately helpful to the project design teams, special interest groups, and the general public. Included in this site are project pictures and 3D computer-generated images that serve as a visual representation of the progress being made on the project. For the engineers there are also CAD drawings organised chronologically as well as project team meeting minutes and a project team contact list (Niazmand, 2000).

2.5.1.2 Implementation and Layout

The implementation and layout of a web page can drastically affect the usability of the site. Different techniques are used to increase the usability and aesthetics of a web site as well as basic rules to follow when making a user interface.

A relatively standard technique for displaying information is to have frames. All of the case studies used frames in one form or another. Usually there is a frame on the left hand side of the web page that is used as an index to the rest of the site. This frame stays the same throughout the navigation of the site while the rest of the page changes.

Most of the WBPA web sites used frames in conjunction with other techniques. For example, in the construction of the Worcester Polytechnic Institute Campus Centre a Windows Explorer-type file navigation (see Figure 2.1) was used for viewing the contents of the database where the information pertaining to the

project was stored. There were folders for CAD drawings, pictures, and meeting

minutes (Roix, 2000).
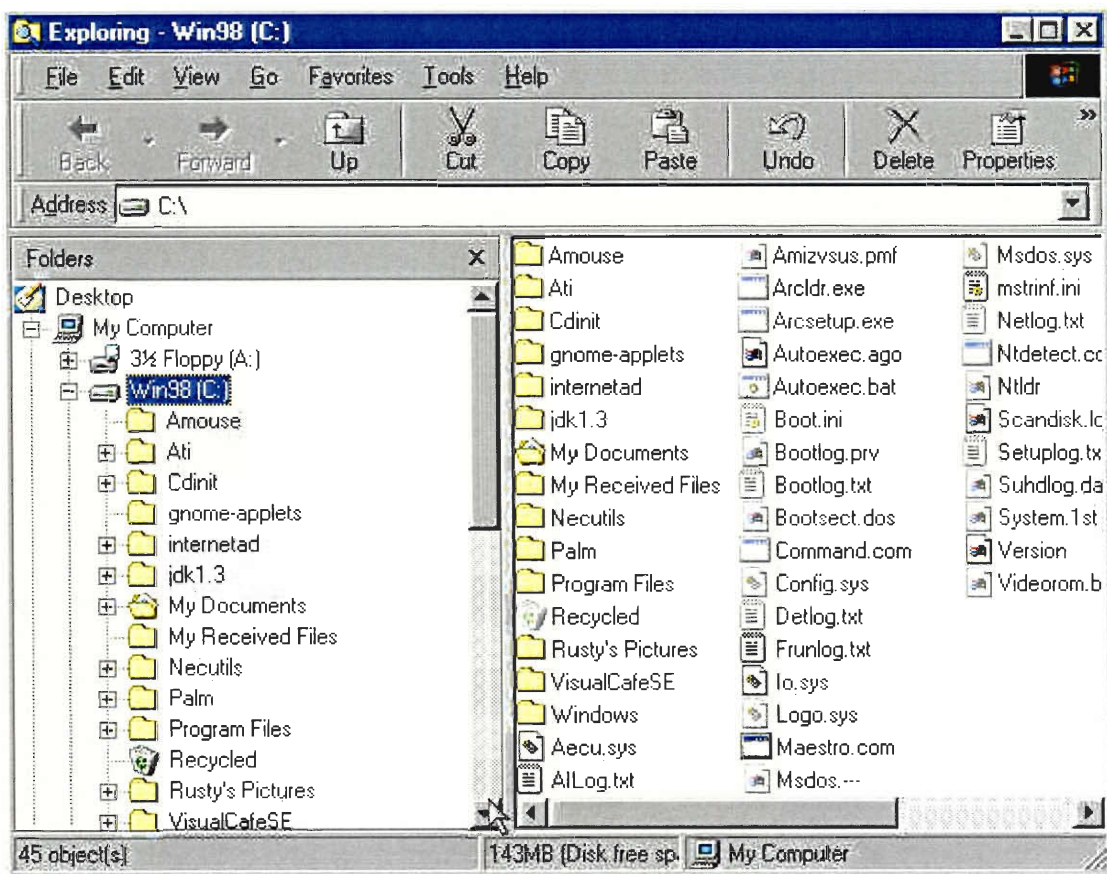
Figure 2.1: Example of a Windows Explorer-type navigation

Another common technique for implementing WBPA tools is to use a software

client application that connects to a server via the Internet. Client-server applications

are covered in greater detail in Section 2.4.1.1. The design teams used this technique

throughout the construction of the Tweeds Head Hospital (Niazmand, 2000).

2.5.1.3   Security

Security is clearly a major issue when dealing with the implementation of new

technologies, especially ones involved with the Internet. There are many issues

concerning security but for the purpose of this project two main issues will be

discussed: the type of information that needs to be secured and the different ways of

securing that information.

There seems to be a lot of variation between WBPA tools in respect to what information should be accessible to the different users. In fact, the only thing that is mutually agreed upon throughout all of the case studies is that there should be some regulation of the information that the general public is authorised to see. A large factor in deciding who is able to gain access to information is the concept of intellectual property.

Intellectual property is simply the ownership of knowledge. When dealing with security in WBPA software, the definition of what is considered and what is not considered intellectual property depends on both the engineers and the owner. Since all the case studies that were researched had a different set of owners and engineers, they all had a different set of standards for intellectual property.

During the construction of Worcester Polytechnic Institute's Campus Centre the general public was able to view a lot of information. This web site kept the public more informed than the rest of the sites. The general public was able to see a participant information section, multimedia section, cost section, and a schedule section. The participant information section contained information on the companies that helped with the design and construction of the Campus Centre. Regularly updated digital pictures of the construction site were available in the multimedia section. The cost section shows a contrast between the projected cost of the project and the actual cost of the project. Similarly, the schedule section was a comparison of the original projected schedule and the current schedule (Roix, 2000).

During the construction of the Tweeds Head Hospital there was also a lot of information available for the public. The general public was able to see the master plan, development application or planning application (a document describing the impacts of the project), scheme design information (a more detailed development

application that has been approved by the client), 3D computer generated images, project feasibility plans (PFP), and project development plans (PDP). In addition to this general public web site, there was another web site for special interest groups such as the user groups. This web site shows more detailed information about the project and allows the users to give feedback to the engineers through a bulletin board system. The special interest users are able to see all the information on the public page as well as the information held on their own page. The information held on their section of the web site includes briefs and plans for departments in addition to the ability to view the design documents without the privilege of downloading them. On this web site the special interest users, also known as user groups, are able to email the design team and give their input pertaining to the project (Niazmand, 2000).

In contrast, the project web site used in the construction of the Zotolli School, a school that was constructed with the assistance of WBPA, was far less public oriented. The public section of this site was used mainly to show the schedule and budget status of the project (Lovet, et al, 2000).

Many generic software packages don't provide a general public section. Framework Technologies' Brian Guiffrida, director of marketing, says, "Our policy as a facilitator of document sharing is to stay out of document and drawing ownership. We remind clients that all of those issues should be set up in the contracts up front, and we give them customisation and configuration tools they need to reflect the right relationships." (Langdon and Williams, 2000, page 3). This leaves the intellectual property issues up to the manager to solve. Although this provides more work for the project manager it may be the only feasible way to manage information sharing between subcontractors (Langdon and Williams, 2000).

Now that it is known that WBPA software must separate information between user groups, it is time to see how this can be accomplished. When implementing a WBPA platform there are many different techniques used to ensure security.

It is important to note that different security measures are taken depending on how secure the information must be kept. For example, if a project is being done on building a missile testing facility then the information involved is highly confidential and should not have any potential for unauthorised viewing. In contrast, a project to build a highway truck stop might not be as confidential and there may be few or no repercussions if the information were to be viewed by unauthorised viewers.

During the construction of the Worcester Polytechnic Institute's Campus Centre the project administration web site was created as two separate web sites: one for the designers and one for the general public. The designers' web site was on InfoQuest's secure web server, which requires a username and password to view a web site on that server. The general public's web site was on a separate non-secure web server that allowed anyone to view it. The largest advantage to using a secure web server to host the confidential information is that it allows the administrator to give different access to different users or groups of users. For example, the web site can be configured to let all the engineers download the CAD drawings while the user groups might not be able to download them or even view them (Roix, 2000).

In the analysis of the construction of the Bullard St. Site School, another school that was constructed with the assistance of WBPA, the project administration web sites were kept secure by putting all of the project pages on the Project Managers intranet web site. By doing this, only certain pages of the web site are accessible through the extranet from the Internet. The study of WBPA during the construction of the Bullard St. Site School also suggested that the most confidential information could

be encrypted. Encryption is a complex way to scramble information so that only authorised viewers are able to unscramble it. Although this approach will work and may be the most secure it was not used for this project web site because this level of security was unnecessary (Hermosa, 1998).

Probably the most unique approach to achieving security was used in the construction of the Tweeds Head Hospital. This project used three separate approaches for each level: general interest users, special interest user, and project design team user. The general interest users, or the general public, were able to access information through a standard web site. The special interest users had a more sophisticated password protected web site similar to the one used in the Worcester Polytechnic Institute's Campus Centre web site. The unique section of the project administration software was the design team section. The design team was able to access their information through a local client application that connects to a remote server application. This client is a commercial software package that lets the design team share information easily. There is no need to worry about the public being able to view confidential information because it can only be accessed by someone who has the proper password and software (Niazmand, 2000).

2.5.2 The Advantages and the Disadvantages of WBPA

There are always advantages and disadvantages to adopting new technologies. WBPA is not an exception to the rule.

2.5.2.1 Advantages

There are many positive outcomes to using WBPA. These advantages can be generalised into three categories: lower cost, increased efficiency, and increased effectiveness of record keeping. When WBPA is done properly it can do these things, which makes it very attractive to companies.

There are many ways that a well-implemented WBPA package can save a company money. Money can be saved on phone bills, courier costs, travel expenses, and by saving time. The use of the web for communication between project groups and user groups should decrease the number of phone calls. Similarly, the use of the web to share information, such as CAD drawings, should save in printing and shipping costs since the need to print and ship the drawings to other project groups should decrease (Hermosa, 1998). All of these things ought to further decrease the overhead costs by reducing paperwork and therefore reducing the cost of office supplies. Cutler Associates claims that the use of Web Based Project Administration saves them between 0.5% and 1% of the overall cost of a project (Roix, 2000). Having a WBPA package should also decrease travel expenses because there should be less need to visit the project site. Also, the different parties involved in the project should not have to visit each other as often (Hermosa, 1998).

In addition to the advantages stated above, money can also be saved indirectly. Money can be saved in the form of time. Carl Bass, president and CEO of buzzsaw.com, put this best when he said, "Extra days of unplanned work could mean the difference between profit and loss for a subcontractor"(Langdon and Williams, 2000, page 2). Since WBPA is supposed to cut down on time-consuming activities like paper work and organisation of information, it can help to decrease the time spent on a project and thus decrease the cost of the project.

In addition to saving money, owners and project managers want to increase the efficiency of a project. Web Based Project Administration does this by improving communication, avoiding and quickly solving contractual disputes, quickly getting feedback on the project, and having constant up-to-date information.

A properly implemented Web Based Project Administration tool can vastly improve the communication between project teams by making information such as drawings and minutes constantly available to the other project teams as well as the user groups in the project (Roix, 2000). This was experienced during the construction of the Bullard St. Site School. Their project administration web site made use of AutoDesk's RedLine software that allows people to view AutoCAD drawings in an Internet browser and mark them with red text and lines. This is a very effective way for design teams to communicate to each other and quickly resolve or even avoid future problems within a project. The earlier a problem is caught, the less it costs to solve it (Hermosa, 2000).

An important part of every civil engineering project is to keep effective records. Records should be kept of the progress made as well as the design decisions during a project. WBPA helps to keep records electronically by storing information into a web accessible database. It allows project managers to effortlessly organise the different records of the project and can increase the accessibility of the information after the project has been completed. This is a valuable advantage to using WBPA for a number of reasons. As discussed earlier, these records can be used during the project to help resolve disputes between subcontractors and possibly even avoid them altogether. In addition, these records are valuable to have after the project is finished because they may be very useful during building maintenance, additions, and renovations (Roix, 2000).

2.5.2.2 Disadvantages

Although there are many good things that can result from the use of WBPA, there is also the possibility for bad things to occur. The two main disadvantages to

using WBPA are implementation costs and security issues. Fortunately these disadvantages should not affect every company that uses WBPA.

The three parts of implementation costs are software costs, hardware costs, and training costs. Software costs involve using an ASP or paying for the development of custom software. Commercial software for WBPA varies greatly in cost from company to company. Some online companies have free Web Based Project Administration solutions while others charge up to US$1,200 per month for each project. In order to use any WBPA tools companies must have computers that are connected to the Internet. While most large corporations already have internal networks, some smaller companies do not have any computers or are not connected to the Internet. Lastly, some people are more computer literate than others and regardless of how computer literate someone is, it still takes a considerable amount of time or training to effectively use Web Based Project Administration software (Langdon and Williams, 2000).

In addition to implementation costs, security issues may arise from Web Based Project Administration. These issues were discussed earlier in this chapter.

Finally, it is essential that everyone affiliated with projects using WBPA be prepared to use the web site. If they are not, then the there is a burdensome overhead added to the project team member's duties. This burden consists of having to do everything electronically through the WBPA web site and then do everything again for the people who are not using the WBPA web site (MacCallum, 2001).

2.6 Conclusions

From performing the background research presented in the problem statement and the literature review, there are certain categories of information that can be identified in order to better conceptualise the problem at hand. These categories, presented as questions, are as follows:

1. How does the flow of information work, and how does a WBPA site better facilitate this flow? What types of information are involved in this flow?
2. How is information managed on this web site? In other words, who is responsible for posting, verifying and updating this information? How do they do this?
3. What are the social and legal issues involved in using WBPA software? How is intellectual property managed? Who owns the computers that host the software? What are the issues surrounding computer literacy and fear of technology? How do people react to the change in the way business is done?
4. What are the technical issues involved in moving to such a system? These issues include computer and Internet access, hardware capabilities, software compatibility, etc. How are security issues identified and reconciled? Also, what technical problems have been encountered in the past when implementing such a web site?
5. How have Web Based Project Administration sites been used in the past? How do people perceive their use in their daily work? How can they be best utilised in the future?

The possible answers to these questions, as they have been looked at in the past, are addressed in the literature review. For each category, the project team has researched several possible solutions.

Information flows throughout the life of a construction project. At the beginning of a project information flows between the designers and users in order to determine what the building should encompass. As the vision for the building evolves, an architectural program is put together. This document is the list of specifications for the building; it will be transmitted to various contractors for bidding. Once a contractor is chosen and the project is started, information will flow between the project team members on the progress of the building. This information can range from specific issues, to costs and schedules.

Web site information can reside in several different places, depending on the use of the site. One possibility is for web site information to reside on a company's own servers, accessed either through an intranet or via an extranet. Another possibility would be for the data to reside off-site, on the servers of either an ASP or a web hosting company. Still a third possibility, suggested by Niazmand (2000) is a combination of the first two, with information present on multiple sites.

A few possibilities for who manages information were discussed in the literature review. An obvious solution would be to hire a full-time employee whose sole purpose is to manage the web site information. If this were not possible, one way to manage information would be on a party basis, where everyone involved is responsible for managing his or her own section of the web site. These parties might include the project manager, architect or general contractor.

The case studies section (Section 2.5) identified three main ways to uphold security within the WBPA web sites. All of the case studies used a combination of secure web servers, client-server applications, or the use of an intranet for security.

There is a variety of ways to use WBPA web sites. The most common of these uses is to share information, give feedback on what was shared, and schedule activities. The types of information being shared were drawings, submittals, RFIs, and meeting minutes. Feedback on these types of information was given through email, bulletin boards, or mark-up utilities such as Redline. Lastly, schedules of budgets and timelines were posted as well.

Although these uses are a good start for a WBPA web site, they are by no means a definitive list. WBPA is a very new technology that has not yet matured. Similarly, WBPA is not something that can be standardised to the point where one model will work for all companies or all users. This project expanded upon each of

the five categories listed above and recommended the most useful solutions that

addressed the needs of DHS.

3 Methodology

3.1 Overview

As stated in the previous sections, many companies and agencies in the construction industry are implementing Web Based Project Administration (WBPA), but there are many issues left unaddressed. These issues can be grouped in the following five categories: the flow of information throughout a project, information management on the web sites, social issues, technical issues surrounding the use of WBPA and most importantly the different ways to use the site.

Interviews were the primary method of gathering information relative to these issues. There were three categories of interviewees, the first two being experienced users of WBPA and people who have never used it. These interviews were conducted with project team members such as the project manager, consultants, user groups, agency representatives, program representative and regional representatives. The third category of interviewees was WBPA consultants – these are representatives of the Application Service Provider (ASP) companies.

In addition to these interviews, ASP companies and software were reviewed. The first step in reviewing the different ASP companies was to review their web sites. Once the web sites were reviewed, the project team narrowed the list down to a dozen ASPs that were then contacted for demonstration software.

The analysis of the information gathered through interviews and software reviews was done by grouping the data into the five broad categories explained above and sorting the information by importance. This information was then recorded in a report with a list of recommendations on using WBPA. These recommendations were then further used to create a model web site for the Capital Management Branch.

3.2 Types of Information

This section explains the five categories of information the project team gathered. As stated above, the first area of interest was the flow of information between CMB and DHS and other members of the project team. The purpose of gathering this information from the DHS and CMB staff as well as from the consultants and agencies CMB works with was to understand how DHS and CMB communicate with their project teams. More specifically, this information answered the following questions: what types of information are exchanged, at what stage of the project are the different types of information exchanged, who provides this information and finally, how the project team members provide feedback to each other on the information that is exchanged during the life of the construction project.

The second area analysed was information management of the web site. The purpose of understanding this information was to determine who is responsible for posting information, deleting information, and archiving information on a WBPA web site.

Social issues were also examined closely in the interviews. Social issues encompasses the concerns people have with intellectual property, electronic signatures, documents that should not be put on a web site, computer literacy as well as the culture change that is brought by WPBA

Technical issues were also analysed in two aspects: security and software compatibility. Security was analysed to gain a better understanding of the different measures that can be taken to ensure security on a web site. The project team spoke to WBPA site users to learn how they felt about the web sites and if they had any concerns when posting confidential documents. The project team also spoke with ASP

consultants and previous WBPA users to gain an understanding of the issues that can arise with software compatibility.

Finally, the most important of these categories was to determine how to use WBPA effectively. This was accomplished by comparing the opinions of experienced WBPA users in construction project management. This was an essential part of the project because when CMB are ready to fully implement a WBPA web site, they will not have to take the time to decide on the best ways to use the site.

3.3   Gathering Information

Throughout this project, the two main techniques for gathering information were interviews and software reviews. Interviews were conducted with people that have never used WBPA, people that have used WBPA and finally people who implement and sell WBPA web sites, hereby referred to as WBPA consultants. Additionally, reviews were conducted on Application Service Provider (ASP) web sites and software.

3.3.1   Interviews

The people that have never used WBPA included CMB project managers, consultants, user groups, agency representatives, DHS program representatives and regional representatives. As a starting point, the group's liaisons, Judith Hemsworth and Carol Neumann, referred the group to a series of people listed below:

- Non-WBPA users
  - CMB staff
  - Program representatives
  - Region representatives
  - Consultants
  - Agency representatives
- WBPA Users
  - Consultants
  - Owners
- WBPA Consultants

The project team contacted the individuals in these different categories and either set up interviews with them or got from them the names of the appropriate people to interview. These people offered details about the flow of information throughout CMB and DHS throughout all phases of a construction project as well as information flow among the key stakeholders. Also, these interviewees gave references of other people who would be helpful to interview such as consultants, agency representatives, program representatives, user group members and previous users of WBPA.

As stated above, the project team interviewed people in three categories: people that have never used WBPA, people that have used WBPA and finally WBPA consultants. Two members of the project team attended each interview; one person was primarily responsible for conducting the interview while the other person was responsible for taking notes. In total, the project team conducted 45 interviews. Of these interviews 11 were project managers, 3 were agencies, 1 was a program representative, 5 were consultants, 11 were WBPA users, 8 were WBPA consultants and 6 were among a variety of other people including IT staff and academic researchers.

The purpose of the interviews was to gather information related to the five main categories of information (for a full list of interview questions, please refer to Appendix C):

    a. How information flows during a construction project.

    b. Who should be responsible for posting, revising, archiving and deleting information on the web site

    c. The social issues involved with using WBPA

    d. Technical issues and problems surrounding the use of WBPA

    e. The best ways to use the different tools offered by a WBPA web site

3.3.2 Application Service Provider (ASP) Reviews

The other major area of research consisted of reviewing ASP software. To begin, a list of 33 known ASPs was gathered (see Appendix D). In order to obtain a more specific and narrowed down list of the ASPs, the ASP web sites in Appendix D were evaluated for professionalism. The criteria for professionalism, detailed in the literature review, consisted of these main points: professional design and appearance of the ASP vendor web page (this was decided based upon the Seven Deadly

Temptations discussed earlier), presence of contact information on the page, information about the product and its tools, examples of projects that have used this specific ASP, availability of demonstration software or tutorials and availability of information about how the WBPA web site will facilitate the flow of information throughout a project (see Appendix E for the preliminary ASP evaluation form). Once the preliminary reviews were completed, the project team chose the ASPs that best represented the criteria set forth in Appendix E. Twelve ASPs were chosen and contacted to get demonstrations and in some cases, interviews with consultants.

The demo software was reviewed in eight different categories. These categories were: usability, aesthetics, cost, configurability, security, expandability, the feature set and the training/support offered by the company. The information gathered by these reviews was organised into a decision matrix, which allowed the project team to select the most appropriate ASP for CMB's needs (this process is explained in detail in Section 5.5, "ASP Selection").

3.4 Data Analysis

There were two types of data collected in this project. The first type was the data obtained from interviews. The second category of data included the observations obtained from doing the detailed review of WBPA software provided by ASPs. The goal of the data analysis was to categorise the information obtained from the research into a coherent body of information, thus allowing the group to make educated decisions and recommendations regarding the role WBPA will play for CMB.

3.4.1 Interview Analysis

The raw data from the interviews were in the form of detailed summaries of the conversations. The purpose of the analysis of the interviews was to determine the opinions and experiences of the interviewees and organise them into categories useful for creating a specification document on how to use WBPA within CMB and also for choosing an ASP that would best fit CMB's needs. The five categories of information that the interview data were put into are as follows: the flow of information throughout a project, information management on the web site, how security will be ensured, legal and technical issues surrounding the use of WBPA and most importantly the different ways to use the WBPA software.

In order to analyse the data obtained from interviewing various people, the group used the five categories of information that were outlined in previous sections. Once detailed interview summaries were completed, the project team then went through each one individually, pulling out the important details. Included in these details were facts and opinions related to the five categories of information that were discussed earlier.

Grouping together the information supplied by each interviewee into the five major categories enabled the group to clearly define a set of specifications for CMB.

This set of specifications showed CMB what tools a WBPA web site should offer

them and the other key stakeholders as well has how these tools should be used. This

list of specifications can be found in the chapter "Analysis". The information from

the interviews was also helpful in determining the structure and content of the site

model (discussed later).

3.4.2 Software Review Analysis

he project team reviewed various Application Service Providers (ASPs) in the

area of WBPA. The first step in the analysis of the data from the software review was

compiling the observations gathered from each individual ASP review into a

comprehensive list based on the review criteria discussed in the previous section,

"Gathering Information."

Once the criteria for ASP reviews had been put into the list, the two sets of

data (interview and software review) could then be compared. The software reviews

allowed the team to learn about the different features ASPs provide. The data

obtained from the interviews provided an understanding of what functionality for a

WBPA system CMB wants and needs. The project team was then able to assign

different weights of importance to the review criteria. The software reviews provided

information about the capabilities of the ASPs on the market. This information

allowed the project team to assign a value between one and five of how well the

particular ASP's software capabilities met the needs of CMB as identified in the

interviews. The ASPs were then graded through the use of a decision matrix. A

decision matrix is a tabular tool used to compare various options with respect to a set

of decision criteria and their relative importance in order to systematically select the

best candidate. The best ASP could be selected based on the outcome of the decision

matrices in Appendix G.

3.5   Modelling a WBPA Site

Throughout the project, the group took careful notice of how the interviewees perceived the way a WBPA web site should be used. Based on the discussions with the various parties involved, the team was then able to determine what types of tools would be most useful for the team members involved in a CMB project. Furthermore, from performing the software reviews and interviews detailed earlier, the team was able to see how these tools are normally implemented.

Once an ASP was chosen that matched the needs of CMB's project management procedures, the modelling of the demonstration web site began. This model presented an overview of how a WBPA web site may work for a CMB project. The model consisted of customised demonstration software that simulates the features identified in the research. For instance, the document management capabilities of the software were customised using the data on information flow that was gathered from interviews. Some of the other key software features such as correspondence modules, history tracking capabilities and mark-up utilities were also modelled.

After the model WBPA web site was created, usability tests were conducted with CMB project managers to confirm that the model was set up in an efficient configuration. Users were given a written user manual to familiarise them quickly with the web site (see Appendix I). The tests began when subjects were given a list of tasks to complete (see Appendix J). If any problems were encountered during the usability test, they were noted and the model was revised to compensate for them.

3.6 Deliverables

There were three major deliverables signifying the end of the project. The first of these was a document outlining the issues and policies necessary to implement a WBPA site for CMB. This document is the culmination of the research performed both in the United States and Australia as applied to the various issues identified by the project team (flow of information, management of information, social and legal issues, technical issues and best possible use of the web site). The main focus was to outline how CMB should best use a WBPA web site and to provide specifications for how to implement WBPA in their organisation.

The second deliverable of the project was a model of a WBPA web site. This model showed how such a site may be structured, navigated, and employed for project administration, with particular emphasis on its use by the key stakeholders in a CMB project. The model was a demonstration showing how the project group envisions the site in the specifications document to work. In order to deliver this model, the ASP that the project group chose was customised in the way the group envisions CMB might use the site.

The final oral presentation was the last deliverable in this project. In this presentation, the project team communicated their findings to the CMB. The presentation outlined the various requirements identified in the specifications document, as well as briefly demonstrated the web site mock-up with a specific focus from the perspective of CMB.

4   Results

4.1   Information Flow Throughout a Project

From the results of the interviews with the key stakeholders involved in a project at the Capital Management Branch (CMB), a description of the flow of information throughout a capital investment project has been constructed. These key stakeholders consist mainly of the members of the Project Control Group (PCG). Three types of meetings facilitate the flow of information during a capital investment project: PCG meetings, site meetings and user group meetings.

A capital investment project consists of five phases in which specific documents are created. These phases are the proposal phase, the planning and evaluation phase, the documentation phase, the implementation phase and the operation phase. During each of these phases, activities take place in order to create documents that define the project scope, budget and design. This section will explain in detail the flow of information that occurs in order to create these documents.

Proposal Phase
- Service Plan
- Business Plan

Planning & Evaluation Phase
- Establish PCG
- Engage Consultants
- Planning Brief
- Functional Brief
- Master Plan Study Cost Plan A
- Feasibility Study Cost Plan B
- Schematic Plan Cost Plan C1
- Investment Evaluation
- Value Managment

Documentation Phase
- Design Development Cost Plan C2
- Documentation Cost Plan D

Implementation Phase
- Tender, Evaluate and Award
- Construction Phase
- Commission

Operation Phase
- Asset Management
- Post Occupancy Evaluation

Figure 4.1: Information flow in a project

4.1.1 The Project Control Group

The PCG is a group of people involved in the management of a capital

investment project. Typically the PCG is comprised of a project manager, an agency

representative, a program representative, a regional representative and a consultancy

board.
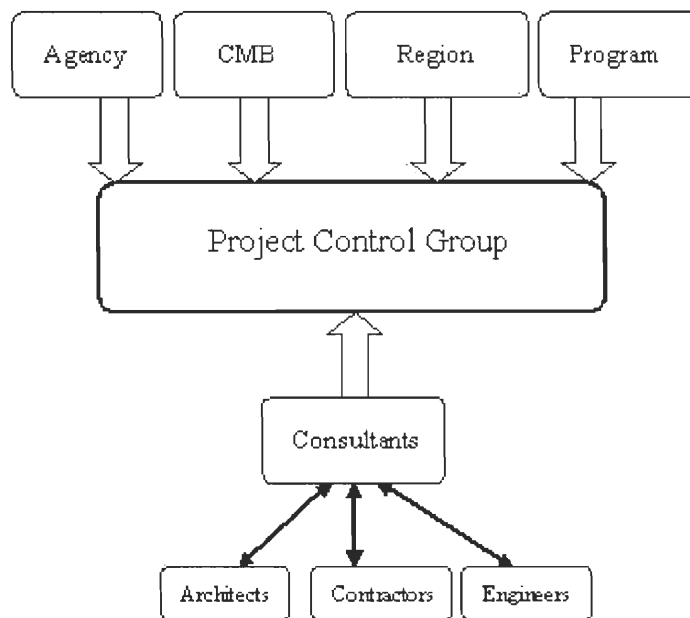
Figure 4.2: Members of the Project Control Group

The project manager is the person who represents the CMB. This person's job

is to manage the project and make sure that the proper procedures are followed

throughout it. The agency representative is usually a member of the management of

the facility being built or renovated. As a representative of the agency, this person's

job is to make sure the final product will best suit the agency. The program

representative is a member of the DHS branch responsible for the services that will be

provided through the capital investment project. In many cases the capital investment

will help to offer a range of services that come from more than one branch of the

DHS. When this is the case, a representative from each branch sits on the PCG. The

regional representative is a person who represents the regional office. DHS has many

regional offices throughout Victoria; the region in which the project is located in will have a representative that sits on the PCG. This person's job is to make sure that all the needs of the region are addressed by the facility. Lastly, the consultancy board that sits on the PCG usually consists of a principal consultant, a cost consultant or quantity surveyor and a chief architect. The principal consultant is an outside consultant that is hired by DHS to manage the design and construction of the project. The chief architect is the person who designs the project and the cost consultant or quantity surveyor's job is to manager the financial aspects of the project (CMB, 1998 and all CMB interviewees).

The PCG has monthly meetings at which the members of the PCG make important project decisions about the services, costs and design of the facilities. The PCG typically meets once a month. However, according to the various consultants interviewed, during the planning and evaluation phases of the project the PCG may meet more often if needed. Before these meetings, the consultants create a monthly report for the PCG. This report is discussed in greater detail in the implementation phase section of this paper. In addition to the monthly reports, minutes of the PCG meetings are kept (CMB, 1998 and all CMB interviewees).

4.1.2 Proposal Phase

The proposal phase begins when the need for a capital investment has been determined. The purpose of the proposal phase is to identify what services are needed and how they will be financially funded. During the proposal phase two documents are created: the service plan and the business plan.

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┌─────────────┐          ┌ ─ ─ ─ ─ ─ ─ ─ ┐          ┌─────────────┐
│ Program/    │          ┊ ┌───────────┐ ┊          │ Approved By: │
│ Agency/     │          ┊ │Service Plan│ ┊          │ 1. Program   │
│ Region/     │ ═══════► ┊ └───────────┘ ┊ ═══════► │ 2. CMB       │
│ Politician/ │          ┊ ┌───────────┐ ┊          │ 3. Region    │
│ Other Sources│         ┊ │Business Plan│┊          │             │
└─────────────┘          ┊ └───────────┘ ┊          └─────────────┘
                         └ ─ ─ ─ ─ ─ ─ ─ ┘
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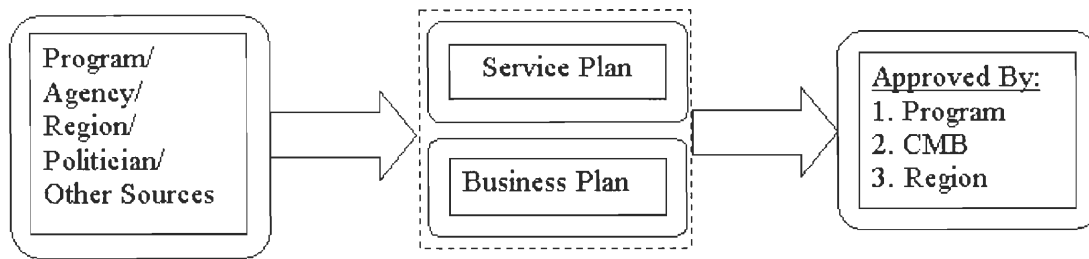
Figure 4.3: Information flow during the Planning and Evaluation Phase

After the need for the capital investment has been identified, a service plan must be created. The service plan is a report that explains what projects need to be done to address the issues described. This document, which is central to the initiation of a capital works project, is typically created by the agency that will use the facility. However, it is not unusual for the document to be created by a DHS program, a DHS regional office, a politician or even a citizen's group. A service plan is typically fifty to 100 pages long containing a combination of both A3 and A4 pages. The majority of the pages are A4 text documents while some of the pages can be A3 containing some basic concept-level drawings.

In theory, the business plan is started by the responsible agency after the service plan has been completed. In reality, the business plan is usually started while the service plan is being finished to help expedite the process. As shown in Figure 4.3, both the service plan and the business plan need to be approved by the program, CMB and the region. This approval process can take a very long time and overlapping the creation of the two documents speeds up the process. The business plan is a document that describes how much it will cost to finance the projects described in the service plan. Typically, the business plan ranges anywhere from 50 to 100 A4 pages although on smaller projects the business plan may only be 20-30 pages. As well as A4 pages, occasionally there may be some A3 pages for flow

charts. The completion of the service plan and business plan marks the end of the proposal phase (Sivathasan, 2001).

