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Creation of a Collaborative Information Hub for the Fire Protection Industry of Australia

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ABSTRACT

This project investigates the criteria for creating the most effective collaborative and informative online learning environment for the Fire Protection Association of Australia. Our team determined the content and technology necessary to implement this online learning Hub through interviews, surveys, focus groups and background research. The Hub will serve as an informative tool for the fire protection industry and will have the potential to improve industry knowledge as well as fire safety throughout Australia.

EXECUTIVE SUMMARY

Every year 80,000 people are killed as a result of more than 8 million fires worldwide. Also, another 800,000 people are injured each year due to these fires. Of the 80,000 deaths, nearly 90% resulted from fires originating inside of buildings (Wagner 2006). This is a devastating statistic considering fire protection systems are mandated worldwide in most public buildings today. Fire protection systems vary from simple audible or visible warning systems to highly advanced fire suppression systems. Nonetheless, these systems need to be reliable in order to be effective.

The fire protection industry holds the responsibility of ensuring that fire protection systems are reliable and operate as intended. In Australia, this industry is represented by the Fire Protection Association of Australia. This not-for-profit organization serves as both a publisher of training material and a representative body for the industry. It is their mission to promote fire and life safety in Australia by ensuring that all members of the industry, including engineers, technicians, and inspectors, are knowledgeable on the fire safety requirements for Australia. They currently publish training material in print, CD, and video formats.

FPA Australia wishes to further promote industry knowledge by creating an online website to be referred to as the Hub. This website will serve as a repository of information relating to the installation and maintenance of fire protection systems and equipment. The Hub will contain information created by FPA Australia and validated information uploaded by industry members. This information will include best practice guides and examples for servicing fire protection equipment. The Hub will foster a more knowledgeable and skilled workforce because it will provide access to information regarding the proper way to perform job related tasks.

One of the main goals of this project was to determine the best online technology for creating this website. Over the project time frame, we surveyed 2056 industry members and conducted many informal interviews with industry professionals and FPA Australia staff members. Our survey response rate was approximately 12% and included industry members from all Australian states and territories except for the Northern Territories. From this dataset, the project team determined what content the industry desired to be displayed on the Hub. We developed questions regarding the specific content that the industry ranked as the most useful

and why. We also obtained data regarding the general level of Internet competency including their degree of familiarity with social networking websites. We created three Hub prototype websites, and provided multiple recommendations to FPA Australia based on our research and prototype testing.

Based on the results of our research, we recommended that the content initially focus on the skills required for inspecting and testing fire protection equipment in the field. This will allow for the industry to view already familiar information while initially exploring the Hub. Also, to facilitate ease of use and familiarity, we recommend that the Hub be designed as close to the layout of Facebook as possible. From our survey data, we determined that Facebook was the most popular social networking site throughout the industry. By designing a Hub similar to Facebook, it will ensure that most of the Hub users will be familiar with the layout and how to navigate the site. Another recommendation to FPA Australia pertains to the future assessment of the Hub to ensure it is useful as an industry-wide tool. We recommend that FPA Australia survey Hub users once it has been implemented. This will help determine the effectiveness and highlight any specific problems. This will ensure that the Hub will be of maximum use to the industry and illustrate any areas of necessary improvement.

Finally, based on our research, we determined that the best technology for FPA Australia to implement the Hub is Wordpress. This is the best option because Wordpress provides a user-friendly environment, is easily maintained, and it has enormous potential to be customized. Some concerns with Wordpress are that it needs to be installed on a web server that would incur a cost and that it may require professional consultation to be fully customized. Even with these drawbacks, Wordpress has distinguished itself as the best possible option in the short and long run for FPA Australia to implement the Hub.

By serving as a repository of best practices as well as a way to communicate and solve problems with the help of other industry members, it is our expectation that the Hub will enhance industry-wide knowledge thus the overall level fire safety across Australia.

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CHAPTER 1: INTRODUCTION

Every year 80,000 people are killed and another 800,000 injured as a result of more than 8 million fires worldwide. Approximately 90% of these deaths are a result of fires inside of buildings (Wagner 2006). This is a considerable number, particularly because fire protection systems are mandated worldwide in most public buildings today. Fire protection systems vary from simple audible or visible warning systems to highly advanced fire suppression systems. However, regardless of the complexity of these systems, they need to be reliable in order to be effective. In 2003, more than 2.9 million false alarms were reported to worldwide fire departments. This represented 10% of the world's total fire calls that can include false alarms, structure fires, brush fires and car accidents (Wagner 2006). False alarms have a variety of possible causes including faulty wiring or conditions that may simulate a fire event such as dust or smoke from a candle. Also, failures in other types of fire protection equipment, such as sprinkler systems, occur for different reasons. Causes include, but are not limited to, improperly designed systems, lack of maintenance, or the failure to turn the water supply back on after routine maintenance or testing (Hall 2009). Although some of these causes are inevitable, others can be prevented with relative ease. The professionals responsible for installing and maintaining fire protection systems must be particularly competent in their field in order for the fire protection systems to have the maximum possible reliability.

In 2003, Australia had 138,000 false alarms, which accounted for 48.9% of all alarms. This percentage was the largest of the entire developed world (Brushlinsky, Hall, Sokolov, & Wagner, 2006). Throughout 2003, Australia spent approximately 1.15% of its GDP on all aspects associated with fire. This percentage equates to AUD$ 5.24 billion of Australia's AUD$ 455 billion gross domestic product (GDP) and includes fire losses, fire prevention, and fire service administration. The installation and regular maintenance of fire protection systems makes up 0.372% of Australia's GDP or AUD$ 1.7 billion (Ashe 2004). Because this percentage is consistent with other country's numbers, one can see there is an obvious problem with Australia's high number of false alarms in relation to the money being spent on fire protection systems. It is important that the fire protection industry of Australia operates as efficiently as possible in order to reduce the number of false alarms and system failures. This will ultimately lead to advancement of the industry's goal of protecting life and property.

Overall, when fire sprinklers operate as intended, they are very effective. Reports from the National Fire Protection Association (Hall 2009) have shown that sprinklers in the United States in 2006 were effective 96% of the time when the fire grew large enough to activate them (Hall 2009). However, this only holds true when the system actually activates, which occurs in 93% of all fires where a sprinkler was present. There are some factors that may hinder fire sprinkler systems from activating. Hall (2009) stated that 63% of all sprinkler system failures were due to the system being shut off prior to the fire event. Lack of maintenance accounted for 14% of these failures, possible design errors held 11% of the total, and manual intervention of the system accounted for 9%. Only 3% of these failures were due to actual component damage. From this, one can conclude that 97% of all fire sprinkler failures were the result of negative human effects on the systems. In order for fire protection systems to perform at their peak capacity, all workers in the industry must be up-to-date with the codes and standards regarding these systems and apply them in a competent fashion. From Hall (2009), it is clear that fire sprinklers are effective unless human error occurs and tarnishes the reliability factor of these systems. Therefore, technicians must be knowledgeable and competent in their work so that sources of failure for sprinklers are reduced.

The Fire Protection Association of Australia (FPA Australia) is concerned with ensuring that fire protection professionals receive adequate training and education. To achieve this objective, FPA Australia sponsors seminars and publishes training materials such as textbooks and videos to educate and inform the industry. These efforts supplement the training and certification requirements that are required by the government. The current methods used by FPA Australia to inform and educate the industry are effective at providing information regarding code requirements and best practice guides to the industry.

FPA Australia's efforts have been complicated by the introduction of new licensing requirements and the lack of a method to instantaneously update the fire protection industry on important changes. Current methods such as textbooks or technical conferences limit user feedback and are constrained by the content, speed of delivery, and number of examples FPA Australia can provide. A possible solution to this, which FPA Australia has begun exploring, is an online collaborative learning Hub. This Hub will function as an online forum to allow the fire protection industry of Australia to share, as well as collaboratively build their knowledge. This system will also allow FPA Australia to rapidly distribute the most current information on

licensing, as well as information on installation and maintenance practices. A study done to assess the benefits of collaborative learning among school children evaluated collaborative technologies similar to those currently being explored by FPA Australia. This study shows an increase in the problem-solving capacity of the children exposed to a collaborative environment (Lazakidou 2009). This study suggests that collaborative learning has potential to be a useful method of learning, but this study was done with school children in a traditional classroom environment, and the effect on adults within an online environment, such as the fire protection Hub, is unclear. FPA Australia has developed pilot programs within the industry to evaluate the willingness of industry members to learn from e-learning programs. The agency has also identified a number of online technologies that could be used to implement the proposed Hub. However, the specific content that will be most useful to the industry is unknown at this point.

The project is intended to improve the practices of fire protection systems installation and maintenance in Australia by introducing an online collaborative system of education. The system will provide information to keep industry professionals up to date on requirements and best practice methods. This will be accomplished by determining the advantages and disadvantages of this online style of education and researching technologies to implement this system. Also, by interviewing various industry individuals as well as examining historical fire data, the content of the Hub will be determined. These content criteria, as well as the technology which can be used most successfully to implement the online Hub, was recommended to FPA Australia. The specific project objectives were to determine the most beneficial Hub content, to find the most effective and user-friendly methods of implementing the collaborative environment, to understand the industry perceptions of the Hub, and to make recommendations to FPA Australia based on our findings.

CHAPTER 2: BACKGROUND

Protecting people and property from fire is a pressing issue of the modern world. The losses from fires have a great impact on mankind every year. Fire protection systems, such as building-wide fire alarm systems and fire suppression systems, are methods of fire protection designed to protect property and individuals from fire. Unfortunately, sometimes these systems are installed or maintained improperly, which may cause unnecessary system failures. Efforts are currently underway in Australia to reduce improper installations by improving training, certification and education. An example of this is the development and implementation of a collaborative and informative online Hub to serve as a tool to aid all industry professionals.

This research project was sponsored by the Fire Protection Association of Australia, which, through education and representation of the industry to the government and in the public eye, aims to achieve the highest levels of life safety and property protection throughout Australia (FPA Australia 2009). FPA Australia proposed this online collaborative learning and information Hub as a possible method of obtaining these goals. This chapter will outline what FPA Australia has accomplished in the past and what they plan to accomplish in the future with regard to collaborative learning, education, and training. The chapter also provides important background information on the overall fire protection problem in Australia. We describe the industry of fire protection engineering (FPE) in Australia to give background information on the various fire protection systems and their design, installation, and required regular maintenance. We also describe the different groups of professionals that comprise the FPE industry to portray the industry structure. Also, the educational and training backgrounds of each professional group within the industry will be discussed. This background chapter will discuss collaborative learning as a general approach to the improvement of industry-wide education and training. Finally it will examine the use of online information Hubs or websites as specific tools that can facilitate the sharing of knowledge throughout the industry.

2.1 Fire Risk in Australia

Along with Australia's infamous wildfires, the structural fires that occur in any highly inhabited areas also affect its citizens. Australia spends approximately AUD$ 5.24 billion annually on all aspects associated with fire of which AUD$ 1.7 billion is spent on fire protection

systems. Each year there are approximately 3000 injuries and 100 deaths related to structure fires in Australia (Ashe 2004). This occurs even in the presence of the fire protection systems currently mandated in most public buildings. These fire protection systems are intended to provide safety to the Australian public and to help minimize property damage in the event of a fire. Although this is the intent, there are still incidents that result in deaths and significant property damage. Having these systems installed greatly reduces the risk of death and property damage. However, this only holds true if the systems function correctly. Proper installation and regular maintenance will increase the reliability of the systems, thereby increasing the overall level of property protection and life safety. The fire protection engineering industry is responsible for designing, installing, and maintaining these systems.

2.2 Overview of Australian Fire Protection Industry

2.2.1 Fire Protection Systems Throughout Australia

Fire protection systems encompass fire suppression systems such as sprinklers, passive fire protection such as fire rated doors, and fire alarm systems such as smoke detectors and warning devices. Suppression systems are designed to activate and contain a fire until the fire department arrives. These systems minimize property damage and ensure that building occupants have enough time to evacuate safely. The technology of fire suppression systems is very advanced and undergoes continual development. Water suppression systems are the most common type and may be installed in typical structures such as office buildings, hospitals, and hotel rooms. There are also gaseous systems that extinguish a fire by expelling a gas into the room of origin, which inhibits the oxygen consumption of the fire. This technology is generally found in applications where water would cause significant damage, such as computer rooms or areas with other sensitive electrical equipment. These gaseous systems are not typically installed building-wide and require an evacuation warning before activating because the gaseous suppressants may be harmful to humans if breathed in. Also, there are foam systems that dispense water-based foam that has an expansion ratio of up to 1000:1. These systems are installed to protect a very large area such as the bay of an aircraft hangar. Such a system could fill a large aircraft hangar with the expandable foam in minutes. (Koetter Fire Protection, 2008)

Another central technology in fire safety is that of fire alarm systems, which are designed to detect a fire as early as possible and notify building occupants that there is an emergency.

There are various system initiating devices in fire alarm systems, such as heat and smoke detectors, rate of rise heat detectors that activate based on the rate at which the room temperature increases, and manual fire alarm pull stations to name a few. In addition to the initiating devices, there are notification devices installed on a separate electrical circuit. These devices include strobe lights, horns and speakers.

2.2.2 Industry Structure

Australia's fire protection engineering (FPE) industry is part of the solution to the fire protection problem of Australia. The industry professionals work to provide the maximum fire protection and life safety to the entire country. They fight fire proactively by designing, installing and maintaining fire protection systems. There are many subgroups that comprise the FPE industry and each of these groups plays a pivotal role in keeping Australia safe from fire.