4.1.3 Planning and Evaluation

The planning and evaluation phase follows the proposal phase. The purpose of the planning and evaluation phase is primarily to develop a preliminary design for the project, make decisions within the design based on cost and evaluate the alternative investment options. Throughout this phase there are seven major documents created. These documents are the planning brief, functional brief, master plan, feasibility study, schematic design, investment evaluation and value management report.
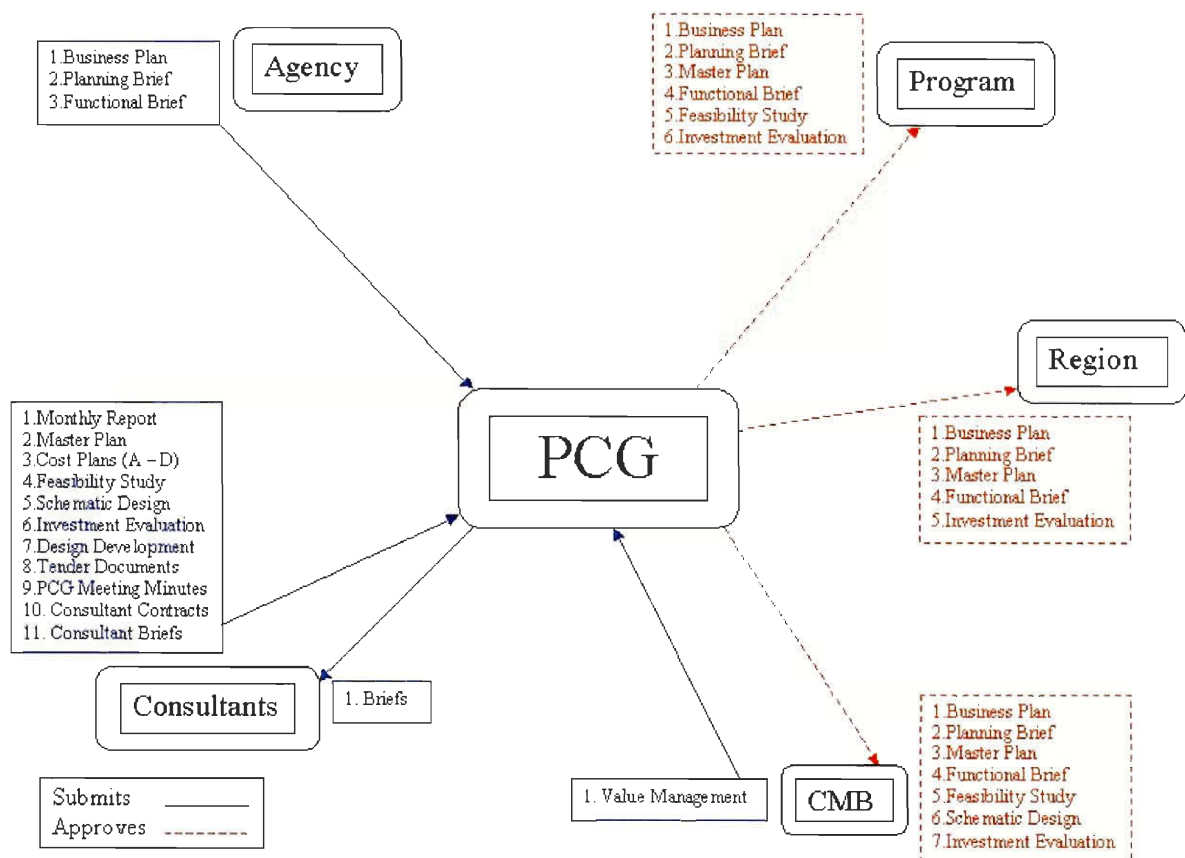
Figure 4.4: Information flow through the PCG during the Planning and Evaluation Phase

As depicted in Figure 4.4, the Project Control Group (PCG) is the centre of the planning and evaluation phase of a capital investment project. As mentioned earlier, the PCG is comprised of five major groups: a program representative, a regional representative, a project manager, some consultants and a representative of the agency. The left half of the figure shows the different documents that are submitted for review by the PCG. The members of the PCG review each document and suggest changes until the PCG, as a whole, believes that the document is ready to be approved by the proper authorities.

In addition to the PCG meetings held during the planning and evaluation phase of a capital works project, the architect has user group meetings with the future users of the facilities to gain an understanding of what the users need. For example, in the construction of a hospital, the architect would have meetings with the hospital staff including doctors, nurses, custodians and management to obtain an understanding of how their facilities need to be arranged in order to design a building that will best suit their needs (Pope, 2001). A user group will be created for the different departments of the new facility and each separate user group will usually meet six or eight times during the life of the project. Prior to the meetings the user will receive room data sheets to fill out. These are a standard document format that allows the users to give information about their needs, for example, doctors can say how many beds are needed in their departments. Unlike the site meetings and the PCG meetings, the meeting minutes kept at the user group meetings are in the form of action statements. Action statements are a condensed set of minutes that only contain information on topics covered during the meeting that need to be acted upon. This help the architect keep track of what things need to change in the designs (Howard, 2001).

The first set of documents in the planning and evaluation phase of a capital investment project are planning and functional briefs. These documents serve as instructions to the principal consultant. The principal consultant (also known as a project manager) is in charge of managing the design and construction of the project. It is worthwhile to note that in projects smaller than AUD$5,000,000 the principal consultant is the chief architect while in larger projects there is a separate person engaged to manage the construction. The planning brief is a translation of the service plan including information about service requirements, policies, relevant trends and planning considerations (CMB, 1998 and Sivathasan, 2001). As shown in Figure 4.4, this document is prepared by the agency and reviewed by the PCG. The planning briefs are usually A4 text documents although there is the possibility that they could contain some A3 pages for a few simple engineering sketches (Sivathasan, 2001).

When the principal consultant has been given the planning brief, the consultancy team is able to begin working on the master plan and the feasibility study. In smaller projects, the feasibility study is created as part of the master plan, while in larger projects it is not uncommon for the two documents to be created separately. According to all the project managers interviewed, the master plan is the first document that begins to show the big picture with a greater level of detail than the previous documents. The purpose of the master plan is to determine the different physical orientations for the building, assess the current condition, functional adequacy and space usage of all the parts of the building (if a renovation is being planned), prepare the cost plan A and examine the different options for approaching the project (Steegstra, 2001 and CMB, 1998). The cost plan A is a large part of the master plan and often is created as a separate document. According to the majority of DHS staff interviewed, the purpose of the cost plan A is to evaluate the general costs

of the different facilities and their equipment. The master plan is typically 50 – 100 A4 pages including some drawings that should be folded A3 pages (CMB, 1998).

As mentioned earlier, the feasibility study is created during the same time period as the master plan and is typically included in the master plan for smaller projects. The feasibility study is conducted to evaluate the different alternatives identified in the master plan and to develop a preferred approach. Similarly to the master plan, the quantity surveyors prepare a cost plan as a part of the feasibility study. This is known as the cost plan B. The cost plan B is a more detailed cost plan that is specific to the preferred approach discussed in the feasibility study. This cost plan includes an estimate for the cost per unit area of the structure. Similar to the format of the master plan, the feasibility study is usually between 80 and 100 A4 pages with a 20 to 25 page cost plan (CMB, 1998 and Steegstra, 2001).

When the master plan and feasibility study have been completed, the functional brief is started. The functional brief describes the broad physical requirements and establishes functional planning parameters from the perspective of the user (Pope and Steegstra, 2001). In simpler terms, the functional brief is "a description of the functions to be accommodated in the facility, and the relationship between these functions" (CMB, 1998). As seen in Figure 4.4, the functional brief and planning brief are created by the agency. The PCG members then review the documents and they make corrections when it is necessary.. Once the PCG endorses the documents, they are distributed to the CMB, Program and Region for approval. After approval is obtained the documents go to the consultants. The functional brief is typically 20 to 50 A4 pages whereas the planning brief is typically 50 to 100 A4 pages (Sivathasan, 2001).

The schematic design is the last major part of the planning and evaluation phase. The schematic design contains the next level of detail in the architectural drawings. These drawings show detail of the key physical elements such as areas, locations, and volumes (CMB, 1998). These drawings show the plans in a 1:100 format including elevations and the major external dimensions (Steel, 2001). As well as the drawings, the schematic design includes a timetable for the construction and the cost plan C1. The cost plan C1 is a revised version of the cost plan B including more detailed information now that there are more detailed plans. The schematic design is typically between 100 and 150 pages primarily consisting of A4 text and A4 or A3 folded drawings (CMB, 1998).

Two additional documents are created throughout the course of the planning and evaluation phase. These reports are the investment evaluation and the value management. These documents are created at various stages within the project and these stages vary from project to project.

Investment evaluation is a process that verifies that the plans being developed will adequately provide the services needed. This is accomplished in 10 steps: identification of the service needs, identification of the goals, definition of the smallest development necessary to provide the services and achieve the goals, development of a financial estimate, identification of the socio-economic impacts, comparison of the socio-economic impacts with the financial estimate for each available option, determination of the preferred option, development of a risk management policy, consideration of the implementation management for each option and lastly, approval by the chief executive officer (CMB, 1998). As shown in Figure 4.4, the investment evaluation is created by the consultants and approved by the program, CMB and region. The investment evaluation is usually a document ranging

from 60 to 100 pages containing A4 text and the occasional A4 or folded A3 drawing (Sivathasan, 2001). An investment evaluation is most commonly conducted after the master plan or feasibility study and after the schematic design.

Usually, the primary consultant brings in two independent (not project-related) consultants to conduct the value management: the first is an expert in the type of facility being constructed and the second is an expert in the design and construction of buildings. The facility expert checks to make sure that the plans for the facility will provide the services in an efficient manner and the building expert checks to make sure that the materials and designs are the most cost effective approach. The value management report is typically 10 to 20 A4 pages consisting primarily of text (Sivathasan, 2001).

4.1.4 Documentation Phase

The documentation phase is the point in the project when the architect and engineers do the majority of the work to prepare the fully detailed designs for the capital investment project. The documents created during the documentation phase are the design development document and the design documents.

The design development report includes a more detailed set of designs than the set produced in the schematic design. These designs show in-depth plan details and dimensions. In addition to the designs, the design development report contains the cost plan C2. The cost plan C2 is a confirmation of the cost plan C1, showing how the costs of the capital investment project are broken down (Steegstra, 2001). The design development report is usually a little more than 100 pages but not likely to be larger than 150 pages. Within the design document there are mostly A3 drawings with some A4 containing the report (Sivathasan, 2001).

After the completion of the design development, the design documentation is compiled. The design documentation shows the evolution of the designs and the decisions made throughout the planning and evaluation phase and the documentation phase of the capital investment project. This document serves as a set of instructions for the builders in the implementation phase of the project. The design documentation is regularly a combination of A3 and A4 pages of both text and drawings and can reach over 1000 pages (Sivathasan, 2001).

4.1.5 Implementation Phase
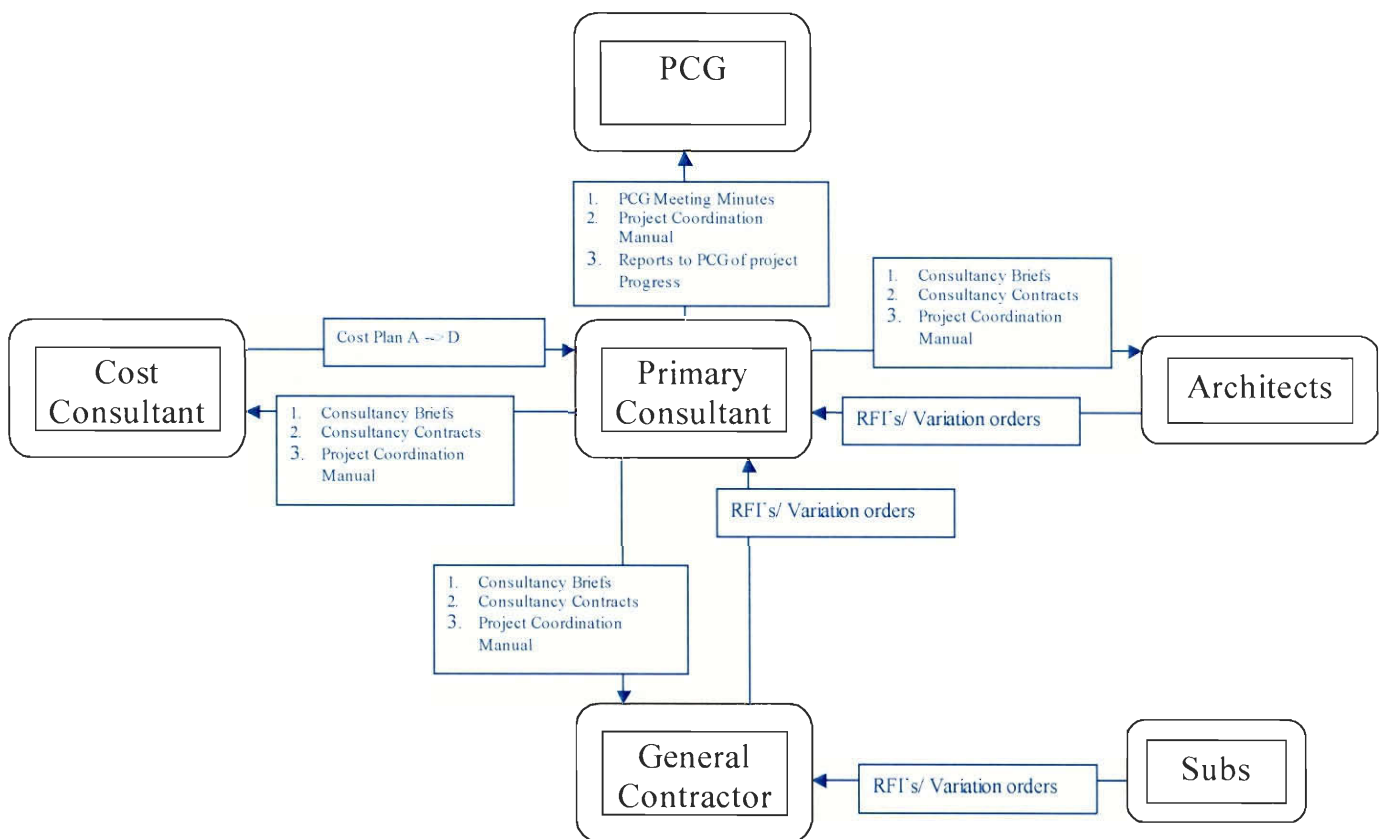
Figure 4.5: Information flow through the Primary Consultant

After the design phase of a capital investment project has been completed the project goes out to tender. After the tendering process is complete, the composition of the PCG changes so that it can focus on the construction of the facilities. There will

be more consultants and architects attending the PCG meetings and in some projects there will be a new principal consultant

After construction has commenced, it is important to note that the transfer of information becomes much less formal. In fact, the only things that continue to be formal are meeting minutes and monthly consultant reports. Meeting minutes are taken at every formal meeting during all phases of a capital investment project (PCG meetings, site meetings, and sometimes user group meetings). As mentioned in the Project Control Group section, before each PCG meeting, all the consultants collectively compile a formal monthly report. Each of the consultants, be it the quantity surveyor, the architect, or any other consultant, prepares a report focusing on his or her own particular area. All of these reports are summarised into one report and this report explains the current project status as well as any issues that may need to be resolved. The individual consultant reports are included in the appendix of the master report. Monthly reports are generally around 100 A4 pages and may have a few folded A3 pages.

During the implementation phase of a project, the general contractor is responsible for holding fortnightly site meetings in order to deal with the management of the construction process. The principal consultant and the general contractor as well as any other parties that have a keen interest in the topics being discussed during the meeting are usually in attendance. As mentioned earlier, meeting minutes are also kept at the site meetings (Steele and Langdon, 2001).

Although meeting minutes and monthly reports provide a formal medium for communication after the tender process, the bulk of the information flow happens informally through Requests For Information (RFIs) and change orders. Any request for information is termed an RFI. For example, an RFI can be as simple as a

contractor asking the cost consultant how much money they are able to spend on the floor tiles. A change order is issued when an obstacle is encountered during the construction of a building that forces a deviation from the original designs (as specified in the tender). This process is often much more formal than the RFI process and involves more people. Usually the principal consultant should approve the change, then the architects and cost consultants will be notified of the change and finally the new design will be given to the proper contractors. Because the Victorian government engages consultants through competitive bidding and there is no industry-wide standard for creating RFIs or change orders, this process will be different from project to project (Byrne, 2001).

4.1.6 Operating Phase

When construction is complete the operating phase begins. During this phase the facilities are in regular operation. Twelve months after the opening of the facility, a Post-Occupancy Evaluation (POE) is conducted. The POE is a review of the facility by an outside consultant to ensure compliance to codes and standards (Kimber, 2001). When the POE has been conducted the project is complete.

4.1.7 Efficiency of This Process

From the interviews with the project managers there were some common conclusions drawn about the efficiency of the process. Although a few project managers feel that this process is flawless, the majority of them agree that there are some key inefficiencies. These inefficiencies include the proposal phase being too slow, the approvals holding each other back, the paper trail being difficult to deal with on large projects and unwanted political involvement in the project.

During the proposal phase many of the program members take a lot of time to finalise the service plan. Often, the service plan does not get completed until the

planning and evaluation phase is halfway done. This causes a large slowdown in the process because the planning and evaluation phase is supposed to build on top of things done in the service plan. If the service plan is not complete, then the creators of the new documents have to do extra work to create the details from the non-existent service plan.

The approval process can also hold back the process. It is not uncommon to find a document that has been approved by one or two of the necessary parties while the third does not approve the document. Then the document gets updated and resubmitted for approval and this time one of the parties that originally approved it does not like the changes and does not approve it this time. This can become a long and drawn out process that holds a project back.

In addition to the slowness of the proposal phase and the complexity of the approval process, on large projects the paper trail may be difficult to track. In short, large projects produce many versions of documents and when the government has to produce an audit trail it is can be hard to organise.

Finally, political involvement can cause problems in a capital works projects. For example, a member of the government may promise the public a new hospital in a certain area. This puts unexpected pressure on CMB to build this hospital and in most instances there is little time to do so. As a result of the rush, many parts of the process, such as the service plan and business plan, will be skipped and then done later on during the planning and evaluation phase or even during the documentation phase.

4.2   Information Management on a Web Site

The majority of the interviewees who had used WBPA indicated that a web site administrator was put in place to oversee the whole web site. This person was usually the project manager. Their role as a web site administrator is to oversee the site and make sure that the project team members use it correctly. This person also has to make sure that action items are followed through and when the related issues are resolved, the web site administrator has to make sure the item is marked as closed on the web site.

In addition to the web site administrator, the different project parties are also able to access the web site. Each individual is responsible for posting the information that they have authored. The other users will be able to view these documents (if they are given access) but the person who originally posted the document is the one responsible for making changes to it. This does not, however, mean that people cannot download and make changes to the document locally. When people wish to revise a document, they can often download it and mark it up in order to provide feedback to the document author. When they have completed reviewing and revising a document, they can then upload it to the site again. However, this document will be marked as a revised document and not the official version, thus allowing the original author to retain ownership. The specifics of document management will be discussed further in Section 5.2, "Features".

Level	Description
None	Cannot see the folder/document
View	Ability to just view or download the document
Review	Ability to markup, redline and post comments on documents
Post	Ability to post new documents into a folder
All	Ability to view, review, post, move and delete documents

Table 4.1: The different access levels users can be assigned

The figure above presents the different access levels that can be set up for the folders on the WBPA web site. As explained above, it is the responsibility of the web site administrator to set up access levels. These access levels are defined as: none, view, review, post and all.

The "none" access level means that when a user logs on to a web site they will not see the folder in question because they were given no access to it. The second type of access is "view" access. View will allow a user to see the folder as well as download information contained within it.

The next possible access is "review". This access level is similar to the view access, however, in addition to seeing the folder, the user can mark it up and post comments on the document contained within that folder. The next type of access is "post" access, which will allow a user to post a document in a folder. The final type of access is defined as "all", meaning that a user can do all the features described in the three previous access levels plus delete a document in a folder. A user with all access can therefore have access to the folders, they can view the documents contained within that folder, they can download the documents and they can comment and mark them up.

4.3 Social Issues

4.3.1 Intellectual Property

An issue that came across all interviews is that of intellectual property. This topic deals with questions such as who owns the information on the web site and what role the ASP plays in the ownership. For instance, if the contracting company is responsible for hosting the web site then the information resides on their computers (McPhee, 2001). This can become a problem if a conflict arises in the project, because the contractor may refuse to give the information back to the different parties involved. In order to avoid these problems it is necessary to specify in the contract with the different users that "records and files remain the property of the author." (Thorpe, 2001)

Another problem that can arise from using an ASP is the potential loss of information if the ASP goes out of business. Guy Sendy, an architect from Billard Leece Partnership Pty Ltd, mentioned that there was a case of this sort last year where an ASP sold the information of one of its clients to the client's competitors. Although he did not provide information to back this up, it can be viewed as potential problem that should not be overlooked. In order to avoid such a problem, a company can chose to host the software in-house, which means that they have total control over their information (Sendy, 2001).

It must be noted however, that the ASP does not own the information; they are only hosting the information. This is something that should be made clear in the contract with the ASP so that problems such as the one described by Sendy do not occur.

4.3.2 Electronic Data Exchange

Another concern with posting documents on the web site is the validity of electronic signatures. Most states in Australia are in the process of allowing the use of electronic signatures (Kejewski, 2001). This means that in order to post a document containing a signature it must be scanned in. Otherwise, if a person uses an electronic signature they risk running into legal problems later because their document may not be valid. In Victoria, The Electronic Transactions Bill of 1999, under paragraph (a) of clause 10, "only requires that the signature method allows a person to indicate their approval of the information contained in the communication." Furthermore, the clause does not establish a particular signature technology. The reason behind this is so that the law will not have to be revised when new technology is created. For the reasons indicated above, Victorian law authorises electronic signatures so long as they validate the approval of the signing party.

An easy way to avoid any problems of document validity is to post the document and then keep a hard copy containing the signature. This will allow the different project parties to view the information over the web, while knowing at the same time that the document has a legal sign off.

In addition to looking at legal signatures, the Victorian law also takes into consideration electronic files. The Capital Management Branch needs to have a very accurate audit trail for all its projects, which results in many shelves of files. If CMB were to implement a WBPA web site, they could store all their project information on the web site, thus reducing the amount of paper used in the office. The biggest concern with electronic filing is the validity of the files once they are in electronic form. Victoria law states that "If, by or under a law of this jurisdiction, a person is required to retain, for a particular period, a document that is in the form of paper, an

article or other material, that requirement is taken to have been met if the person retains, or causes another person to retain, an electronic form of the document throughout that period, where –

(a) having regard to all relevant circumstances at the time of the generation of the electronic form of the document, the method of generating the electronic form of the document provided a reliable means of assuring the maintenance of the integrity of the information contained in the document…" (Electronic Data Transaction, 2000)

This means that CMB can use a WBPA site to keep an audit trail of their information without having to worry about the validity of the documents.

4.3.3 Sensitive Information

A concern from Peter Cox, who works as a cost consultant for CMB, is posting files on the web site that might disclose the formulas his company uses to calculate costs. This could be a problem because users of the web site could disclose this proprietary information to other cost consulting agencies. This problem can be solved by using a read-only format for the document. This would prevent users from seeing anything but the results of the spreadsheet.

It is the consensus between the interviewed cost consultants that contractors should not be given access to preliminary cost plans. Indeed, during the creation of the documents, the numbers are not good reflections of those that will be presented in the final report. In addition, cost consultants will often overestimate the value of certain parts of the project in order to prevent any monetary shortages if the project should change during construction. Contractors should not be allowed to see the breakdown of this cost information because then they will plan with the extra money in mind. If this happens and there is a deviation from the original plans, the project might overrun the budget (Cox, 2001).

4.3.4 Computer Access and Literacy

Another problem that a majority of the users of WBPA encountered deals with computer literacy and computer access. Most of the consultants and head architects involved in the projects managed by WBPA were fairly computer literate and had reasonable computer and Internet access. Most problems arise from the subcontractors because they do not use computers often, which means that it is harder for them to participate in WBPA systems. Adequate training, according to one WBPA consultant, should eliminate this difficulty (Kejewski, 2001). Some interviewees were not as hopeful; they believed that training is ineffective These interviewees mentioned that experience is the only way to truly learn how to use a WBPA web site (McPhee and Byrne, 2001)..

In locations such as rural areas where high-speed Internet access is not available, access can be a problem because people will often only have access to the Internet through a modem. A slow connection to the WBPA web site makes it difficult for project team members to use as a management tool. A slow connection could make it hard to transfer documents over the Internet when this is the primary means of collaboration (Thorpe, 2001). This is also an obstacle on construction web sites (even in the city) because the only way to connect to the Internet may be over the phone and most contractors do not even have computers on site (Byrne, 2001). Perhaps mobile Internet connection will solve this problem in the future.

4.3.5 Culture Change

In addition to discussing poor computer access and low computer knowledge, David Thorpe and Antony McPhee also mentioned the problems that occur with culture change. A culture change can be described as a shift in the way business is

normally conducted, hence a change in corporate culture. The resulting culture change usually makes people reluctant to try using WBPA because they view it as just another system that will take up valuable time. This time, they believe, can be better used for working with people rather than working with electronic systems (Buttery, 2001).

Also, implementing a new system is something that takes time. Users need a certain level of experience using a business tool such as WBPA in order to train them not to automatically reach for older methods of communication. Antony McPhee noted that he encountered problems because some of the people he was working with on a project were not used to WBPA. These people would, therefore, often revert to conventional methods (such as faxes) instead of posting a message on the WBPA web site. It can be really difficult to manage information when part of it resides in hard copy and another part on the web site.

In order to ensure that project participants are not reluctant to use the web site and that they will not forget to use the web site, it must be clear in the contracts with the different parties involved that WBPA will be the management tool for the project at hand, which means that the project team members will be required to use this method at all times (McPhee, 2001).

4.4   Technical Issues

4.4.1   Security

All of the ASP web sites that were examined and discussed with the WBPA users are password controlled. The user logging on is restricted to a certain amount of information. The amount of information a person is allowed to view will depend on their role in the project. As indicated above, project managers have access to all the information because this is necessary for them to correctly manage the project. Subcontractors, for example, do not need all the information contained in the web site. They will therefore be restricted to the information relevant to their specific job.

In addition to being password protected, some web sites have a feature that require the user to log back into the web site if they have not been active for a certain amount of time (this time can be customised). This feature keeps the information on the web site safe even when a user forgets to log off (McPhee, 2001).

The project manager decides what parties can have access to the different parts of the web site. The access to the web site can be limited by company, by documents, on a person by person basis or on a per module basis. The project manager will nominate a person from each project team, and this person will then be responsible for pointing out who should have access to the web site within their organisation (Kejewski, 2001).

Once a user has logged on the web site, he or she will have different access levels to the information. As explained in Section 4.2 "Information Management on a Web Site", these access levels are either none, view, review, post or all. These access levels can be limited on a folder basis, which means that the person accessing a folder will only have access to the documents contained within that folder according to their overall access level to the folder. For example, if the user has view only access, this

means that for all the documents contained in the folder they will only have view access. This is another security feature because this still allows information flow, however it limits the number of people that can print and download the information, therefore limiting the number of people to whom the information could be distributed.

Many of the previous WBPA users (such as Antony McPhee, David Thorpe, Jen Holt and David Lowry) indicated that when a user posts a message or a document they can also limit the access to these documents by indicating for whom they are posting it. This is another measure to make sure that unwanted users do not have access to confidential information.

The Department of Public Works is also using a WBPA tool, however, instead of limiting the view to the different parts of the web site, the department set up view-only accesses. This means that anyone with access to the web site can view all the information posted but they are not allowed to make any changes because they have a view-only access. Only a few people can actually change the documents and download them (Haug, 2001).

None of the WBPA users interviewed found security to be a big issue. They indicated that the measures taken by the software companies were sufficient and they did not think that security was an issue at all once they have correctly set up the users.

4.4.2 Compatibility

Software compatibility is another technical issue that was identified through the interviews with users of WBPA. This area includes such issues as the interoperability of ASPs within different web browsers and the ability to view files as they were originally intended to be viewed.

Another compatibility issue arises from the way the ASP software is written. Some ASP software applications are written for a specific browser. This can create

problems when a user accesses an ASP with a different browser than the one it was meant for. The ASP can take longer to load and some of the information may be altered (McPhee, 2001). Also some ASP software is written for new browsers, which means that if a user is working with an old version he could have trouble using the web site (Niazmand, 2001).

An important issue in the area of compatibility is the problem of file formats. Documents are most often uploaded in the format of the program that created them. Some of these formats include AutoCAD (DWG), Microsoft Excel (XLS) and Microsoft Project (MPF). A problem that is presented when using a web based system is that some people may not be able to view a document unless their computer has the appropriate viewing software installed on it. There are two different methods used to solve this: using document viewers and converting to a common format.

Document viewers are applications that are used especially for viewing documents, and not creating them. In order to solve the problem of not having the program that created a document, a document viewer may be used. If a viewer program is available for a document format, a user can still see the content of a file and not edit it. Some ASPs provide their own document viewers that handle all of the popular document formats. A user only needs to click a hyperlink that loads up the site's document viewer (often a Java application) and the document can be viewed. Some advantages of a system like this are that the viewer doesn't have to be downloaded and installed on the user's system, the supported document formats of the viewer can be constantly updated by the ASP and finally the viewer, if it is a Java application, will be able to run on any computing platform that supports Java.

The second solution to the problem of document formats is to use a common, agreed upon document format for all posted documents. If every user of the system

can view this particular format, then the problem of document viewing will be solved. Many WBPA web sites use this approach in order to maintain compatibility among documents with users. The common format used by almost all web sites is the Adobe Portable Document Format (PDF). Virtually any format of document can be converted to PDF. Furthermore, a PDF viewer is available for almost every computing platform in existence. In addition, a diverse range of files from AutoCAD DWGs to Microsoft Word DOCs can be converted to and viewed as PDF files.

4.5 Uses of a WBPA Site

Users of Web Based Project Administration (WBPA) generally agreed that the purpose of such a web site is to streamline and improve the communication process in a project. Using a WBPA system, a project manager has full control over the flow of information within a project (Kejewski, 2001). In order to achieve this goal, the tools on a web site must be chosen carefully and used properly. This section will summarise the experiences of WBPA users as to what tools are used in order to get the most out of an investment in such a web site.

4.5.1 Document management

The most used tool on a WBPA web site is document management capabilities. These capabilities are used to carry out the usual processes involved in document management only in a quicker, electronic form. A web-based system like this replaces paper-based systems, which for large projects can be difficult to manage and take up a significant portion of a manager's time. For example, in the case of the Austin & Repatriation Medical Centre (A&RMC) project, with a budget of more than AUD$320 million, the site will be used primarily to manage the documents that are passed around by the different parties involved (Crettenden, 2001).

There is a wide variety of functionality in an online document management system. The types of documents that a system such as this can help manage are unlimited. As long as the document is in electronic form, a document management system can support it. Some of the types of documents being managed by these systems include: concept designs, sketches, developed designs, specifications documents, commission documents, monthly reports, meeting minutes, briefs (functional briefs, feasibility briefs, schematic briefs, etc.), cost plans and various drawings (Haug, 2001).

The basic concept behind a web based document management system is the organisation of documents into a system where they can be controlled and audited by a central authority while being viewed and commented upon by people with vested interests in the documents. This is achieved by using a server to store electronic copies of documents. While the server stores the actual document, the WBPA software stores information pertaining to the document, such as its main contact person, its status (working draft, waiting for approval, approved, etc.) and its revision number. As discussed in the above section, "Security," various project parties are given permissions on the document, such as read-only or read-write, depending on their role in the process.

One of the most basic uses of web based document management solutions is as an archive of project documents. By having a central repository of project-related documents, the parties that are interested in particular documents have instant access to them. Instead of waiting for documents to be sent via post or wading through stacks of hard-copy documents, a quick query to a web based document management system will simplify access to important project documentation. Indeed, many ASPs offer a search function such as this.

A system such as this has far more uses than a simple repository of information. When a document is posted onto a web site, it can then be viewed by many of the people who have a particular stake in the document. After they view it, users may then post comments on the document in order to provide the author and other interested parties with feedback on the information it contains. This feedback mechanism is a vital part of a web based document management tool.

There are several ways for people to produce feedback for documents posted online. One of these methods, mentioned above, is through posting a simple comment

that is associated with the document's online entry. When the document's information is requested from the WBPA software, the comments are displayed in a format that lets a user see the progression of the comment-reply process. These comments can then be viewed by the document author, who can in turn incorporate the suggestions in the comments into the next document version.

A more advanced way to produce feedback on documents posted online is through a process known as redlining. Redlining, which has its most useful application for drawings, is a way to mark up any document with comments. By using one of the document viewer programs discussed above, an interested party can take a document and produce annotations right in the electronic file itself. Once a user has completed redlining a document, he or she may then upload the marked-up file to the site in order for the author and others to view the comments. Some sites handle the redlining process automatically, with tools such as a Java-based document viewer. Another way to reline documents is through the PDF format. The industry-standard program, Adobe Acrobat, has capabilities built-in that allow a user to redline a document of the PDF format. Once a PDF has been redlined, it can be saved and uploaded back to the site.

The document feedback process provides authors with important comments about the ways to improve their documents. Some sites' document management tools allow for the tracking and controlling of document versions. In these cases, the site will display the newest version of the document in the document list. If a user would like to see a history of the document revisions, he or she may then view the document information to see the complete list of revisions the document has gone through. The old version of the document is then available for the user to download so that they can view the changes that have been made to it by comparing it to the newest one.

This process, the post-feedback-revise process, is the essence of the online document management functionality of project management web sites. The vast majority of users of Web Based Project Administration identified online document management as one of the two most used tools offered by ASPs in the area.

4.5.2 Online Collaboration

Another major use of WBPA web sites is for correspondence and collaboration among project parties. According to some interviewees, using a web based system for communication in a project increases the rate of communication among the people involved (Kejewski, 2001). Some of the tools include features such as message exchange, assigned tasks and To-Do lists.

A feature popular with WBPA users is a system for sending messages on the web site between people on the project. When a person wants to send a message to one or more people involved with the project, that person opens a new correspondence. These correspondences can be addressed to one or many of the people with access to the project web site. Aside from entering a text message, the author can attach files, assign due dates associated with the correspondence and also assign it a status. When the note and/or files are sent, the addressees receive an email notification that a new message has been addressed to them. Some WBPA systems will even notify the recipients via their mobile phone or pager.

Once a user has been notified of a new correspondence, they must log into the web site in order to receive it. There are several reasons for this. When a user logs in to the web site, the software can then record that they have received and looked at the particular message. This allows the author to keep a close watch on who has looked at his post and who hasn't. Tracking this activity also serves as proof that someone has seen what was sent to him or her. Another reason for requiring users to

correspond on the web site instead of simply using email is to keep an accurate history of flow of communication. This history provides a recorded sequence on a specific topic and will allow someone to sort through or search correspondences in order to see at a glance how issues were raised and problems solved.

The group communication on a WBPA web site may provide a method to perform the Request for Information (RFI) process online. When a project party originates an RFI, he or she creates a new correspondence addressed to the appropriate people. Many tools have an option to assign a date to a correspondence, which specifies the when the correspondence must be answered. This date can be used to provide a due-date for a particular task. Many history tracking tools allow an RFI author to ascertain when the addressee looked at the RFI, or whether he looked at it at all. This will force the addressee to be accountable for an RFI assigned to him or her.

There are many other collaboration tools available on WBPA web sites. One of these tools is a To-Do List. Like an RFI system, managers are able to assign tasks to members of a project team. There are also notice boards where web site administrators are able to post messages that every member of the project group will be able to see.

One widely used collaboration feature is the daily summary. This tool is usually the first thing most project parties see when they log into the WBPA web site. It presents the user with a concise summary of the communication and action that is currently taking place. For example, there is a summary of the outstanding tasks the user may have together with their due-date and a short summary. Also listed may be a summary of new correspondences or RFIs that may have been addressed to the user. Also shown in the daily summary may be information such as project activity logs, a list of people who have viewed a user's correspondences with them, and a summary

of the newly posted documents. A system such as this allows a member of the project team to get an at-a-glance look at the status of the project.

In some WBPA users' experiences, WBPA correspondence features were the most used tool on the site (Thorpe, 2001). By streamlining and speeding communication in a project, people are kept informed of what is going on, what they need to do, and when.

4.5.3   Other WBPA features

Aside from the two tools mentioned above, WBPA web sites offer several other tools to help better manage the construction project process. These include schedule and calendar features and budget tracking features.

Some previous users of WBPA used the scheduling feature in order to keep track of important events during the lifetime of the project. Many sites have a module for a shared calendar where everybody can see what is scheduled for the project. The level of detail could be anywhere from the start and end dates to important milestones to specific site meetings. The site administrator decides upon the level of detail. Many times, the scheduling features are used to track major project events rather than personal events because people tend to use their own calendar and personal information management software. There are, however, tools available from some web sites that allow people to synchronise their web site calendar with their desktop scheduling software or their PDA.

Some web sites offer tools that allow project managers to manage and track a project's budget. However, these tools are not widely used since many projects require a level of sophistication in their budgeting that is simply not currently offered by web-based software. Many companies have highly sophisticated budgeting and

cash flow systems already in place. For this reason, ASP-provided budget tools are

hardly ever used.   85

Finally, there are web site tools available to aid in the tendering process for

projects. None of the WBPA users that were spoken to actually used one of these

tools. There is one major reason for this that was presented in the interviews:

security. The issue with the online tendering process is that the information is highly

sensitive. Many people feel that they are simply not ready to trust a system that can

perceivably be broken into and eavesdropped upon. The chance of corporate

espionage is too great in people's eyes, even though there are measures in place to

combat such activity.

4.6 Summary

The preceding discussion addresses the five major categories of information obtained through interviews with users of WBPA, non-users of WBPA and WBPA consultants. The area of information flow, addressed mainly through interviews with DHS employees, identified the main phases of a construction project and the documents that are exchanged during these phases. Through interviews with previous users of WBPA, the remaining four information categories were addressed. Information management was discussed in terms of who is responsible for the information that is posted on a WBPA site. Social issues were discussed from both a legal and personal standpoint. A range of issues from intellectual property management to the culture change associated with doing business on the web were presented. Technological issues were also taken up, including computer and Internet access as well as site security. Finally, this chapter presented the current practices of WBPA site usage from an industry standpoint. It addressed two major tools, document management and online collaboration, as well as some of the less-used tools such as group scheduling. This chapter, taken in its entirety, provides the necessary background for the project team to plan an implementation of WBPA for the Capital Management Branch.

5 Specifications

Section 4.5, "Uses of a WBPA Site" described the different features offered by Application Service Providers (ASP) and how to use these features. This section will focus on the features that are necessary for the management of capital investment projects. Based on the data collected from the interviews presented in Chapter 4, "Results", the project team created the implementation specifications outlined in this chapter. These guidelines are meant to explain what functionality CMB needs in a WBPA web site, how CMB should use a WBPA web site to manage capital investment projects and how an ASP should be chosen for them.

5.1 Hosting Options

The project team's recommendation for hosting the software responsible for running the web interface to the WBPA software is for CMB to outsource it to an Application Service Provider (ASP). This conclusion was reached based on the following analysis of the advantages and disadvantages of the two available options.

The first option for hosting WBPA software would be to install it locally on the servers located at the Department of Human Services. One advantage of doing this would be that DHS has complete control over the software and its deployment. By having the software on their servers and assuming the necessary expertise is available, DHS could be able to make minor modifications to the way it looks and acts without having to contract out a third party to do this for them. A second advantage of hosting the software locally would be that for people internal to the department's network, the access speed for the software may be many times faster than if it had to be accessed over the Internet. Finally, when the software is stored locally on DHS's servers, the department would have full access to the underlying database that holds all of a project's information. By having this access, DHS could backup, copy or archive an entire project at a moment's notice.

Outsourcing the software hosting by the use of an ASP has its advantages, as well. The major advantage is that the department would not have to provide the resources for upgrading, maintaining and supporting the software themselves. This type of service is including in the subscription price of the software. Whenever an ASP wants to upgrade their WBPA software, they only need to do it on their servers and all of their customers receive the upgrade automatically. By outsourcing the service to an ASP, the department does not need to buy any new hardware or software in order to run the software themselves. The ASP takes care of this by maintaining

their own hardware and scaling it up as the demand on their servers increases. This is all transparent to the subscriber. By outsourcing WBPA services to an ASP, there is an organisation to hold accountable for backing up information and making sure that the site is always up and running. A subscriber to the service, such as DHS might well be, does not have to dedicate any resources to maintenance such as this.

As discussed above, the major disadvantage to hosting a WBPA web site internally to the department would be the major cost in resources that need to be dedicated to such an endeavour. Staff must be ready to maintain and support the site on a moment's notice. With so many people depending on the site for their day-to-day work, the WBPA software and its supporting infrastructure would become a mission-critical resource. The increased load on the DHS internal network would also be a major disadvantage to hosting the site internally. With many outside parties accessing the site 24 hours a day, the department may experience a major drain in network speed. This is because people would be transferring files to and from the site on a regular basis. People from all over the country, including consultants, regional offices, user groups and the general public would be accessing the site constantly. The magnitude of this traffic would severely limit the speed of the network DHS has today.

There are also a few disadvantages to having an ASP host WBPA software for the department. The first of these is that all traffic would need to travel over the Internet in order to facilitate the use of the software. The reason this is a disadvantage is because a user might experience slow-downs due to the fact that Internet traffic has to make it through several servers all over the world in order to reach a final destination. A slowdown on any one of these servers could cause delays in communication. A second disadvantage of having WBPA software hosted over the

Internet is the perceived security risks involved. Some people may not feel safe transferring "sensitive" information over the Internet and to an unrelated third party. Several ASPs combat this concern by the use of various measures to ensure that communication is encrypted so as to thwart potential eavesdroppers.

There is a third option for hosting the WBPA software, which is to require that the principal consultant be responsible for hosting it. This would not be recommended because consultants would typically not have the resources (discussed above) to support such as site. If a consultant firm were mandated responsible for hosting the site, their best course of action would be to turn around and outsource it to an ASP.

Based on the analysis presented above, it is quite clear that the best way to implement WBPA for projects managed by CMB would be to outsource it to an ASP, at least initially. It is far easier for the department to trial the system with an outsourced host than to immediately dedicate resources to support it. Furthermore, an ASP already has the infrastructure necessary to support this system and is already prepared to adapt in order to handle all of the web site traffic.

5.2 Features

5.2.1 Mandatory Features

In order to satisfy the needs of a capital investment project managed by the Capital Management Branch (CMB) of the Department of Human Services (DHS), an ASP's software needs to satisfy the following requirements:

- Facilities for document management

- History tracking and version control

- Correspondence capabilities

- Security at both global and document levels

- Regular backups of the information on the site

- Ability to supply the entire project database to the customer

As explained throughout this document, CMB is responsible for managing construction projects within DHS. From the proposal phase through the implementation phase, CMB works with a series of different documents and corresponds with various project team members. In order to facilitate this flow of information through an ASP, it is necessary for the ASP software to offer a document management system. This system should have features such as version control and history tracking. When a user posts a documents, the other users that have access to it should be allowed to view it and mark it up. The ASP software needs to store these comments and mark-ups.

In addition to tracking comments, the ASP software needs to be able to provide version control. When a user post a document, the document will be version one, and as the document gets improved and posted again, it will be posted as version two, three, four and so on. The software needs to show the most recent version while still allowing the users to view previous versions.

In addition to managing documents, the ASP software should allow the project parties to communicate with each other as well as keep track of this communication. This can be done through a correspondence tool, which allows the project team members to communicate when they are not scheduled to meet in person. The correspondence tools should archive previous messages on a specific topic. The users will then be able to go back to the web site and read how an issue was handled or simply learn the status of a particular issue.

Many of the documents prepared for the construction of a building with CMB are not to be viewed by the whole project team. Therefore, when a project team member posts a document, he or she needs to be able to limit the access to this document. The ability to limit the view of individual documents is called per-document security and this is also a tool that WBPA software needs to offer in order to be considered for use by CMB.

The access to the web site should be limited on a user group level, if possible on a user-by-user access. The site should allow the administrator to control all levels of user access. It is essential that the web site access can be limited at least on a group level because the different project parties accessing the web site should not be able to see all the information contained on the web site. The project team members should be limited to the information and functions that are required for them to do their jobs. As explained in Section 4.2, "Information Management on a Web Site" (see Table 4.1), there are different types of possible accesses: none, view, review, post and all. It is with these types of access levels that users and user groups should be able to access the web site.

The ASP must also ensure that its system is backed up appropriately so that none of the project information can be lost. The ASP should backup their information

at least on a nightly basis. The ASP should also use server redundancy so that if one server goes down another will take over, thus allowing for uninterrupted work on the web site.

CMB is part of a government branch and for this reason CMB is required to keep an audit trail. The ASP can also facilitate this audit trail by providing the project database at the end of the project. It is essential to CMB that the ASP chosen has the ability to provide this electronic database so it can satisfy the audit requirement. As well as having the ability to obtain the data held on the project web site, it is also important that this information can be kept in a form that will be accessible in the future. For example, it is safe to assume that information held in databases or in HTML format on CDs will be accessible at least for the next five years. Also, once a new storage medium is introduced, CMB may be required to convert the CD. This, however, should not be a problem.

5.2.2 Optional Features

In addition to these mandatory tools, an ASP's software can offer additional features that help manage a construction project but that are not necessary to the project's success. These tools include a calendar function, a Request For Information (RFI) system, document viewers and per-module security.

A calendar feature is useful in project management because it allows users to keep track of their appointments and it allows them to set up meetings with other users. It is important to keep in mind that many companies already have their own electronic journal systems and may be more likely to use their own calendar features over those on the web site.

A built in RFI system is also useful, especially during construction. This feature, however, is not mandatory because the correspondence feature should allow a

user to submit an RFI when there is no specific RFI system in place. A specialised RFI system would be beneficial because it may offer features specific to RFIs that may not be in a general correspondence module. These may include respond dates, special reference numbers or special status indicators specific to RFIs.

In addition to these two features, a document viewer can be very useful. This tool allows the user to view all the documents posted on the site (as long as the user has been given read-level access to these documents) regardless of the document format. If a document viewer is not available for a particular format, a user may be unable to view documents in that format at all.

Per-module security allows the web site administrator to limit the use of the web site's tools to individuals or groups. By limiting the tools the different users see to the tools that are necessary for their job, the web site becomes less confusing and easier to use.

This section has explained the different tools CMB needs to manage a construction project using a WBPA web site, as well as the tools that are helpful to this management process without being essential. The following section will go into greater detail about the criteria that were created to evaluate the ASPs following the guidelines explained above.

5.3 Criteria for Choosing a WBPA solution

In order to select the most appropriate software solution for the key stakeholders involved in capital works projects with DHS, a decision matrix was used. The decision matrix and the process by which it was utilised will be covered in detail in Section 5.5, "ASP Selection". This decision matrix rated eight major categories composed of aesthetics, usability, cost, configurability, security, expandability, features and training.

5.3.1 Usability

The purpose of this category is to determine how useable the WBPA system is. Usability has been broken down in to four major sub-categories: easy to learn, response/download time, professional interface and navigability.

Is it easy to learn how to use the ASP software?

It is very important that the ASP software is easy to learn to use because this will reduce the effort it takes to begin using it. This category is a subjective opinion on how long the person evaluating the web site feels it would take to become proficient in the use of the software.

Does the WBPA web site download quickly?

In evaluating this section it is important to take note of the use of frames as well as the use of graphics. Frames help minimise the amount of information that is downloaded each time a hyperlink is clicked by only having to download a section of the page rather than the entire page. In addition, by avoiding the use of large graphics the site will also download quicker. Both of these things will speed up the navigation of the site. Last but not least, it is important to keep in mind the use of Java applets in the WBPA software. An applet is a program that is built into the web site. Every time someone goes to a web site that uses an applet they have to wait while the applet

downloads and executes. The alternative to using an applet is to have a plug-in. A plug-in is a program that is downloaded once (this usually will be a larger download than the applet counterpart) and then only needs to be executed when the user visits the web site. One major draw back to using plug-ins is that they are very rarely cross-platform compliant. For example, a plug-in that runs on a Windows-based machine probably will not run properly on a Macintosh, Linux or Unix-based machine. As well as considering the use of frames, graphics, plug-ins and applets to evaluate the download time, the system response time was considered. This means that if a button or hyperlink is clicked and there is little or no delay before the desired action takes place, the download time is good. If there is a considerable delay and the user has to wait for the web site to respond, then the download time is poor.

Does the ASP software look professionally designed (Does it avoid the Seven Deadly Temptations)?

Similar to the preliminary ASP web site reviews, the ASP software systems were graded on their ability to avoid the Seven Deadly Temptations of creating a graphical user interface. If the ASP followed these guidelines when they created their WBPA system, it should be very easy to use and intuitive to manage.

Is the site easily navigable from one place to another?

In evaluating this sub-category, to the evaluator noted how difficult it was to navigate from one part of the site to another in addition to how difficult it was to find the different tools offered by the software. If a web site is easily navigable, a new user should be able to find their way around the web site with little difficulty. When evaluating the ASPs software, the software packages that were intuitive were given a high grade, while the ones that were difficult to understand were given a poor score.

5.3.2 Aesthetics

Is the ASP software visually pleasing?

This is a subjective category that simply indicates if the evaluator felt that the ASP software "looks good".

5.3.3 Cost

Is the commitment to using the ASP software flexible?

This consists of determining the length of the contract with the ASP. The ASPs that allow subscribers to work on a monthly basis or on a project basis were given a high score, while ASPs that require their customers to be tied down in a contract for a fixed period of time received low scores.

How much does it cost to use the ASP for 1 project?

Based on the information received from the ASP, the project team calculated the cost of one three-year project with 25 users. This number was compared to the price of the other sites. The least expensive site was be given a perfect score in this category, while the most expensive was given the lowest score. The rest of the ASPs were ranked on a linear scale ranging from the least to the most expensive.

How much does it cost to use the ASP for 100 projects?

Similarly to what was done above, the project team calculated the cost of 100 three-year projects with each project consisting of 25 users. This number was then compared to the price for the other sites. The least expensive site was given a perfect score in this category.

5.3.4 Configurability

Configurability is a measure of how difficult it is to administer the WBPA web site and apply the web sites' tools to the needs of the users. In determining this, two

categories were chosen: configurability of the tools and difficulty of configuring these tools.

Can the existing modules be configured to the way a capital investment project works?

For this category, the person evaluating the software decided if the ASP software can be configured for CMB while administering a project. The reviewer takes into account about the functionality of the feature set, security, usability and expandability and assigns a number based on how well he or she thinks the site can be configured for the needs of CMB.

Is the configuration process intuitive?

This category rates the software according to how difficult it is to customise the ASP software to the needs of a specific project or user. For example, although there may be a template WBPA web site format, the needs of the users will change from project to project and the WBPA web site will have to change to accommodate their needs.

5.3.5 Security

The issue of security and intellectual property pertaining to the information on the web site is a topic of interest for the people who use systems like the ones reviewed in this project. Security issues were broken into five categories: general public access, user group security, individual security, module security and document security.

Is there a section of the web site that is accessible to the general public?

Since this WBPA system will be used for managing human service projects, it is important to keep the public aware of the progress being made.

Can the ASP software support different user access groups?

One of the goals of the WBPA system is for it to be easily configurable so that little or no training is required to administer the web site. One way to ease the process

of setting up access privileges is to have the ability to make user groups. User groups allow the administrator to give an entire group of people a set of default privileges.

Can an administrator configure access on a user-by-user basis?

In addition to being able to have user access groups, it is important that a WBPA system has the ability to have individual security. Individual security allows the system to be far more flexible as well as allow the system to expand to adapt new features in the future. For example, if a user needs to use a feature that his group isn't generally allowed to, a system administrator can assign this access if the site provides user-by-user security.

Can an administrator configure security on a per-module basis?

The ability to hide certain features from certain users is valuable for two reasons. First it is important that a WBPA system is simple by only showing the features a user needs to use. Being able to hide certain tools of the web site from people that are not going to use them makes the web site much easier to use. Also, it stops users from knowing what they do not have access to.

Can an administrator configure security on a per-document basis?

Similar to the need for per-module security, it is important that there is per-document security because it allows people to post a document so that only the appropriate people get to see it. Again, this will cut down on the unneeded information that people see.

5.3.6 Expandability

While choosing a WBPA system, it is important to consider the current needs of the users as well as their future needs. The four areas in this section address the most important expandability issues. These areas are: custom features, storage,

availability to purchase the software that runs the web site and web site improvements.

Can custom features be added?

In the event that the key stakeholders using the WBPA web site decide that it would be helpful to have a new feature on the web site, it would be beneficial if the ASP could develop that feature for them. This is not a mandatory requirement for an ASP, but it is a very nice benefit.

Does the site offer as much storage as CMB needs?

For large projects (above $5 million), there are rarely more than 2000 final pages of text documents. A standard MS-Word 2000 document created for a capital works project takes 18 KB + 10 KB * (# of pages). Therefore, twenty 100-page Word documents would take up approximately 20 MB. In addition, a typical CAD drawing created for a CMB project takes up slightly less than 1.5 MB. Large capital works projects usually produce about 30 CAD drawings taking up about 45 MB. As well, pictures may be posted to the web site. A series of 10 pictures taken once a week saved as JPEG format (compressed pictures), will take up approximately 750 KB. If this is done every week during construction and construction takes 100 weeks this will take up 75 MB of disk space.

It is also very important not to overlook that a good WBPA web site will have a version control feature. Version control features keep old versions of files so that there is a constant history of the work done on them. Since there is an estimate of 20 MB of text documents and 45 MB of drawings there is a total of 65 MB for each version of the files. If there are 7 versions of every document and CAD drawing, this makes another 455 MB or 530 MB in total for all of the files. In addition to the space required for the document files, it is important to include space for the comments and

discussions made on the web site. Therefore, an estimate of 1 GB of space for each project should be sufficient (Edgar, 2001).

Can the ASP software be purchased and installed locally?

Since ASPs are usually priced on a per project, per user or per Megabyte basis, the more an ASP is used, the more it will cost. Therefore, if DHS uses an ASP for all its projects, it may be more cost effective to buy the WBPA software from the ASP and host it locally.

Is the site being actively developed?

It is important to understand that WBPA is a relatively new idea and is not a mature technology. If an ASP is in the process of developing new features then it is to the ASP users' greatest advantage because the software will constantly be upgraded, incorporating better features.

5.3.7 Feature Set

The feature set of the ASP software is one of the most important things to analyse during the software reviews. This is what determines the functionality of the software. The feature set has been broken down into ten categories consisting of document management, correspondence, history tracking, scheduling, backups, software integration, RFI system, document viewers, the ability to obtain the database and the ability to integrate with other ASPs.

Does the web site offer document management tools?

It is vital to the functionality of the WBPA web site that the users are able to post documents, collaborate on documents, track the changes that they made to the document and show the previous versions of the documents.

Does the site offer correspondence features?

Correspondence features are also very important for WBPA. These features include the tracking of email communication, the use of bulletin boards, instant messengers, chat rooms, assigned tasks and a history of these correspondences.

Does the site offer history tracking?

In addition to document management and correspondence features, history tracking is also very valuable. History tracking allows the web site administrators and the users that have access to this feature to look at the different correspondences that went on surrounding certain issues and documents. In addition, the most important use for history tracking is the ability to see who has looked at what documents. This is can be a useful tracking tool because it allows the person who posted to document to see if anyone has looked at it. In addition to being able to see who has viewed specific documents, ASP software should also allow correspondence and RFI tracking. This will allow a user to access all of the information available on a topic so that they can understand where an issue stands or so that they can understand why certain decision were made.

Does the site have scheduling capabilities?

Many WBPA web sites have scheduling capabilities that help remind the users of milestones in the project and allow them

to schedule meetings with each other.

Is there a way to backup the information on the ASP?

The information stored on the web site is very valuable and must be kept safe from the never-ending danger of computer malfunctions. Because of this, it is important to know how the ASP protects this information. In addition to having redundant servers, many ASPs have multiple ways to backup the information on the web site.

Does the ASP integrate with software that CMB uses?

Software integration is another added bonus that a WBPA web site could have. For example, if a WBPA web site could integrate with Lotus Notes (a major software package that DHS uses) so that the calendars were synchronised and the email was interconnected; this would be very useful. Similarly, it is very useful when the web site calendar integrates with the user's Personal Digital Assistant (PDA) software or is able to send notifications to people's mobile phones and pagers.

Does the WBPA software have a way to implement an RFI system?

Requests For Information (RFIs) are a major part of the communication after the tender process in capital investment projects and it would be advantageous to have an automated system for handling these RFIs.

Does the WBPA web site have its own tools for viewing CAD drawings and other documents?

Document viewers allow anyone with access to the WBPA web site look at all of the documents regardless of what software they have on their computer. This will be extremely helpful for most of the agencies since they may not have the same software for typical word processing and spreadsheet files and most likely do not have any CAD viewing software.

Is there a way to get the database of information from the ASP?

If CMB starts using an ASP and later decides that they no longer want to use that ASP, it is mandatory that they will still have a way to access the information from previous projects to satisfy their audit trail requirement. In addition, it would make sense to archive the project information for finished projects at DHS instead of paying an ASP for the disk space.

Is this ASP software able to integrate with other WBPA ASPs?

If a consultant is already using a different ASP and DHS is using a WBPA system for all its projects, it would be very helpful for the WBPA system that DHS uses to integrate with the WBPA system that the consultants are already using.

5.3.8 Training and Support

The final major topic of interest while reviewing an ASP is what type of training and support it offers its customers. This topic has been broken up into five sub-categories consisting of on-site training, documentation, telephone support, help provided with the implementation of their software and remote training.

Does the ASP offer on-site training?

Since the majority of the ASPs that were reviewed are primarily US based companies, it is important to take note if they offer on-site training in Australia.

Is adequate documentation provided with a subscription?

It is necessary for the people responsible for maintaining the web site to have a good reference to consult if any confusion arises.

Is phone support offered 24 hours?

This question is mainly focused at US based ASPs because it is very important that the ASP provides phone support during the regular business hours in Melbourne.

Does the provider help ease the transition to WBPA?

As discussed earlier, there may be some culture shock while moving from a paper-based system to an electronic WBPA system and any help that an ASP will provide is more than welcome.

Does the ASP offer remote training?

In many cases, it is not feasible to conduct on-site training or phone support to train members from agencies or consulting firms. It would be very useful to have some sort of remote training program for these situations.

5.4 Setting Up the Web Site

This section focuses on the web site and the way it should be set up for the different access groups. The different access groups this section describes are summarised in Table 5.1 below. Table 5.2 at the end of this section summarises the information presented here into a concise table.

Group Name	Description
PCG	Everyone on the Project Control Group
➤ Principal Consultant	The Principal Consultant
Agency	People representing the Agency
Region	People representing the Regional office
Program	People representing the DHS Program(s)
CMB	People representing the CMB
Consultants	Consultants working in the project
➤ Quantity Surveyors	Quantity surveyors
➤ Architects	People at the architects office
➤ Contractors	Contractors working on the project
User Group	People from the Agency's departments

Table 5.1: Recommended user access groups

5.4.1   The Public

CMB needs to have a public web site for its projects in order to inform the community about the building being constructed. This web site should include a virtual 3D model of the facility, pictures of the construction progress (during the implementation phase), a high-level schedule explaining the major phases of the construction and finally a description of the services that the facility will offer.

5.4.2   The User Group

The user group should have access to 3D models as well as CAD layout and plans of the facility. They should be able to view these drawings at any time in order to gain a better understanding of the building being designed. The access to these drawings should allow the users to review the design for the building before a user group meeting, allowing them to be prepared with comments for the architect when the meetings takes place.

The user group should also have access to online room data sheets so they can fill them out at their ease at the appropriate time in the planning phase. In addition to these documents, the user group should have access to the schedules for the construction, as well as the meeting minutes that were taken from the previous user group meetings.

The user group should be able to view the different documents listed above without having any editing rights on the documents. They should, however, be allowed to complete the room data sheets, which means that for these documents they need to have editing access. They should also be able to use the correspondence tools to communicate with the architect between user group meetings.

5.4.3 The Project Control Group Members

Each member of the Project Control Group (PCG) should have various accesses to the major documents. These documents include the Service Plan, Business Plan, Planning Brief, Master Plan, Feasibility Study, Functional Brief, Schematic Design, Investment Evaluation Report, Value Management Report, Design Development Report and Design Documentation. The PCG members should also have access to viewing and commenting on the cost plans, the monthly consultant reports, PCG meeting minutes and site meeting minutes.

5.4.4 The Principal Consultant

The principal consultant is responsible for the entire project. As explained in the previous chapter, the principal consultant is hired by CMB to manage the construction project. When the project is under five million dollars, the head architect will play this role.

Because of his or her role, the principal consultant needs to have full access to the web site. Because of their role in a project, it makes sense that the principal

consultant will be the web site administrator. This means that he or she will be responsible for managing the whole web site. The principal consultant will also be responsible for making sure the web site operates correctly and that all of the project team members are using the web site correctly.

The principal consultant will be responsible for determining who should have access to the web site and what level of access this person should be granted. He or she will be in close contact with the program representative, agency representative, CMB project manager, architects and consultants. The principal consultant will establish with these representatives which people from the different project groups should have access to the web site. For instance, the architect and agency will inform the project manager who the different user group members are. This will allow the principal consultant to set these people up as users of the web site.

5.4.5 The Agency

In addition to the major documents listed above, the agency representatives should have access to the cost plans, the Model of Care and user group meeting minutes. These people should be able to use the viewing tools to see the documents they have access to and they should be able to review the documents by putting in comments and corrections.

5.4.6 The Region

The regional representatives do not need to see any more documents than the major documents viewed by the PCG. These representatives should have access to the viewing tools in order to see the major documents. They should also be able to use the editing tools offered by the web site in order to insert comments and edit the documents they have access to. Finally, they need to have access to the

correspondence tools in order to communicate with the other user groups involved in the project.

5.4.7 The Program

In addition to the major documents listed above, people from the program should be able to view more detailed versions of the cost plans that go into the major documents. They also need to have access to the Model of Care.

As with the regional representatives, the program representatives should be able to use the viewing tools of the web site in order view all the documents they have access to. In addition, for the Service Plan and the Business Plan, the program representative should have access to the editing tools to make comments and changes to these two documents.

5.4.8 CMB

Much like the program representative, CMB should have access to all the main documents as well as the detail behind the different cost plans. CMB should also be able to use the viewing tools and editing tools in order to make comments and changes to these documents. It should also have access to the correspondence tools so they can communicate with the other project team members at any time during the course of the project.

5.4.9 The Consultants

The consultants should also have access to the web site. They will have access to all the major documents described in the PCG section above. They should be allowed to use the viewing tools in order to see the documents posted on the web site. The consultants will also need to have access to the correspondence tools offered by the ASP. As stated above, the correspondence tools are an important form of communication during a construction project, especially between meetings. This is particularly true for the consultants, as they put most of the main documents together.

They should, therefore, be able to communicate easily with the rest of the project team to discuss these documents.

5.4.10 The Architects

In addition to having access to all the documents viewed by the PCG, the architects should have access to the user group meeting minutes in order to keep track of the discussion. The architects should also have access to the room data sheets that have already been filled out so that he or she can have a better idea of what the user group desires for their new facility. The architect will need to use the viewing tools of the web site as well as the editing tools so that he or she can make changes to the documents.

It must also be noted that for projects under five million dollars, the architect will serve as the principal consultant. When this is the case, the architect will take on all of the principal consultant's responsibilities including the job as web site administrator.

5.4.11 The Contractors

The contractors should have view access to documents such as drawings and the site meeting minutes. If the contracting company has been hired to do a small portion of the work, its employees should only have access to the portion of the documents that affect the job it is working on.

The contractors will have little access to the web site in general. Their primary use of the web site will be to view drawings and use the correspondence features to discuss RFIs and change orders with the principal consultant.

Table 5.2 below summarises the information presented within this section. On the left hand side of the table is the document folder, or category, that exists within the WBPA system. In the second and third columns, the user access group (see Table 5.1) and its respective level of access is shown.

Folder	Access Group	Type of Access
Public Documents		
➤ *Schedules*	Principal Consultant	Post
	Everyone Else	View
➤ *Pictures*	Principal Consultant	Post
	Everyone Else	View
➤ *News*	Principal Consultant	Post
	Everyone Else	View
➤ *Drawings*	Principal Consultant	Post
	Everyone Else	View
Major Project Documents	CMB	Review
	Region	Review
	Agency	Review
	PCG	Review
	Program	Review
	Consultants	View
	Contractors	None
	User group	None
Meeting Minutes		
➤ *PCG Meetings*	Principal Consultant	Post
	PCG	View
	Everyone Else	None
➤ *Site Meetings*	Contractors	Post
	Principal Consultant	View
	PCG	View
	Everyone Else	None
➤ *User Group Meetings*	Architects	Post
	User group	View
	PCG	View
	Everyone Else	None
Cost Plans	PCG	Review
	Agency	Review
	Quantity Surveyors	Post
	Everyone Else	None
Monthly Reports	Principal Consultant	Post
	PCG	View
	Everyone Else	None
Drawings and Plans	PCG	Review
	Architects	Post
	Principal Consultant	View
	Everyone Else	None

Table 5.2: Types of document access users should be granted

5.5 ASP Selection

As discussed in Chapter 3, "Methodology," the main tool used to analyse the data collected from the reviews of the various Application Service Providers (ASPs) was a weighted decision matrix. This matrix allowed the project group to mathematically and systematically determine which ASP was best suited for the needs of CMB.

Each ASP has a resultant value, between zero and five indicating how well each one meets the criteria that the project group had previously determined. These requirements, broken down into eight major categories, were discussed earlier in this chapter. A final rating of zero indicates that the ASP doesn't meet any of the requirements, whereas a rating of five would mean that the ASP rates perfect. A perfect rating indicates that the ASP exceeds the required functionality, implementing features that weren't deemed absolutely necessary. With a five being a perfect score, this result as an overall score is not expected from any of the ASPs. A more realistic end result for an ASP would be around four, which indicates that the ASP meets the requirements that were set for CMB, and meets them well.

This matrix uses a hierarchical rating system. Each of the eight major categories (features, configurability, cost, security, training and support, expandability, usability and aesthetics) was assigned a percentage (weighting) of the overall rating of the ASP. Each of the eight categories is rated between zero and five as to the level of requirement compliance it meets. This rating (Value) is then multiplied by the percentage of the total it represents, thus obtaining the weighted value for the category. These weighted ratings together add up to the end rating of the ASP.

The project group assigned each of the eight categories a certain weight, based on the perceived importance of that category. Both the feature set and configurability categories were assigned weights of 20%, together totalling almost half of the entire rank of the ASP. Since feature set is the core functionality of the WBPA software, including the tools that are available and the services that go along with these tools, this category is given a large weight with respect to the rest of the categories. Just as important as the features the site offers is the level of configuration that can be done on these tools in order to make them work the way CMB works in a project. Since these two categories together determine the overall usage of the site, they were given the most influence in the final score of the ASP.

The next category, cost, was given an overall weight of 15%. This was decided because cost is an important factor in deciding what ASP to choose. Since the Department of Human Services (DHS) will ultimately be responsible for covering the cost of the service, it was determined that this would be a major issue when choosing which service to buy. However, the cost category was not given as much weight as the two most important categories: feature set and configurability.

The category of security was also given a weight of 15%. Security of a site, although important to the way that CMB works, was not deemed as important as the level of use the site would get (as demonstrated in the feature set and configurability categories). Nearly every ASP on the Internet offers some level of security filtering by requiring users to log in with a username and a password. The security category simply judges the level of control a web site administrator has over what users can see and do. However, if the web site offers limited functionality in the tools available to users, then the security of these tools will not be as important. However, security is

still an important concern, so it is given a weight close to that of feature set and configurability.

Expandability, the next category, was given a weight of 10%. Expandability focuses on how adaptable an ASP's software is to unforeseen future concerns. Since most ASPs have the possibility of being constantly upgraded and reside on servers that are potentially scalable to store mass amounts of data, this category doesn't have as much significance as the core functionality of the software. However, it is important to identify how much a web site's software is expandable, therefore warranting a 10% weight on this category.

The category of usability was given an overall weighting of 7%. This was decided because the usability factor of the WBPA software, although important, was deemed less important than the actual functionality of the software and the level of services offered by the provider. The usability factor is also affected by the level of training a user receives. This is why the training and support category was given a weight of 10% of the total ranking. When a user receives training and support on a product, the usability increases as the user becomes comfortable with the software. If the level of training and support is sufficient, any usability problems will be effectively countered. For these reasons, these two categories have a combined weight of 17%

The final category, aesthetics, was given a weight of 3% of the overall ASP rank. This was simply because, for the purposes of this project, function is more important than form. However, since aesthetics is somewhat important, a site that is exceptional in functionality but lacking in aesthetic value cannot get a perfect score of five.