Fire protection engineers design fire protection systems that comply with the applicable Australian codes and standards such as the relevant sections of the Building Code of Australia (BCA). These engineers are employed by a variety of different organizations. These include but are not limited to appropriate government departments, engineering firms, code consulting firms and fire system and equipment companies. The engineers are also involved in construction and building design processes. They may provide designs or recommendations for passive fire protection elements such as fire and smoke rated doors and walls. Fire protection engineers are also capable of designing other methods of fire protection such as hose reels or gaseous suppression systems. Overall, they are responsible for ensuring that their designs are compliant with the Australian government requirements and any other applicable codes.

Another group that comprises the fire protection industry is that of fire protection technicians who are responsible for installing the aforementioned systems properly. They work closely with the engineers to ensure that the systems are installed per the engineer's designs and specifications. They also maintain previously installed systems to ensure that they are in proper working order. As with the engineers, they have various codes and standards to follow with regard to installation and maintenance tasks. In addition, they have guidelines that address how frequently maintenance should be performed. Technicians are required to be licensed according to the type of work they are doing. For example, a technician installing a fire alarm system will be required to hold an electrical license depending on the type of electrical work involved.

Currently Queensland is the only state of Australia that requires a specific occupational license for fire protection work. This industry sub-group is critical to ensuring that fire protection systems are maintained and are effective means of fire protection throughout Australia.

The Australian government also plays a role in the fire protection industry. With the exception of Queensland, all states and territories of Australia use the same fire protection regulations and standards. However, in addition to the other state and territorial regulations, Queensland has requirements for occupational licensing and extended gaseous fire suppression regulations. Typically, a third party such as Standards Australia will develop and publish the code or standard (Standards Australia, 2010). The local government will then adopt them into its laws. An exception to this is The Building Code of Australia (BCA). This code was developed and is maintained by the Australian government. Among other building regulations, the BCA includes specific fire protection regulations and references multiple fire protection standards published by Standards Australia. The BCA is accepted nation-wide by all states and territories of Australia. The Australian Building Code Board (ABCB) maintains the BCA. This board comprises individuals representing the fire protection industry, the Australian government, and executives from each of the state and territory governments (Australia Building Codes Board, 2010). The Australian government requires inspections of systems after the installation period, as well as periodically, to ensure they are functioning properly and comply with the requirements. Certificates of inspection are issued upon inspection and need to be renewed on an annual basis (Fire Rate Fire Protection Services, 2005).

The structure of the fire protection industry in Australia is similar to that of the United States. Like Australia, the local government (for example the state fire marshal's office) in the United States is the highest-ranking power within the industry in an individual state. The local government determines which codes are adopted into law and oversees all systems through inspections. However, each state has a unique set of adopted codes due to the differences among state governments. Currently, the non-profit National Fire Protection Association (NFPA) publishes most fire codes that are adopted by states within the US. Examples of commonly adopted NFPA codes are NFPA 72 – National Fire Alarm and Signaling Code, NFPA 13 – Standard for the Installation of Sprinkler Systems, and NFPA 1- Uniform Fire Code. These codes apply to engineers in their designs as well as technicians in terms of installation and maintenance. A professional engineer must certify a design's compliance with the relevant codes

by placing his or her professional engineer (PE) stamp on all final design drawings. In Australia, the fire protection industry operates in a similar manner. Standards Australia plays a similar role to that of the NFPA in the US. They write codes and standards that local governments may adopt into law. Overall the two industries have many similarities.

2.2.3 Fire Protection Training

There are varying levels of education and training required within the FPE industry, depending on the industry sub-group. Engineers have the highest level of education. They typically have a bachelor's or master's degree in engineering or science in addition to further education in the area of fire safety engineering (Koffel, 2010). The requirements and certifications for fire protection engineers vary throughout the states of Australia. Victoria, for example, certifies fire protection engineers as registered building practitioners if they demonstrate that they are competent in the material relevant to their work (Building Commission of Victoria, 2009).

Technicians typically have less formal education than fire protection engineers. However, they may have a certain level of certification depending on the type of work they are doing. There are multiple levels of certification for installation and maintenance. A PRM20406 Certificate II in Asset Maintenance of Fire Protection Equipment, for example, applies to non-trade installation and regular maintenance of fire protection equipment and systems. A PRM30406 Certificate III in Asset Maintenance of Fire Protection Equipment applies to installation, commissioning, and complex maintenance of fire protection equipment and systems. This certificate also gives permission to oversee fire protection services work (FPAA, 2010). To receive these certifications, as well as others, technicians may enroll in courses taught by registered training organizations such as the Fire Protection Association Australia (FPAA, 2010). The actual courses and credits vary depending on the desired certifications. However, the information is supplied by FPA Australia and the individual is allowed time to review the material. The content is available in published guide-books or CDs created by FPA Australia. In some cases, the material is beginning to be available online. After the individual reviews and studies the relevant content, he or she contacts an assessor to administer the final evaluation for the particular certification (FPAA, 2010). Certifications allow the technician to demonstrate his or her competency of fire protection to an employer or building owner.

2.2.4 FPA Australia Overview

The Fire Protection Association of Australia is a not-for-profit organization founded on January 1, 1997 as an educational and representative body for the fire protection industry in Australia. The goal of FPA Australia is to promote the defense of life and property from fire, by educating and representing the industry to the public and the government. The association makes use of Technical Committees and Special Interest Groups to research and develop the best educational materials based on existing codes and standards. FPA Australia distributes technical information through the industry magazine, *Fire Australia*, as well as various Internet newsletters.

FPA Australia also provides a number of materials for purchase to support and educate the industry. These include Australian standards, NFPA codes, log books, fire extinguisher pocket guides, DVDs and textbooks. They have also recently introduced a Good Practice Guideline, a how-to guide, which has been deemed suitable by FPA Australia to apply to the common conditions in Australia (Fire Protection Association of Australia 2009).

To promote face-to-face learning and collaboration, FPA Australia also sponsors a number of events and conferences in Australia throughout each year. These events include the Fire Australia Conference and Exhibition that hosted 800 industry members in 2008. This event served to educate those in attendance about evacuation from fires, green buildings, and the future of firefighting on the wilderness-urban interface. The future of the industry and where it was heading was also discussed. The event provided an exhibition for makers of fire protection equipment to demonstrate their products. FPA Australia also runs an annual Hazmat conference, which seeks to explore the dangers of hazardous materials, and how risks associated with them can be mitigated. A number of smaller seminars are held throughout Australia on a variety of topics such as business management, standards updates, and sprinkler workshops (FPAA, 2010)

2.3 Fire Protection System Failures

2.3.1 Suppression System Failures

Fire suppression systems have the possibility of failing to operate. As stated before, when they do activate they are 96% effective in containing or extinguishing the fire (Hall 2009). It is

estimated that fire sprinklers fail to operate in 7% of fires where a properly functioning system would have activated. A remarkable 63% of all failures were due to the system being turned off prior to the fire event (Hall 2009). This may have been due to system maintenance or testing when the system had to be taken out of service for a short period of time. The technician may have forgotten to turn the system back on, resulting in a costly system failure. Training or education may have reinforced the repercussions of forgetting to bring a fire suppression system back into service after being worked on. The next highest percentage of failures (14%) was attributed to a lack of maintenance. An example of this can be found in an availability analysis of sprinkler systems conducted in Germany (Hauptmanns et al. 2008). This report created a fault tree, which examined the reasons why a sprinkler was unable to operate. They found that one specific valve component was the cause of 93% of failures, and thus by reducing the time between maintenance from three years to two, they could increase system availability by a factor of 10.

Another 11% of failures were due to the fact that the improper equipment had been installed for the type of fire that occurred. An example of this would be a system in which sprinkler heads did not supply enough water to suppress or contain the fire. In such a case the fuel load of the building, or the amount of combustible material in the building, was too large for the system to handle. This could have been averted by properly understanding the requirements needed to put out a fire in the protected area, then designing and selecting the best fire suppression devices for that type of fire. Nine percent of failures were due to manual intervention of the system (Hall 2009). This is categorized as the system being intentionally shut off after the fire has started but before the sprinklers have activated. This may be done to try and prevent water damage to the building or if the fire was thought to be under control. It is unclear if any other scenarios fall under this percentile. Just 3% of all failures were due to equipment damage. As one can conclude, 97% of these failures are the result of a human's actions or lack thereof. If all human errors were eliminated, the failure rate for fire sprinkler systems could potentially drop from 5% to a mere 0.2% (Hall 2009). The NFPA report states that training and education are effective methods to decrease these failure rates.

2.3.2 False Alarms

In 2003, Australia as a whole received 138,000 false alarms (Brushlinsky, Hall, Sokolov, & Wagner, 2006). This staggering number represents just fewer than 48.9% of all alarms received. False fire alarms are not only a burden to the fire services responding, but they also take the responders out of service so they cannot respond to a real fire incident if one arises. Overall, false alarms are unsafe and unnecessary since they can often be prevented through proper inspection and maintenance. In the period of 2005-2006, there were 2.9 million false alarms reported to fire departments worldwide. This figure represents approximately 10% of all fire alarms worldwide. Also as a comparison, false alarms made up nearly 11.5% of the total alarm responses for the United States fire departments in 2004 (FEMA; USFA, 2007). From these comparative statistics, it is evident that Australia has a particular problem with false alarms, experiencing nearly five times the number of annual false alarms than the world average. Also, the country had the highest false alarm percentage of all the developed nations surveyed by the International Association of Fire and Rescue Services (CTIF) (Brushlinsky, Hall, Sokolov, & Wagner, 2006).One possible reason for this high false alarm rate is the difference in sensitivity requirements of smoke detectors between the United States and Australia.

Fire alarm systems can only be effective if the individuals being notified of a problem find the alarm system credible. A psychological issue arises because each false alarm reduces the credibility of the warning system (Breznitz 1984). This has a dramatic affect on the actions taken in response to an alarm. With each false alarm, the message that the alarm is portraying is taken less seriously than the previous alarm. This phenomenon is often referred to as the False Alarm Effect or FAE (Breznitz 1984). If there were no false alarms and systems functioned exactly as they were intended, the FAE would not be applicable. Every time the alarm system activated, the alarm observers would know for a fact that there was a threat and they would take necessary actions such as evacuating a building. The FAE demonstrates that false alarms are a factor that significantly decreases the life safety of individuals. Overall, it is nearly impossible to completely eliminate false alarms and the FAE. However, false alarms due to maintenance or improper installation have the potential to be eliminated. This may be possible with more training and increased knowledge of the fire protection technicians.

2.3.3 Monetary Effects of Failures

In 2002-2003, Australia spent a total of AUD$1.6 billion on the funding of the fire services. An estimated 80%, or AUD$1.3 billion, of that was deemed to be fire incident related, omitting any time spent on non-fire incident related activities such as equipment maintenance. Assuming the percentages of false alarms for Australia is 50% (see section 2.3), and that false alarms cost the fire services approximately 50% of the cost of an actual alarm, then as much as AUD$ 32.5 million was spent on false alarms alone in the 2002-2003 period (Ashe et a. 2005).

Fire protection systems, specifically fire sprinkler systems, can cause thousands of dollars in damage if they are incorrectly activated. A fire sprinkler system, for example, may leak, rupture, or activate unintentionally, allowing the suppressing agent (typically water) to flow until someone disables the system. It typically takes a significant amount of time for the system to be deactivated. This is because an individual has to first determine if the alarm is authentic, determine where the problem is occurring within the system, and then finally disable it. By this time the amount of water damage can be drastic. An example of this, detailed later in this section, occurred in a high-rise hospital in the United States. It was later determined that the coupling was installed improperly.

A study of healthcare facilities demonstrated how much monetary loss sprinklers prevent. For the United States in 2006, fires in buildings including hospitals, nursing homes and clinics, had vast differences in monetary losses between fire scenarios where sprinklers were installed and where sprinklers were not present. Healthcare buildings with sprinklers experienced a per-incident average loss of $3,000. In fires where sprinklers were not present, the losses were an average of $11,000 per incident (Hall 2009). Within all occupancies, the losses when sprinklers were not present were at least double (in most cases) that of the losses when sprinklers were installed (Hall 2009).

2.3.4 Case Studies

Fire protection systems have been demonstrated to be highly effective in protecting life and property. While those responsible for installing and maintaining these systems generally do a professional job, there have been examples in which human error in either maintenance or installation systems has caused property damage and loss of life. While education will not

prevent all mistakes from occurring, the purpose of demonstrating these failures is to better understand how education could potentially help the industry in preventing such failures.

An important case which occurred in Australia is the Childers Palace backpacker fire of June 2000. This tragedy, in which 15 people died, occurred in the Childers Palace Hostel in Queensland, Australia as a result of arson by a disgruntled former resident. There were numerous instances of human error that enabled this fire to be so devastating. The primary reason is that the hostel's fire alarm system was turned off because it was malfunctioning. A local electrician had attempted to fix the alarm once and had failed (Mercer 2002). He was expected to attempt to fix the system again but failed to show up. Also, overcrowded rooms and barred windows prevented the occupants from escaping. The bars were not removable and thus those inside were essentially trapped. The fire extinguisher on the first floor, which was the only one, could not be found in the dense smoke because of its non-obvious location (Phillips 2000). There are reports that authorities had inspected the hostel and told the owners to fix the fire protection related problems, but the inspectors never followed up to determine if this had been done. This fire is an important case study because had the alarm been functioning, and had a clear escape plan existed, there would likely have been more survivors.

It is unclear whether or not the local electrician had any fire system experience, but this incident highlights the importance of education and certification in the fire protection field. While many of the aspects that made this fire so deadly are a result of poor management of the property on the part of the hostel owners, there is a possibility that a functioning alarm could have given the occupants time to escape. There are many potential reasons why the electrician failed to repair the system, one of which could be a lack of alarm specific education. This fire is also significant because, as a result of the tragedy, the "Building Fire Safety in Queensland Budget Accommodation Report" was released, which emphasized the need for the fire protection industry to improve its practices (BSA 2009). The new fire protection licensing requirements in Queensland are a direct result of this report as mentioned above.

A second case study of a fire protection system failure is based in the United States. In this incident, a wet sprinkler system was installed in a large metropolitan hospital in order to provide fire suppression capabilities. A coupling between two sections of sprinkler piping managed to separate, flooding the hospital with in excess of 10,000 gallons of water, causing major equipment damage and disruption of hospital operations (Arnold 2004). The subsequent

investigation found that the coupling had been installed improperly, the bolts not tightened, required pipe hangers were missing, and the system improperly designed so that it did not include a pressure release valve. Testing indicated that the fault would occur only when the coupling bolts were "finger tight" as they were in the case of the hospital. The coupling surfaces had a visible gap between them, indicating they were not properly tightened. Had pictures of a properly installed coupling been present, the system installer could have noticed the visible gap present. Additionally, knowledge of the requisite codes would have shown the installer that more pipe hangers were required around that specific coupling, although it is possible that the installer knew the required number and something prevented him/her from installing the hangers. This study demonstrates how, had additional knowledge and education resources been available to the technician at the time of installation, this failure could have potentially been averted. Common oversights such as not tightening a bolt do occur; however, in this case there were visible signs that the installation had been done improperly. The case also demonstrates that the failure of a fire protection installer can cause monetary damages even when a fire did not occur.

2.4 Need for Collaboration

2.4.1 Flaws in Current Education

Prior to 2008, the fire protection industry in Australia had limited licensing requirements for companies performing fire-related work. A report published by the Fire Protection Systems Working Party revealed concerns about the state of education and certification in the Australian fire protection industry today. The main concern of the industry was that there was no independent party to check that the companies performing work on fire protection systems had done the work to a desirable standard (Fire Protection Systems Working Party 2008). All that was required was that the companies certify that they had performed their work according to the Building Code of Australia. The lack of any verification or enforcement of the work done meant that companies were essentially "self certifying" their work. According to the Fire Protection Systems Working Party, this led to systems being improperly designed, installed and maintained as well as contributing to a lack of communication between fire protection companies and other parties. These included fire marshals, building contractors, and building owners.

The problems associated with the industry prior to 2008 seem to be grounded in both education and certification shortfalls. Designers of systems did not need to be licensed and thus

plans were submitted which did not meet applicable standards or were not of sufficient detail for the systems to be properly installed. Plans were also not properly reviewed prior to being accepted and put into use. According to the Fire Protection System Working Party (2008), in the installation field there is a lack of knowledge, specifically of building codes, which leads to the systems being improperly installed. Additionally, a lack of communication between the fire protection industry and other building trades lead to the removal of important fire barriers and compromising of passive fire protection elements. Fire systems were not properly maintained, again due to a lack of knowledge on the part of maintenance technicians as stated in the report. This was in addition to a lack of communication with the building owners on the expectations and limitations of the system. Furthermore, documentation of the maintenance and testing procedures of installed systems was lacking. The report further stated that there was a lack of training which lead to the confusion of some individuals within the industry pertaining to the laws and regulations under which their work falls. It also cites a lack of up to date technical knowledge regarding installing fire protection systems properly as per the specifications.

2.4.2 Effectiveness of Collaborative Learning

The Hub system, which our team will be developing for FPA Australia, includes the concept of collaborative learning. Collaborative learning refers to the process of combining ideas among a group of individuals in order to ultimately solve a problem. In our context, collaborative learning can be defined as learning by the observation of other industry individual's content submissions or by direct communication through the Hub. By posting industry-wide information to all members of the fire protection engineering industry and combining it with important updates from the Australian government, the collaborative Hub will allow FPE technicians to become more knowledgeable on installation and maintenance practices. This increased level of education will enhance installation and maintenance efficiency across all areas of fire protection and allow for higher level of trust for FPE technicians. This efficiency will ultimately lead to a higher level of safety experienced throughout Australia. Through collaborative learning, problems can be assessed and solved quickly and in a more efficient manner. One benefit of this method is that a problem can be viewed from multiple perspectives. Through the collaborative environment provided by the Hub, technicians will have access to information for them to either improve upon their skills or learn new ones. This will allow them to broaden their areas of

expertise in preparation for licensing tests or to ensure that they are performing tasks competently.

Another benefit of a collaborative learning environment is that users can constructively criticize each other's input. By critiquing one another, users can reach solutions quickly and develop new methods by combining portions of each other's ideas. The benefits of this increase in information sharing, provided by the Hub, will be particularly important as Australia moves towards developing new terms of licensing technicians.

During a study done at the Helsinki University of Technology in Finland, researchers discovered that collaborative learning was beneficial to the comprehensive abilities of individuals within the study (Bistrom 2005). A group of people were divided into teams and given an assignment to solve using a collaborative method. This collaborative, person-to-person program provided an environment where students were able to contact one another and share documents between themselves freely. The results of the study showed that using such a learning method had a positive effect on the subjects. Each student was given a multiple-choice survey at the termination of the experiment and results showed that students felt more engaged. This finding was supported by the fact that the average number of contributions from students increased from 4.62 to nearly 12. The open forum created for collaborative learning allowed the students to feel freer to speak their minds and to compare and contrast ideas with one another. Another promising result was that the number of non-contributing students dropped dramatically from 56% to 17%. Overall, 87% of students involved in the experiment reported feeling that they had enjoyed the collaborative work environment. Also, 64% of the students agreed that they would benefit from the different learning methods associated with the program.

Another study found that among 127 MBA students at the University of Maryland in 1994, those who used collaborative learning perceived higher levels of skill development, and in fact did better on the final test for the study (Alavi 1994). This study notes that not only do those involved with collaborative learning statistically receive better grades, they also enjoy the learning process more. It states that the students reported they enjoyed learning by following up on ideas and concepts first presented by others. Additional reports are mentioned in this study that all comment on how collaborative learning increased the critical thinking and problem solving skills of students involved. These studies suggest that collaborative learning allows students to increase critical skills that are not necessarily addressed by other styles of learning.

2.4.3 Current Licensing in Australia

Australia lacks licensing requirements specific to fire protection services other than the new regulations implemented in Queensland. However, everywhere else, the installation and maintenance of fire protection systems that involve plumbing and electrical work may require certain levels of licensing depending on the specific work being completed. In order to work on these fire protection systems, technicians must be licensed as electricians or plumbers because the systems interact with the main electrical and water utilities. For example, a technician must have different levels of electrical qualification in order to work on Low Voltage or Extra Low Voltage detection systems, but these are electrician certifications, not specific to fire protection. While there are no required licenses outside of being a registered plumber or electrician, all technicians must abide by information presented in the Building Code of Australia (BCA). Penalties can be issued if buildings do not meet the requirements set forth by the standards. These penalties would not be issued to the building owner, but rather to the technician/company who had completed the work. The entire Commonwealth of Australia follows this type of legislation except for Queensland and Tasmania. Queensland abides by its own form of an occupational type of license while Tasmania uses a permit system. Queensland also has more specific regulations in terms of gaseous fire suppression systems.

A technician has the option to be certified by a registered training organization in a variety of units of competency. These units of competency can range from any topic including "PRMPFES03C: Safely move materials and loads in the workplace" and "PRMPFES46A: Decommission gaseous agent containers and actuation services". There are many of these units of competency that are each important for certain tasks to be completed by technicians.

2.4.4 New Licensing Requirements in Queensland

In January 2009, the government of Queensland, Australia adopted a new licensing requirement for any person or company performing fire protection services (Building Services Authority 2009). These include areas of fire protection such as installing, maintaining, designing or certifying a fire protection system, or developing an evacuation and fire safety plan. The new plan requires that any technician working on or supervising fire protection work must hold an occupational license for the type of system on which they are operating. In addition, companies performing fire protection work must hold a contractor license in order to be contracted for work

within a specific field. There is currently a grace period in order to allow those affected by this requirement time to receive training in their fire protection fields. After January 2011, these new license requirements will become mandatory for anyone providing work in the fire protection field. This new law is a result of the "Building Fire Safety in Queensland Budget Accommodation Report" which was published as a result of the Childers backpacker hostel fire in 2000, in which fifteen people died (BSA 2009). The report specified that the fire protection industry in Australia needed improving, as evidenced by the fact that a number of alarm systems were turned off or malfunctioned in that fire. The reasons stated for introducing this new legislation include greater community confidence in the work performed, better protection for life and property, and improved training and safety for the industry (BSA 2009). The new requirements were a direct reason for FPA Australia's desire to create and implement the new Hub (K. Ebbs, personal communication). FPA Australia wanted those within the industry to have a central database to which they could turn in order to educate themselves in preparation for meeting the new license requirements.

2.4.5 FPA Australia's E-learning Efforts

FPA Australia has begun the early stages of collaborative online education. Since FPA Australia is a registered training organization, it is responsible for delivering fire protection related training material to the industry. According to FPA Australia 2008-09 annual report, FPA Australia has begun to provide training material regarding passive fire protection online, allowing the content to be interactive, and to be instantly updated (FPA Australia 2009).

FPA Australia recently began training technicians on the new extinguishing agent licensing requirements (which are included in the new Queensland licensing requirements) using an e-learning pilot program. Their program provided the industry with compact disks containing information pertaining to the licensing of and regulations regarding the use of ozone depleting extinguishing agents. FPA Australia used this pilot program to gather information on how receptive the industry would be to e-learning. Through the use of surveys and phone interviews, the FPA Australia team gathered feedback from participants on this training system including what aspects were helpful in navigating the information. Participants reported that the training increased their understanding of the regulations and licensing and helped them improve e-learning and computer skills. While this program does not prove that e-learning will ultimately

be successful, it did demonstrate to FPA Australia that the industry believes e-learning is a useful strategy and it also emphasized the areas in which subsequent e-learning programs would need improvement, specifically in navigation, visual presentation, the need for validation of examples, and the need for additional chances to review learned material.

FPA Australia has already begun testing a potential collaborative Internet technology, the social networking site Ning.com. Information provided by our FPA Australia contact person Katharine Ebbs and additional FPA Australia literature have expressed that online education is a primary goal of FPA Australia in the near future (FPA Australia 2009).

2.4.6 Challenges With Collaborative Learning

Collaborative learning has demonstrated benefits to those who have used it. While the effectiveness of collaborative learning when applied to the fire protection industry is unclear, our background research has shown that it has been useful in other environments. However, no method of learning is completely without fault. There are some key challenges to collaborative learning that the FPA Australia system will have to overcome in order to be effective.

Since the Hub will be Internet based, and thus accessed by members of the industry throughout Australia, it can be viewed as a distance-learning network. Members of the industry who wish to learn from the Hub will be doing so through the use of online examples, feedback and collaboration. This is very different from the personal nature of a classroom or conference lecture. This presents a challenge because it takes a certain type of person to make full use of this environment. As stated in a report on quality in distance education programs (Stella et al. 2004), “Distance education requires disciplined and self-motivated students”. While this report primarily deals with online college courses, it may be applicable to the Hub. The members of the industry will have to be willing to use the Hub and use it effectively in order to obtain any benefit. Our FPA Australia contact, Katharine Ebbs, stated that some members of the industry have extensive experience and thus may be may not be particularly receptive of new technologies or new methods of learning. Our research needed to identify those aspects of the Hub that will make it attractive to industry members who may be leery of new technology. In order for the Hub to be effective it will be necessary to convince members that putting in the time and effort to learn from it will be beneficial to them.

Another challenge of collaborative learning is to overcome the possibility that contributors may believe that other users are taking advantage of their knowledge, and therefore these people are not doing any work for themselves (Bistrom 2005). This is a challenge for the proposed Hub because members of the industry may be unwilling to share their knowledge with the group if there is no incentive for them to do so. Members may be unwilling to share examples of best practices or comment on the mistakes of others due to a lack of financial incentive or fear of others stealing their techniques. The benefit to sharing however is the essence of a collaborative environment. By using one's knowledge to improve the understanding of others, both will work towards solving a common problem. In addition, there is always the chance that a collaborator will benefit from someone else's knowledge. The benefits of using the Hub as a collaborative learning tool will have to be shown to the industry members so they fully grasp the importance of sharing their individual knowledge for the greater good.

A final challenge is the heterogeneity problem (Bistrom 2005). In this report, heterogeneity is described as a conflict existing due to differing prior knowledge and ways of thinking. This can occur in our system because the users of the Hub will be from throughout Australia and they will have been educated in different ways and will have worked in different conditions. This is a challenge because one method of maintenance or installation may be understood by one technician, and another technician may believe that method to be incorrect or inadequate. It is possible that neither position is wrong and that they simply have a differing view on the best way to accomplish a fire protection task. As with the problem stated above, educating the users of the Hub on the benefits of the system will be vital in overcoming this challenge. The users of the Hub will need to understand that differing opinions on the best practices may result in discussion, which can potentially lead to progress and enhanced learning.

2.4.7 Case Study of an Industry Specific Learning Environment

Collaborative and online learning is a fairly advanced concept and has been successfully implemented in multiple scenarios. The WPI team contacted the National Fire Protection Association (NFPA) to inquire about any technology that was similar to the Hub proposed by FPA Australia. Since the NFPA and FPA Australia are similar organizations, a technology implemented by the NFPA would provide a valuable example to FPA Australia. The team

determined that the NFPA did not have an online environment similar to the Hub. However, the team found some other examples that support the technology of collaborative and online learning.

A case study of collaborative online learning within the Australian veterinary and animal genetics industry provides useful information that supports the case for FPA Australia's proposed Hub. The report (Forsyth 2008) is primarily focused on using distance learning to promote post-graduate education in Australia; however many of the points it makes are applicable to the technical education provided by the Hub. It states that distance education in Australia is useful because the populations are spread out and that it facilitates participation from users in remote and rural parts of the country (Forsyth 2008). This is notable because areas of fire protection can be spread out just as areas of the veterinary industry are. Those working in rural areas should have access to the same educational material that those closer to the cities do.