To obtain the value for each individual category, a second matrix is used. This is the reason why the top-level decision matrix is termed a hierarchical matrix. In the second matrix, shown in Table 5.3, each individual ASP's qualities were ranked and weighted. This matrix was used to determine the value for each of the eight individual categories. In order to obtain the category score, each category is broken down into a series of sub-categories. The explanation and the rationale for the sub-categories that are in Table 5.3 were given in section 5.3, "Criteria for Choosing a WBPA Solution". These sub-categories are in turn given weights that factor into the final value for the major category.

ASP Decision Matrix

Category	Weight	Rank	Notes

Feature Set (20%)

	Category	Weight	Rank	Notes
*	Document Management	30%		
*	Correspondence	20%		
*	History Tracking	15%		
	Scheduling	5%		
*	Backups	5%		
	Software Integration	5%		
	RFI System	4%		
	Document Viewers	10%		
*	Obtain Database	5%		
	Integrate with other ASPs	1%		
	Total	0.00		

Configurability (20%)

	Category	Weight	Rank	Notes
*	Configure for DHS	70%		
	Intuitive Configuration	30%		
	Total	0.00		

Cost (15%)

Category	Weight	Rank	Notes
Cost: 100 Projects	55%		
Flexible Commitment	30%		
Cost: 1 Project	15%		
Total	0.00		

Security (15%)

	Category	Weight	Rank	Notes
	Section for General Public	15%		
	User Access Groups	20%		
	User-by-User Security	20%		
	Per-module Security	20%		
*	Per-document Security	25%		
	Total	0.00		

Expandability (10%)

Category	Weight	Rank	Notes
Custom Features	30%		
Storage	30%		
Ability to Purchase	25%		
Continuous Development	15%		
Total	0.00		

Training and Support (10%)

Category	Weight	Rank	Notes
On-Site Training	30%		
Adequate Documentation	25%		
24-Hour Support	20%		
Help with Transition	15%		
Remote Training	10%		
Total	0.00		

Usability (7%)

Category	Weight	Rank	Notes
Easy to Learn	50%		
Download Quickly	20%		
Professional Looking	20%		
Easily Navigable	10%		
Total	0.00		

Aesthetics (3%)

Category	Weight	Rank	Notes
Visually Pleasing	100%		
Total	0.00		

Table 5.3: Individual ASP evaluation matrix

The weight of each individual sub-category is shown in Table 5.3. Note, however, that some sub-categories are marked with an asterisk to the left of the category name. This signifies that the sub-category has been deemed a necessary requirement in order for the site to be considered In other words, if the sub-category has a rank of zero or one, the site will not be considered for recommendation. That being said, some sub-categories, although essential, have a lesser weight than other, nonessential sub-categories. This is because the essential categories will be taken into consideration no matter how high or low their weighting factor is. For this reason, they were sometimes awarded a lower value in order to allow other (nonessential) categories to have an impact on the ASP grading, even if they weren't absolutely necessary.

Within the feature set category, the two sub-categories "Document Management" and "Correspondence" hold the weights of 30% and 20%, respectively. With a combined weight of 50%, these two required sub-categories rank the basic functionality that a WBPA web site must have in order to be considered for CMB. The essential sub-category "History Tracking" is also given a large weighting, with 15%. This weight is lower than those for document management and online correspondence because the quality of the history tracking mechanism doesn't need to be perfect – as long as it can be done – whereas the document management and the correspondence features should be fairly robust. Two other sub-categories of the feature set are marked as absolutely necessary for CMB. These two are "Backups" and "Obtain Database." If the web site does not have sufficient backup practices, it will not be considered. Likewise, if a web site will not let the user obtain their data back from the software provider, no permanent archive can be kept at CMB and thus the web site will not be considered. The rest of the sub-categories of the feature set

category are given relatively low weights because, although they are useful features, they are not absolutely necessary for the operation of a CMB project.

The sub-categories of the configurability category are divided with 70% of the weight going to the essential sub-category "Configure for DHS." This decision was made in order to make this category an umbrella category, which sums up the overall impression from the other categories into one number – before the final ranking. In an ideal situation, the final rank of the ASP would be proportional to the grade received in this category.

The next category in the individual ASP matrix is cost. The sub-category "Flexible Commitment" was given a weight of 30% based on the fact that someday CMB might want to back out of a contract with an ASP, and they would not like to be locked into a vendor for a specified period of time if they could help it. The other two sub-categories, "Total Cost: 100 Projects" and "Total Cost: 1 Project" were evaluated once every individual review was completed. For each of these sub-categories, the cost per project was computed assuming a three-year, 25 user project on average. (see Figure 5.1 on the next page for the breakdown of costs) Once all of the costs were calculated, the low and the high end of the resulting spectrum were assigned values of 5 and 1, respectively. Then the spectrum was broken into fifths, and the value for each sub-category on each ASP matrix was filled in based on a linear scale.

Cost Per Project
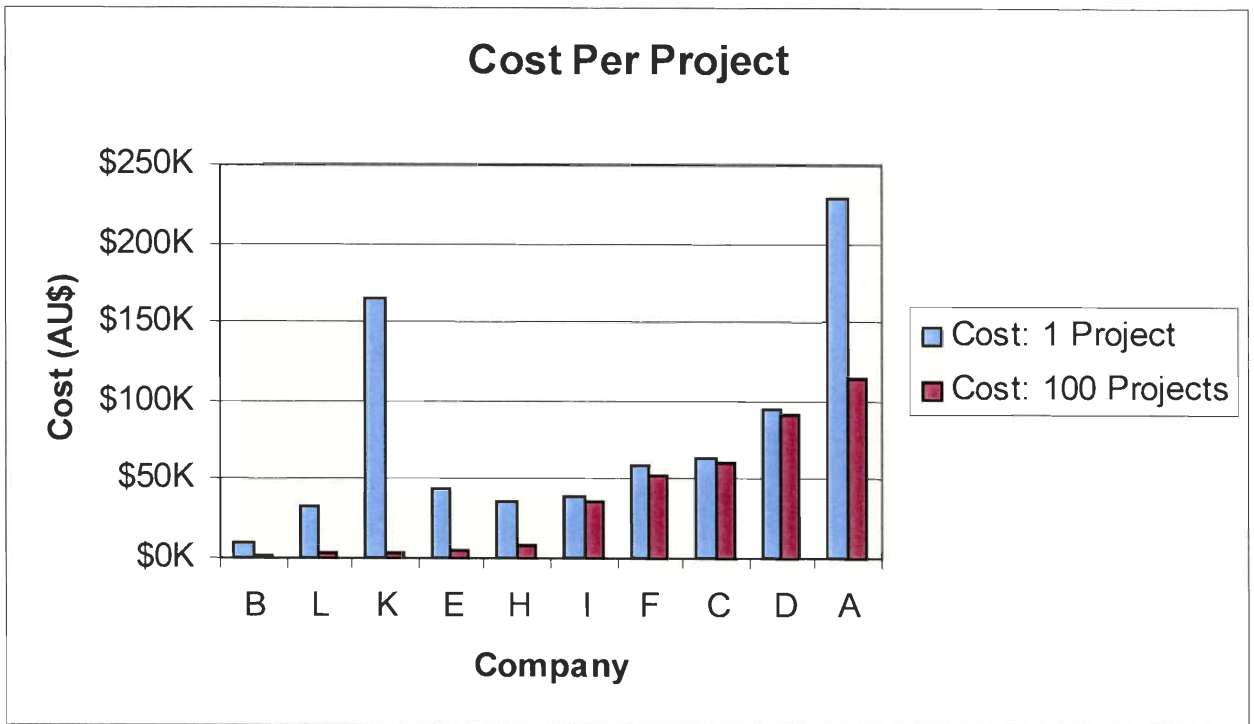
Figure 5.1: Chart showing ASP costs for both 1 and 100 projects

From the numbers above the various ASPs were graded for their costs. The breakdown is as follows:

On a one project basis the grading was done as follows:

- 5: AU$9,480 → AU$53,184: B, E, I

- 4: AU$53,185 → AU$96,888: C,F, H, L

- 3: AU$96,888 → AU$140,592: D

- 2: AU$140,592 → AU$184,296: K

- 1: AU$184, 296 → AU$228,000: A

On a one hundred project basis the grading was done as follows:

- 5: AU$2,298 → AU$24,633.8: B, E, H, K, L

- 4: AU$24,638.40 → AU$4,697,8.80: I

- 3: AU$46,978.80 → AU$69,319.20: C, F

- 2: AU$69,319.20 → AU$114,00,0: D

- 1: AU$91,660 → AU$ 114,000: A

The security category is divided up relatively evenly, with the greatest weight being placed on the "Per-document Security" sub-category. The reason this was made higher than the rest of the sub-categories was because it was decided that per-document security was an essential feature of WBPA for CMB. In this way, the per-document security sub-category can have slightly more weight than the other sub-categories. The "Section for the General Public" sub-category was chosen to take the 15% weight because, although an important part of a web site for CMB, this could always be implemented elsewhere if the need arose.

In the expandability category, the two sub-categories with the highest weights are "Custom Features" and "Storage." As discussed in the previous section, "Criteria for Choosing a WBPA Solution", it has been determined that custom features could be needed if the Capital Management Branch decided to use a WBPA system full-time. Also, storage could be an issue if a large number of pictures and drawings are being passed back and forth among the project participants. If the web site does not provide or cannot facilitate the necessary storage, then this would be severely detrimental to the effectiveness of a WBPA web site. These two sub-categories are assigned weights of 30% while the remaining 40% is split between "Ability to Purchase" and "Continuous Development." The ability to purchase the software is weighted higher than the rate of software development because the need may arise to host the web site on DHS's servers, while a constant rate of development and upgrades is seen as a fringe benefit of using an ASP.

The highest-weighted sub-category under training and support is the "On-site Training" sub-category. This was chosen because it was felt that person-to-person training is a better way to learn a software tool than any of the other two methods listed (remote training and simply reading documentation). A sub-category for help

with the transition to WBPA from the standard way of management was also included, since this feature would be useful if provided.

The largest factor within the final category, usability, is "Easy to Learn," taking up 50% of the total weighting. This decision was made because the primary factor in the usability of a software item is the ability to learn to how use it – whether by intuition or by training.

Once each of the eight categories had obtained a ranking from summing up the weighted values of the sub-categories, these numbers were then entered into the top-level decision matrix. Each of the ASPs that the team reviewed has its own entry in the final table. When all of the ASPs were reviewed and their individual review matrices filled in, the top-level matrix indicated which ASP best meets CMB's requirements. The final top-level decision matrix is shown in on the next page. As shown by this matrix, the ASP receiving the highest score is Company B.

Needs		A		B		C		D		E		F	
Category	Weight	Value	Weighted	Value	Weighted	Value	Weighted	Value	Weighted	Value	Weighted	Value	Weighted
Aesthetics	3%	3.67	0.11	4.00	0.12	4.33	0.13	4.00	0.12	4.67	0.14	3.33	0.10
Usability	7%	4.00	0.28	3.97	0.28	3.03	0.21	3.10	0.22	4.07	0.28	2.80	0.20
Cost	15%	1.30	0.20	4.60	0.69	3.05	0.46	2.75	0.41	4.50	0.68	3.35	0.50
Configurability	20%	3.47	0.69	4.30	0.86	3.27	0.65	2.57	0.51	3.90	0.78	2.27	0.45
Security	15%	2.70	0.41	4.05	0.61	4.42	0.66	3.07	0.46	2.55	0.38	2.07	0.31
Expandability	10%	3.90	0.39	2.35	0.24	2.50	0.25	3.77	0.38	4.35	0.44	2.40	0.24
Features	20%	4.06	0.81	3.61	0.72	3.74	0.75	4.01	0.80	3.49	0.70	2.90	0.58
Training	10%	2.95	0.29	4.63	0.46	3.40	0.34	3.43	0.34	3.40	0.34	3.83	0.38
Totals	100%	3.18		**3.98**		3.45		3.24		**3.74**		2.77	

Needs		G		H		I		J		K		L	
Category	Weight	Value	Weighted	Value	Weighted	Value	Weighted	Value	Weighted	Value	Weighted	Value	Weighted
Aesthetics	3%			3.67	0.11	4.00	0.12			2.33	0.07	4.00	0.12
Usability	7%	0.00	0.00	4.57	0.32	3.57	0.25	0.00	0.00	2.07	0.14	3.30	0.23
Cost	15%			4.75	0.71	3.65	0.55			3.55	0.53	3.35	0.50
Configurability	20%	0.00	0.00	3.67	0.73	1.63	0.33	0.00	0.00	2.27	0.45	1.77	0.35
Security	15%			3.57	0.54	1.55	0.23			3.30	0.50	1.03	0.16
Expandability	10%	0.00	0.00	3.28	0.33	2.40	0.24	0.00	0.00	3.90	0.39	4.50	0.45
Features	20%			3.62	0.72	2.55	0.51			3.60	0.72	2.71	0.54
Training	10%	0.00	0.00	4.03	0.40	3.28	0.33	0.00	0.00	3.92	0.39	3.15	0.32
Totals	100%	0.00		**3.87**		2.55		0.00		3.20		2.67	

Figure 5.2: The final ASP decision matrix

Figure 5.2 summarises the scores of the various ASPs reviewed. Companies G and J both have zeros for their grading. The reason behind this is because they never responded to the project team. Various emails and phone calls were made to these companies over the course of two weeks, and a response was never provided. It is for this reason that they were not reviewed.

The top three ASPs, B, E and H have very close scores ranging between 3.98 and 3.74. The next score is Company C at 3.45. There is a slightly significant difference (0.3) between the third and the fourth best ASP. The project team decided to recommend the top three ASPs because their numerical scores are close in value.

5.6 Comparing the Top Three ASPs

	Value	Company B	Value	Company H	Value	Company E
Configurability (20%)	4.3		3.67		3.9	
Feature Set (20%)	3.61		3.62		3.49	
Cost (15%)	4.6		4.75		4.5	
Security (15%)	4.05		3.57		2.55	
Expandibility (10%)	2.35		3.28		4.35	
Training and Support (10%)	4.63		4.03		3.4	
Usability (7%)	4.67		4.57		4.07	
Aesthetics (3%)	4		3.67		4.67	
		1 2 3 4 5		1 2 3 4 5		1 2 3 4 5
TOTAL	3.98		3.87		3.74	

Figure 5.3: A comparison of the top three ASPs

5.6.1 Configurability (20%)

A received the highest score in configurability with a 4.3. Company B has many features that are tailored to CMB's needs as well as the needs of the other construction project team members. Companies H and E on the other hand received respectively 3.67 and 3.90, well behind Company A. The reason they scored lower is because the project team felt that overall they did not satisfy the requirements for an ASP as well as ASP B did. This judgement was based on the overall impression each team member had as to the level of configurability of the ASP. In addition, Company B is more intuitively configurable than the other two ASPs, which also increased B's score.

5.6.2 Feature Set (20%)

All three ASPs received very close scores in this category with B receiving a 3.61, E receiving a 3.49 and H receiving a 3.62. The three ASPs provide a complete document management system and correspondence system. The reason E scored lower was due to the lack of adequate history tracking. E and H also both received low scores in the document viewer subcategory because they lack this feature.

5.6.3 Cost (15%)

In this category, H rated the highest with a 4.75. Not only does H cost little to use, the commitment is very also flexible. It takes less than 24 hours to set up a project and the project can be ended whenever needed.

B and E come in very close with their costs. Company B is overall the least expensive (this is on a one project basis and a one hundred project basis). The reason they did not rate as well as H overall is because their commitment is done on a monthly basis and, while this is still very flexible, it is not as convenient as a weekly commitment.

5.6.4 Security (15%)

Company B again scored the highest in this category because it satisfies the various requirements set forth in the decision matrix. ASP E on the other hand scored a very low 2.55 because it was lacking a complete section for the general public and per module security. H rated fairly well in this category with a 3.67, however the user access group and user-by-user security each received a 3.00 because they are not as complete as they should be.

5.6.5 Expandability (10%)

A received the lowest score for a two reasons. First, B has never created custom features. Another aspect that lowered the score was the lack of the ability to purchase the software.

E on the other hand received a high score of 4.35 because it rated high in all the categories contained under expandability (custom features, storage space, ability to purchase and continuous development).

5.6.6 Training/Support (10%)

Company E received the lowest score in this category with a 3.40. They lost most of their score through on-site training. This is not currently being done, however, it could be negotiated. E does not offer 24 hour support. They have a support phone line but it is run during normal PST working hours. Company B on the other hand has 24-hour phone line, which means that a customer in Australia does not need to worry about the time difference when they need support. Finally, H is a Sydney based company so there should be no problem trying to get in touch when them during Australian business hours.

5.6.7 Usability (7%)

Company B received the highest score in this category with a 4.67. The other two ASPs are very easy to use, but B really differentiated itself by the ease in learning how to use the web site. It takes a user little time to figure out what the different features can be used for and how to set up a project using these features.

5.6.8 Aesthetics (3%)

The ASP that received the best score was E because the graphics were visually pleasing. Company H received a score of 3.67 because the graphics did not look as nice and B received a 4.00.

The three ASPs explained above are good choices for CMB because they satisfy the major requirements put forth by the project team. The best one of the three, however, is B, which is why it was used to develop the model web site described in Chapter 6, Model WBPA Web Site.

5.7 An Implementation Strategy

This section outlines a recommended strategy for introducing WBPA into the project management process in the Capital Management Branch (CMB). The necessary policy to be in place for such a system to succeed is discussed first. After that, a four-phase plan to establish WBPA as a CMB standard is detailed.

5.7.1 Policy

In order to effectively deliver a WBPA solution for CMB and the various groups involved in a project, certain policies must be implemented. These three key policies will assure that the use of the software will be beneficial to all parties, especially CMB. These policies are: determining who has administrator responsibilities, requiring the use of the site and protecting intellectual property.

The site administrator responsibilities, as explained in a previous section, should rest on the shoulders of the principal consultant. The reason for this is that the principal consultant has the job of overseeing the entire project and ensuring that it is running smoothly. As an active participant in almost every aspect of the management of a project, this person should be the one that sets up user accounts, configures site security, creates document folders, and performs regular site maintenance. In order for WBPA to be effective in the organisation, CMB should adopt as a policy that the principal project manager consultant takes on the role of the site administrator. This should be stipulated in the contract during the consultant engagement process. This consultant, likewise, should allocate funds in their tender in order to receive the training necessary to fulfil this obligation.

The second policy CMB should adopt involves guaranteeing the use of the web site during the lifetime of a project. As stated in Chapter 4, "Results," a WBPA web site is not fully effective unless all project communication and all project

document management is done through the software. To summarise, if communication is done in a mix of online and offline processes, an accurate audit trail cannot be kept and project communication is hindered instead of helped. In order for CMB and the principal consultant to guarantee that project parties use the WBPA web site instead of traditional methods, it should be stipulated in the consultancy contracts that web site use for communication and document exchange is mandatory. This contract provision should be strictly enforced. It may be a problem, however, to mandate that people from other DHS branches (Programs and Regions) make use of the web site in the required fashion since these groups are not being paid by CMB. It is recommended that a DHS policy should be put in place and enforced for these parties in order maximise site use. In order to help prevent non-use of the web site, project parties should be informed of the importance of using the web site. In addition, everyone who will be using the web site for project work should have access to training materials, support lines and online help.

The final policy issue that needs to be addressed before a WBPA web site can be put into full use is the issue of intellectual property and information ownership. Again, the way to effectively address this issue is through stipulations in the contracts with both the ASP and the project parties. These contracts should state that all information originating from an organisation is the sole property of that organisation and ownership cannot be assumed either by the ASP or the party in receipt of the document, unless ownership is explicitly granted. Most ASPs have provisions in their contracts that make this the case, so problems with an ASP should not arise regarding this issue. It is important, however, to make this clear to the parties involved with the project and the project web site in order to assuage any fears or uncertainties about the technology or the provider in question.

5.7.2 Implementation in Phases

The introduction of WBPA into the project process should be done in phases so as to ease the transition of business culture from a paper-based system to a fully electronic system. The reason for this is to avoid overwhelming users at the beginning, therefore causing resentment of the system, and to slowly wean people away from traditional methods so that they become accustomed to using the Web for project communication needs. This document suggests four possible phases for CMB to consider in their move to WBPA. The four phases are summarised in the table below and are explained in detail in the sections that follow.

Phase	Number of Projects	Features
I	1	Document management, reviewing and version control.
II	1	All from Phase I plus correspondence, RFIs, To-Do lists and assigned tasks.
III	All	All Phase II features plus any additional features, such as group scheduling.
IV	All	All Phase III features plus future developed features such as tendering and contract administration.

Table 5.4: Summary of the recommended implementation phases

5.7.2.1 Phase I

The first phase of implementation would be to use the WBPA web site on one project only and strictly as a document management tool and a document archive. The purpose of this phase is to introduce users to the concept of Web Based Project Administration (WBPA) and get them comfortable with the idea of using it on a day-to-day basis. All of the parties that have access to shared documents in a project including the PCG members, the primary consultant or any number of the other consultants, should be given access to the web site. Once a document draft is completed, it shall be posted to the web site and left for others to comment on and redline if necessary. The document revision process should take place over the web, and users should be encouraged to re-post their comments to the web site, awaiting

the next revision. All other features of the web site, such as To-Do lists, group scheduling, etc. should be disabled so as not to confuse or overwhelm users. In addition to a document management system, the site administrator should be getting experience maintaining a public web site. Once this trial project is complete, a review should be done to assess the level of satisfaction and the level of web site use by the people involved.

By using only the document management features of the site at the beginning, a user will be able to increase their productivity while still learning how to use a site like this. By starting with simple, static document management functionality, a user will be able to become accustomed to the way WBPA works. More importantly, they will be poised to begin using the site on a day-to-day basis by taking advantage of advanced correspondence features.

5.7.2.2   Phase II

The second phase of the implementation of WBPA is to enable the correspondence features of the web site, again for one project only. The purpose of this phase is to get the people that have experience using the site (from Phase I) communicating via the web in order to better facilitate the flow of information throughout a project, while continuing the document revision process that was going on in Phase I. Items such as RFIs, assigned tasks and discussion boards should be enabled at this point. With communication measures in place, a project may be effectively managed almost entirely over the Internet, thus minimising communication overhead, reducing paper use and saving valuable time on the part of the parties involved. Once this phase is complete, everyone involved should be well versed and experienced in the realm of WBPA. People will be familiar with the advantages and disadvantages of the system and a thorough review can be done.

It may be beneficial to repeat Phases I and II a number of times with different project managers, programs, agencies and consultants in order to provide everyone with experience and to get everybody to the same level of comfort and expertise with the system. Once most of the members of the CMB staff are comfortable with using the system on daily basis to complete their work, CMB can then move into Phase III.

5.7.2.3 *Phase III*

The third phase entails using a WBPA system to facilitate the management of all CMB projects. Assuming that everyone involved in the project process is comfortable using the system, the flow of information throughout this process should be quite streamlined at this point. In addition to the major features of the web site, document management and correspondence, a Phase III web site will have all of the features enabled for the appropriate users. This includes a group calendar, which can be used to keep track of project events, important milestones, and meetings. Also for a Phase III web site, User Groups should be given access to a portion of the web site that is deemed relevant to them (See Section 5.4, "Setting Up the Web Site"). In this way, communication with User Groups can be accomplished over the Internet, while not overwhelming the consultants since they will be comfortable with the system. When Phase III has been implemented, CMB will be at a point where WBPA is an indispensable mechanism for doing business.

Phase III is an ongoing process for CMB. It is characterised by the reliance on daily use of the web site in order to get management tasks done. When Phase III is reached, traditional business practices will seem outdated and inefficient. Once this point is reached, Phase IV can be considered.

5.7.2.4 Phase IV

Phase IV involves incorporating a WBPA web site into all of the project management process. This includes such traditional activities as tendering, contract administration, and budget management. The currently available online tools for these activities have been deemed immature at this point and are not recommended for use as they currently stand. However, it is recognised that software systems evolve over time and that better tools will be available in the future. Once Phase IV has been reached, it is recommended to re-evaluate these tools in order to determine the feasibility of their use. Phase IV might also entail the move from an ASP-based WBPA system to a system that is hosted internally on DHS servers. Assuming that WBPA is successful within CMB, DHS might justify the costs of buying resources to host, maintain and support a WBPA web site within their organisation. If this is done, further systems integration may be able to take place. For example, DHS or CMB may feel it justified spending resources on integrating their in-house cash flow management system (CAPWORKS) with the WBPA system, to eliminate the need for using two different systems for project management. In Phase IV, the WBPA system can be adapted in ways like this in order to fit CMB's business practices exactly and be in the position to evolve with the organisation.

Phase	Number of Projects	Features
I	1	Document management, reviewing and version control.
II	1	All from Phase I plus correspondence, RFIs, To-Do lists and assigned tasks.
III	All	All Phase II features plus any additional features, such as group scheduling.
IV	All	All Phase III features plus future developed features such as tendering and contract administration.

Table 5.5: Summary of the recommended implementation phases

Table 5.5 summarises the four phases that are recommended to CMB in order to smoothly transition to the use of WBPA. Phase I involves using the software to

simply manage document flow on one project. Phase II, also used for one project, adds the use of online correspondence to further facilitate the flow of information. Once Phases I and II are complete, all WBPA features can be used on all projects, thus signifying Phase III. Phase IV is reserved for the future of the organisation, involving tight systems integration and possibly internally hosting the web site. Once the transition has been made, especially the one outlined in Phase IV, CMB will have a fully electronic project management system, thus streamlining their current processes.

6 Model WBPA Web Site

As mentioned in the methodology, a model WBPA web site was created for the Department of Human Services. The purpose of this web site was to show CMB how a WBPA web site should function. This web site was modelled from Company B's software (the highest ranked ASP in the decision matrix – see Chapter 5, "Specifications," for more information). The main features that the model web site includes are document management, history tracking and correspondence.

6.1 Document Management

The model web site's document management is robust. It includes a versioning system, a document viewer, mark-up utilities and an advanced security system.
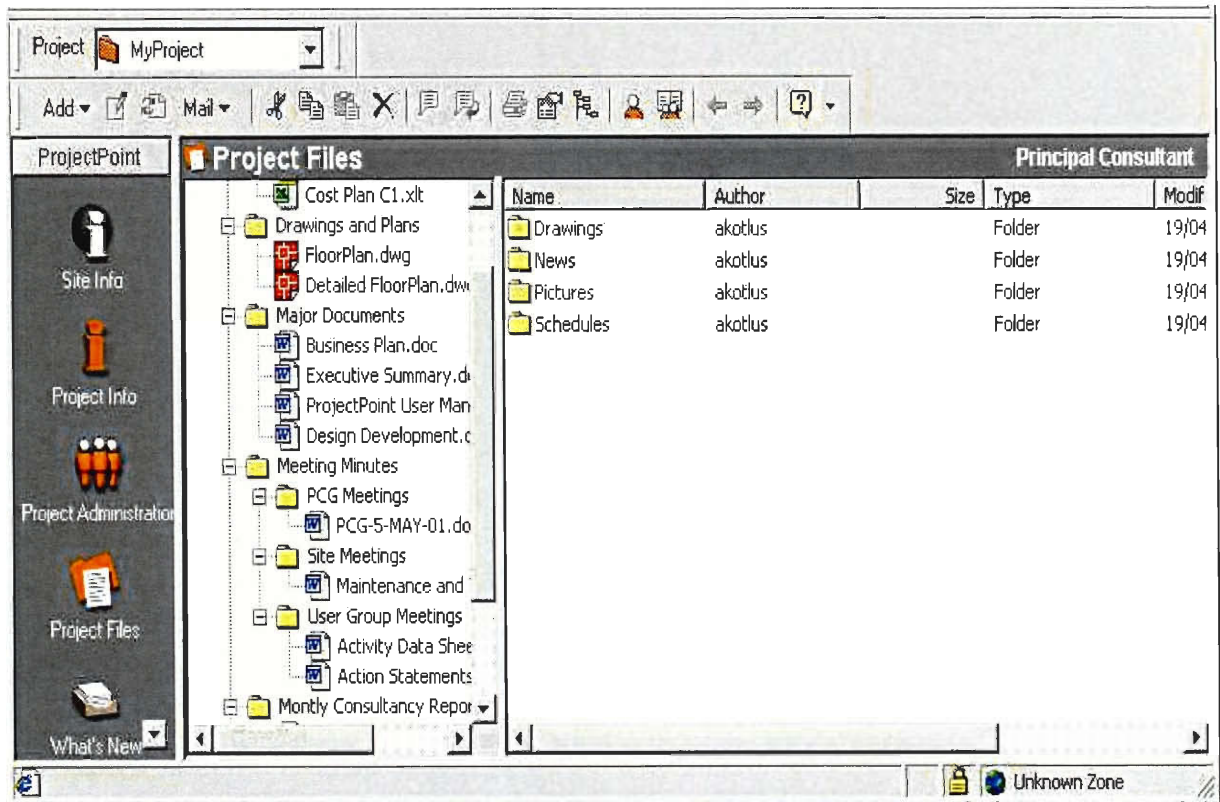
Figure 6.1: Screen shot of the model's document management system

As shown in Figure 6.1, the user interface for the document management system in Company B is similar to that of the Windows Explorer. It allows users to drag and drop files and folders to and from the web site. As seen in Figure 6.1, the orange folders are Project Folders while the traditional yellow folders are subfolders within the project. It is also possible to have smaller subprojects within a large project.
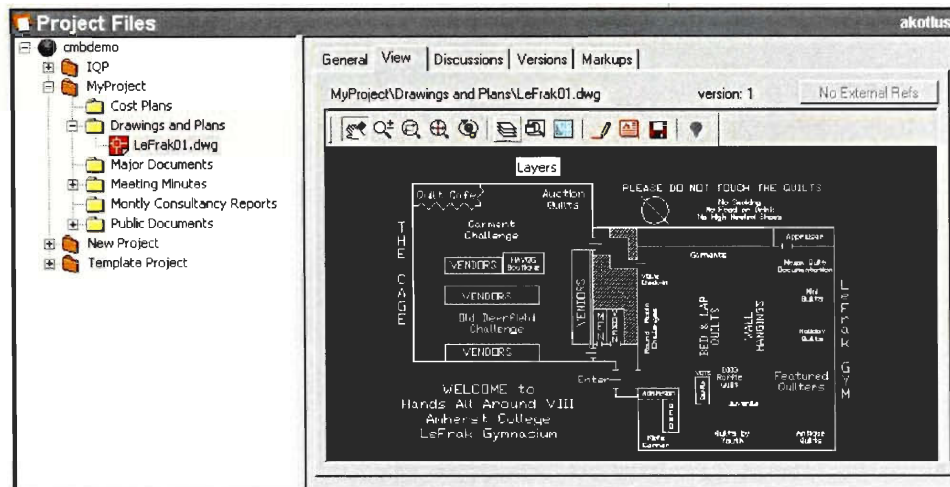
Figure 6.2: Picture of CAD file view in the web site model

Figure 6.2 shows how the model web site views CAD drawings. Company B uses the Volo Viewer Plug-In to view and mark-up CAD drawings. This viewer has the capability to hide layers, zoom in and out and change the 3D orientation of the drawing.
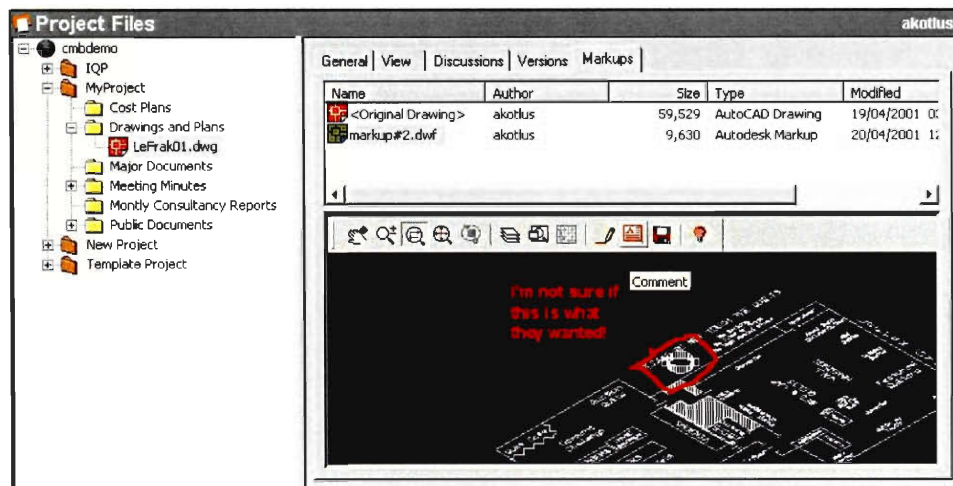
Figure 6.3: Screen shot showing the file mark-up capabilities of the model

As shown in Figure 6.3 and explained earlier, the model web site has a built in mark-up utility. This is part of the Volo Viewer software Plug-In and allows users of the web site to add comments to other users' drawings without changing the original drawing.
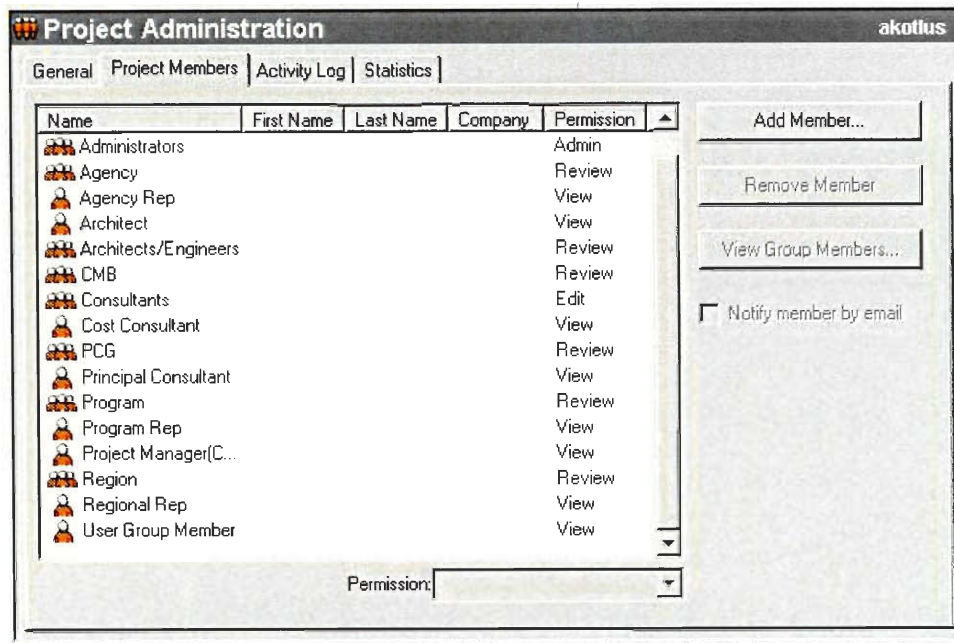
Figure 6.4: Screen shot showing how permissions are handled in the web site model

As mentioned previously, the model web site includes an advanced document security system. This security system, as shown in Figure 6.4, has both user and group security. The different security access levels are: No Access, List, View, Review, Edit and Admin. No Access means that the document or folder will not be visible to the user or group, List access means that the document or folder can be seen by user or group but the user or group is unable to download the file, View access means that the document or folder is viewable and downloadable to the user or group, Review access means that the document can be marked-up by the user or group, Edit access means that new versions of the document may be added by the user or group and Admin access means that the document or folder privileges may be changed by the user or group.