The report details a case study of the Animal Breeding Management course, an online course developed in cooperation with the University of Sydney and University of New England. The course was designed to include both information relating to core content including animal genetics and breeding in addition to occupational skills such as management and leadership. The team setting up the course desired to provide real world education that would mimic the skills required in the industry. Through the use of surveys of students who were participating in the course, the report showed the feedback regarding this learning method. Students reported that the combination of practical and industry knowledge was useful and expected it would enhance their career path. In addition, they reported finding non-live discussions hard to follow whereas live chats or video conferences were easier to learn from. This should be considered when evaluating design decisions for the Hub.

The report concludes that this type of environment was useful and that "it also gives opportunities for collaboration between various sectors to produce interesting synergies between them" (Forsyth 2008). This is a statement that is supportive of the potential for the proposed Hub. The point of a collaborative environment is for students to work together to promote learning based on their unique viewpoints of the same information. The fact that the industry in this study had such an interaction means that the Hub also has the potential for technicians to successfully learn from each other by collaborating. The report noted that quality assurance

measures needed to be taken so that the content was accurate. This is also a concern of FPA Australia. This highlights the needs for a strong method of approval for any content posted to the site. The report demonstrates a specific industry within Australia for which online collaborative education has been beneficial. It provides further support for the type of learning system which FPA Australia plans to implement.

2.5 Effective Hub Design

This section of the report details information relevant to considerations necessary for implementing the Hub. Such information includes what type of information the site should contain, technological requirements of implementing such a system, and background information on the technologies that can be used to implement the Hub. The information also includes a summary of costs, perceived advantages and limitations.

2.5.1 Hub Content

In order for the proposed Hub to be effective it needs to contain information relevant to the work of the fire protection industry. There are two ways in which content will be added to the Hub. The first is educational material published by FPA Australia for its members. The second source of information will be generated by the users of the Hub. This content can either be verified by FPA Australia-appointed technical experts to become an accepted technical example, or the information can be posted in order to receive feedback from the community. Both styles can publish content such as, but not limited to, details and commentary on the fire codes and standards of Australia, best practice examples, and information on the new licensing requirements.

Information regarding the fire codes of Australia will primarily focus on clarifications of the code and how to apply the code in specific situations. FPA Australia can publish content relating to what the codes state, how they need to be applied and common errors that violate the fire codes. Users of the Hub can publish images or videos, which will show the industry how certain situations within a building would be interpreted under the code. The users may also submit examples of how technicians are supposed to install a system in order to satisfy the code requirements. All of this information will help members of the industry install and maintain

systems according to regulations and therefore aid in the attainment of the maximum level of safety to the residents of Australia.

Best practice examples will include information portraying the accepted way of installing and maintaining fire protection systems. This differs from code information, because while the code specifies how the system must operate, where it must be located, and other information related to the system, it does not specify how to go about doing this. Best practice examples will show technicians the practical skills required to install or maintain a specific system so that it both meets the code and so that they do not waste time with unnecessary steps. This will be of interest to the industry because it can potentially cut down on wasteful mistakes and will make workers more efficient. Efficient workers will be productive, increase the profits of the company, and produce accurate work. This will decrease the potential of a mistake resulting in system failure.

Finally, information on the licensing requirements for Australia will be helpful for the industry to ensure that its members can legally perform work within the territory in which they operate. Also, the information will help fire protection individuals avoid fines and legal problems. Since the certification and licensing requirements for Australia are not country-wide and are instead dependent upon the territory or state, it may be difficult for members of the industry to keep track this information. In addition, the new licensing requirements in Australia, specifically those detailed above, make a central repository of licensing information necessary. Information regarding which members of the fire protection industry are required to be licensed, for which tasks they have to be certified, and procedures for obtaining this licensing and certification will be valuable for the industry. A central database of this content could potentially cut down on confusion within the industry and allow fire protection technicians to become certified more quickly as they will know the exact method of doing so.

2.5.2 Technological Requirements

The online information Hub will be integrated into FPA Australia's current website. Step-by-step procedures will be documented and presented in an organized and easily accessible format. The technology chosen for the Hub must meet a number of requirements in order to achieve the objectives that FPA Australia has set. The technology must be user -friendly, it must support the uploading of both pictures and videos, and it must be able to be secured against

unauthorized editors and viewers. Also of interest to FPA Australia are the costs associated with using a technology, as well as the resources needed in terms of hosting requirements and programming knowledge necessary to implement a proposed technology.

Users may contribute by uploading media in either video or image format. The ideal video format would be Mpeg4 because it is the most common file type for videos and it is designed for streaming downloadable content. Uploading a video for installation or maintenance tasks is beneficial because it clearly portrays every step involved in a given process. Also, videos give users the advantage of being able to stop or rewind the film at any point. A drawback to posting information in a video format is that some videos may take a long period of time to download, especially if the user has a slow Internet connection.

An alternative for displaying media is the use of images. Images allow users to follow an easy step-by-step process at their own pace. This is useful because not everyone who will be using this Hub system will be a professional. Another benefit of using images is that they are often small in file size, so that they take less time to download. A basic guideline for image file sizes is that large, high quality pictures should be formatted to be within the range of 60K-100K, while smaller images should stay around 30K or lower. The most common file type for images is JPEG. JPEG's are effective because the format is a compressed image file that can typically achieve a 10:1 compression ratio with minimal effect on the quality or resolution of the picture. Even though Australia's Internet speed is slower than that of most other developed nations, file sizes this small would not present any significant problems (AAP, 2006).

A report by World Bank (AAP, 2006) showed that Australia's average connection speed was just less than one mbps (megabit per second), which was far behind that of other developed nations such as Britain (13 mbps), France (8.4mbps) and even the United States (3.3 mbps). This problem could inhibit the use of videos due to users becoming frustrated with the duration of a video download. This low connection speed could be due in part to the large number of rural areas. The Internet connections of the rural areas are much slower because the connections are almost entirely dial up..

The Hub must display its images, videos, and information in an interface that is user-friendly in nature. A user-friendly Hub will be one in which a user can access all capabilities of the site with minimal instruction. This includes viewing and commenting on information published by FPA Australia, in addition to viewing and commenting on information published by

others. The user should also be able to publish pictures and videos to the site with ease. If users encounter trouble, it should be clear where they could receive assistance. Our sponsor expressed concern that a number of individuals within the fire protection industry are of an older generation and thus do not have as much experience with computers as younger generations do. Because of this, the technology should be such that a person who does not have much computer experience will be reasonably able to perform these tasks.

Most of the media collected within the repository will be accessible to all FPA Australia members; however, there will be an option for individuals to create their own e-portfolios. E-portfolios are essentially online folders to which individuals can transfer and download material in order to keep themselves organized. Individuals will create e-portfolios to provide documentation of their competency in certain skills and so that fellow technicians can provide recommendations. Also, the portfolios may be evaluated by an instructor as a means of licensing or certification which will be especially useful to technicians in Australia now that the government is reconfiguring its licensing requirements. With an e-portfolio, technicians can document every installation or maintenance job to prove that they have completed the job and followed proper procedures.

Another benefit of the e-portfolio is that it enables users to create a self-directed learning schedule. This plan can be created either by the user or by an advisor to that user. The e-portfolio will allow for easy assessment of the level of learning achieved. To achieve this, the technology must have varying levels of security. There will be a basic level to restrict viewing of the material to only FPA Australia members with a registered account. Additionally, users will be able to comment on aspects of another users “e-portfolio” but should not be allowed to edit that content. In addition, FPA Australia will be able to approve or dismiss information published by members based on whether or not that information is technically accurate. Finally, FPA Australia will maintain an administration level so that they can manage the entire Hub. These administrators will have the capabilities to add or delete user accounts, publish information, and remove any content posted by a user that they believe to be inaccurate or in appropriate with minimal effort.

2.5.3 Potential Technologies

A number of existing online technologies are available, which will allow the proposed Hub to be implemented according to FPA Australia's desired outcomes. "Online technology" can be described as a website, or as a piece of software which will allow the proposed online Hub to be created. In the case of software, the software would be installed on an FPA Australia-owned server and would be used to create the website. The desire for the Hub arises from the potential benefit of it being completely internet-based such that no user of the site will need to download any software. The administrators of the Hub will be FPA Australia programmers, or a web-hosting partner. Content for the Hub will be created by FPA Australia staff and may also be uploaded by members of the industry after it has been verified by experts with relevant knowledge.

The website Ning.com is the technology currently used for the FPA Australia's collaborative Hub test (K. Ebbs, personal communication). It is a website designed to allow users to create their own social networking site, which can either be public or private (Ning.com , 2010). This site allows users to create a network in which they can add or remove pre-made features such as forums, chat rooms, blogs and photos. A user of the site must create a free Ning account. The network can either be set to public, where anyone can join, or private, where the group creator must approve users. The FPA Australia test site shows that Ning allows the types of features that the agency requires, such as the ability of users to upload photos and videos and comment on them. Additionally, Ning has an option that allows network administrators to approve any content posted by users before it is uploaded to the site. This will allow technical experts to validate industry examples before the rest of the community can see them. The video file size limit is 100mb of .mov, .mpg, .avi, .3gp and .wmv video formats.

Ning.com offers a free account with some limitations. The free account offers 10 Gb of storage with 100 Gb of bandwidth. This is the total amount of data that a user's site transfers per month. The address for the network is www.yournetwork.ning.com. The free account also includes small advertisement banners on the page, in addition to three promotional links for Ning.com. The summary of the costs of removing the free hosting limitations is shown in Table 1.

Service	Cost ($US)	Cost ($AUD)	Terms
Control the Ads	24.95	27.92	Per Month
Custom Domain Name	4.95	5.54	Per Month
Remove Promotion Links	24.95	27.92	Per Month
Increased Storage (10 Gb)	9.95	11.13	Per Month Per Unit
Increased Bandwidth(100 Gb)	9.95	11.13	Per Month Per Unit

Source: Ning.com Exchange Rate Used: $1USD = $1.11888AUD

Table 1: Summary of Ning.com Hosting Costs

There is a developer network for Ning which includes thousands of applications to enhance the usefulness of the website. These applications range from calendars, to online sales, to integration with Google documents. Many of these applications are created by the user community and are offered for free download. They can be viewed in the application marketplace, and can be added to the site without any programming experience.

The trial FPA Australia site is evidence that Ning.com can meet their Hub requirements. It offers the ability for users to upload both photos and videos. The site also allows users to comment on any information uploaded, and has a blog feature, which could allow FPA Australia to distribute information to the industry. However, it does not provide as much flexibility as some of the other potential technologies. Since it is a website, users must use Ning's resources and there is no software to be installed on FPA Australia's servers.

Wordpress is an open-source blogging software which is used by approximately 202 million people worldwide (Peterson, 2009). Open source means that the code that drives the program is available to be freely studied and edited. Also, the software can be run without any type of licensing fee. A blog, which is short for "web-log", is a website which can be thought of as an online magazine. Articles are published to the blog and can then be searched, viewed, and commented on. The articles will remain on the site as long as the host server has enough space. In addition, the user who posted these articles can edit them at any time.

The most popular host for this software is Wordpress.com which allows users to run a free blog with limitations similar to Ning.com but has costs associated with the premium features. Alternatively the Wordpress software can be downloaded and installed on a web server

that FPA Australia already owns. Wordpress has a large community, which develops thousands of "plug-ins" that are pieces of code that give the software increased functionality. These plug-ins are also open-source and thus are available free of charge over the internet.

If hosted by Wordpress.com, the blog would receive 3 Gb of storage and a web address of www.yourblog.wordpress.com. The free version allows for pictures but prohibits videos to be included in blog postings. It allows for a private blog to be created, but the free version is limited to a 35-member capacity. If the blog is not private, anyone can view all of the material posted to it. Similar to Ning.com, Wordpress also runs some advertisements on the free version. (Wordpress.com, 2010). The costs associated with removing these limitations are shown in Table 2.

Service	Cost ($US)	Cost ($AUD)	Terms
Control the Ads	29.97	33.54	Per Year
Domain Name Registration	5.00	5.60	Per Year
Domain Name Mapping	9.97	11.16	Per Year
Video Press	59.97	67.12	Per Year
Custom CSS	14.97	16.75	Per Year
Unlimited Private Users	29.97	33.54	Per Year
Space Upgrade (5 Gb)	19.97	22.34	Per Year
Space Upgrade (15 Gb)	49.97	55.91	Per Year
Space Upgrade (25 Gb)	89.97	100.67	Per Year

Source: Wordpress.com Exchange Rate Used: $1USD = $1.11888AUD

Table 2: Summary of Wordpress.com Hosting Costs

These costs are specific to using Wordpress.com as a host. As stated above, the software can be downloaded free and installed on a web server of FPA Australia's choice. This would incur costs equal to whatever the company owning the server charges for hosting space, bandwidth, and domain names.

Of particular interest of the free plug-ins, are the ones that allow videos to be uploaded, as well as those that allow privacy and moderation options. The "Absolute Privacy Plug-in" is a free piece of software, which requires moderators of a Wordpress blog to give permission to a user before they can see or comment on a blog post. The user must have a free Wordpress account and they will be asked for a username and password. If this is their first time visiting the site, an email will be sent to the moderator, who must approve them and set their level of access.

This level can vary from being able to view the blog to being able to create postings. This would allow FPA Australia to restrict access to specific information to only members of their organization. Furthermore, they can place restrictions on who contributes, so that only validated experts are sharing information.

Moodle is an open-source software package that can be described as a "Course Management System" (Miller, 2009). It allows educators to create online "classrooms", which can include pictures, videos, tests, wikis, and discussion boards. Like Wordpress, it is also open-source meaning there are no licensing fees and that the code can be modified to the users' needs, so long as they do not hide or copyright the changes that they made. Unlike Wordpress, there is no official hosting solution and Moodle instead recommends partners such as Netspot Pty Ltd and Pukunui Technology. Both of these companies are Moodle's Australian web hosting partners. Since it is open source, there are no costs associated with Moodle; instead all costs are related to what the webhost charges for storage space, bandwidth and a domain name.

Moodle supports both pictures and videos in all major file formats. There are no inherent size limitations for files but the site is instead limited by the storage space and bandwidth capacities of the web host used. It also contains such features as online tests, discussion boards, databases and course management. Similar to Wordpress and Ning, there are many freely available plug-ins, which can be added to Moodle in order to enhance its capabilities. Moodle can be run as-is, with minimal programming knowledge, but in order to customize it, knowledge of the PHP programming language is needed.

For security, Moodle can restrict users to four levels of access. The most basic is guest, which allows anyone to sign in so long the administrator allows guest access. This type requires no username, and will usually be limited to simply viewing the content. The second level is student, and it requires users to create a user name and password. This allows them to enroll in classes and take quizzes. The software will keep track of all student accounts including what files they have uploaded and what classes they have taken. The third level is the teacher account. The owner of this account can edit and publish course information, approve student contributions or post their own. The teacher however has limited access to the overall system and thus cannot change aspects of the overall Hub. The final level of access is the administrator who controls the overall operation of the system. They can add or remove student and/or teacher accounts, edit anything published by teachers or students and change the layout of the system. This level of

security would be very beneficial in implementing the type of system that FPA Australia has in mind. They can allow students, the technicians, to add information to the Hub without fear of them affecting the overall system. They can have certified professionals use the teacher accounts to approve contributions to the site in order to verify accuracy of submitted examples. Finally, FPA Australia may retain control of the overall operation of the Hub by restricting the administrator account to only members of FPA Australia.

2.6 Summary

The Fire Protection Association of Australia currently has a website that provides important information regarding fire safety to the entirety of Australia. While this site may be efficient, there are certain aspects which could be improved or new features could be added that would greatly increase the overall effectiveness of the site. Many incidents of fire protection system failure were attributed to faulty installation or maintenance. With the use of the fire protection systems installation and maintenance Hub, the members of the Fire Protection Engineering industry will have access to information that will increase their overall knowledge of fire protection. Also, a collaborative online environment will allow for increased levels of understanding within the industry as a whole. The creation of this Hub also raises the potential for future utilization regarding online licensing. Technicians will be able to improve their skills and learn new aspects of their trade which will make them more desirable employees and more likely to pass the licensing requirements. As a result of improving the fire protection industry of Australia by means of this Hub, the country will ideally see an increased level of fire and life safety.

CHAPTER 3: METHODOLOGY

This project was implemented with the goal of improving the practices of fire protection systems installation and maintenance in Australia by introducing an online collaborative system of education and information in order to keep industry professionals up to date on best practice procedures and certification requirements. The technology that can most successfully support the online Hub was recommended to FPA Australia. These technologies were chosen based on how effective they were in implementing the Hub as an industry-wide tool.

We accomplished our project goal by achieving a number of specific objectives. First, our team identified the content that the industry felt was the most useful in their practices. Second, we determined the most effective and user-friendly technology available to most effectively implement the Hub by creating three prototype Hubs using three different technologies. Third, we determined the general perception of the fire protection industry on the usefulness of the Hub, as well as, its expectations for what the Hub should accomplish so FPA Australia would have a starting point to further research this. Lastly, we made a series of recommendations to FPA Australia based on our research regarding the online Hub. To better illustrate our project objectives, the rest of this chapter will follow the sections below:

- Section 3.1: Determine the Hub content desired by the industry
- Section 3.2: Selection of the most effective and user-friendly technology needed to implement the Hub
- Section 3.3: Determine ways that FPA Australia can evaluate the industry's perception of a functional Hub
- Section 3.4: Draft a recommendation to FPA Australia based on findings

3.1 Objective 1: Determine the Hub Content Desired by the Industry

The first objective of this research project determined the specific Hub content that will most benefit the fire protection industry. Also, it was important that the needs and desires of the industry workers were addressed regarding Hub content areas. Previous surveys done by FPA Australia determined some key skill areas on which to focus the content. We further determined that these data matched what the majority of the industry thinks. In order to design an effective Hub for the industry, the content must be useful and applicable to the entire industry. To determine the most desired content, we used data acquired from a range of methods including:

- Surveying the fire protection industry
- Interviewing industry professionals including technicians, engineers and fire departments
- Observing fire protection technicians to gather content examples

3.1.1 Survey the Fire Protection Industry

We developed a survey to administer to the fire protection industry regarding the content of the Hub. A draft of this survey is shown in APPENDIX A. This enabled us to gather data specific to the potential content of the Hub. Members of the industry had the opportunity to voice their suggestions for the Hub within a survey question dedicated to suggestions. We hypothesized that by administering this industry-wide survey, we would determine the content that the industry would like to see and what content would be the most useful. These data allowed us to support FPA Australia's decision on which areas of content they planned to include in the Hub.

We developed the survey questions and presented them to FPA Australia for approval before we administered them to the industry. Also, we tested the survey on individuals within the FPA Australia office to ensure that the questions were as clear and concise as possible. We looked to FPA Australia for help in selecting the individuals to survey since it is a well-known association within the fire protection industry. Also, we used the Internet to administer this survey because it was the easiest and most effective method. However, we consulted FPA Australia before using this administering method to ensure it was the most effective; which they believed it was. It was our goal to administer the survey to the entire membership of FPA Australia and we hoped to obtain at least a 10% response rate. We planned to collect all of the survey data by the end of our fourth week in Australia. In the weeks following, we analyzed the data and determined the most desired Hub content.

3.1.2 Interview Industry Individuals

Industry individuals were interviewed from multiple sub-groups of the fire protection industry including technicians, engineers, fire department employees, and pertinent members of FPA Australia. We interviewed Katharine Ebbs, our liaison with FPA Australia, to determine her thoughts on the basic needs of the industry.. Additionally, our interviewees were asked questions

regarding the content of the final Hub. We asked them to provide suggestions for the Hub as well as to voice their expectations with regards to content. This data, along with other interview data from other objectives, was analyzed and examined to determine the most effective and useful content for the Hub. Interview forms were developed and utilized during these interviews to ensure consistency and organization of our data collection.

With aid from FPA Australia, we selected various individuals from throughout the country's fire protection industry. Interviews were conducted during the typical business hours of 9:00am to 4:00pm, Monday through Friday. We based the location of the interviews on the preference of the interviewees. We expected to host interviews at the FPA Australia office in Melbourne as well as travel to various workplaces close-by. In addition, we utilized Skype and the telephone to conduct interviews whenever a face-to-face meeting could not be arranged, especially in the case of interviewing individuals located in other areas of Australia. Overall, we planned on conducting interviews with approximately ten fire protection individuals.

3.1.3 Participant Observation of Industry Technicians

The willing technicians were observed performing daily fire protection tasks in order to provide a clearer understanding of what their job entails as well as identify common issues or problems they might regularly face. We determined which tasks were the most time-consuming, the most difficult, and which tasks were performed with relative ease. In addition, we gathered photographs, videos and text descriptions of the tasks that the technicians regularly perform. This provided us with videos and pictures that could be uploaded to the prototype Hubs under appropriate content areas. It also allowed us to see the steps in which they perform tasks so that we could create Hub content to be used as a best practice guide. Standard field observation forms were developed which we will used to record data from each technician we observed. This enabled us to consistently record and organize all of our final data. The field observation forms also allowed for easier analysis once we had observed multiple technicians. By carrying out these observations, we hoped to gain insight and content for our Hub development.

We planned the observations to take place during the technicians' workweek, typically Monday through Friday from 9:00am to 4:00pm. Although this may not be the exact hourly schedule of each technician, we expected that they would be working and able to be observed during this time. We relied on FPA Australia to provide us with technicians that we could

shadow and observe. We observed technicians within the Melbourne area because FPA Australia coordinated with local workers so we would not waste time traveling. However, on two occasions, we traveled outside of the Melbourne area. We observed a fire protection class at Swinburne University and also observed fire extinguisher training in at the CFA fire station in Castlemaine Victoria.

3.2 Objective 2: Most Effective and User-Friendly Technology for Hub

After the content for the proposed Hub had been established, we determined which online technology would be most appropriate and effective for presenting the information to the end users. To determine the technology that will provide the most effective and user friendly technology Hub, we completed the following tasks:

- Created prototype Hubs from the possible implementation technologies
- Interviewed FPA Australia and industry members
- Surveyed members of the industry
- Created a prototype Hub test group
- Made use of a decision matrix to recommend a technology to FPA Australia

3.2.1 Create Prototype Hubs

In order to demonstrate the operation of the Hub to members of the industry and to form the best recommendation for FPA Australia, we created prototype Hubs using the three different technologies described in 2.5.3. Our background research led us to infer that these three technologies demonstrated the greatest potential for success within the fire protection industry of Australia. Although we did not fully know what a specific technology was capable of solely from the marketing information, we were able to make a reasonable determination of its capabilities. If any unexpected problems occurred during the development of the prototypes, we re-evaluated our selected technologies as necessary. Since the creation of the prototypes was vital to the collection of data as outlined in Sections 3.3 and 3.4, we started this process in the second week and had functional prototypes by the end of the third week of the project.

3.2.2 Interview FPA Australia and Industry Members

Having done extensive research on technologies that could support the proposed Hub, the team interviewed employees of FPA Australia to discuss our results. While in Australia, we arranged a mutually agreeable time and date for an interview in which the team hoped to gain valuable feedback regarding our research. Our liaison, Katharine Ebbs, indicated that some criteria for the Hub technology included: how easy it is to upload pictures and videos, whether videos and pictures be commented on, file size limits, whether there are spaces for personal videos and pictures, and what kind of security the site contains (K. Ebbs, personal communication). By determining which technology had these features, and which most successfully implemented them, we determined which technology would be most effective in meeting FPA Australia's objective.

We presented employees of FPA Australia with our research material regarding the potential technologies and asked questions intended to provide a clear picture of the requirements for the Hub. Such questions were based on the relative importance of criteria such as costs, aesthetics, and technical limitations of a proposed technology. It was also important to determine the resources FPA Australia had in terms of a web server. Other important details included information regarding the monetary funding of this project and whether or not there was access to any web programmers. Through our sponsor's reactions to these queries, we determined which technology would be most effective for their Hub and made an informed recommendation to FPA Australia.

3.2.3 Survey Members of the Fire Protection Engineering Industry

The ease with which the industry members can navigate the Hub is also very important to the project. We wanted to choose a collaborative technology which would allow both experienced and in-experienced users to quickly receive important information and interact with other users. We used a preliminary survey to determine general industry attitudes towards Internet and computer use. This survey was the same as the one referenced in section 3.2.1 (APPENDIX A) and thus contained questions pertaining to both Hub content and user-friendly technologies. This survey was web based and was distributed to FPA Australia members

throughout the country so that we could gather a sufficient amount of data in order to draw conclusions that were representative of the entire Australian fire protection industry. We hoped to receive feedback from at least ten percent of the membership of FPA Australia including various professions within the industry. The questions within this survey addressed general web activities and included such information as how much time they typically spend online, where they access the internet, what websites a technician typical browses, characteristics of websites they find easy to navigate, and what a common source of frustration is when dealing with websites or computers. One purpose of this survey was to determine aspects of a website that make it easy for the average technician to navigate. We also wanted to determine the average level of computer literacy among the industry, in addition to any technical limitations (i.e. connection speed or access) they may have. This allowed us to begin to identify what aspects of a particular Hub may or may not hinder use by the industry.

3.2.3 Form a Hub Prototype Test Group

The team formed a prototype test group consisting of various personnel within the fire protection industry with the goal of determining the necessary functionality and the design elements needed to make the Hub useful and user friendly. This group was given access to the prototype Hubs and evaluated them over a series of weeks. The group consisted of nine willing students from Swinburne University who were studying the fire protection field as well as members of the FPA Australia office. The Swinburne University students were assigned to a prototype Hub and analyzed only the Hub that they are assigned to. We planned to assign at least three students to a single Hub prototype. However, the staff members of FPA Australia also had access to all Hub sites. The testing group was coordinated via e-mail and they were asked to respond to specific questions geared towards their opinions of their use of and the effectiveness of the Hub Prototype. The group was encouraged to provide feedback, comments and recommendations regarding the Hub sites. In addition, they were asked to report anything they would like the Hub to contain in terms of functionality or content.

Since all communication and evaluation took place over the Internet, it was not necessary for the students to be from the Melbourne area. We emailed the students following an observation of their class at Swinburne University. The team gave the group members access to the Hub prototypes that they were working with as well as asked for a convenient time to contact

them for further input. We wanted to keep the number of communications with them to a minimum so as not to become a nuisance or take up too much of their daily work time. Since this was a class of students studying fire protection, we understood that they may not be highly experienced technicians. While it was preferable to have some advanced technicians in the test group, even those inexperienced individuals were able to provide feedback on areas of the Hub not relating to specific content. In addition, there were individuals in the class who had worked in the field and were simply taking the class for certification or continuing education. This allowed for feedback on the specific content in addition to general comments on functionality and layout. We planned for this prototype group to evaluate the Hub between weeks four and six of the project.

3.2.4 Develop a Decision Matrix to Form a Recommendation to FPA Australia

Once the data was collected from these surveys, in addition to any comments made during the FPA Australia interview, the field of potential technologies with which to implement this Hub was reduced. To do this, a decision matrix was implemented, such as the example shown in Table 3.