If a user is included in a group and the group has a different security privilege from the user, the higher security access will be the access that prevails. For example, if a user is given access to mark-up a drawing while the group that user is in is only able to view the drawing, when the user logs into the web site, they will be

able to mark-up the drawing. The only exception to this rule is the "No Access" privilege. If a group is given "No Access" to a folder/file on the web site, regardless of the individual user privileges, the users in that group will not see that folder/file.

6.2   History Tracking

In addition to the document management features offered by the model web

site that was created for CMB, there are also history tracking features.
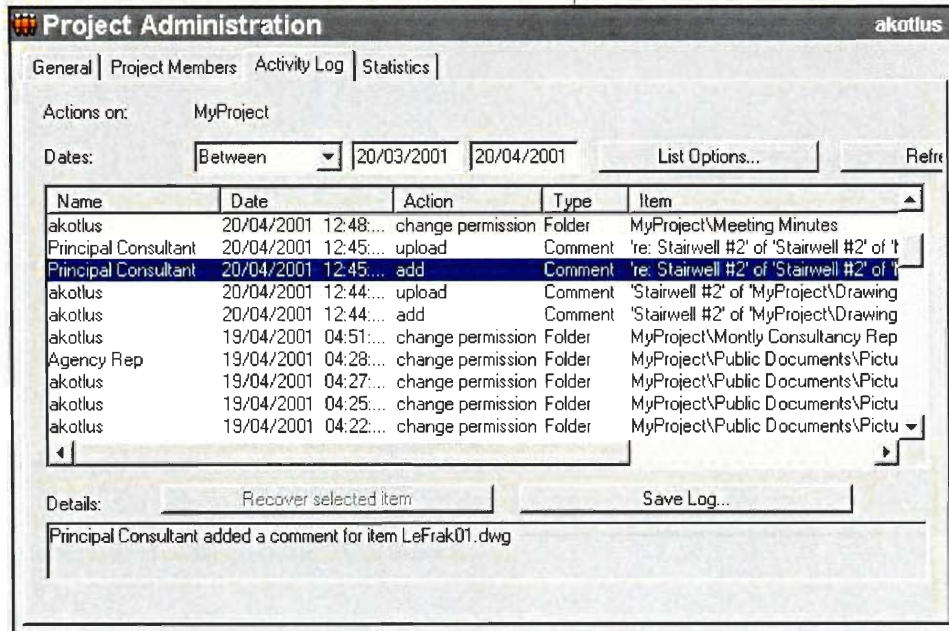
Figure 6.5: Demonstration of the history tracking functions of the web site model

Figure 6.5 shows a detailed list of actions that took place on the web site,

including every change a user makes as well as the time the user made that change.

This list can be sorted in many different ways, for instance by user, date, action, type

and item.

In addition to the history kept on the entire system, a separate history is also kept

for each folder and file within the system. This is a similar history that shows the

same type of information but is specific to the folder or document.

6.3 Correspondence

The correspondence features of the model web site are found in two locations on the web site: the first is through threaded discussions that are specific to a file, as shown in Figure 6.6, and second is through e-mail, as shown in Figure 6.7.
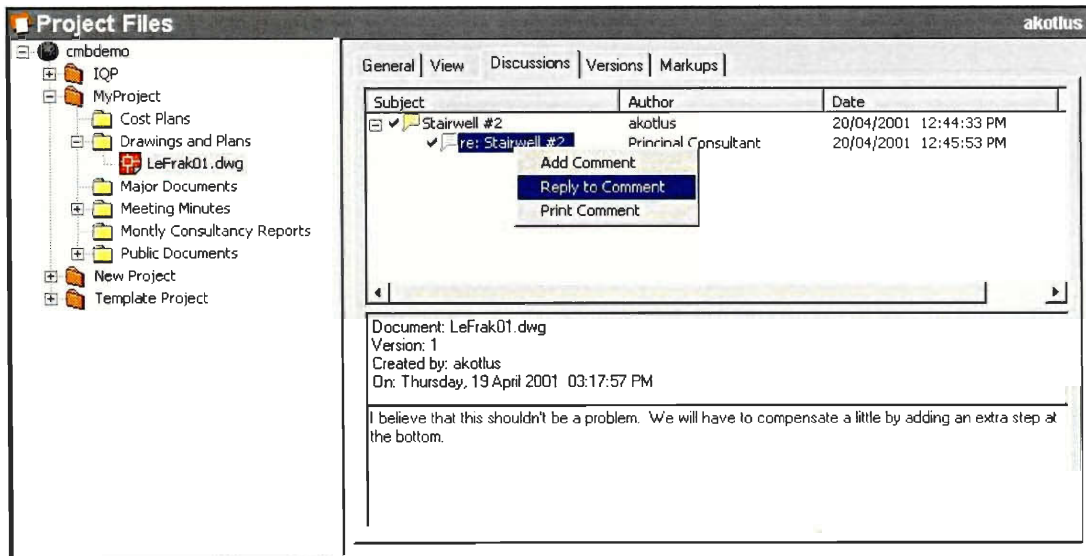
Figure 6.6: Screen shot showing the model web site's discussion forums

Figure 6.6 shows an entry in the threaded discussion for the drawing file named LeFrak.dwg. Threaded discussions that are specific to each file are easy to use and good for requesting information as well as tracking issues throughout a project. It is also very useful for project managers on future projects to be able to look back and see how similar issues were resolved, helping them to increase efficiency.
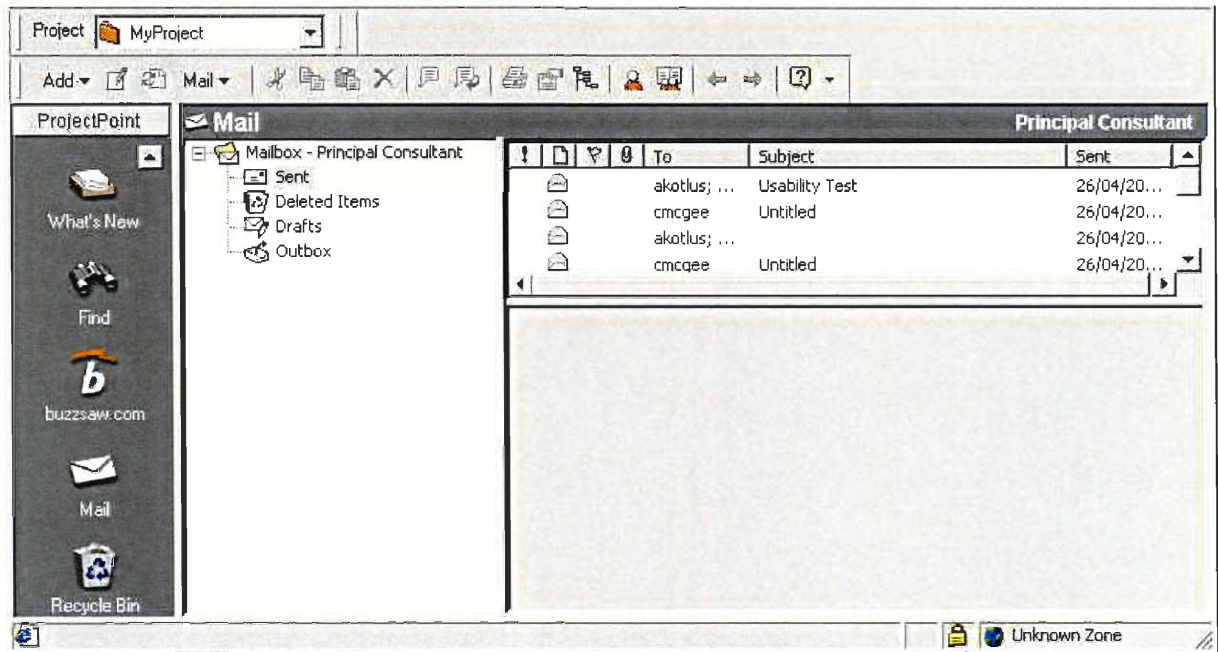
Figure 6.7: Screen shot showing the mail feature of the web site model

In addition to the threaded discussions, Company B offers tools for sending email.

The built-in email tool is very similar to the layout of Microsoft Outlook and

automatically has a contact list of all the members of the web site. By sending email

to the other project members through the web site, more of the informal project

communication can be tracked.

6.4 Usability of the Model

The usability test contained in Appendix J was administered to five project managers from the Capital Management Branch. The purpose of conducting this test was to observe people's reactions to the web site and gather information on the web site's usability. The project team was also interested in learning what these people thought of the folder structure contained on the web site.

In order to administer the test, the project team identified five project managers from the Capital Management branch, each with different computer skills. It was important to choose people with various levels of computer knowledge because it allowed the project team to see the reactions from a mix of users. At the beginning of the test, the subject was given a list of tasks as well as a user manual (see Appendix I) with information regarding how to perform these tasks. The usability test consisted of demonstrating the main features of the web site to the test subject. These features included the "What's New" function where users can see any new information that is posted for them. The test also included viewing documents and marking up drawings. Finally, the test required the subject to send an email to confirm that the test was indeed over.

Upon analysis of the test results, it seems that the subjects that had less computer skills were nervous and hesitant at the beginning. They needed to be prompted by the project team to look at the user manual when they were stuck on a task. As the test neared the end, the person being tested was usually more comfortable and had learned to refer to the user manual when they had a question.

There was an apparent learning curve for the test subjects with less computer skills. As explained above, they were at first hesitant but as the test progressed, they

completed the tasks more promptly and with less hesitation because they had learned to refer to the user manual.

After the test was over, the test subjects discussed their reactions. They agreed that the reason they had made mistakes while first completing the tasks was because the ASP software was unfamiliar. However, as they used it to accomplish more tasks, they agreed that it is an easy piece of software to use and only takes is a bit of practise to learn.

For the people with better computer skills, the test took about half the time taken by people with fewer skills. These people did not refer to the user manual; instead they just tried the different features on the web site. These people agreed that the web site was very user friendly and intuitive.

Four out of the five test subjects thought that this software would be able to help them do their job. They liked the fact that all documents are in one place and the user can just refer to them, without always having to email them out again. They also liked being able to view CAD drawings and mark them up. The only concern brought up was that this might be yet another system for the CMB staff to use. They are worried that this system will not integrate correctly with the other systems in place.

Finally the general conclusion was that the CMB staff would have to see this system put in place for one specific project in order to learn how to use the software and determine if it indeed is as helpful as they think.

7 Conclusion

This project's goal was to analyse Web Based Project Administration (WBPA) in order to recommend to the Capital Management Branch the best course of action in implementing this type of management tool. The first step towards achieving this was to map out the flow of information that takes place when CMB is planning and managing a project. From the various interviews with previous WBPA users, the project team concluded that an Application Service Provider (ASP) is the easiest, most customisable and inexpensive way of achieving online collaboration. The group then put together a comprehensive set of requirements by which to judge the prospects of an ASP to be used by CMB.

The project team then reviewed various ASPs and choose three, which they recommended to CMB. These ASPs were chosen because they offer the different features that were deemed necessary for CMB's use.

Most of the ASPs reviewed had solid document management as well as correspondence tools. WBPA users are now utilising these tools to manage their projects. Some of the ASPs also offer scheduling and cost management functions. However, these advanced tools still have a long way to go in order to be fully effective. It is expected that over the next few years ASPs will offer better software in this respect. Once this is the case, more and more companies will turn to full online management. Until then, companies will limit their use of ASPs to document management and correspondence.

Based on these observations, the project team has recommended that CMB begin using an ASP for document collaboration and management as well as correspondence. The CMB staff should implement this on one project to familiarise themselves with this new management tool. Once the branch and the other project

parties involved in the construction projects are comfortable with the use of an ASP, the project team recommends that CMB use this type of management tool on all their projects. This will allow CMB to become more efficient through better history tracking and time saving.

The process described above is outlined by the four phases discussed in this report. The project team put these four steps together as well as a list of specifications to ease the transition to WBPA. In the future, when ASPs become more powerful and better developed, CMB should consider moving all their project management online. This would include creating schedules and managing costs through online tools.

ASPs are new and they have many tools to develop before they can fully support project management. For this reason, none of the ASPs reviewed had all the features that CMB needs to fully manage a project. There is more work to be done in the field, and it is constantly evolving. In the mean time, CMB should start using WBPA to familiarise itself with the tools and as time moves on, CMB and the other construction project parties will be able to do all their project management online.

With the results of this project, CMB has the distinct advantage of having a roadmap for transitioning to WBPA. This roadmap consists of: a set of specifications identifying the key functionality needed by a WBPA web site, a series of criteria by which to judge Application Service Providers, an implementation strategy for the Branch and finally a model of a web site. A plan such as this will enable CMB to move its project management process online not only today, but also in the future.

Glossary

ASP: Application Service Provider. A company that offers individuals or enterprises access over the Internet to applications and related services that would otherwise have to be located in their own personal or enterprise computers.

Client: In terms of client-server computing, the client is the party that is typically the user end of the connection.

Development Application: According to Niazmand (2001), a Development Application (DA) is the equivalent of a Planning Application in Victoria. It is lodged with the local Council for approval. It is required to include the following:

- Architectural Plans in 1:200 scale
- Landscaping
- Hydraulic systems including overland flow and detention
- Development report including:
    - Statement of environmental effects
    - Traffic impact
    - Materials and finishes
    - Waste disposal policy
    - Heritage impact (if applicable)

Extranet: a privately owned network that uses the Internet to securely share part of a business's information or operations with the public.

Field monitoring: Field monitoring consists of the day-to-day observation of the project progress.

Firewall: A device or computer program designed to either accept or reject network connections based on various criteria, such as from whom the request originates.

HTML: Hypertext Markup Language. A popular language used to describe the layout and content of web pages.

HTTP: Hypertext Transfer Protocol. The standard method of communication used between web clients and servers.

Intellectual Property: The ownership of ideas and control over the tangible or virtual representation of those ideas. Use of another person's intellectual property may or may not involve royalty payments or permission, but should always include proper credit to the source.

Intranet: A private network that is contained within an enterprise.

Project: A project is usually a one-time activity with a well-defined set of desired end results.

Resource: A resource is an available mean. In construction management it includes time, money, people and equipment.

Scheme Design: According to Niazmand (2001), a Scheme Design is a stage after DA. This refers to a more developed, and client-approved design including Architectural and all Engineering disciplines. For further information, listed are all the stages used for the procurement of Health Facilities in NSW:

- PFP- Procurement Feasibility Plan
- PDP-Project Definition Plan including Master Plan
- DA- Development Application
- Scheme Design
- Design Development
- Tender Documentation
- Construction
- As-built Documentation

Server: In terms of client-server computing, the server is the content provider that the client connects to.

Submittal: Documentation and models that a contractor gives to an architect to describe the structure they are bidding on.

URL: Uniform Resource Locator. A unique identifier for pages on the WWW.

WBPA: Web Based Project Administration. The process of managing a project by using the World Wide Web and associated technologies.

Web Application: A server-based application whose user interface is transmitted via the WWW.

Web Portal: A site on the web that intends to build a community for a user group around a core set of services and information offerings.

WWW: World Wide Web.

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Appendix A: Work Plan

Work Plan

Activity	Week 1		Week 2		Week 3		Week 4		Week 5		Week 6		Week 7	
	14-Mar	16-Mar	19-Mar	23-Mar	26-Mar	30-Mar	2-Apr	6-Apr	9-Apr	13-Apr	16-Apr	20-Apr	23-Apr	27-Apr
Interview														
Design Interviews	■													
Contact People to Interview	■	■	■	■	■	■	■							
Conduct Interviews		■	■	■	■	■	■	■						
ASP Review														
Initial Review/ Selection				■	■	■								
Software Review							■	■						
Analyze Data		■	■	■	■	■	■	■	■	■	■	■		
Model Web Site														
Develop Specifications									■	■				
Create Model										■	■	■		
Write Report						■	■	■	■	■	■	■	■	
Present findings												■	■	■

Appendix B: Australian Projects Using WBPA

The names and locations of these projects are found in the Australian

Procurement and Construction Council (2000) document, listed in the references.

1. The National Museum of Australia – ACT
    216 Northbourne Ave
    Braddon, ACT, 2612
    Australia
    Phone: (02) 6208 5000

2. Extension of the Eastern Freeway – Victoria

3. Online Remote Construction Management Project – Queensland

4. Second Primary School at Glenmore Park – NSW
    Garswood Rd
    Glenmore Park, NSW, 2745
    Australia
    Phone: (02) 4733 6204

5. Christensens Road State School – Queensland

6. Tweed Head Hospital Redevelopment – NSW

    Cnr Florence & Powell Sts
    Tweed Heads
    NSW, 2485
    Phone: (07) 5536 1133

7. Electronic plan room facilities-Project Services – Queensland

8. Camden High School – NSW

9. Princess Alexandra Hospital – Queensland

Appendix C: Interview Questions

Interview Questions for the non-WBPA project user groups

Introduction
- We are working for the DHS on a study of a possible WBPA implementation.
- Explanation of WBPA
- Trying to assess how best to use WBPA for DHS projects
- Thank them for their time

Agenda
1. Could you tell me a little bit about company x?
2. What is your role within company x?
3. Throughout the course of a project who do you communicate with?
    a. Probe if they don't get all the categories

For each category mentioned:
4. What types of information are exchanged with category x?
    a. What is the approval process for different documents?
    b. Who sees this information?
    c. Who approves this information?
5. During what stages of the project is this information exchanged?
    a. At what time in the project do you feel it is most important communicate with category x?
6. How is this information exchanged?
    a. What format is the document in?
    b. What size is it (number of pages)
7. How efficient do you think the communication process for projects is?
    a. If there are problems, ask how to improve it.
8. How often do you use the web?
    a. Is there a high level of computer literacy in your organisation?
    b. Do you have any ideas how WBPA might be used within your company?
    c. Do you have any ideas how WBPA might be used in other types of projects?
    d. (if they didn't mention any tools) What types of features do you think would be valuable for a WBPA site?
    e. What do you think might not benefit from being web-enabled?

Conclusion
- That just about concludes our questions for you, do you have any questions for us?
- Ask for references
- Thank you

Interview of Previous users of WBPA

Introduction
- We are working for the DHS on a study of a possible WBPA implementation.
- Explanation of WBPA
- Trying to assess how best to use WBPA for DHS projects
- Thank them for their time

Ask all of the questions from the non-users (except question 8).

6. Tell me about your experience with WBPA
   a. How long have you been using WBPA?
   b. Why did you decide to switch to WBPA?
   c. Do you use custom software or an ASP?
   d. What types of projects do you use it for?
      i. Size/scale
      ii. How many people are involved in these projects?
      iii. Complexity
   e. What features does this site offer?
7. What were the varying levels of user access on the site?
   a. Was any art of the site accessible to the general public?
   b. Did different stakeholders have access to different things?
8. Throughout a project who is responsible for posting information on the site?
   a. Refer to the types of information discussed earlier (make sure they are all covered).
   b. Who is able to post information to the WBPA site?
      i. Deleting
      ii. Refreshing
      iii. Archiving
   c. Is there an approval process for posting documents?
9. Whose computers hold the information that the site uses?
   a. How much storage is provided by the site?
   b. Is the site backed up?
10. Have you encountered any technical problems?
    a. Software compatibility
    b. How long does it take you to download the page?
    c. How often is the site down?
    d. What do you do when the site is down?
11. Legal issues:
    a. How do you deal with ownership of information?
    b. What role does this actual site play in this ownership issues?
    c. What is specified in the contract with the ASP?
12. What measures were taken to ensure security on this site?
    a. Does the site require you to log in again if you have not been active for some time?
    b. Do you feel that these security measures are adequate?
    c. Is there any way that this security system could be improved?
    d. Who has access to the information on the site?
    e. What specifically do users and don't users have access to?
13. Of the features mentioned before (refresh their memory) which ones did you find to be most effective?
    a. What do you feel the best uses of these features are?
    b. Are there any features that you didn't like?
14. Are there any types of communication that may be better off done without the use WBPA?
    a. Why?
15. Did you encounter any difficulties when you implemented your WBPA system?
    a. Training needed
    b. Level of participation
    c. People adapting to change in the way they do business (culture change)?
    d. Technology problems (new software and hardware)
16. How did you deal with these issues?

Conclusion
- That just about concludes our questions for you, do you have any questions for us?
- Ask for references
- Thank you

Interview of WBPA Consultants

Introduction
- We are working for the DHS on a study of a possible WBPA implementation.
- Explanation of WBPA
- Trying to assess how best to use WBPA for DHS projects
- Thank them for their time

1. Could you tell me a little bit about company x?
   a. How long has your company existed?

Let the consultant do their demonstration

Check to see what was not covered:
- flow of information
- Where the info resides
- Who manages it
- Back-up system
- Security
- How it should be used

1. Throughout the course of a project how do people communicate with each other?
   a. Probe if they don't get all the categories
For each category mentioned:
2. What types of information are exchanged with category x?
3. During what stages of the project is this information able to be exchanged?
4. Throughout a project who is responsible for posting information on the site?
   a. Refer to the types of information discussed earlier (make sure they are all covered).
5. What type of a back-up system is offered?
   a. In a worst case scenario (where the entire system fails) is there a hard copy of the project information?
6. What is involved in the transition to a WBPA system?
   a. Does your company offer any assistance in the process, such as training?
7. With your software, where does the information reside?
   a. Do you offer any other alternatives?
8. What measures were taken to ensure security on this site?
   a. Do you feel that these security measures are adequate?
   b. Is there any way that this security system could be improved?
9. Are there any types of communication that may be better off done without the use WBPA?

Conclusion
- That just about concludes our questions for you, do you have any questions for us?
- Ask for references
- Thank you

Appendix D: Application Service Providers

Based upon various articles (Kraker, Doherty and Salwen) and web searches, the project team compiled the following list of ASPs to consider while doing the software reviews.

- AdvantageNet (www.emerginesolutions.com)
- AdvantageWARE (www.infoad.com)
- Banyan SiteMinder (www.banyan.com)
- Bidcom (www.bidcom.com)
- Blueline Online (www.blueline.com)
- BuildPoint (www.buildpoint.com)
- Buzzsaw (www.buzzsaw.com)
- Cephren (www.cephren.com)
- Citadon (www.citadon.com)
- Contructw@are (www.contructware.com)
- Cubus Corp. ReviewIt AEC (www.cubus.net)
- eBuilder (www.mpinteractive.com)
- eProject (www.eproject.com)
- FirstLine (www.constructures.com)
- Framework Technologies – Active Project (www.frametech.com)
- IronSpire JobSite (www.ironspire.com)
- Paragon FYI (www.vianovus.com)
- Primavera Systems' Teamplay (www.primavera.com)
- PrimeContract (www.primecontract.com)
- projectCentre (www.evolv.com)
- BricsNet (www.bricsnet.com)
- ProjectEdge (www.projectedge.com)
- ProjectGrid (www.projectgrid.com)
- ProjectSolve (www.projectsolve.com)
- ProjectTalk (www.projecttalk.com)
- ProjectWise (www.workplacesystems.com)
- Prolog Web (www.mps-inc.com)
- Spider (www.welcom.com)
- Struxion (www.struxion.com)
- Teambuilder (www.ebuilder.net)
  - ThePigeonHole (www.thepigeonhole.com)
  - Viecon (www.viecon.com)
  - VISTA 2000 (www.marketstreet.com)

Appendix E: Review Criteria

Preliminary ASP Review Criteria:

ASP Review

Web Site:
Company:
Date:

❑   Professional looking site (Avoid 7 deadly temptations)

❑   Contact information

❑   List of clients/projects

❑   Does it mention demo software or tutorials?

❑   Information flow:
    Do they mention different access levels?

    Bulletin boards

    History Tracking

    Document Sharing/Tracking system

    Scheduling (budget, progress)

Appendix F: People Interviewed

DHS Staff (18)

CMB (11)
John	Bentivoglio
Jon	Buttery
Brad	Edgar
Ben	Gelnay
John	Kimber
Allan	Stokes
Lindsay	Stratford
Carol	Neumann
Siva	Sivathasan
Albertus	Steegstra
Gary	Pund

Program (1)
Alison	Hallahan

Regional (1)
Robyn	King

ISB (5)
Stanley	Rastutis
James	Taylor
Matt	Brown
Bruce	Lawrence
Helen	Barry

WBPA Consultants (8)
Peter	Coelho
Brian	MacDonald
Matt	Brooks
Steve	Delk
Mollie	Rose
Matt	Miner
Rodney	Anderson
Michael	Guyler

Agency (3)
Brian	Pope
John	Morris
Jill	Howard

Consultants (5)
Peter	Cox
Alan	Miller
Brian	Davenport
Todd	Dunlop
Kelvin	Steel

WBPA Users (11)
Antony	McPhee
Mark	Haug
Guy	Sendy
Anthony	Sidwell
David	Thorpe
Jen	Holt
Julien	Byrne
Aladin	Niazmand
David	Lowry
Andrew	Crettenden
Stephen	Kejewski

Appendix G: ASP Review Results

The table below shows the final results of the ASP reviews.

Needs		A		B		C		D		E		F	
Category	Weight	Value	Weighted	Value	Weighted	Value	Weighted	Value	Weighted	Value	Weighted	Value	Weighted
Aesthetics	3%	3.67	0.11	4.00	0.12	4.33	0.13	4.00	0.12	4.67	0.14	3.33	0.10
Usability	7%	4.00	0.28	3.97	0.28	3.03	0.21	3.10	0.22	4.07	0.28	2.80	0.20
Cost	15%	1.30	0.20	4.60	0.69	3.05	0.46	2.75	0.41	4.50	0.68	3.35	0.50
Configurability	20%	3.47	0.69	4.30	0.86	3.27	0.65	2.57	0.51	3.90	0.78	2.27	0.45
Security	15%	2.70	0.41	4.05	0.61	4.42	0.66	3.07	0.46	2.55	0.38	2.07	0.31
Expandability	10%	3.90	0.39	2.35	0.24	2.50	0.25	3.77	0.38	4.35	0.44	2.40	0.24
Features	20%	4.06	0.81	3.61	0.72	3.74	0.75	4.01	0.80	3.49	0.70	2.90	0.58
Training	10%	2.95	0.29	4.63	0.46	3.40	0.34	3.43	0.34	3.40	0.34	3.83	0.38
Totals	100%		3.18		**3.98**		3.45		3.24		**3.74**		2.77

Needs		G		H		I		J		K		L	
Category	Weight	Value	Weighted	Value	Weighted	Value	Weighted	Value	Weighted	Value	Weighted	Value	Weighted
Aesthetics	3%			3.67	0.11	4.00	0.12			2.33	0.07	4.00	0.12
Usability	7%	0.00	0.00	4.57	0.32	3.57	0.25	0.00	0.00	2.07	0.14	3.30	0.23
Cost	15%			4.75	0.71	3.65	0.55			3.55	0.53	3.35	0.50
Configurability	20%	0.00	0.00	3.67	0.73	1.63	0.33	0.00	0.00	2.27	0.45	1.77	0.35
Security	15%			3.57	0.54	1.55	0.23			3.30	0.50	1.03	0.16
Expandability	10%	0.00	0.00	3.28	0.33	2.40	0.24	0.00	0.00	3.90	0.39	4.50	0.45
Features	20%			3.62	0.72	2.55	0.51			3.60	0.72	2.71	0.54
Training	10%	0.00	0.00	4.03	0.40	3.28	0.33	0.00	0.00	3.92	0.39	3.15	0.32
Totals	100%		0.00		**3.87**		2.55		0.00		3.20		2.67

The tables on the next ten pages show the results for the individual ASP reviews. These results are reflected in the table above. The individual results are presented in the order they were reviewed.

Company D

Category	Weight	Rank	Notes

1. Usability (7%)

Category	Weight	Rank	Notes
Easy to Learn	50%	3.00	
Download Quickly	20%	2.33	very slow
Professional Looking	20%	3.67	
Easily Navigable	10%	4.00	
Total	3.10		

2. Aesthetics (3%)

Category	Weight	Rank	Notes
Visually Pleasing	100%	4.00	
Total	4.00		

3. Cost (15%)

Category	Weight	Rank	Notes
Cost: 100 Projects	55%	2.00	
Flexible Commitment	30%	4.00	
Cost: 1 Project	15%	3.00	
Total	2.75		

4. Configurability (20%)

	Category	Weight	Rank	Notes
*	Configure for DHS	70%	2.67	
	Intuitive Configuration	30%	2.33	
	Total	2.57		

5. Security (15%)

	Category	Weight	Rank	Notes
	Section for General Public	15%	1.00	
	User Access Groups	20%	4.00	
	User-by-User Security	20%	3.67	
	Per-module Security	20%	2.33	Must be done by them
*	Per-document Security	25%	3.67	
		3.07		

6. Expandability (10%)

Category	Weight	Rank	Notes
Custom Features	30%	3.00	
Storage	30%	4.33	
Ability to Purchase	25%	3.67	
Continuous Development	15%	4.33	
Total	3.77		

7. Feature Set (20%)

	Category	Weight	Rank	Notes
*	Document Management	30%	4.33	
*	Correspondence	20%	3.67	
*	History Tracking	15%	4.33	
	Scheduling	5%	4.67	
*	Backups	5%	2.67	
	Software Integration	5%	3.33	
	RFI System	4%	4.67	
	Document Viewers	10%	3.67	
*	Obtain Database	5%	4.33	
	Integrate with other ASPs	1%	2.33	
	Total	4.01		

8. Training and Support (10%)

Category	Weight	Rank	Notes
On-Site Training	30%	4.33	
Adequate Documentation	25%	3.33	
24-Hour Support	20%	2.33	
Help with Transition	15%	3.33	
Remote Training	10%	3.33	
Total	3.43		

Company C

Category	Weight	Rank	Notes

1. Usability (7%)

Category	Weight	Rank	Notes
Easy to Learn	50%	2.33	
Download Quickly	20%	3.67	
Professional Looking	20%	4.33	
Easily Navigable	10%	2.67	
Total	3.03		

2. Aesthetics (3%)

Category	Weight	Rank	Notes
Visually Pleasing	100%	4.33	
Total	4.33		

3. Cost (15%)

Category	Weight	Rank	Notes
Cost: 100 Projects	55%	3.00	
Flexible Commitment	30%	2.67	only yearly
Cost: 1 Project	15%	4.00	
Total	3.05		

4. Configurability (20%)

Category	Weight	Rank	Notes
* Configure for DHS	70%	3.67	
Intuitive Configuration	30%	2.33	
Total	3.27		

5. Security (15%)

Category	Weight	Rank	Notes
Section for General Public	15%	5.00	
User Access Groups	20%	5.00	
User-by-User Security	20%	5.00	
Per-module Security	20%	5.00	yes, 130 modules
* Per-document Security	25%	2.67	
Total	4.42		

6. Expandability (10%)

Category	Weight	Rank	Notes
Custom Features	30%	0.67	
Storage	30%	5.00	unlimited
Ability to Purchase	25%	1.00	never been done, but could be
Continuous Development	15%	3.67	
Total	2.50		

7. Feature Set (20%)

Category	Weight	Rank	Notes
* Document Management	30%	4.33	
* Correspondence	20%	4.00	
* History Tracking	15%	3.33	
Scheduling	5%	2.67	
* Backups	5%	5.00	hourly on tape
Software Integration	5%	0.00	
RFI System	4%	4.33	
Document Viewers	10%	4.00	
* Obtain Database	5%	3.67	one time fee $1000 USD
Integrate with other ASPs	1%	0.00	
Total	3.74		

8. Training and Support (10%)

Category	Weight	Rank	Notes
On-Site Training	30%	4.00	"train-the-trainer" program
Adequate Documentation	25%	3.33	
24-Hour Support	20%	2.33	US business hours
Help with Transition	15%	4.00	
Remote Training	10%	3.00	
Total	3.40		

Company E

Category	Weight	Rank	Notes

1. Usability (7%)

Category	Weight	Rank	Notes
Easy to Learn	50%	4.00	
Download Quickly	20%	3.67	
Professional Looking	20%	4.33	
Easily Navigable	10%	4.67	
Total	4.07		

2. Aesthetics (3%)

Category	Weight	Rank	Notes
Visually Pleasing	100%	4.67	
Total	4.67		

3. Cost (15%)

Category	Weight	Rank	Notes
Cost: 100 Projects	55%	5.00	
Flexible Commitment	30%	3.33	
Cost: 1 Project	15%	5.00	
Total	4.50		

4. Configurability (20%)

	Category	Weight	Rank	Notes
*	Configure for DHS	70%	4.00	
	Intuitive Configuration	30%	3.67	
	Total	3.90		

5. Security (15%)

	Category	Weight	Rank	Notes
	Section for General Public	15%	0.67	
	User Access Groups	20%	3.00	
	User-by-User Security	20%	3.00	
	Per-module Security	20%	0.00	
*	Per-document Security	25%	5.00	
	Total	2.55		

6. Expandability (10%)

Category	Weight	Rank	Notes
Custom Features	30%	4.67	feature request system
Storage	30%	3.33	depends on # of users
Ability to Purchase	25%	5.00	
Continuous Development	15%	4.67	20 person development team
Total	4.35		

7. Feature Set (20%)

	Category	Weight	Rank	Notes
*	Document Management	30%	4.67	
*	Correspondence	20%	3.67	
*	History Tracking	15%	1.33	
	Scheduling	5%	4.67	
*	Backups	5%	5.00	hard copy nightly, on tape 15 minutes
	Software Integration	5%	4.33	sync w/ Palm, MS Project, cell phones
	RFI System	4%	3.33	
	Document Viewers	10%	1.00	no internal
*	Obtain Database	5%	4.00	HTML on CD, 39.95/CD
	Integrate with other ASPs	1%	2.67	
	Total	3.49		

8. Training and Support (10%)

Category	Weight	Rank	Notes
On-Site Training	30%	2.67	
Adequate Documentation	25%	4.33	
24-Hour Support	20%	3.00	8am - 5pm PST
Help with Transition	15%	3.00	
Remote Training	10%	4.67	
Total	3.40		

Company H

Category	Weight	Rank	Notes

1. Usability (7%)

	Weight	Rank	Notes
Easy to Learn	50%	4.67	looks like Outlook
Download Quickly	20%	5.00	no graphics
Professional Looking	20%	4.00	
Easily Navigable	10%	4.33	
Total	4.57		

2. Aesthetics (3%)

	Weight	Rank	Notes
Visually Pleasing	100%	3.67	
Total	3.67		

3. Cost (15%)

	Weight	Rank	Notes
Cost: 100 Projects	55%	5.00	
Flexible Commitment	30%	4.67	very flexible (per week)
Cost: 1 Project	15%	4.00	
Total	4.75		

4. Configurability (20%)

		Weight	Rank	Notes
*	Configure for DHS	70%	3.67	
	Intuitive Configuration	30%	3.67	
	Total	3.67		

5. Security (15%)

		Weight	Rank	Notes
	Section for General Public	15%	2.33	Dodgy - must select in list
	User Access Groups	20%	2.33	
	User-by-User Security	20%	4.33	
	Per-module Security	20%	4.00	
*	Per-document Security	25%	4.33	
		3.57		security all done in matrices

6. Expandability (10%)

	Weight	Rank	Notes
Custom Features	30%	3.33	can be done
Storage	30%	4.33	1 Gb free per project
Ability to Purchase	25%	1.33	has not been done
Continuous Development	15%	4.33	
Total	3.28		

7. Feature Set (20%)

		Weight	Rank	Notes
*	Document Management	30%	4.33	version control
*	Correspondence	20%	4.00	
*	History Tracking	15%	4.33	can see who looked at what documents
	Scheduling	5%	3.33	limited
*	Backups	5%	3.67	servers are in a bank vault
	Software Integration	5%	1.67	could be done
	RFI System	4%	4.00	
	Document Viewers	10%	0.67	lacking
*	Obtain Database	5%	4.00	can get in on CD for $50 per CD
	Integrate with other ASPs	1%	1.00	
	Total	3.62		

8. Training and Support (10%)

	Weight	Rank	Notes
On-Site Training	30%	5.00	cheap, "train the trainer" program
Adequate Documentation	25%	3.67	
24-Hour Support	20%	3.67	business hours, 8am to 6pm
Help with Transition	15%	3.67	
Remote Training	10%	3.33	
Total	4.03		

Company I

Category	Weight	Rank	Notes

1. Usability (7%)

Category	Weight	Rank	Notes
Easy to Learn	50%	4.00	
Download Quickly	20%	2.67	
Professional Looking	20%	3.33	
Easily Navigable	10%	3.67	
Total	3.57		

2. Aesthetics (3%)

Category	Weight	Rank	Notes
Visually Pleasing	100%	4.00	
Total	4.00		

3. Cost (15%)

Category	Weight	Rank	Notes
Cost: 100 Projects	55%	4.00	
Flexible Commitment	30%	2.33	
Cost: 1 Project	15%	5.00	
Total	3.65		

4. Configurability (20%)

	Category	Weight	Rank	Notes
*	Configure for DHS	70%	1.33	
	Intuitive Configuration	30%	2.33	
	Total	1.63		

5. Security (15%)

	Category	Weight	Rank	Notes
	Section for General Public	15%	0.00	
	User Access Groups	20%	3.67	
	User-by-User Security	20%	1.00	
	Per-module Security	20%	1.00	
*	Per-document Security	25%	1.67	
		1.55		

6. Expandability (10%)

Category	Weight	Rank	Notes
Custom Features	30%	2.50	
Storage	30%	1.33	
Ability to Purchase	25%	4.00	
Continuous Development	15%	1.67	
Total	2.40		

7. Feature Set (20%)

	Category	Weight	Rank	Notes
*	Document Management	30%	3.00	
*	Correspondence	20%	3.00	
*	History Tracking	15%	1.67	
	Scheduling	5%	4.00	
*	Backups	5%	3.00	
	Software Integration	5%	1.33	
	RFI System	4%	2.00	
	Document Viewers	10%	1.33	
*	Obtain Database	5%	3.33	
	Integrate with other ASPs	1%	0.00	
	Total	2.55		

8. Training and Support (10%)

Category	Weight	Rank	Notes
On-Site Training	30%	3.67	
Adequate Documentation	25%	4.00	
24-Hour Support	20%	3.00	
Help with Transition	15%	3.00	
Remote Training	10%	1.33	
Total	3.28		

Company K

Category	Weight	Rank	Notes

1. Usability (7%)

Category	Weight	Rank	Notes
Easy to Learn	50%	1.67	
Download Quickly	20%	2.33	
Professional Looking	20%	3.00	
Easily Navigable	10%	1.67	
Total	2.07		

2. Aesthetics (3%)

Category	Weight	Rank	Notes
Visually Pleasing	100%	2.33	
Total	2.33		

3. Cost (15%)

Category	Weight	Rank	Notes
Cost: 100 Projects	55%	5.00	
Flexible Commitment	30%	1.67	
Cost: 1 Project	15%	2.00	
Total	3.55		

4. Configurability (20%)

	Category	Weight	Rank	Notes
*	Configure for DHS	70%	2.67	
	Intuitive Configuration	30%	1.33	
	Total	2.27		

5. Security (15%)

	Category	Weight	Rank	Notes
	Section for General Public	15%	0.00	
	User Access Groups	20%	4.00	
	User-by-User Security	20%	4.00	
	Per-module Security	20%	2.67	
*	Per-document Security	25%	4.67	
		3.30		

6. Expandability (10%)

Category	Weight	Rank	Notes
Custom Features	30%	2.33	
Storage	30%	4.67	
Ability to Purchase	25%	5.00	
Continuous Development	15%	3.67	
Total	3.90		

7. Feature Set (20%)

	Category	Weight	Rank	Notes
*	Document Management	30%	5.00	
*	Correspondence	20%	2.00	
*	History Tracking	15%	4.00	
	Scheduling	5%	0.00	
*	Backups	5%	4.67	
	Software Integration	5%	3.00	
	RFI System	4%	1.33	
	Document Viewers	10%	4.00	
*	Obtain Database	5%	5.00	
	Integrate with other ASPs	1%	1.00	
	Total	3.60		

8. Training and Support (10%)

Category	Weight	Rank	Notes
On-Site Training	30%	3.67	
Adequate Documentation	25%	4.00	
24-Hour Support	20%	5.00	
Help with Transition	15%	3.67	
Remote Training	10%	2.67	
Total	3.92		

Company B

Category	Weight	Rank	Notes
1. Usability (7%)			
Easy to Learn	50%	4.00	
Download Quickly	20%	3.00	We should check with the free trial
Professional Looking	20%	4.67	
Easily Navigable	10%	4.33	
Total	3.97		

Category	Weight	Rank	Notes
2. Aesthetics (3%)			
Visually Pleasing	100%	4.00	
Total	4.00		

Category	Weight	Rank	Notes
3. Cost (15%)			
Cost: 100 Projects	55%	5.00	
Flexible Commitment	30%	3.67	
Cost: 1 Project	15%	5.00	
Total	4.60		

Category	Weight	Rank	Notes
4. Configurability (20%)			
* Configure for DHS	70%	4.00	
Intuitive Configuration	30%	5.00	
Total	4.30		

Category	Weight	Rank	Notes
5. Security (15%)			
Section for General Public	15%	2.67	Public Login
User Access Groups	20%	5.00	
User-by-User Security	20%	5.00	
Per-module Security	20%	2.00	
* Per-document Security	25%	5.00	
	4.05		

Category	Weight	Rank	Notes
6. Expandability (10%)			
Custom Features	30%	2.00	
Storage	30%	3.33	
Ability to Purchase	25%	0.00	
Continuous Development	15%	5.00	Multiple upgrades every month
Total	2.35		

Category	Weight	Rank	Notes
7. Feature Set (20%)			
* Document Management	30%	4.33	
* Correspondence	20%	3.67	
* History Tracking	15%	4.67	
Scheduling	5%	0.00	in the future
* Backups	5%	4.33	several/day
Software Integration	5%	0.67	CSV import for contact lists
RFI System	4%	2.00	
Document Viewers	10%	3.00	
* Obtain Database	5%	5.00	for free anytime (download)
Integrate with other ASPs	1%	0.00	
Total	3.61		

Category	Weight	Rank	Notes
8. Training and Support (10%)			
On-Site Training	30%	4.67	
Adequate Documentation	25%	4.33	
24-Hour Support	20%	5.00	
Help with Transition	15%	4.33	
Remote Training	10%	5.00	free Webex training (during their business hour
Total	4.63		this can be changed for us in Mel, AU

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Company F

Category	Weight	Rank	Notes

1. Usability (7%)

Easy to Learn	50%	2.33	
Download Quickly	20%	4.00	
Professional Looking	20%	3.00	
Easily Navigable	10%	2.33	very tricky
Total	2.80		

2. Aesthetics (3%)

Visually Pleasing	100%	3.33	
Total	3.33		

3. Cost (15%)

Cost: 100 Projects	55%	3.00	
Flexible Commitment	30%	3.67	
Cost: 1 Project	15%	4.00	
Total	3.35		

4. Configurability (20%)

*Configure for DHS	70%	2.67	
Intuitive Configuration	30%	1.33	hardly configurable... isn't meant to be done by
Total	2.27		DHS, only by the ASP people

5. Security (15%)

Section for General Public	15%	0.00	
User Access Groups	20%	3.00	
User-by-User Security	20%	3.00	
Per-module Security	20%	1.00	
*Per-document Security	25%	2.67	
	2.07		you have to ask someone else to do it for you

6. Expandability (10%)

Custom Features	30%	1.67	
Storage	30%	2.33	100MB free / project
Ability to Purchase	25%	2.00	never been done before
Continuous Development	15%	4.67	V2.0 is on the way and it sounds like it is
Total	2.40		going to be WAY better... sounds like
			windows 3.11 talking about win2k

7. Feature Set (20%)

*Document Management	30%	3.33	
*Correspondence	20%	3.00	
*History Tracking	15%	3.00	
Scheduling	5%	0.00	
*Backups	5%	4.33	daily + triple redundancy
Software Integration	5%	0.00	
RFI System	4%	3.00	
Document Viewers	10%	3.00	
*Obtain Database	5%	4.33	SQL 7 --> $199/project
Integrate with other ASPs	1%	0.00	
Total	2.90		

8. Training and Support (10%)

On-Site Training	30%	4.33	
Adequate Documentation	25%	4.33	
24-Hour Support	20%	2.33	7-5 pacific standard time
Help with Transition	15%	3.67	
Remote Training	10%	4.33	
Total	3.83		

Company L

Category	Weight	Rank	Notes

1. Usability (7%)

Category	Weight	Rank	Notes
Easy to Learn	50%	3.33	
Download Quickly	20%	2.33	
Professional Looking	20%	4.00	
Easily Navigable	10%	3.67	
Total	3.30		

2. Aesthetics (3%)

Category	Weight	Rank	Notes
Visually Pleasing	100%	4.00	
Total	4.00		

3. Cost (15%)

Category	Weight	Rank	Notes
Cost: 100 Projects	55%	5.00	
Flexible Commitment	30%	0.00	you have to buy it
Cost: 1 Project	15%	4.00	
Total	3.35		

4. Configurability (20%)

	Category	Weight	Rank	Notes
*	Configure for DHS	70%	1.67	
	Intuitive Configuration	30%	2.00	
	Total	1.77		

5. Security (15%)

	Category	Weight	Rank	Notes
	Section for General Public	15%	0.00	
	User Access Groups	20%	3.00	only real security measure
	User-by-User Security	20%	0.00	
	Per-module Security	20%	1.33	
*	Per-document Security	25%	0.67	
		1.03		

6. Expandability (10%)

Category	Weight	Rank	Notes
Custom Features	30%	4.00	
Storage	30%	5.00	
Ability to Purchase	25%	5.00	you have to purchase it
Continuous Development	15%	3.67	
Total	4.50		

7. Feature Set (20%)

	Category	Weight	Rank	Notes
*	Document Management	30%	3.33	
*	Correspondence	20%	2.67	
*	History Tracking	15%	2.33	
	Scheduling	5%	0.00	none
*	Backups	5%	4.67	
	Software Integration	5%	4.00	integrates MSProject,OpenPlan, others
	RFI System	4%	3.67	Action-Items
	Document Viewers	10%	0.00	
*	Obtain Database	5%	5.00	
	Integrate with other ASPs	1%	0.00	
	Total	2.71		

8. Training and Support (10%)

Category	Weight	Rank	Notes
On-Site Training	30%	3.33	
Adequate Documentation	25%	4.00	5x8 support in AU
24-Hour Support	20%	4.00	
Help with Transition	15%	2.33	
Remote Training	10%	0.00	none
Total	3.15		

Company A

Category	Weight	Rank	Notes
Category	*Weight*	*Rank*	*Notes*

1. Usability (7%)

Category	Weight	Rank	Notes
Easy to Learn	50%	4.00	
Download Quickly	20%	4.00	
Professional Looking	20%	4.00	
Easily Navigable	10%	4.00	
Total	4.00		

2. Aesthetics (3%)

Category	Weight	Rank	Notes
Visually Pleasing	100%	3.67	
Total	3.67		

3. Cost (15%)

Category	Weight	Rank	Notes
Cost: 100 Projects	55%	1.00	
Flexible Commitment	30%	2.00	
Cost: 1 Project	15%	1.00	
Total	1.30		

4. Configurability (20%)

Category	Weight	Rank	Notes
* Configure for DHS	70%	3.67	
Intuitive Configuration	30%	3.00	
Total	3.47		

5. Security (15%)

Category	Weight	Rank	Notes
Section for General Public	15%	2.33	
User Access Groups	20%	4.00	
User-by-User Security	20%	3.00	
Per-module Security	20%	2.67	
* Per-document Security	25%	1.67	
	2.70		

6. Expandability (10%)

Category	Weight	Rank	Notes
Custom Features	30%	3.00	
Storage	30%	4.33	
Ability to Purchase	25%	5.00	
Continuous Development	15%	3.00	
Total	3.90		

7. Feature Set (20%)

Category	Weight	Rank	Notes
* Document Management	30%	4.00	
* Correspondence	20%	4.67	
* History Tracking	15%	4.00	
Scheduling	5%	1.00	
* Backups	5%	4.67	
Software Integration	5%	3.33	
RFI System	4%	4.00	
Document Viewers	10%	4.67	
* Obtain Database	5%	5.00	
Integrate with other ASPs	1%	0.00	
Total	4.06		

8. Training and Support (10%)

Category	Weight	Rank	Notes
On-Site Training	30%	3.00	
Adequate Documentation	25%	3.33	
24-Hour Support	20%	2.00	
Help with Transition	15%	4.33	
Remote Training	10%	1.67	
Total	2.95		

Appendix H: Cost Review Data

ASP	Cost: 1 Project	Cost: 100 Projects
B	$9,480	$229,800
L	$32,358	$288,614
K	$165,000	$360,000
E	$44,900	$457,000
H	$35,800	$775,000
I	$40,000	$3,604,000
F	$58,568	$5,226,448
C	$63,000	$6,003,000
D	$95,000	$9,104,000
A	$228,000	$11,400,000

This figure summarizes the costs of the various ASPs.

→The cost was analysed for one project assuming it lasts three years and has 25 users.
→The cost for 100 projects was also analysed assuming this will last three years and involves (at a worst case scenario) 2500 users in total.

In addition to the project cost, the cost of training was also added in.

Company A*
→ [$9500 (per 50 users every quarter) x 12 quarters] = US$114,000 = **AU$228,000**

→ [$9500 (per 50 users every quarter) x 50 (because we have 2500 people for 100 projects) x 12 quarters = US$5,700,000 = **AU$11,400,000**

Company C*
→ [$400 (per user per year) x 25 users x 3 years] + $1500 (training) = US$31,500
= **AU$63,000**

→ [$400 (per user per year) x 2500 users x 3 years] + $1500 (training) = US$3,001,500
= **AU$6,003,000**

Company D*
→ [$50 (per user per month) x 25 users x 36 months] + $1500 (first project set-up fee) + $1000 (remote training) = US$47,500 = **AU$95,000**

→ [$50 (per user per month) x 2500 users x 36 months] + $1500 (first project set-up fee) + [99 projects x $500 (fee for each additional project)] + $1000 (remote training) = US$4,552,000 = **AU$ 9,104,000**

Company E*
→ [$575 (per month for 25 users) x 36 months] + $1750 (set-up fee) = US$22,450
= **AU$44,900**

→ [$4000 (per month for first 1000 users) x 36 months] + $7500 (set-up fee for first 1000 users) + [$2000 (for the next 1500 users) x 36 months] + $5000 (set-up fee for the next 1500 users) = US$228,500 = **AU$ 457,000**

Company F*

→ [$29 (per users per month) x 25 users x 36 months] + [$99 (user set up) x 25 users] + $499 (first project set-up) + $250 (training) = US$29,324 = **AU$58,648**

→ [$29 (per user per month) x 2500 users x 36 months] +[$99 (user set up) x 25 users] + $499 (first project set-up) + $250 (training) = US$2,613,224 = **AU$5,226,448**

Company H

→ [AU$200 (per week for one project) x 154 weeks] + AU$5000 (training) = **AU$35,800**

→ [AU$50 (per week for 100 projects) x 154 weeks] + AU$5000 (training) = **AU$775,000**

Company B*

→ [$1080 (per project annually) x 3 years] + $1500 (training) =US$4740 = **AU$9480**

→ [$37 800 (for 100 projects annually) x 3 years] + $1500 (training) = US$114,900 = **AU$229,800**

Company I*

→ US$20,000 for one project = **AU$40,000**

→ US$1 802 000 for 100 projects = **AU$3,604,000**

Company K

→ AU$55,000 (for 25 users per year) x 3 years] = **AU$165,000**

→ AU$120,000 (for 100+ users per year) x 3 years] = **AU$360,000**

Company L

→ [AU$30 558 (25 users) + AU$1800 (training)] = **AU$32 358**

→ [AU$286 814 (for 1000+ users) + AU$1800 (training)] = **AU$288 614**

*Note: This is in AU$ with a conversion of AU$1=US$0.5

Appendix I: ASP Model User Manual

Introduction

This user manual was assembled for the CMB staff to guide them through any questions they may have while taking the ProjectPoint usability tests.

Login
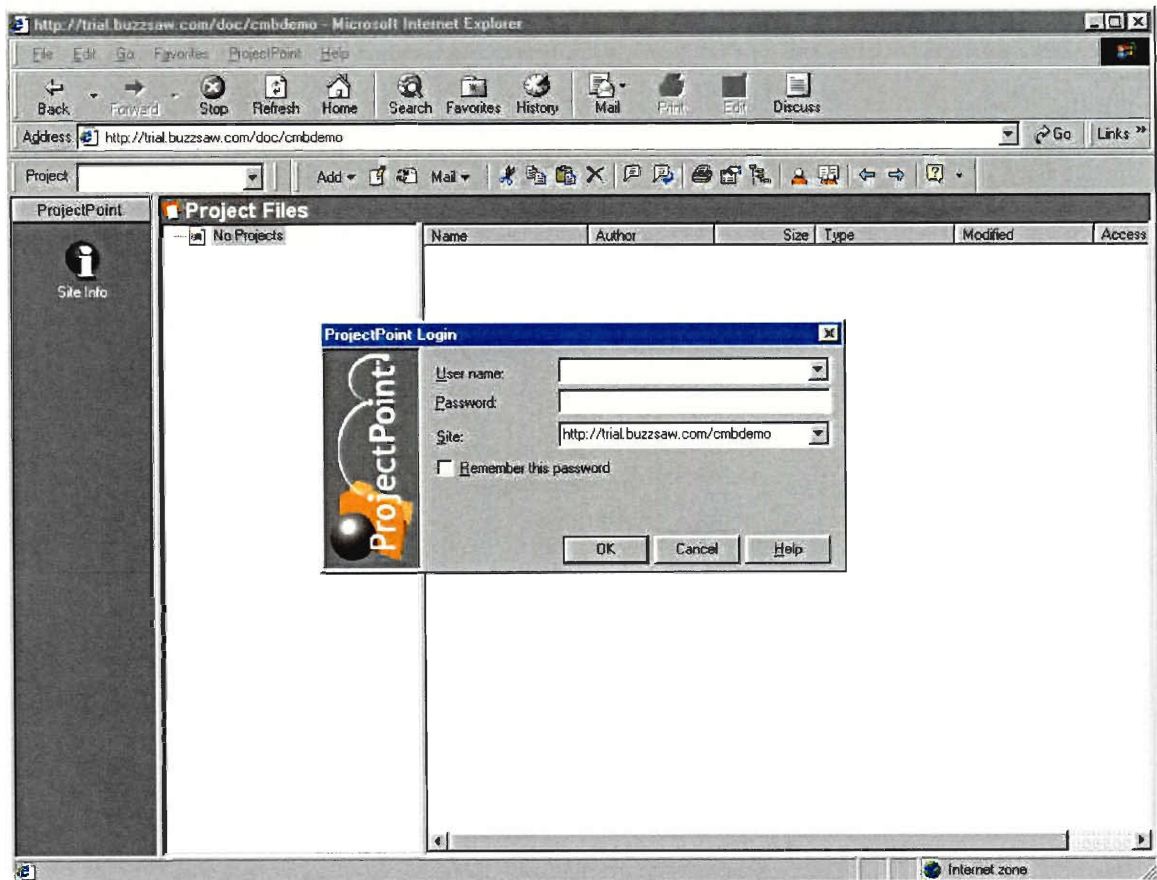
Figure 1: The shows the ProjectPoint login screen.

As shown in Figure , to log into the ProjectPoint web site a user must go to https://trial.buzzsaw.com/client/cmbdemo and input a user name and password. For the purpose of this project, the users and passwords are as follows:

Name	Password
(public)	A12345678
Agency Rep	A12345678
Architect	A12345678
Cost Consultant	A12345678
Principal Consultant	A12345678
Program Rep	A12345678
Project Manager(CMB)	A12345678
Regional Rep	A12345678
User Group Member	A12345678
akotlus	A12345678
cmcgee	A12345678
rgeldmacher	A12345678

To log into the web site simply enter your user name and password and *click* **OK**.
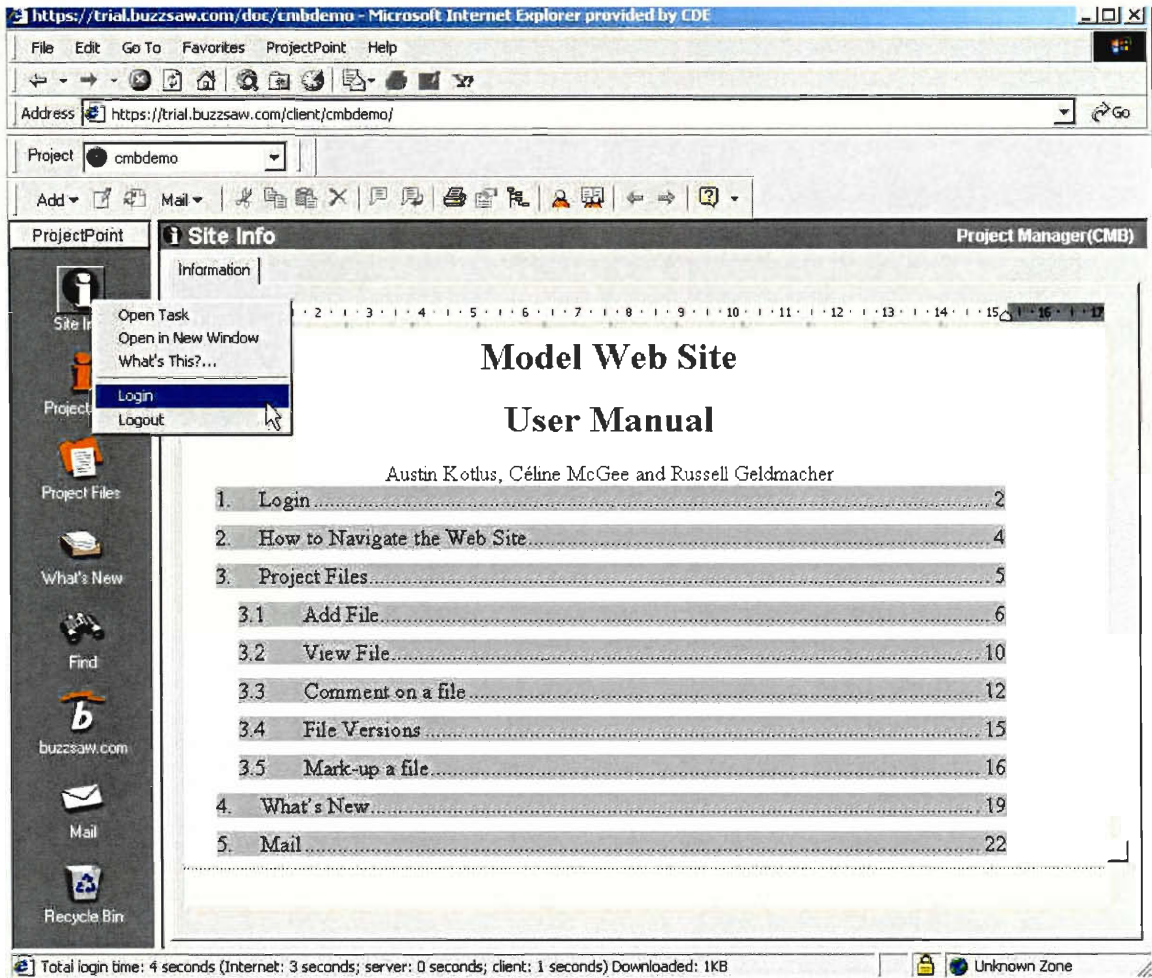
Figure 1: How to login as a new user or logout of the system.

As shown in Figure 1, once a user is logged into the web site they are able to login as a different user or logout completely. This can be accomplished by *right-clicking* in the **left-hand frame** of the ProjectPoint web site and *selecting* either **login or logout** respectively.

NOTE: Because of the way the network is set up at DHS, after a user enters the url: https://trial.buzzsaw.com/client/cmbdemo and the ProjectPoint software gets loaded, if Internet Explorer does not prompt the user for their internet password they must *click* the **Cancel** button on the ProjectPoint Login screen. This will cause the Internet Explorer password screen to appear. At this point, the user should enter their Internet password and login by *right-clicking* on the **left-hand** side of the ProjectPoint web site and *selecting* **login**.

How to Navigate the Web Site
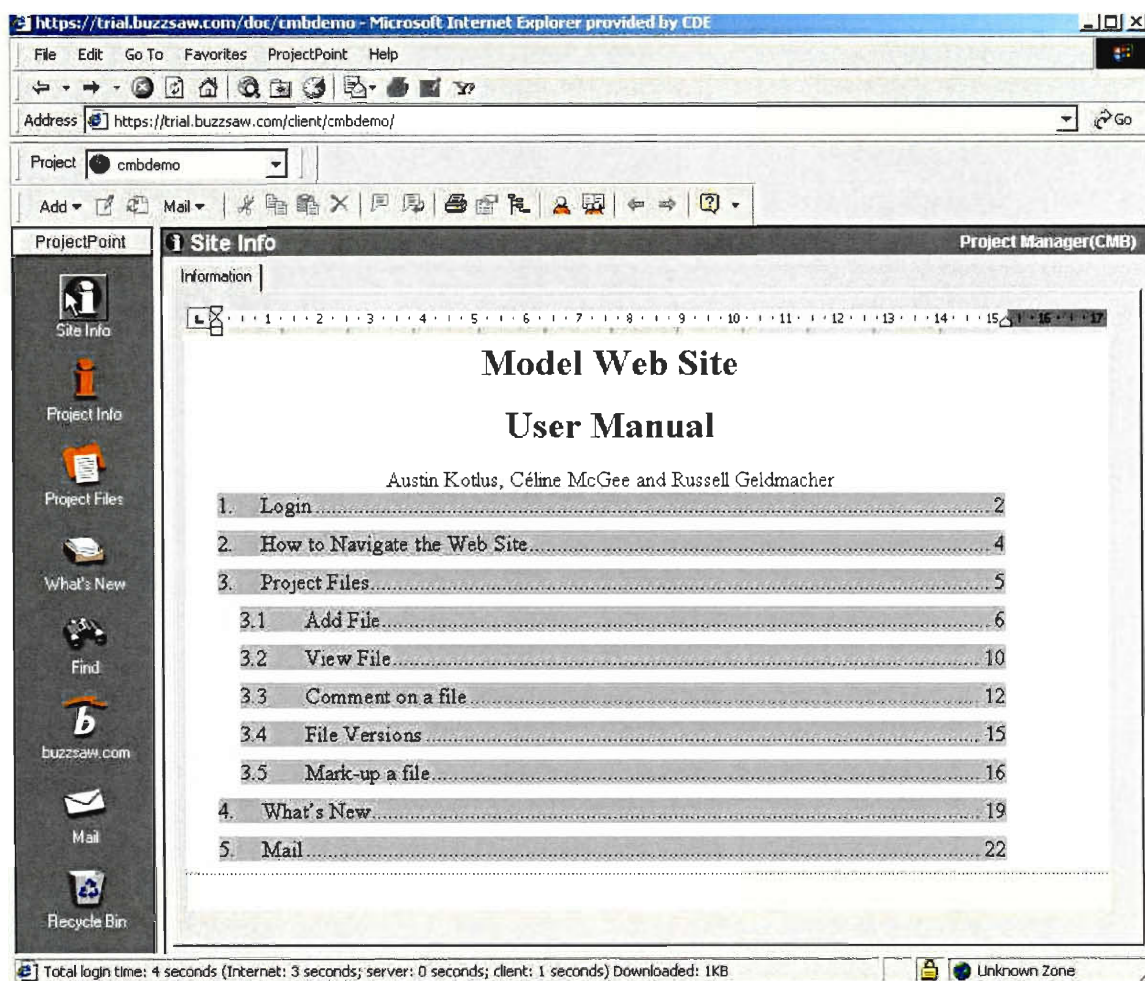
Figure 3: This shows how the web site looks directly after a Project Manager logs in.

In the upper left-hand side of Figure 3 there is a Project dropdown menu. This dropdown menu is used to select which project the user is viewing. Directly underneath the project dropdown menu and a little to the right is the name of the feature that the user is using. All the way to the right of the feature being used is the name of the user that is logged into the site. In Figure 3 the user is Project Manager(CMB) and they are using the Project Files feature of the web site.

As shown in Figure 3, there is a navigation frame on the left-hand side of the ProjectPoint web site. This navigation consists of 7 options for project managers: Site Info, Project Info, Project Files, What's New, Find, buzzsaw.com and Mail.

Site Info is a general information page containing this document explaining how to use the most significant features of the project web site. Project Info is a customisable page that shows general information about the specific project. Project Files, the active feature shown in Figure 3, contains the project files. The What's New section of the web site shows all the information that the current user, Project Manager(CMB), has not looked at yet. The Find section of the web site is a searching feature to help people find files. The buzzsaw.com section of the web site opens the buzzsaw.com homepage. Lastly, the Mail section of the web site allows the users of the web site to communicate through e-mail.

Project Files

To enter the Project Files section of the web site the user should *left-click* the

Project Files button shown in the left hand side of Figure 3.

Add File
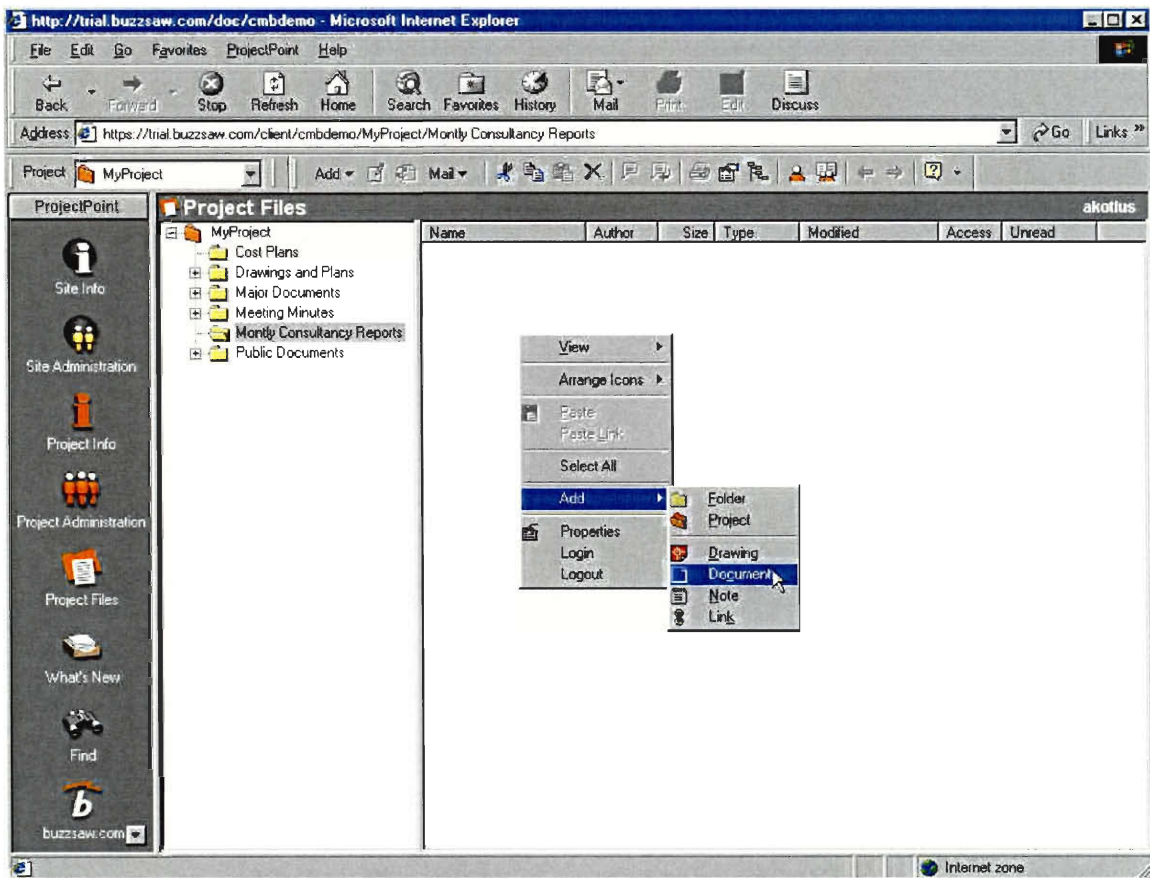
Figure 4: This shows how a file can be added to a folder within a project.