Criteria	Weight	Moodle		Ning		Wordpress	
		Score	Total	Score	Total	Score	Total
Ease of Use	5	3	15	4	20	5	25
Ease of Installation	2	3	6	5	10	4	8
Ease of Moderation	4	5	20	5	20	5	20
Cost	3	5	15	3	9	5	15
Astethics	4	2	8	4	16	5	20
Server Requirements	3	4	12	5	15	4	12
Functionality	5	3	15	3	15	5	25
Upgrade Capability	5	5	25	2	10	5	25
Security	5	5	25	4	20	5	25
		Total:	141	Total:	135	Total:	175

Table 3: Technology Decision Matrix

The individual criteria for the Hub (columns) was assigned a weight based on the relative importance as determined by FPA Australia and industry interviews. The scale is from 1 to 5, with 5 indicating the highest relative importance. However, this may change based on the specific criteria that is necessary to be ranked. Next, the technologies (rows) are graded on how they meet the proposed criteria, with a 1 signifying that the technology barely addresses this need and a 5 indicating that it fully meets it. A solution's total score is determined by its grade in a

certain critera, multiplied by that criteria's ranking, and summed with all other criteria scores. The solution with the greatest final score represented the best solution to the proposed criteria, but we kept in mind any overriding factors such as excessive cost. Using this allows us to quantify which online technology best fits the criteria set forth by FPA Australia.

3.3 Objective 3: Industry Perception of the Hub

The third objective of the project was to identify general industry perception of the Hub and methods by which FPA Australia could further determine how the industry perceives how useful the Hub is as a learning method. This is necessary in order to determine the potential benefits of implementing such a system. The first step in accomplishing this objective was to conduct background research involving journal articles and studies which provided information and statistics on the effectiveness of collaborative learning, as shown in our background section. Verifiable, statistical evidence of the usefulness of collaborative learning instead of, or in conjunction with, traditional styles, showed that the proposed Hub had the potential to increase the level of competency in the fire protection industry. Additionally, it showed common mistakes of collaborative environments, which allowed us to avoid them when implementing the Hub. The following tasks allowed us to complete our objective:

- Interviewed a select number of industry members
- Surveyed members of the industry to obtain their thoughts on how they would use the Hub

3.3.1 Interview Industry Members

In order to determine how the fire protection industry views the proposed information Hub, our team interviewed and conducted surveys on its members from a range of professions including technicians and engineers. We planned to interview 5-10 individuals so that we had a range of professions within our data. Some of these individuals had access to the prototype Hubs during the testing phase. We used FPA Australia to assist in determining which individuals to invite to the Hubs in order to obtain broad and useful perspectives. Our team conducted these tasks during the week and ranging from 9 AM to 4 PM, the typical workday hours. We specifically aimed to interview members from a broad age range to get a variety of opinions on the ease of use of the internet. The reason for this was that our sponsor informed us that the older

members of the industry were not always very willing to change their methods, so any information on what the Hub needed to be like in order for them to use it would be helpful in ensuring that the Hub was used by the broadest number of professionals. Through our interviews, we wanted to gather information from the industry such as how they will use the Hub, what makes it useful and why. Through these questions, we expected to gain information as to how the industry perceived the usefulness of the Hub project as a concept. From this initial information, we were be able to recommend to FPA Australia possible areas of concern within the industry that they should follow up on once the project was completed and functioning.

3.3.2 Survey Industry Members Regarding How They Would Use the Hub

In addition to specific interviews, we wanted to survey members of the industry to determine their thoughts on the effectiveness of the proposed Hub. While the interviews provided in depth data and opinions on what industry members think of the Hub, questions in the survey described above were used to provide quantitative data on the usability of the Hub.

Also, while participants in the Hub test groups (explained in section 3.2.3) evaluated the prototypes, any comments that they had which pointed to concerns regarding the Hub project's progress as a whole were documented. These comments provided a useful source of insight into industry members' thoughts on the Hub after using a prototype. We used these comments to enhance our recommendation to FPA Australia regarding maintaining support for this project from the industry.

3.4 Objective 4: Recommendation to FPA Australia Based on Project Findings

The last project objective was to make recommendations to FPA Australia pertaining to the proposed online collaborative and informative Hub. These recommendations were supported by the data that we collected while completing each of the above project objectives. We made a recommendation based on what content areas the industry desired most and explained the reasons behind choosing these areas. We analyzed what the industry thought the Hub needed to have in order to be both user-friendly and a useful resource. From the data we collected, regarding each individual site, we determined the strengths and weaknesses of each Hub technology. Of utmost importance in our final decision was the ease of use and social networking capabilities available. Also, we recommended to FPA Australia, the technology with which they

could implement an effective and user-friendly online Hub environment. We supported our recommendation with data from our second project objective, selecting effective and user-friendly Hub implementation technology. Lastly, our recommendation included how to determine the fire protection industry's perception of a fully functional Hub. This allowed FPA Australia to understand how the industry would respond and what they expected from the online Hub.

It was our goal to compile these recommendations as soon as possible while we were working in Australia. We realized that this was one of our final tasks and it was dependent on the data from all the previous objectives. However, it was our goal to complete this recommendation during the 6th or 7th week of our project. If time remained after this recommendation was submitted, we would assist FPA Australia in the implementation process in any way possible.

CHAPTER 4: RESULTS AND ANALYSIS

4.1 Determining Hub Content

As discussed in the methodology, our first objective was to determine the specific content required for the Hub website. Our interview with Katharine Ebbs revealed that a group of assessors within the fire protection industry had been previously surveyed regarding Hub content areas that would be of use to the industry. The assessors play an important role in certifying technicians in specific fire protection skill areas. The assessors were given a list of fire protection skill areas and asked to rank the areas that they believed would provide the most benefit to the industry. After analysis of these preliminary survey responses, the five skill areas that received the highest rankings were as follows:

- Inspect and test fire hose reels
- Conduct routine inspection and testing of fire extinguishers and fire blankets
- Demonstrate first attack firefighting equipment
- Recognize types of installed fire safety equipment and systems
- Install portable fire extinguishers and fire blankets

These insights highlight the assessors' views of which primary skill areas the industry would benefit most from if information on this content was provided on the Hub. During an informal interview, Ian Ronalds, an asset maintenance instructor involved with fire protection within the School of Engineering at Swinburne University, further supported these survey results by revealing that his classes covered material within the top rated skill areas from the assessor survey results.

To further verify the specific content desired by the fire protection industry, we developed and administered a survey to members of FPA Australia, Our survey was received by more than 2065 members comprising engineers, technicians, and other industry professionals including managers and salespersons. An email (APPENDIX B**)** introducing the Hub and our role in the project was sent out to members whose email addresses were on file with FPA Australia. The email contained a link to the online survey hosted by Surveygizmo.com. We used Surveygizmo.com to ensure an easy way for the members to respond and to allow for the data to be easily collected and sorted electronically. The email informed recipients that they had one

week to submit the completed survey. Additionally, a print version of the survey was administered to nine Swinburne University students during an observation of one of Mr. Ronalds' classes.

Of the 2065 surveys, 243 responses were received (APPENDIX C). This represented a response rate of approximately 12%, slightly exceeding our target minimum response rate of 10%. Approximately 20 members responded to our email stating that they could not complete the survey because it did not apply to them due to their work being solely involved with the distribution or selling of fire protection products. This may account for why the response rate was not even higher. We received responses from all states and territories except for he Northern Territory as shown below in Figure 1.

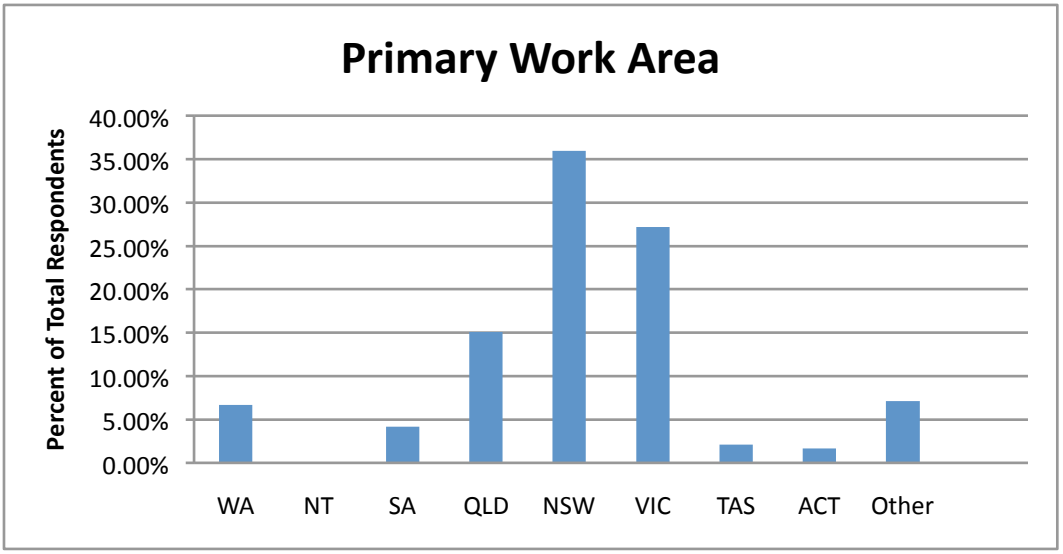

Figure 1: Survey Responses by Location

The participants of the survey were asked to consider a list of eleven skill areas. These skill areas were less specific than those of the preliminary survey administered by FPA Australia. Similar to FPA Australia's preliminary survey, the recipients were asked to choose the top five choices out of eleven and rank these five as to which ones provide the greatest benefit to the industry if included within the Hub. Additionally, they were asked to elaborate on why they made their decision. We first sorted the data to determine which five of the skill areas were ranked highest overall among the 11 options. To determine this, we calculated the number of

times each one was selected as a top five choice. The results of the overall rankings are shown in Figure 2.

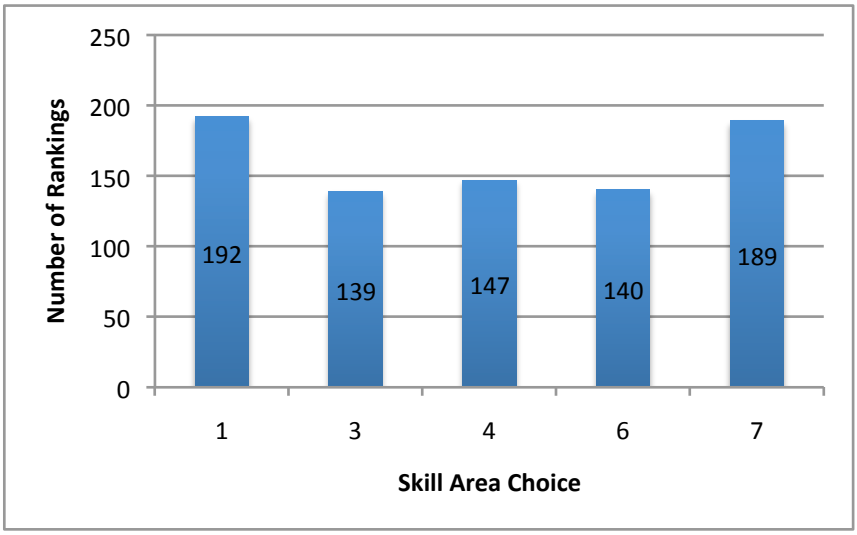

Figure 2: Number of Top 5 Choices Per Skill Area

1: Inspect and Test Fire Protection Equipment in the Field
3: Inspect, test, and maintain pre-engineered fire suppression systems
4: Inspect and test water-based fire suppression systems
6: Inspect, test, and maintain passive fire and smoke containment products and systems
7: Inspect and test fire detection and warning systems

A total of 192 (79%) respondents ranked the choice "Inspect and test fire protection equipment in the field" in their top five. Of these respondents, 98 (51%) individuals stated that it was their first choice. From this, it can be stated that 40% of all surveyed individuals believe that this skill area would be of the most use to the industry and 79% believe that it is within the top five most important skill areas out of the eleven listed. It is important to note that this general area: "inspect and test fire protection equipment in the field" includes the more specific skill areas included in FPA Australia's preliminary survey to select assessors. This provides more support for the determination of appropriate Hub content as our survey highlights the need for content on this general area while FPA Australia's preliminary survey to the assessors further breaks down this area into more specific sections. These data provided guidelines for developing the Hub material.

The five highest- ranked content areas are shown in figure?? above. The highest ranked skill areas represent the areas ranked in the top five by more than 57% of respondents. This can be said because the skill area that received the lowest percentage (57%) of top 5 rankings was "Inspect, test, and maintain pre-engineered fire suppression systems". Because of these statistics the team believes that these five areas will be the most beneficial to the industry.

A follow-up question asked participants to indicate why they ranked their first choice. The reason for including this question was to obtain an understanding of why the survey respondents chose the top areas. We originally predicted that the skill areas that the respondents had the least knowledge of, or the most difficult skill areas, would rank highest. It was our belief that the respondents would not need information on common tasks since they perform them regularly and are likely to have suitable knowledge regarding them. However, it is important to note that although they may be performing the same task repeatedly and they may be confident in doing so, they may be completing it incorrectly. Some older industry members may have been performing a task for many years while teaching the younger generation their methods. This is only beneficial if the task is being preformed and taught correctly. Our prediction was proven wrong as seen from the responses to this question in Figure 3.