As shown in Figure 4, a user of the web site is able to add a file to the Project Files section of the web site by *selecting* the **folder** they want the file to be in and *right-clicking* on the **right-hand frame** of the web site and *selecting* **Add**. Under the Add menu there are multiple options such as Folder, Project, Drawing, Document, Note and Link. In Figure 4 the user has selected Add→Document to add a document to the "Monthly Consultancy Reports" folder. This task can also be accomplished by *selecting* the **Monthly Consultancy Reports** folder and *clicking* the **Add** button on the toolbar.
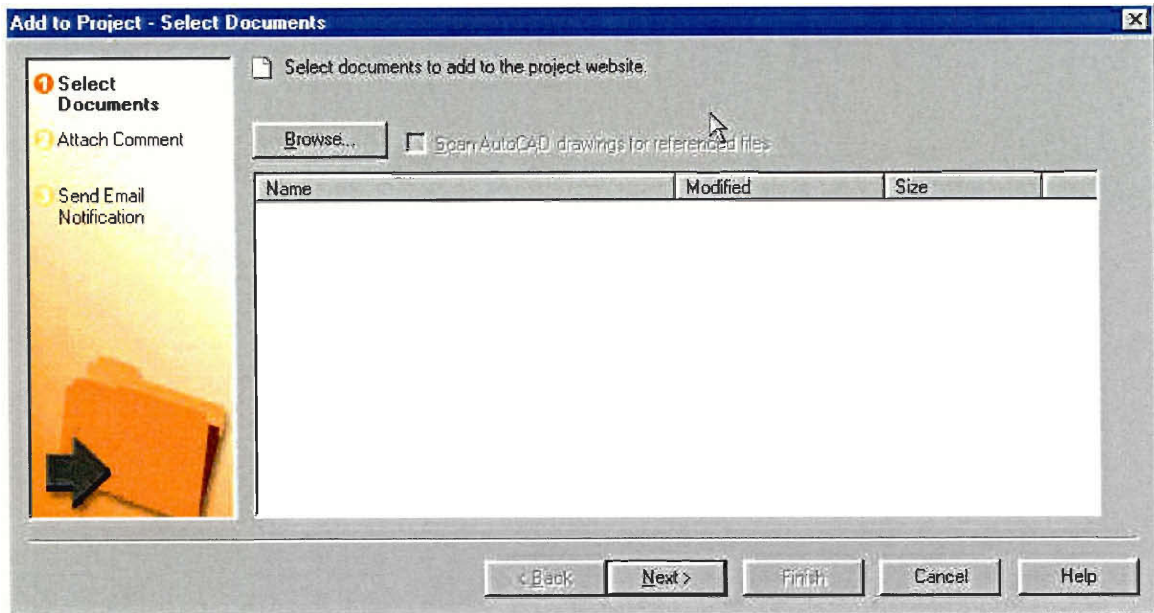
Figure 5: This shows how a file is added to the web site.

Once the user has selected to add a document to the web site this screen appears. At this point the **Browse** button should be *clicked* to browse the users computer for the file they want to add to the web site.
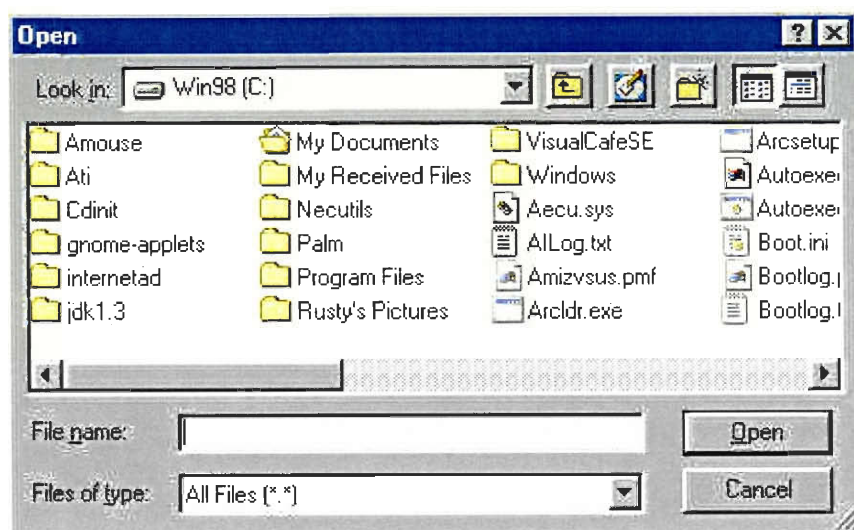
Figure 6: This shows the standard browse window.

When the user *left-clicks* the **Browse** button from Figure 5, the window seen in Figure 6 appears. This window shows the files on the user's hard drive. The user then finds the file they would like to upload to the web site selects it and *left-clicks* the **Open** button. This file is then added into the Files Dialog box shown in Figure 6. When the user has finished selecting all of the files they would like added to the web

site they are able to *left-click* the **Next** button **or** the **Finish** button. The Finish button will add the files listed in the Files Dialog box to the web site now. The Next button will allow the user to add a comment or discussion to the file as well as allow the user to send e-mail notifications to other users of the web site telling them that the file has been uploaded.
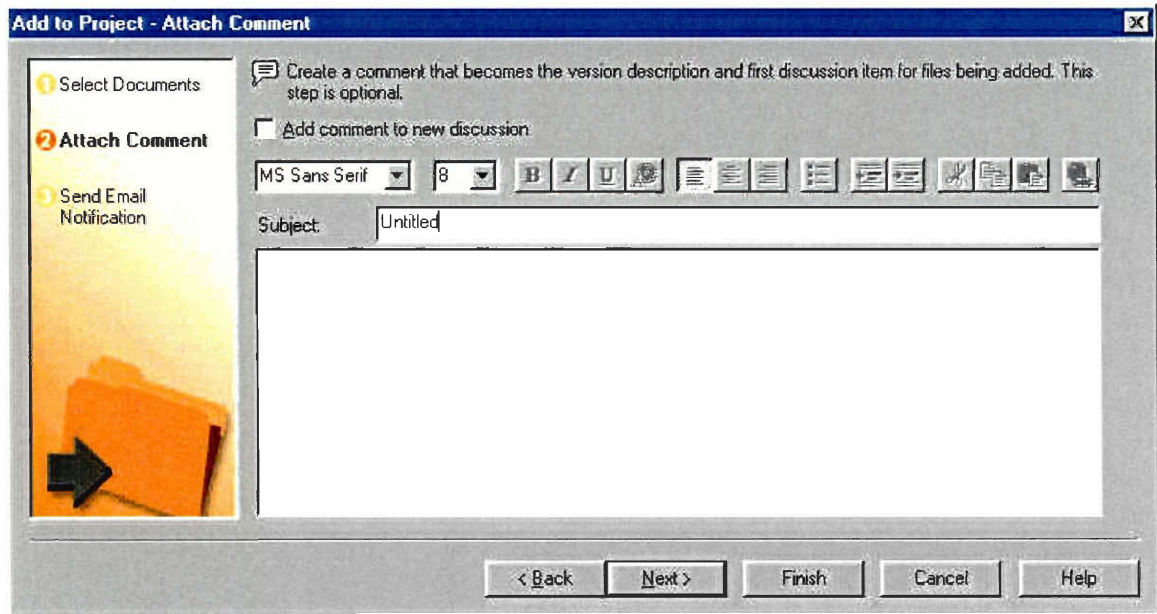
Figure 7: This picture shows how a comment can be added to the file.

By *left-clicking* the **Next** button in Figure 5, this window is displayed. Here the user is able to add a comment to the file(s) they are adding. There is a check box at the top of the screen that allows the user to have this comment added to the file as a discussion. Discussions may be used to resolve issues surrounding a document.

After the user has completed entering their comment (or they can choose not enter a comment at all) they *press* the **Next** button to notify some other users of the web site that the file has been uploaded or the user can *left-click* the **Finish** button to add the files now.
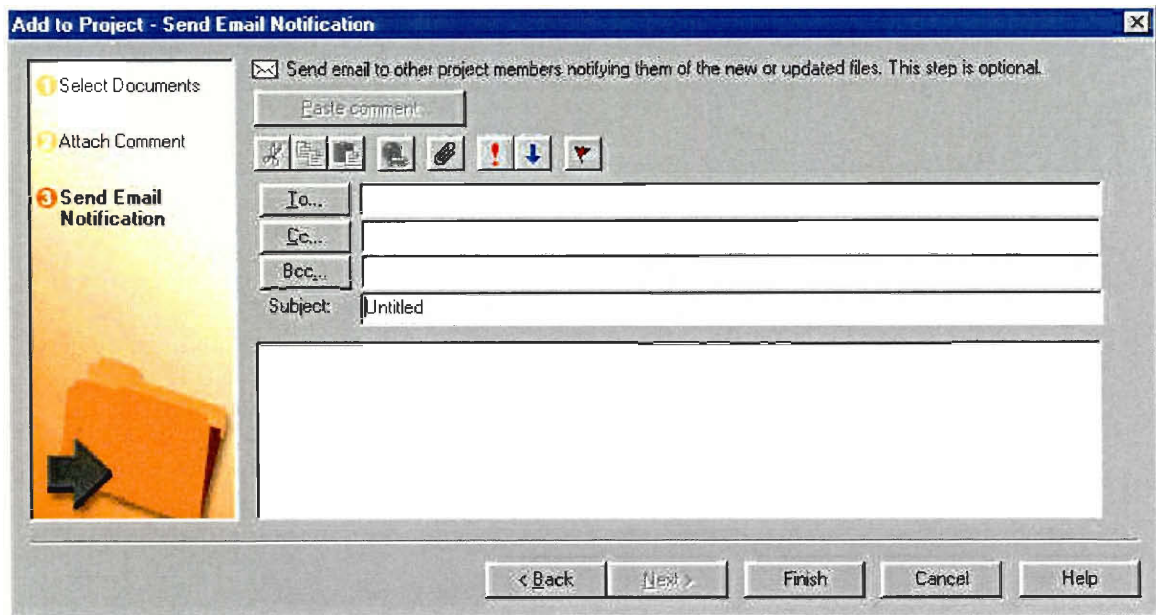
Figure 8: This shows how to notify users of the file being uploaded.

As shown in Figure 8, the notification tool is very similar to most major e-mail programs such as Microsoft Outlook. By *left-clicking* the **To** button the user can add members from their contact list (all of the users of the web site are automatically in the contact list). Now the user should *select* the **Finish** button to add the file(s) to the web site, notify the proper users and attach a discussion to the file(s).
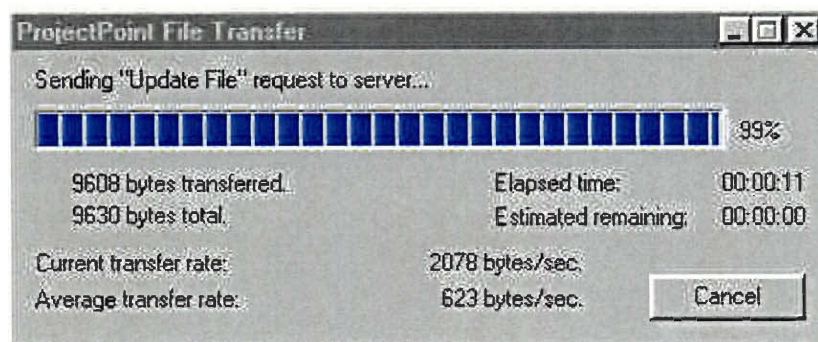
Figure 9: This is the upload progress window.

When the user decides to upload files to the web site by *left-clicking* the **Finish** button from Figure8, Figure 7 or Figure 5, the upload progress window seen in Figure9 appears on the screen. When the upload is complete, the window shown in Figure9 will disappear and the user will be back at the original Project Files view of the web site shown in Figure4.

View File
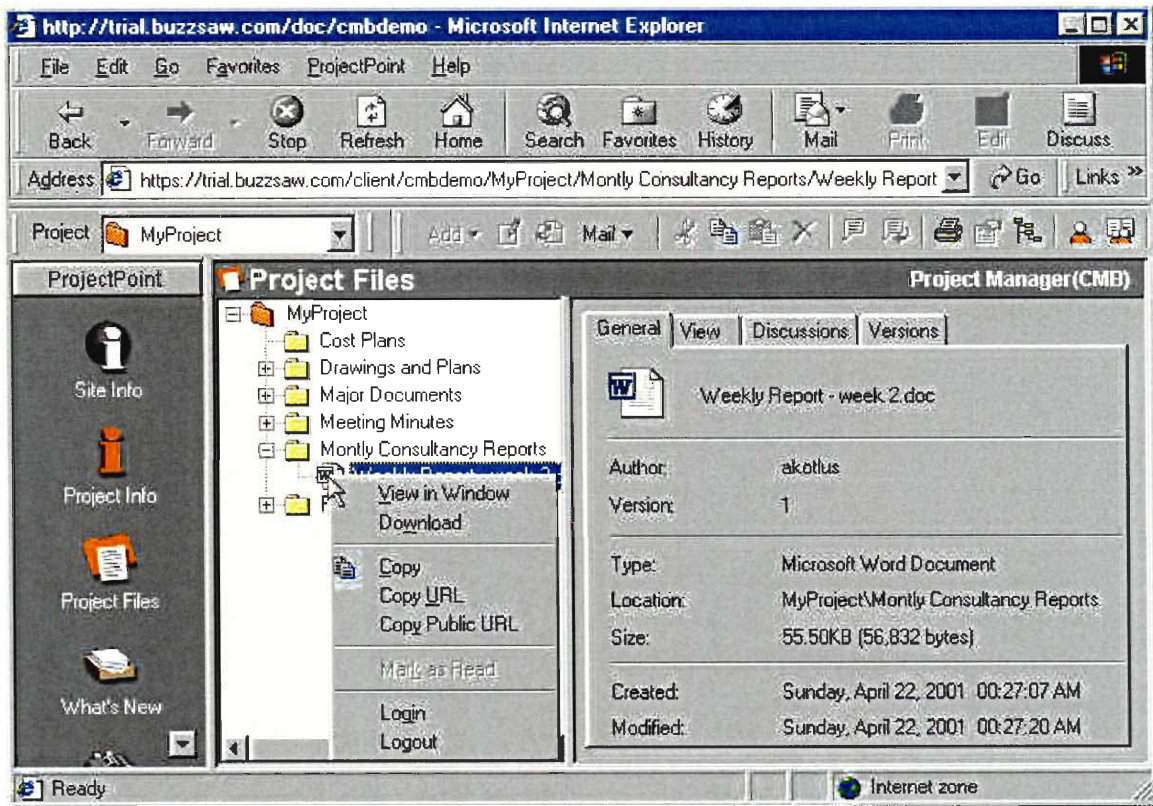
Figure 0: This figure shows how to view a file within the web site.

As shown in Figure 0, there are a few ways to view a file within the ProjectPoint web site. The user can either ***right-click*** on the **document** and *select* the **View in Window** option **or** they can *select* **the file** and *select* the **View** tab on the right-hand side of the web site.
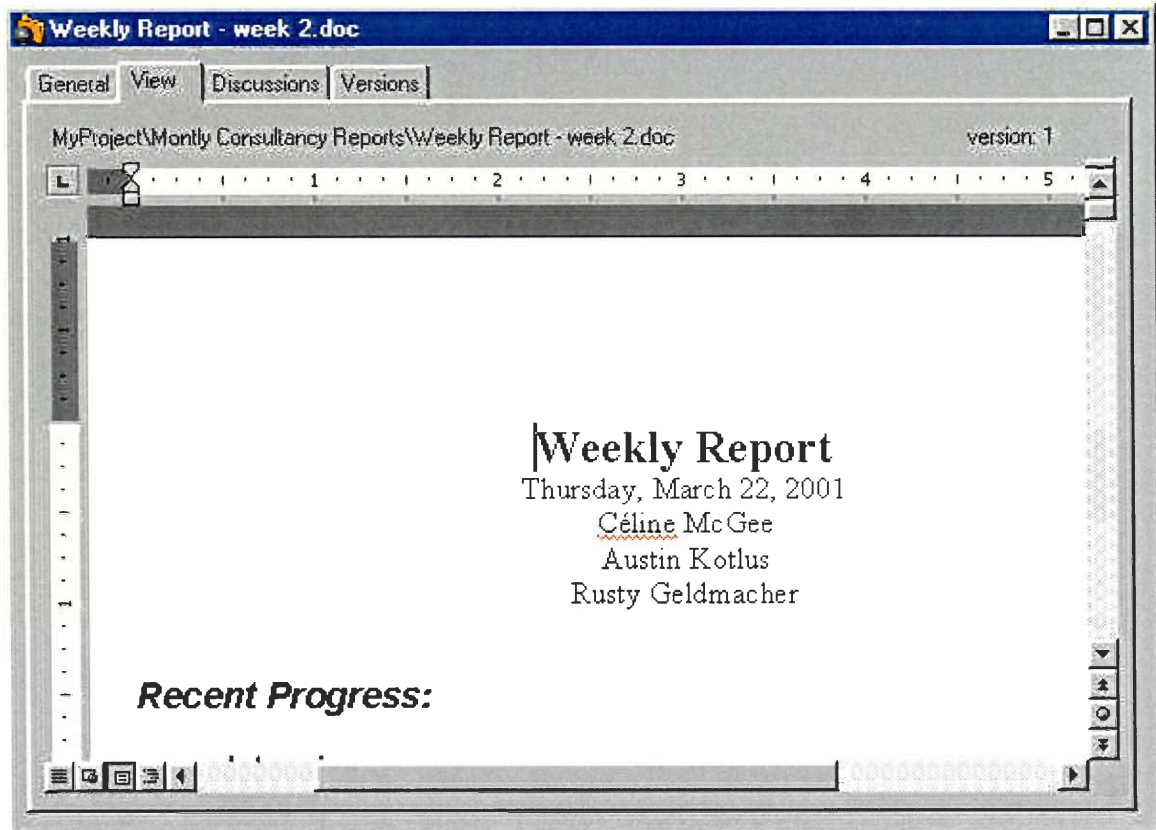
Figure 11: This shows the document viewer offered by ProjectPoint.

In Figure 11, the user has selected to view the document in a separate window. Here, the user is viewing a progress report in Microsoft Word format. In order to view Microsoft Word documents the user must have Microsoft Word installed on their computer. This is the case with all documents that get stored on the web site except for AutoCAD files. The ProjectPoint web site incorporates the Volvo Viewer plug-in to allow all users of the web site to view AutoCAD files. If the web site users decide that they want to store files that are in a less common format it is suggested that they convert these files to PDF (Adobe Acrobat) format so that all the users will have the ability to read these files.

Comment on a file
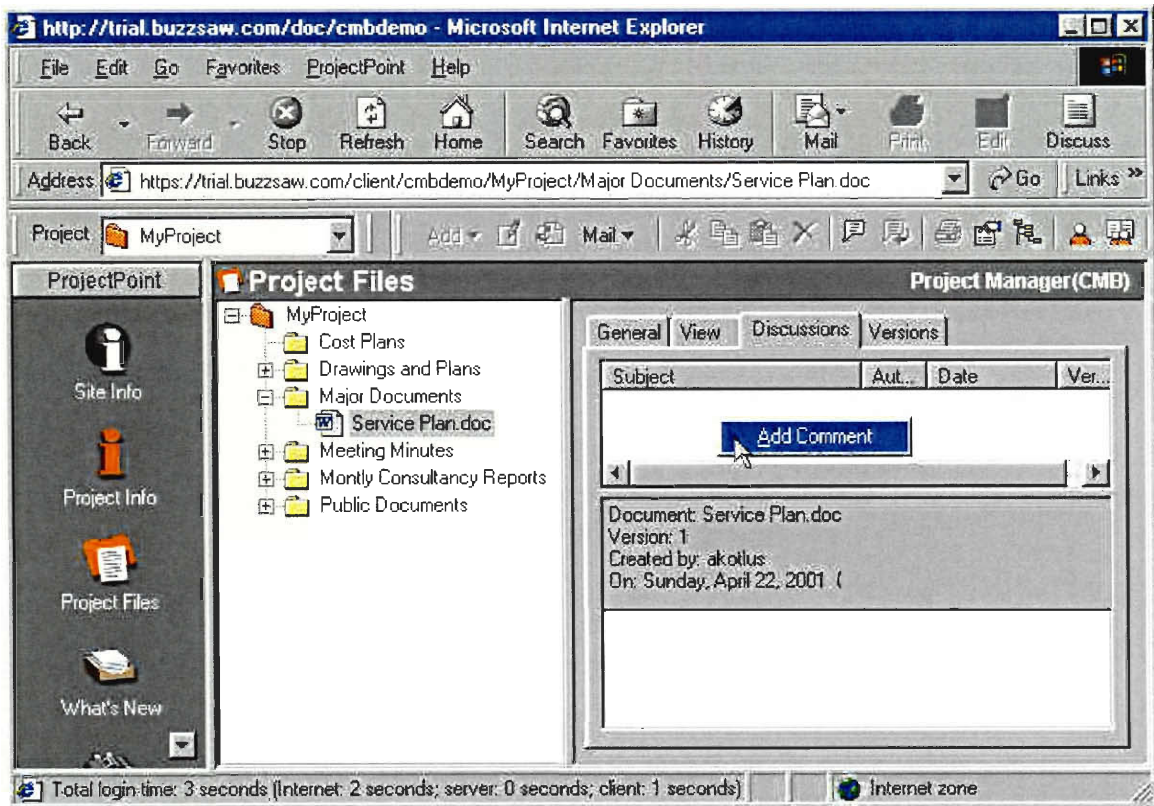
Figure 12: This shows how a comment can be added to a file.

As shown in Figure 12, users are able to add comments to files that reside within the web site. Similarly to the way that files can be added to the web site, comments may be added either by *selecting* **the file**, *selecting* the **Discussion** tab, *right-clicking and selecting* **Add Comment** or by *selecting* **the file** and *left-clicking* the **Add Comment** button on the toolbar.
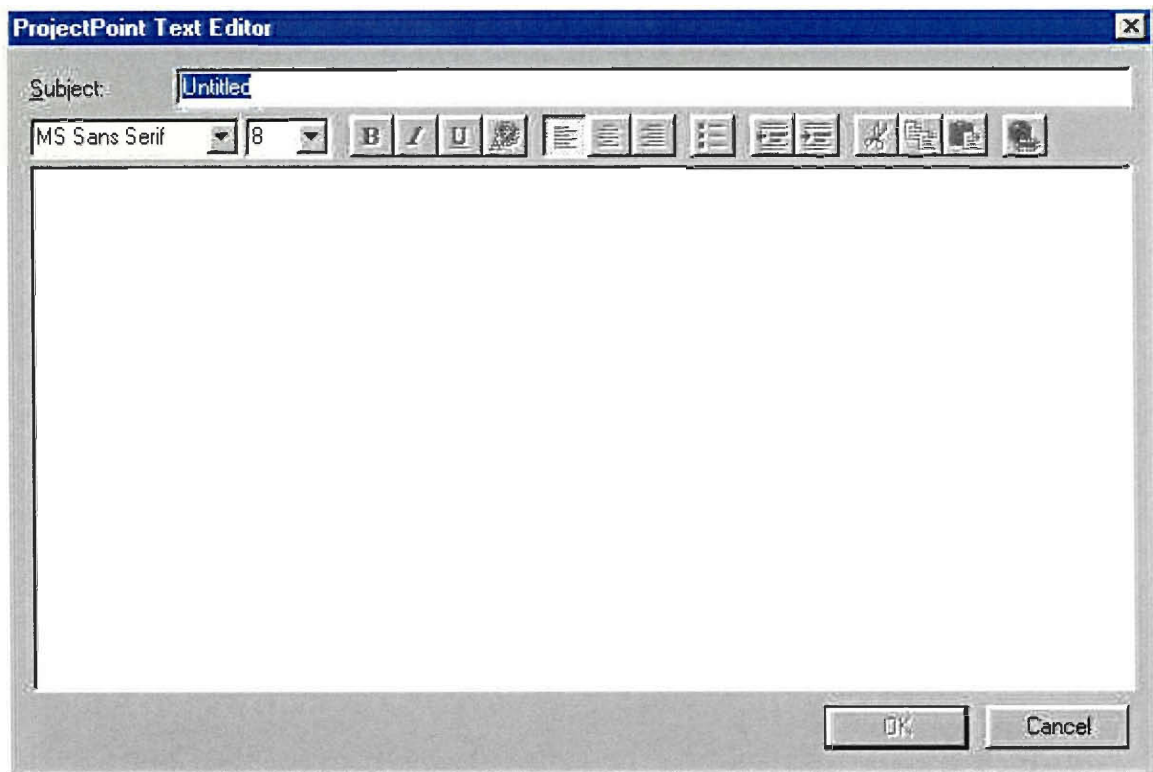
Figure 13: This shows how comments are written.

After the user selects the Add Comment button in one of the two ways mentioned earlier, the window shown in Figure 13 will appear on the screen. The user then should enter a subject for the comment and put the comment in the large text area similarly to how they would write an e-mail. When they have finished writing the comment they *left-click* the **OK** button shown at the bottom right-hand corner of Figure 13.
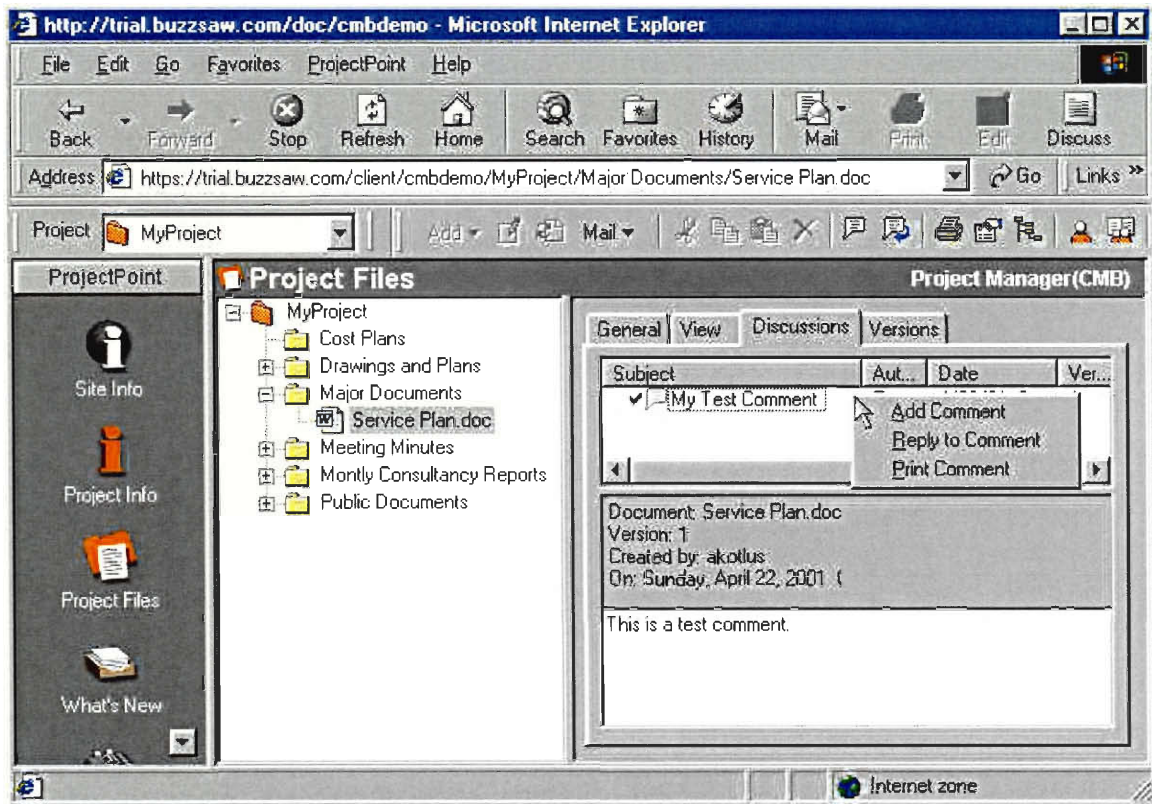
Figure 14: This shows how comments can be viewed, replied to and printed.

After the user has added their comment it may be viewed by selecting it. In addition to viewing and adding comments, the user is able to reply to comments and print comments. As shown in Figure 14, this is accomplished by *right-clicking* **on a comment** and *selecting* **Reply to Comment or Print Comment**.

File Versions
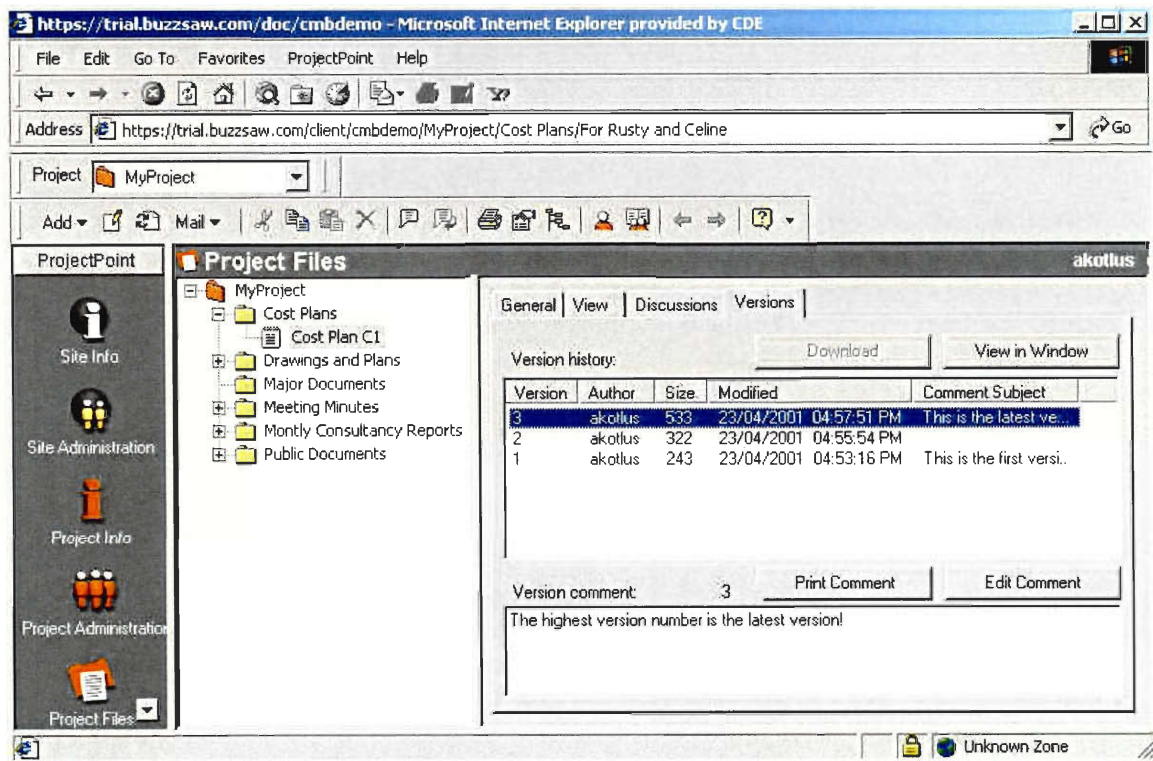
Figure 15: This shows how ProjectPoint handles version control.

ProjectPoint has an advanced version control system shown in Figure 15. To see the different versions of a file, select that file and then select the Versions tab on the right-hand side of the window. As shown in Figure 15, there are three versions of Cost Plan C1. Version 3 is the latest version and version 1 is the first version. Each version can be either viewed in a separate window or downloaded to the users desktop by *selecting* **the version** and *left-clicking* the **View in Window** button **or** the **Download** button respectively. NOTE: each time a file is edited and saved, a new version is created.

Mark-up a file
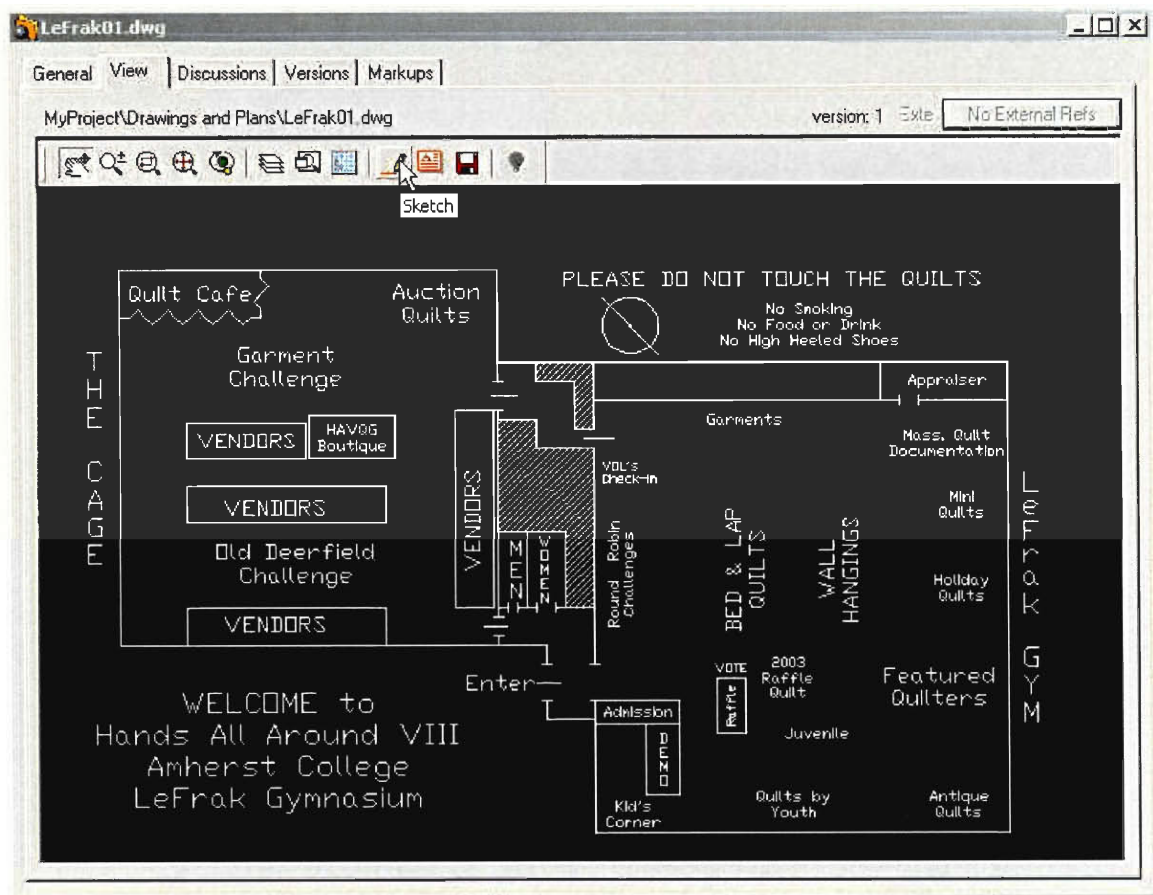
Figure 16: This window shows the LeFrak01.dwg AutoCAD file being viewed in a new window.