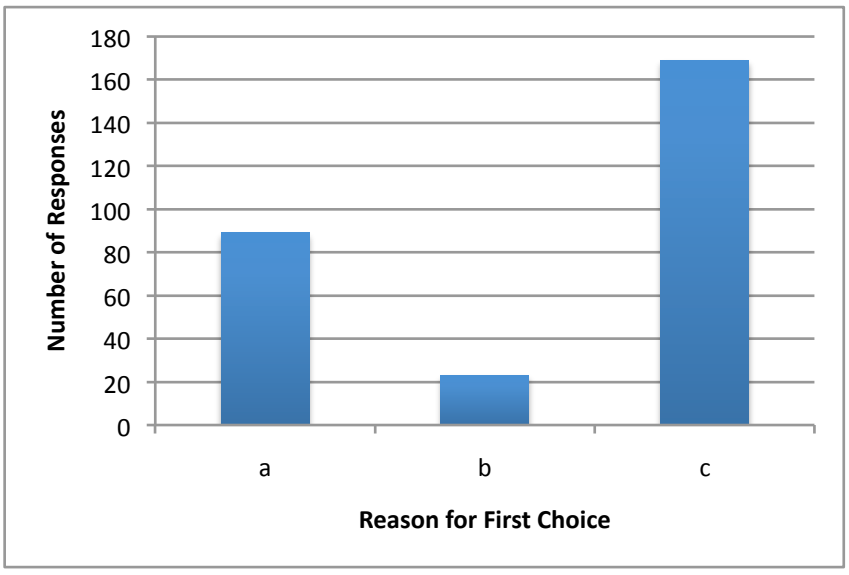

Figure 3: Reasons for First Preference

a: You would like to have a better understanding of this skill area
b: You Feel That the Skills in This Area Are Difficult to Perform
c: You Feel That Skills in This Area Are Used Frequently

Results showed that 169 (70%) participants stated they ranked their first choice because that skill area is frequently used. Eighty-nine (37%) participants stated that they would use the Hub to gain a better understanding of the particular skill area and 23 (9%) stated that the specific skill area contained tasks that were difficult to perform. This data proves that our prediction was incorrect. Only 9% of respondents would use the Hub for information regarding skill areas that were difficult to perform. This suggests that they have sufficient knowledge for the task and the difficulty may be independent of knowledge. Seventy percent stated that they chose the skill area because it was used frequently. This suggests the possibility that knowledge of a task may be independent of the frequency of a task. Participants were also given a text box to elaborate on their responses. While responses varied, many users indicated that a majority of their business dealt with their skill area choices and that is why they selected it. These elaborating comments emphasize the fact that the majority of the survey participants would like to see content related to the tasks that they perform frequently.

Also of interest was the fact that members of different occupations ranked different choices for their first overall pick. For example 36% of respondents who self-identified as engineers, ranked “Inspect and test water-based fire suppression systems” as their first choice while 33% of self-identified educators and persons with other occupations ranked “Inspect and test fire detection and warning systems” as first overall. This highlights that while the majority of the industry can benefit from the “Inspect and test fire protection equipment in the field” skill area, individuals with different occupations have different needs. This is most likely due to the nature of their work. Fire protection engineers, who spend most of their time designing fire protection systems, most likely have no need for information related to servicing fire extinguishers yet desire information on sprinkler systems, which may make up the majority if their work. Similarly, educators might notice that students have trouble learning the “Inspect and test fire detection and warning systems” skill area and this would point to why that was their first choice.

From analysis of datasets from both our survey and FPA Australia’s preliminary survey, we can infer that information regarding the “Inspect and test fire protection equipment in the field” skill area will be of the greatest use to the fire protection industry. This is due to the fact that both surveys highlight the same general skill area as being the most useful to the industry.

Clearly, for the members who are teaching, assessing, and learning are in agreement about which content areas of the Hub would provide the most benefit. This represents a wide segment of the fire protection industry of Australia. Additionally, the data from the survey reveals what other content areas the industry feels would be useful on the Hub. This provides future guidelines for FPA Australia to use when developing Hub content.

4.2 Industry Perception of a Functional Hub

This objective was to determine general Hub perception as well as to identify further methods that FPA Australia can use to evaluate the perception of a functional Hub website. Through our interviews, surveys and interaction with the industry members, we were able to gain a general understanding of how the Hub project is perceived. This information is not specific to one prototype and it allows for a better general understanding of why the industry would use the Hub and what benefit (or detriment) they thought it would have to the industry.

Through both our experience within the fire protection industry of Australia and our informal interviews, we found that the Hub project was perceived as a beneficial tool if implemented. Technicians and engineers expressed that an increase of industry knowledge within specific skill areas was necessary and this would provide a possible solution. The overall perception of the Hub as an industry tool was positive. However, there were some areas of concern among the industry. One concern regarded the sustainability of the Hub once the funding has been exhausted. Questions were asked related to the administration and upkeep of the Hub by FPA Australia. Also, some concerns were related to the specific Hub content. Some companies were apprehensive about uploading their content because they wanted to share it with solely the members of their organization. Since there are many different ways of reaching the same outcome in fire protection installation and maintenance tasks, some companies guard their standard procedures as they may allow them to have an advantage over their competitors. One more point of concern was the possibility of indirect advertisement of different fire protection companies in the Hub videos and pictures. Some industry members thought the functionality to upload content might give rise to companies or individuals promoting and advertising their businesses. This may lead to more contribution to the Hub, but it may also lead to possible conflicts between companies.

Our survey allowed us to further determine the general perception of the Hub. Questions where respondents were allowed to freely comment on questions such as how they would use the Hub, why they chose the content rankings they selected, and what would make the Hub easier, allowed us to analyze the direct verbal responses of the surveyed members. In general, the perception was positive. One respondent reported that "better understanding and in depth knowledge of fire system are always required to keep up to date with testing, servicing and maintenance", while another stated that "a greater understanding of detection system technology and applications is required by many in this field". One respondent expressed that he or she would not use the Hub and prefers written material such as books. This individual had 11-20 years of experience in the fire protection industry and was in the age group 35-44. This one member represents less than 1% of all surveyed members and was the only respondent that specifically stated they had no interest in the Hub.

4.3 Hub Technology

This objective was to determine the technology with which the Hub would be implemented. Three Hub prototypes were developed for the testing of the different implementation technologies. In addition to our internal testing of the prototypes, FPA Australia staff and select industry members were asked to evaluate each of the prototypes and provide comments and suggestions. Through these activities, we were able to gather data on the specific technologies regarding their specifications, costs, and user-friendliness.

For this objective Katharine Ebbs from the FPA Australia staff was interviewed to determine any technical requirements or limitations of implementing the Hub. Also, her opinions regarding how the Hub should appear and operate were noted. From this interview we found that the Hub project had a total budget of $58,000 AUD for the duration of 16 months. Katharine stated that there is room in the project budget for any reasonable hosting or software costs associated with the Hub. This includes a web server to host the installation of any necessary Hub software as well as $4,000 AUD for the hiring of a consultant to help with complex technical and programming issues. Katharine will serve as the Hub moderator during the development and implementation stages over the duration of the 16-month project period. Beyond that period of time, FPA Australia and the project co-sponsors will determine the future of the Hub and secure additional funding if necessary. As stated by Katharine, it is a project goal to develop a Hub that

is easily sustainable and requires minimum maintenance. It is also a goal that the Hub monetarily sustains itself either through charging members to access the site or by charging companies to advertise on the Hubs' pages. Through any of these revenue-generating options, the Hub project could obtain a steady income to support ongoing costs such as server hosting, software upgrades, and content moderation.. This would decrease the amount of funding FPA Australia would need in order to maintain the Hub.

It was our goal to develop the Hub prototypes with layouts and usability based on what the industry believes to be most user-friendly. From our survey, we determined that (47%) of the individuals who responded to the social networking question are members of the social networking website Facebook.com. This represented the most popular social networking site among our survey respondents. The other responses to this question are shown in Figure 4 below. We used this as a guide when developing the prototypes and incorporated similar layouts to that of facebook.com as much as possible. For the prototype Hubs, there was a limited need for the use of videos. The potential for video to load slowly, as well as the time required to edit user-uploaded videos, were prohibiting factors. Images and text were utilized to describe all procedures in specific detail. However, one short video was uploaded on each of the prototypes for demonstration purposes.

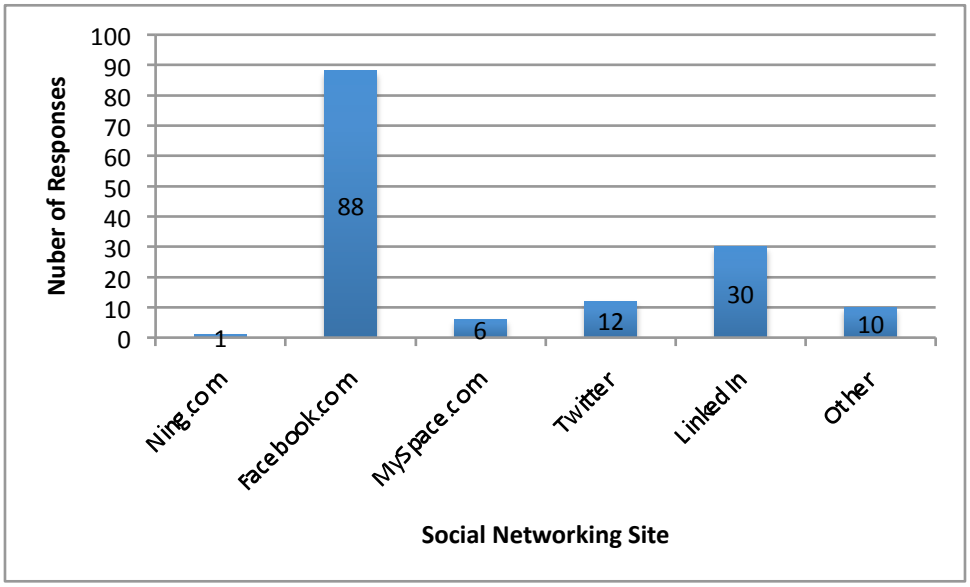

Figure 4: Social Networking Sites Used by Industry Members

One of our interviews with Katharine cleared up any technical requirements or limitations that FPA Australia had regarding the Hub. Since their budget accounts for any hosting or technical consultation costs, we can include all three potential technologies in our considerations. None of the proposed technologies will overtax their budget. FPA Australia had no specific requirements for the layout or design so long as the end user could easily navigate the Hub. This was important to know because any design considerations were evaluated based on the data gathered from industry surveys and interviews. Also, FPA Australia does not anticipate having content in any unusual media formats (K. Ebbs, personal communication). Because of this information can be easily added to the Hub with any of the proposed technologies.

We also addressed this objective through additional data from our survey of FPA Australia members. The survey contained questions relating to requirements for a user-friendly Hub. Since these questions were related to individual computer competency and computer access, and since the survey was administered online, there is the likely bias toward confident computer users. Users willing to and capable of completing an online survey are likely to be more computer-literate than the average industry member. In this case, however, using an online survey was unavoidable in order to obtain the desired number of responses in the time required. However, responses to the survey did indicate a variety of competencies in using the Internet. This shows that the survey did not solely select for highly competent computer users. It is likely that the members of the industry who have computers will possess the minimal skills necessary to navigate the Hub and utilize the resources within it. This is evident from our survey data which indicates just 13 respondents classifying their Internet competence as “Basic: I can perform simple tasks”. This represented just 5.4% of the total responses and from this we can state that approximately 95% of all survey respondents have at least an intermediate (“I can perform a fair amount of tasks”) level of internet competency.

Responses relating to technology stemmed from questions regarding the industry’s level of familiarity with computers, social networking, and technical details on their Internet connection. The resulting data showed that 70% of participants brought a laptop to work and that 65% ranked their work Internet connection as fast (every part of a webpage loads almost instantly). This laptop statistic is important to note because it provides evidence that the members of the industry can access the Hub while at work, and thus use it to refresh their

knowledge related to a specific skill area. Since the majority of those surveyed have access to a laptop at work, they can download and either save material to their computer or print task guides before they travel into the field. This eliminates the need for Internet access in the field. However, if Internet access is available in the field the Hub will be available for full use. The speed of the work Internet connection statistic shows that there are minimal technical limitations regarding what can be displayed on the site while still allowing for the content to load quickly. Thus, uploading pictures and videos to the Hub will not drastically affect the speed at which the site will download. Additionally, we hypothesized that technicians in small towns or rural areas would benefit least from the Hub due to having a slow Internet connection. However, among respondents from both rural and small towns combined, (which represented only 16 of the total 243 respondents) only 2 members (12.5%) characterized their connection as being slow (pages took over a minute to load). Nine of these 16 individuals (56%) stated that their internet connection had medium speed (pages load quickly but pictures and or videos take longer), and five respondents (31%) stated that they had a fast internet connection. These data disproved our previously stated hypothesis that rural and small town companies do not necessarily have a slow Internet connection. Because of this they can benefit more from the use of the Hub than we predicted. However, large files such as videos may still pose a problem in terms of download speed and may lead to frustration. Regardless, we predict that the members with slower Internet connections will still benefit from the text and image-based Hub content.

Of the survey participants, 60% use the Internet more than 5 hours a week and only 6% ranked their internet competency as basic. This can be compared to 42% of respondents having a moderate competency, and 52% being confident internet users. These statistics again highlight the possible bias with surveying users about technology through the use of an online survey. Clearly, most of those who are capable of filling out an online survey possess at least a moderate level of computer knowledge. However, data were gathered from basic users that allowed for the analysis of their responses to other questions to determine if they, as un-familiar computer users, have any different requirements from other members. We found that among users who rated their Internet confidence as basic (being able to perform simple tasks), 42% used facebook.com. This shows that even though they may think their skills are basic, many of them have experience using a site that will function similarly to the Hub. Of the basic Internet users, 42% reported that on-screen instructions would be the best method of troubleshooting Hub problems. Overall, 45%

of the survey participants responded that on-screen instructions would be the best method to provide aid and troubleshooting advice to the users. From this, it shows that on-screen support will be helpful for both the inexperienced users and the user base as a whole.