As shown in Figure 16 - Figure 18, the user can mark-up the LeFrak01.dwg AutoCAD file by *selecting* the **Sketch** button (see Figure 17) from the tool bar **or** by *selecting* the **Comment** button (see Figure 18) located directly to the right of the Sketch button.
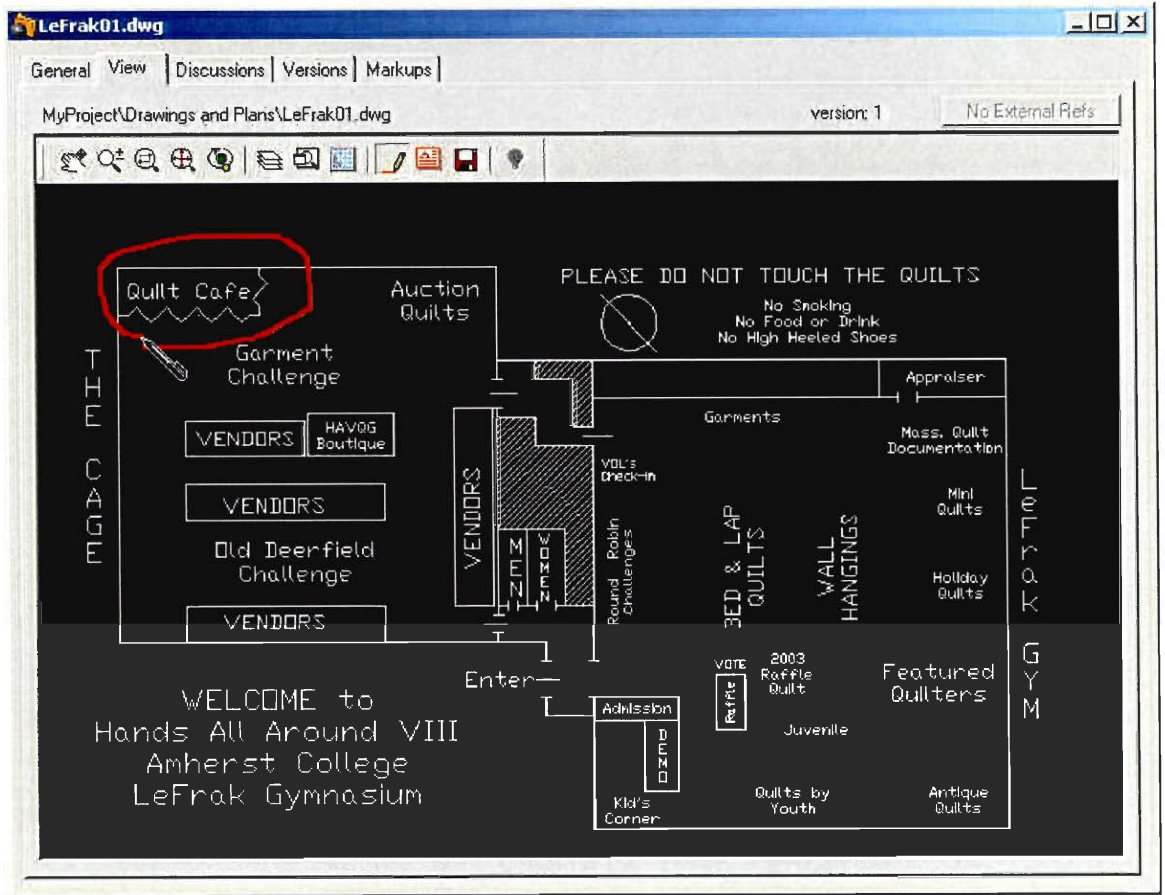
Figure 17: This shows the AutoCAD file being viewed with a Sketch mark-up on it.
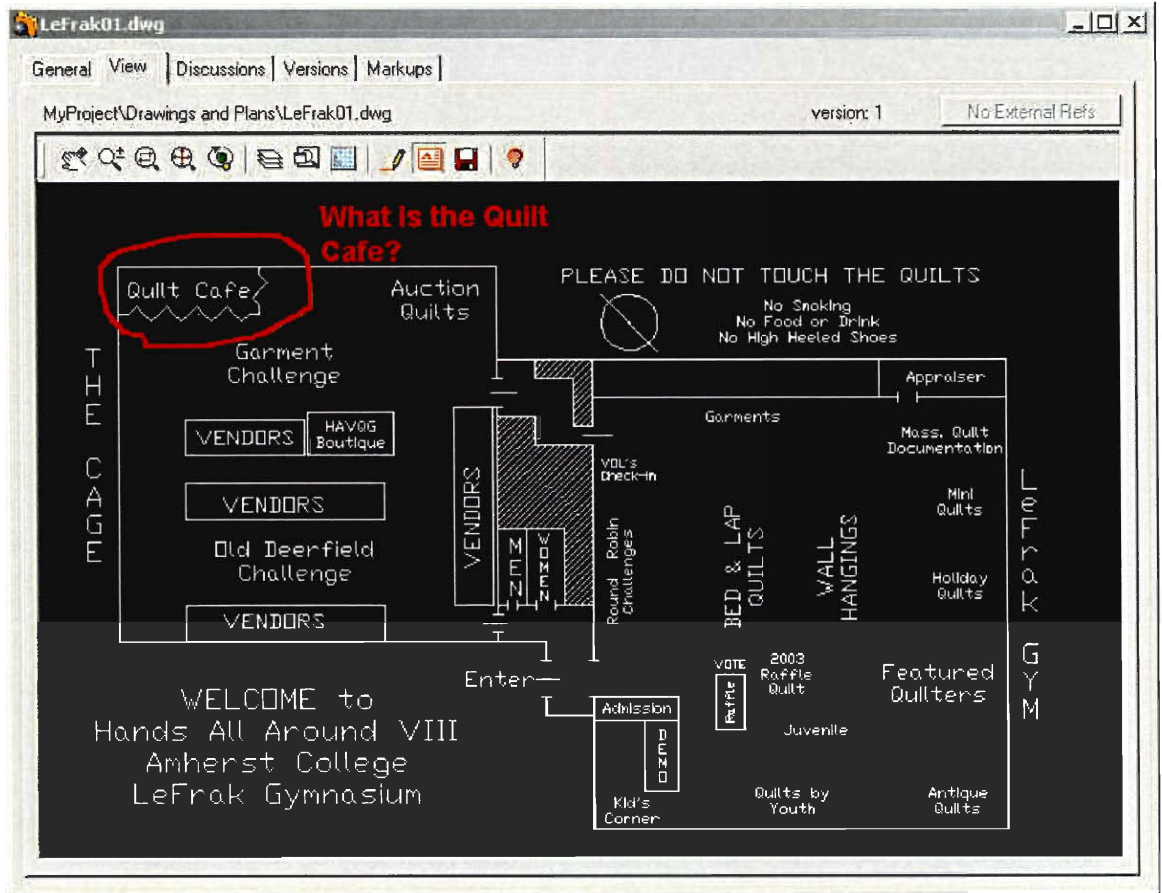
Figure 18: This shows the AutoCAD file being viewed with a Sketch mark-up and a Comment mark-up on it.
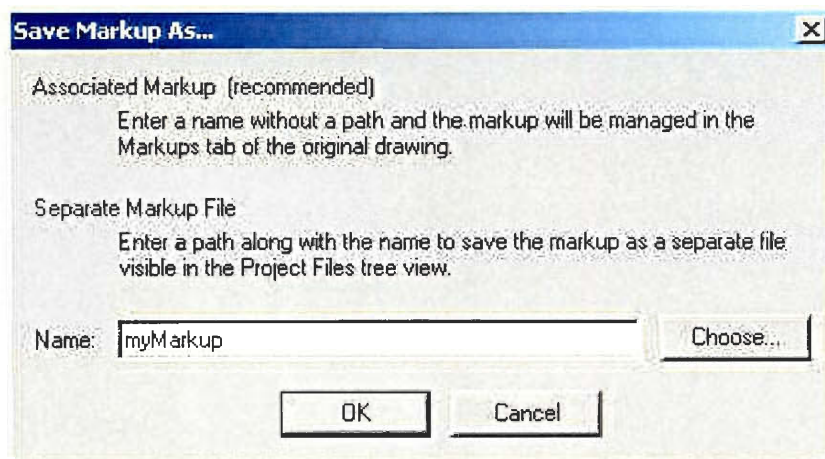
Figure 20: This shows the user saving the mark-up changes.

After the user has marked-up the AutoCAD file that they are looking at they can *left-click* on the red **Save** button located directly to the right of the Comment icon shown in Figure 20. In addition to left clicking on the red **Save** button, the user can

left-click on a **different tab**. This will cause ProjectPoint to ask the user if they would like to save their changes. Now the user is either able to save their mark-ups or to discard their mark-ups.

What's New
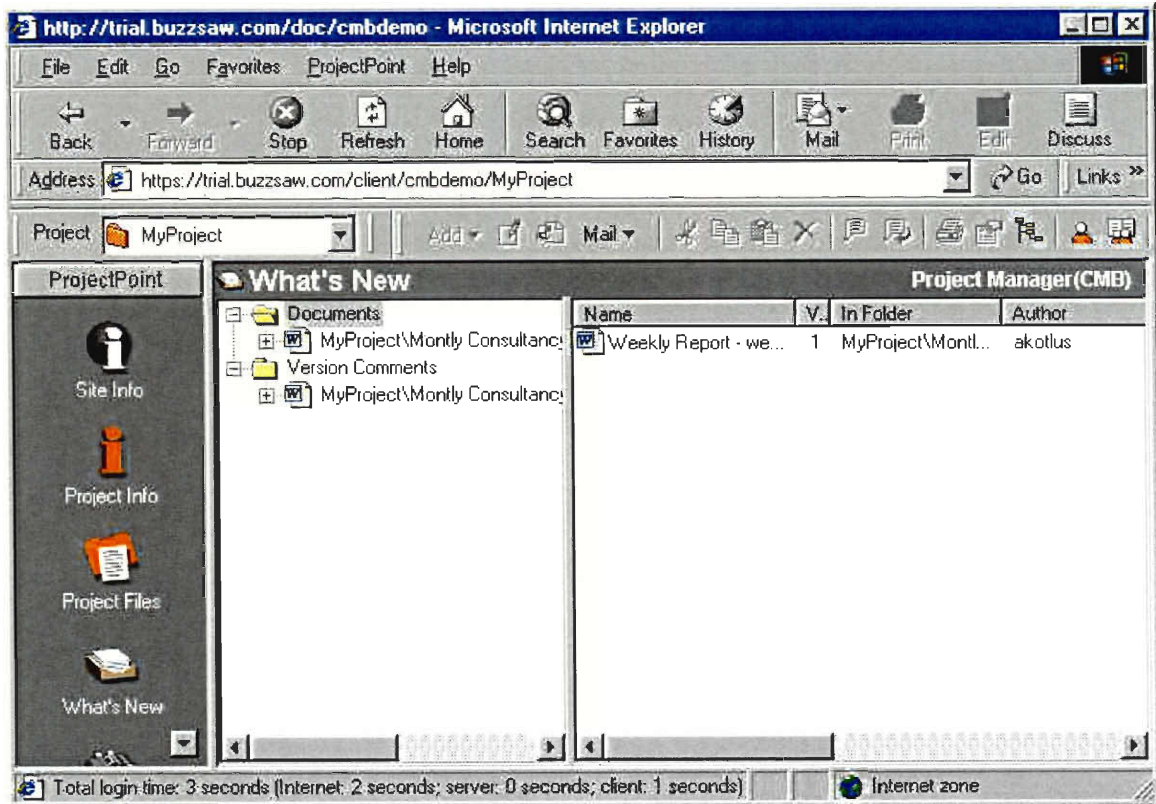
Figure 21: This is what the What's New feature looks like.

The What's New feature of the web site, shown in Figure 21, lists all of the information that is on the web site that the current user has not looked at yet.
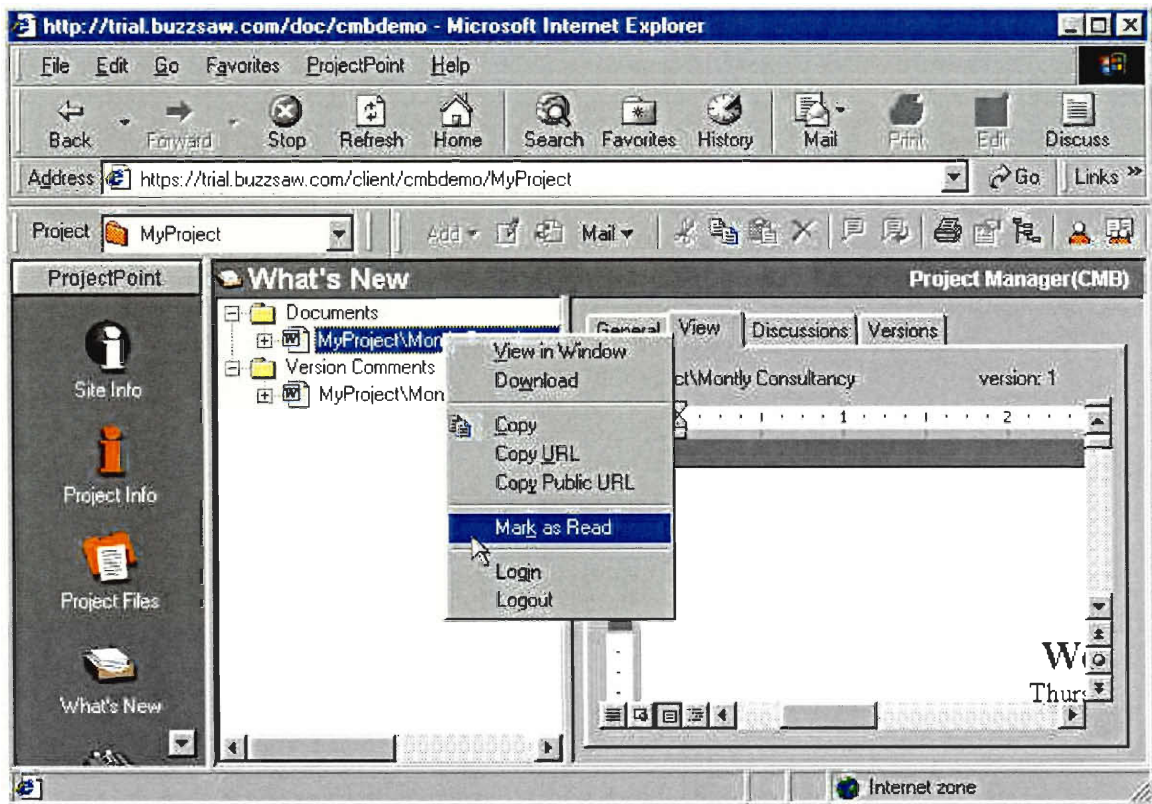
Figure 22: This shows how to mark a document as read.

After the user has seen all of the information on the web site that has been added, they should ***right-click*** on **the file** and ***select*** the **Mark as Read** option as it is shown in Figure 22. Now if the user either ***leaves*** the **What's New** folder **or** ***selects*** the **Refresh** button from the tool bar as seen in Figure , there are no longer any files in the What's New folder because the user has marked those files as read.
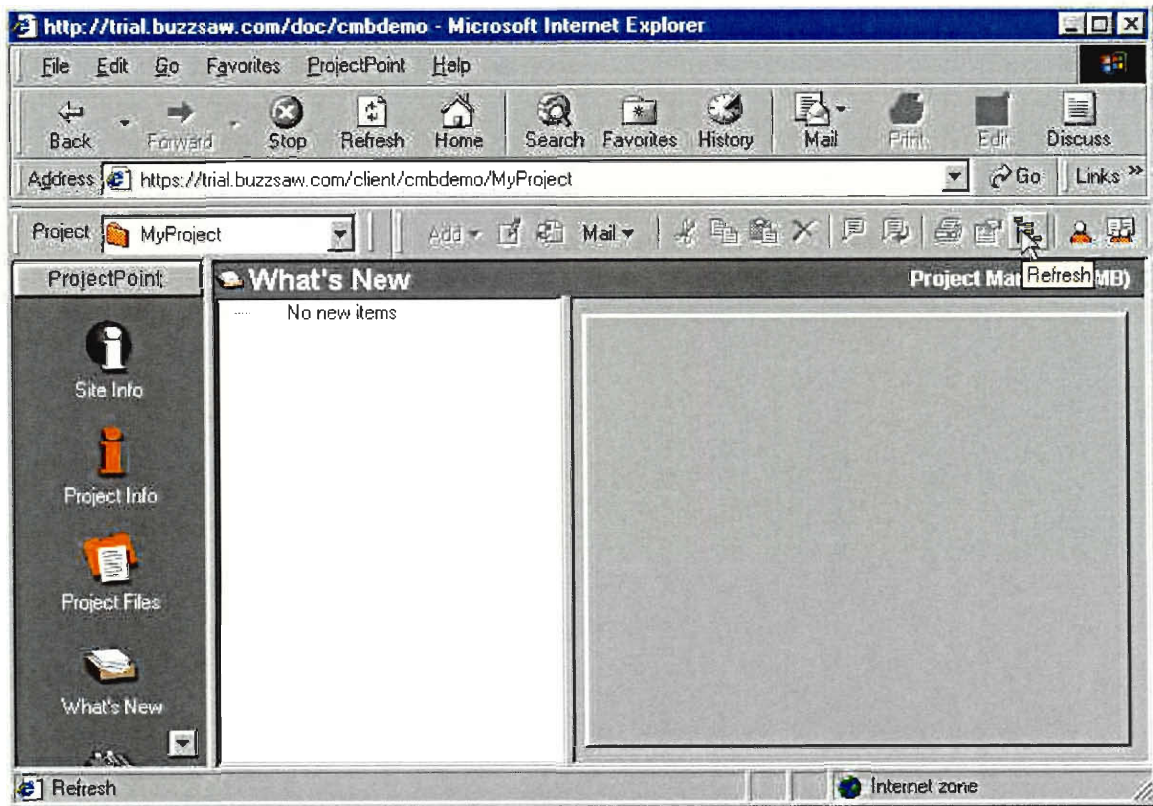
Figure 23: This shows how to refresh a page.

Mail
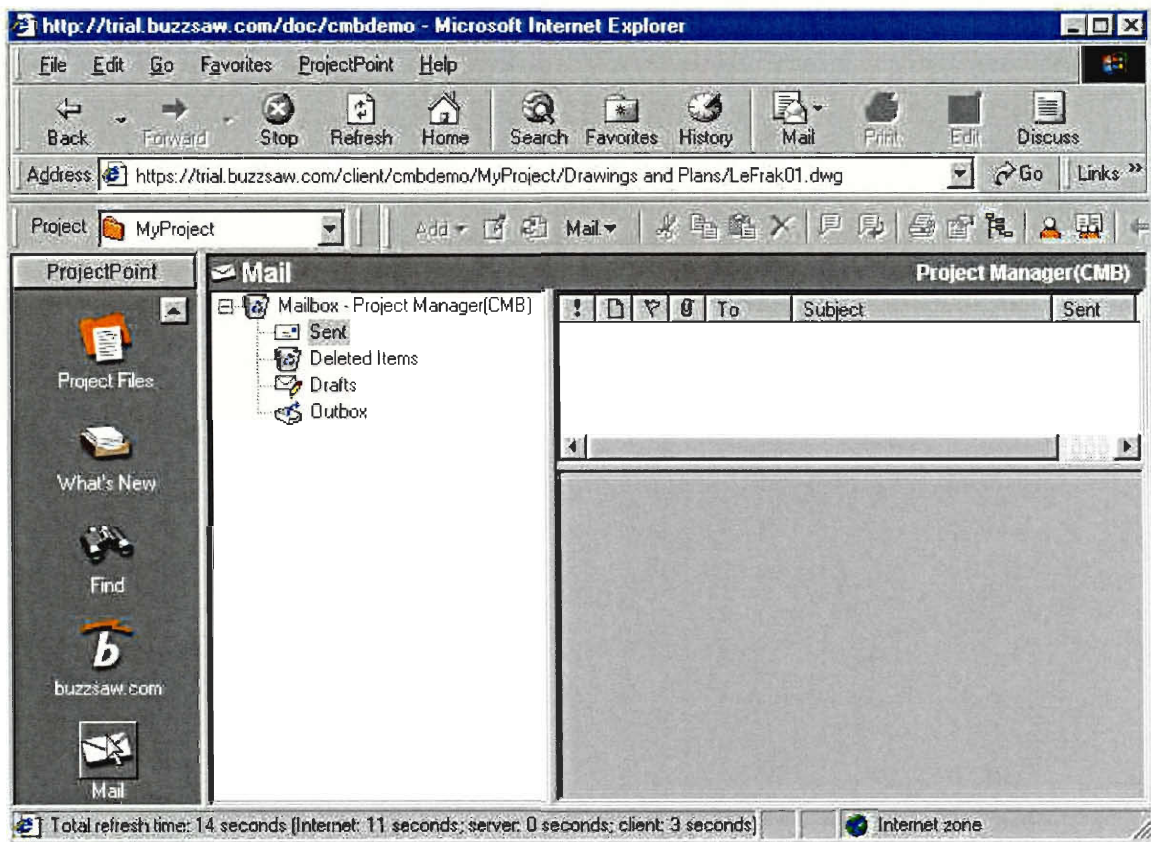
Figure 24: This shows the Mail feature of the ProjectPoint web site.

As shown in Figure 24, the Mail feature of the ProjectPoint web site is very similar to the Mail features of Microsoft Outlook.
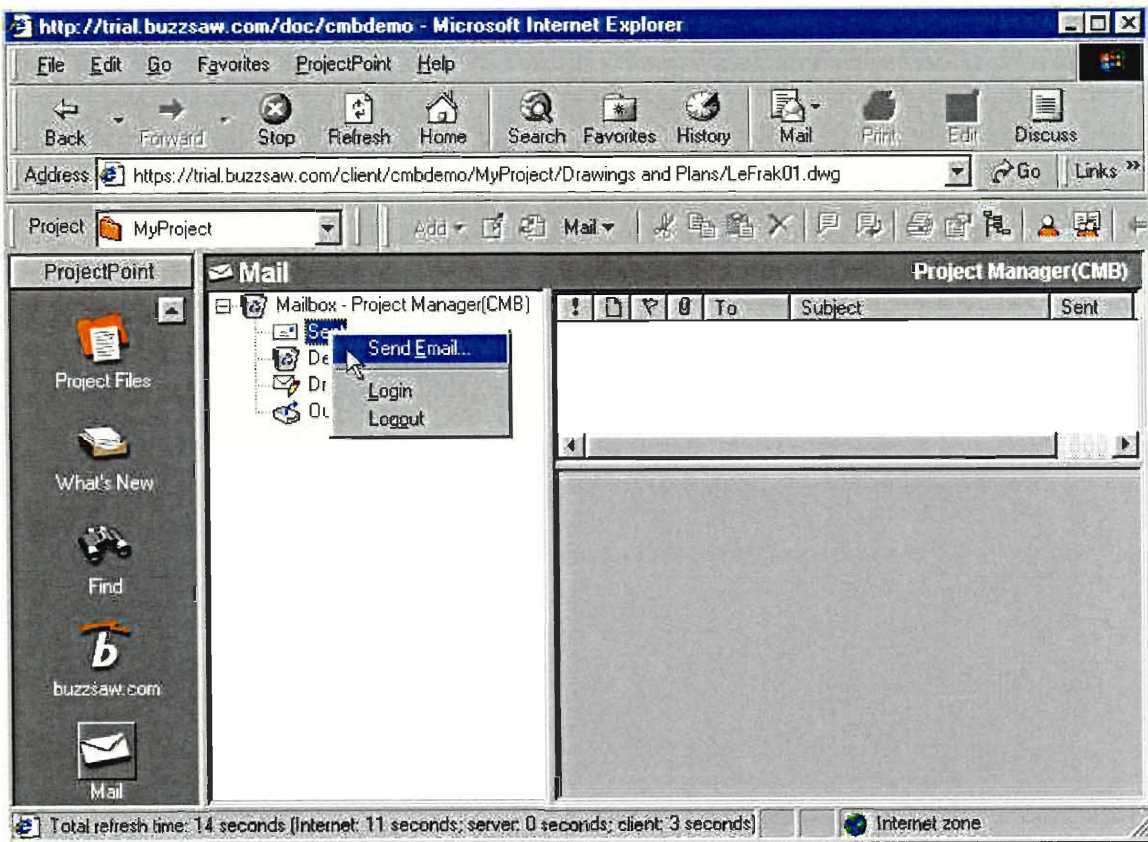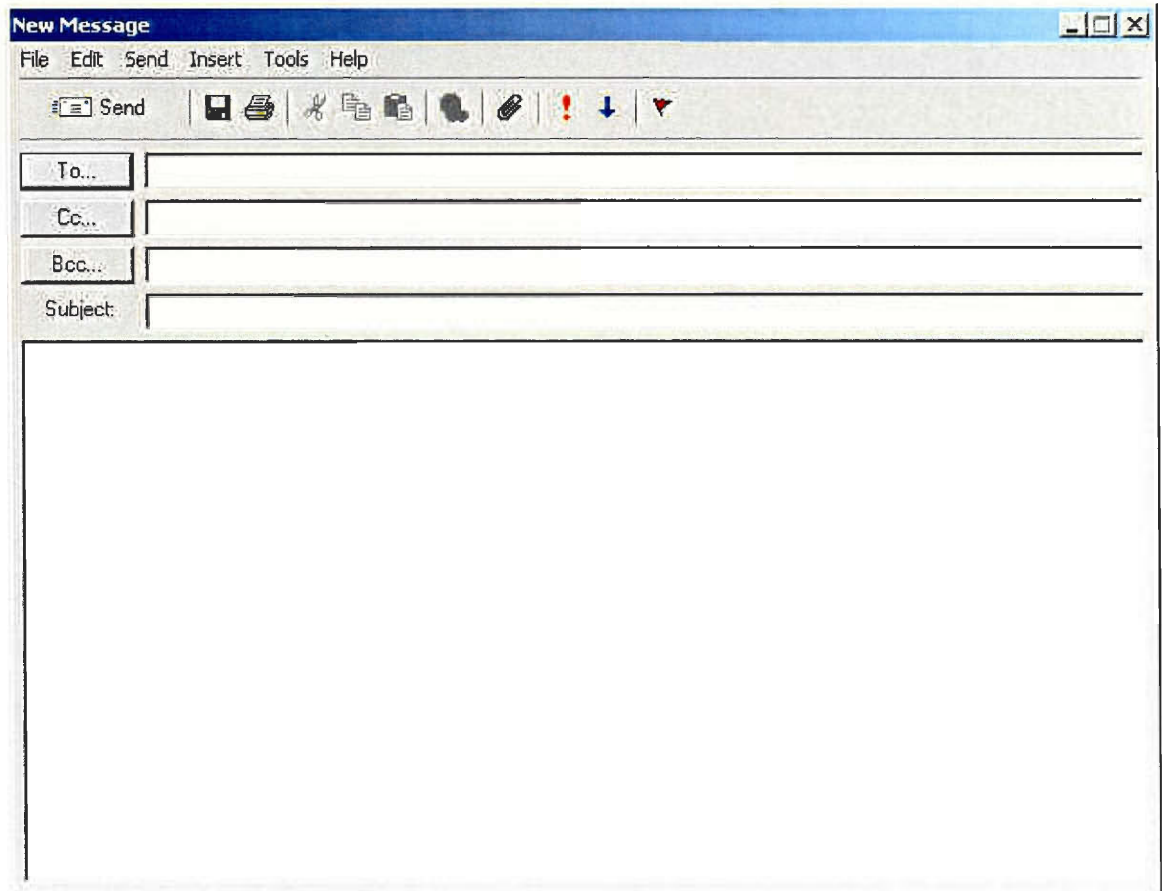
Figure 25: This shows how to send and e-mail with this web site.

As shown in Figure 25, sending and e-mail is similar to adding a file to the web site or adding a comment to a file. The user can either ***right-click*** on the sent folder and select **Send Email or** they are able to ***left-click*** the **Mail** button on the toolbar and *select* **Send Email**.

Figure 26: This shows the Mail Editor feature that comes with ProjectSolve.

As shown in Figure 26, the mail editor window is also set up very similarly to Microsoft Outlook. Mail can be sent to people either by *selecting* the **To** button and adding people from the calendar **or** by *typing* their **e-mail addresses** in manually.
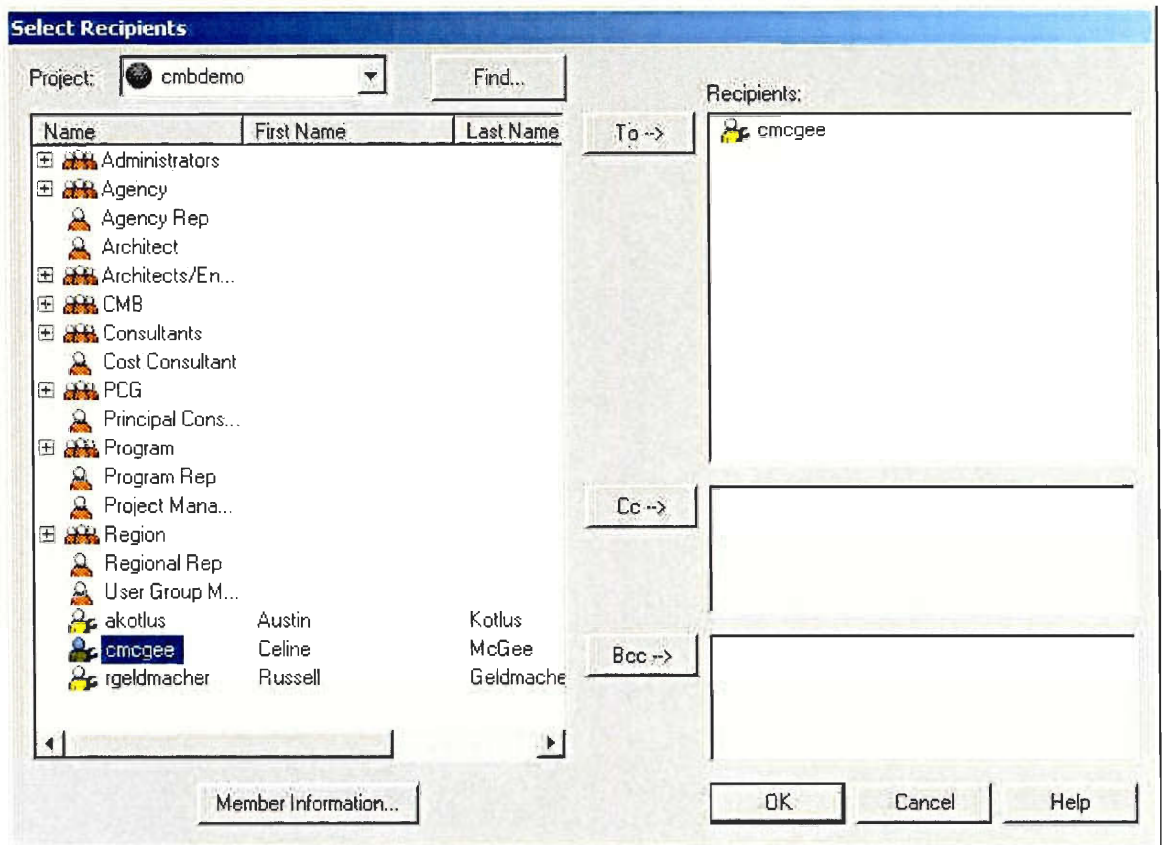
Figure 27: This shows how users can be added from the contact list.

As shown in Figure 27, the user has selected the **To** button from Figure 26 and is now adding users from the contact list. The contact list is comprised of all the users of the web site and all the groups of users of the web site. In Figure 27, the user has decided to send the e-mail to cmcgee.

Appendix J: Usability Test Task List

1. Please read through the entire usability test before you begin
2. Login to the model web site as the Principal Consultant
3. See What's New on the site in

   (This is one of the navigation buttons in the left-hand side of the web site)

   - Open each new item by selecting them from the centre frame and single-click the view tab in the right-hand frame
   - If there are any comments that are directed at you, reply to them (You will know by looking at the comments in the discussion folder)

4. Go to Project Files and enter My Project and select the Major Documents folder.

   - Begin Adding the file Business Plan.doc from the desktop to the Major Documents folder
     i. Click Next to Add a discussion comment to the file you are about to upload
     ii. Click Next to Notify cmcgee about the file
     iii. Click Finish to complete the upload

5. Go to the Drawings and Plans folder

   - View the FloorPlan.dwg AutoCAD drawing
   - Mark-up the drawing
     i. From the view tab, Sketch a circle around the "Quilt Café"
     ii. Add a comment that says, "What is a Quilt Café?"
     iii. Save the changes to a mark-up file called "your name".

6. Go to the PCG Meetings folder inside the Meeting Minutes folder

   - Single-click PCG-5-May-01.doc
     i. View the 1st version of the file
     ii. View the 3rd version of the file
     iii. Select the file PCG-05-MAY-01.doc
     iv. Add a new discussion comment to describing what the difference between the 1st and 3rd version of this file is.

7. Enter the Mail feature

- Send an email to cmcgee, rgeldmacher and akotlus letting us know that you have finished the usability test.