Finally, according to 60% of respondents, the primary source of computer frustration was site-navigation issues. Site navigation issues can be classified as user confusion on how to access desired content while navigating through the pages of a website. This can be due to poorly labeled menu items, poorly labeled pages, small text, or unusual menu locations. This statistic highlights the importance of choosing a technology that has a logical site layout, and modifying it in any way possible in order for it to be easy to navigate. This result relates to the data collected about the social networking sites. If a majority of potential Hub users browse facebook.com, they will likely find a Hub site with similar layout easy to navigate. Thus, if we style our site to be similar to that of facebook.com, it may cut down on navigation problems. The fact that 45% of the surveyed individuals specified that on-screen instructions would be the most useful form of support highlights another method of making the Hub easier to use. From this, we can conclude that the final Hub technology should support a help program or a similar on-screen help page within the Hub site. This could include labeled screenshots or step-by-step instructions of how to use the site, both of which can be easily created.

The interview and initial survey provided useful background information about user-friendly technology and technological requirements. This provided a starting point and highlighted some potential issues to consider when creating the prototypes. Once the three prototype Hubs were created, they were tested internally between the three members of the project team and Katharine Ebbs. The purpose of this was to evaluate if they met the criteria of a successful and useful Hub. It was also to check for any errors or potential sources of user confusion. From this trial, we identified any minor mistakes or problems within each site. This included broken links, grammatical mistakes, and poor layout designs. The purpose of this preliminary internal testing was to ensure that each site was ready to be tested by the prototype groups and that the users would not become frustrated by simple errors on the designer's part.

After the prototypes were internally checked, they were released to test groups which comprising nine swinburne students in the PRMPFES11B certification program. The students were not asked to evaluate every prototype; rather they were each given access to one Hub site.

The project team understood that the technicians had limited time to evaluate the prototypes as many of them were busy working within the fire protection industry and taking classes. By assigning each technician one prototype, it minimized the time commitment for evaluation and allowed each Hub to be viewed by three technicians. Additionally, Hub access was given to the FPA Australia staff and select assessors from the industry. Thus, 47 Individuals were given access to each Hub so they could complete our evaluation. The purpose of this was to get feedback from people within the industry who knew of the Hub but had never used it before. This provided useful information on what first time users would like and dislike about each of the sites. Through their rankings of various aspects of the sites we determined the strengths and weaknesses of each prototype.

We developed a grading rubric (APPENDIX D) that we provided to each evaluator to rank the Hub prototypes. The rubric was divided into three main categories of questions: site navigation; photos and videos; and discussion forums. Evaluators responded by assigning each question a score on a scale of 1-5. Rankings for both FPA Australia staff and industry members were recorded separately, but the average score of both groups was combined to calculate for the final results. The final site scores were calculated as percentages out of a total of 100% and are shown in Figure 5 below.

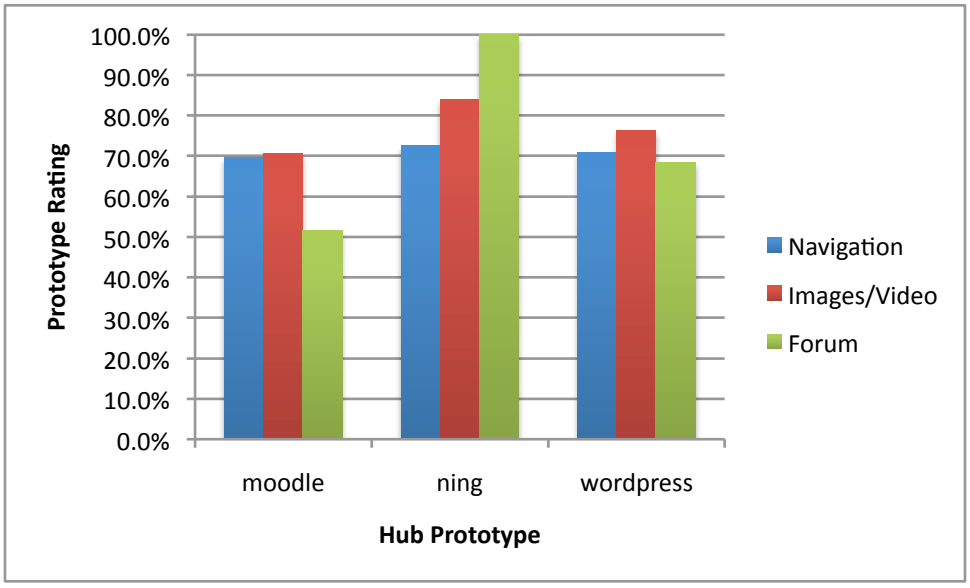

Figure 5: Hub Prototype Ratings

It is important to note that we received responses from seven individuals including FPA Australia staff and assessors. A summary of this data is shown in APPENDIX E. We received a significantly lower number of responses to the Ning prototype. Only three individuals evaluated the Ning prototype and some questions were left unanswered. Because of this we believe that Ning received a higher score than it deserved. Also, through our industry interactions and our own evaluation of Ning, we believe that the Wordpress and Moodle Hubs represent a better option than Ning.

Site navigation questions included whether or not the Hub's purpose was clearly stated, how easy it was to understand the various areas of the site, and how well labeled the skill units were. For this area Ning ranked highest (73/100) with Wordpress in second (71/100) and Moodle in third (70/100). Because all these scores were extremely close to one another it was difficult to conclude which Hub was the best in this category. We examined the individual comments that we received on each Hub to further clarify this category. Some users noted that the front page of Ning was crowded, busy, and that the ads needed removing. They also noted that they could find all areas of the site as well as the group pages. This was a common point of confusion with Wordpress and Moodle. Wordpress did not have group pages and Moodle's were not labeled clearly enough. Participants also noted that all sites needed clearer explanations of what each site was about and directions on how to use each one.

A general comment from one respondent specific to Moodle was that it felt more like a learning tool than a reference tool and that FPA Australia should clarify which one the Hub was supposed to function as. This was not surprising, as Moodle is primarily a learning software, and thus the content on each page is arranged in a manner consistent with a traditional learning environment. The Moodle Hub was configured in a manner such that all resources and content were divided into separate courses. Wordpress is different in that all content is displayed on a page without any separation of content or resources, other than that desired by the creator. This provided an area of discussion between FPA Australia and the project team and it was decided that the Hub should function primarily as a reference tool. From this, and the fact that the Ning data was skewed, we decided that Wordpress was the best choice for site navigation despite the scores in the site navigation category.

Overall, we found that users desired a clean and simple home page in order to understand how to navigate the site. According to respondents, also of importance for site navigation was a clearly labeled menu that enabled users to easily access every area of the site. Users were concerned with the fact that Moodle was navigated via links located at the bottom of the page and that in Wordpress, the skill areas were not fully described in the menus. Despite these initial drawbacks to each site, our team felt that the problems were based on minor wording and layout choices that could be easily remedied. Two areas pose more significant problems to us in addressing these issues. The first is that the homepage of Ning has limited customizability and the advertisements may only be removed by paying a fee. The second problem is that while the layouts of both Wordpress and Moodle can under some circumstances be substantially changed through the use of web programming languages, we found such changes impossible in some cases due to restrictions by the free server hosts and by the fact that the project team did not have adequate technical knowledge to make such alterations. Additionally, this is not something we could address within the time frame for the project. Despite this, FPA Australia has the option to hire someone with sufficient programming knowledge in order to assist them with any major changes.

Photo and video questions were based on the clarity and presentation of these media, proper labeling, formatting, and speed of viewing each item. Again in this area, Ning was ranked the highest at 84/100, followed by Wordpress at 76/100 and Moodle at 71/100. The project team feels that photographs and videos are a clear strength of Ning. These items can be easily uploaded, tagged and commented on within the Ning prototype. Wordpress provides these options but they are slightly more complicated to use, and the tagging and commenting features are lacking within Moodle. During discussion of these results with Katharine Ebbs, we determined that the ability to tag and comment on photographs and videos is a major requirement for the Hub.

Finally, questions in the discussion forum area focused on how easy the forums within each Hub were to use. Ning ranked highest at 100/100 followed by Wordpress at 68/100 and Moodle at 52/100. The forums of Ning were easy to view and to make contributions to the discussions. Overall, users expressed that they wanted to see clarification on how to use the forum sections of the website and if there were any restrictions in terms of posting content or

adding to discussions. Respondents reported general problems with the forums of Wordpress and Moodle. For Wordpress, this was likely due to the forums being displayed in a confined area of the webpage rather than in the full space of the screen. This made them cramped and hard to read. With Moodle there was a problem that prevented users from accessing the forums, which was solved halfway through the evaluation process. This may have led to users being unable to access the forums at the time of their evaluation. It is important to note that the discussion forums are a core part of Ning, whereas they are additional plug-ins that must be installed in the case of Moodle and Wordpress. This may have led to the ease with which the Ning forums were used and the problems with the other two sites.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

5.1 Hub Content Development

After collecting the data detailed in the above section, the project team formed the following recommendations. These recommendations follow the project objectives detailed in the Methodology of Chapter Three. They were formed by drawing conclusions from the data collected and taking into account any requirements of FPA Australia so that the best Hub possible can be created.

Recommendation 1: Initial Hub content should be focused on the "Inspect and Test Fire Protection Equipment in the Field" skill area.

Benefit to FPA Australia: Focusing on this skill area is important because the majority of both the surveyed assessors and industry members identified it as the skill area in which they desired Hub content for. Prior to our arrival, FPA Australia surveyed industry assessors on their most desired content areas. These specific content areas are encompassed by the more generalized skill area of "Inspect and Test Fire Protection Equipment in the Field". From our survey, we determined that even though a similar number of people ranked "Inspect and Test Fire Detection and Warning Systems' in their top five, a greater percentage of people ranked "Inspect and Test Fire Protection Equipment in the Field" as their first choice. Therefore the greatest percentage of respondents ranked this general unit as most beneficial. Although this data reflects a uniform response of assessors and industry members, we predict that the respondents may have inadvertently chosen their most beneficial skill areas synonymous to the skill areas that they most commonly use. We also suspect that these commonly used skills are clearly understood industry-wide, therefore lessening the need for information on this specific content. However it is also possible that users may believe that they have a strong understanding of their everyday tasks when in fact they have been performing the task incorrectly due to a simple or common mistake. Due to these factors, it is still our belief that providing initial Hub content regarding this skill area will be most beneficial to the industry in the early stages of the final Hub. The Hub content on this skill area will have already been taught to and understood by the majority of the Hub users. This will allow them to refresh their knowledge and it will allow them to focus more on navigating the Hub website and becoming accustomed to its features. We believe that if the

original content contained difficult or uncommon skills, the users may become frustrated more easily as they are being exposed to both unfamiliar content and an unfamiliar environment (i.e. the Hub). Once this content is developed and displayed and the users are given time to get accustomed to the Hub environment, more advanced content could be developed. The Hub users may retain this newly developed information easier without the added stress of navigating through an unfamiliar online environment. This is expressed in other recommendations below.

Strategy: The project team collected and edited a large number of photographs and videos depicting tasks within this skill area. These resources can help the FPA in the rapid creation of content, as it is solely a matter of organization and compiling descriptions. This new content can be uploaded to the Hub in a short amount of time, and there are no copyright obstacles to the use of this content, as FPA owns the right to use the materials.

There are two ways in which FPA Australia can create content related to this skill area. The first is to make use of materials already collected and created by the project team. Many of the pictures taken by the team over the duration of the project are of skills being performed within this skill area. Additionally, much of the sample content created for the prototype Hubs was developed from guides for performing tasks related to inspecting and testing equipment in the field. Editing and adding to this already established content will allow FPA Australia to quickly create a functional Hub.

The second possibility for creating content pertaining to this skill area is for FPA Australia to reach out to the industry and request content related to this area. Since the relevant skill area and tasks have been identified, FPA Australia can ask for examples of specific tasks. If the industry is willing to contribute content then FPA Australia will simply need to edit and validate the information before putting it on the Hub. However, they will have to determine the effects of copyright and privacy issues on user-uploaded content. It needs to be clear who owns the copyright to the information once it has been posted and how it is to be used. Additionally, FPA Australia needs to take steps to ensure that information that the creators wish to keep private is posted in an area which only those authorized to view the information have access to it.

Recommendation 2: Future Hub content should focus on the "Inspect and Test Water-based Fire Suppression Systems" and "Inspect and Test Fire Detection and Warning Systems" skill areas.

Benefit to FPA Australia: Although these skill areas were not ranked #1 overall, members of some occupations, such as those that fell under the "educator" or "other" category, ranked them higher than "Inspect and Test Fire Protection Equipment in the Field". We believe that FPA Australia should focus on creating content within these two skill areas once they have made progress in implementing our recommendation above. Both of these content areas are more specific and include more in-depth skills than some of the other areas. By focusing on these content areas later, it will allow the Hub users to become familiar with the Hub before delving into the more detailed and difficult skill areas. However, we do feel that these two skill areas are crucial to be implemented relatively early, as some individuals within the industry complete the majority of their work within these two skill areas. It is important that these skill areas are represented so that members completing work in all skill areas are provided with the same type of resources. Due to the complexity of these skill areas, it is more time consuming for FPA Australia to develop the necessary detailed descriptions and collect relevant media. By focusing on these areas secondarily, FPA Australia will have more time in the early stages of the Hub for continued development as well as time to solve any problems that may occur.

Strategy: The strategy for creating content within these skill areas is identical to the strategy described in the previous recommendation. The project team has gathered photographs and videos relating to material from these skill areas as well. However, more examples could be collected on specific tasks performed in these skill areas.

Recommendation 3: Make the content available for download.

The information from the Hub should be available for download since approximately 70% of the industry has access to a laptop at work. However, they may not have access to the Internet while in the field. Thus, if they can download technical guides before going out into the field, they will still have the ability to consult those guides. This recommendation can be achieved by creating PDF versions of the guides or Hub pages available on the site. Linking to these files in each content page would allow users to locally save a copy of the relevant

information. Creating such information in a PDF document would ensure that individuals could view the information but not alter it.

Recommendation 4: Videos may be used, but must not make up all the content.

From the survey it was determined that 65% of respondents stated they had a fast Internet connection. This was categorized on our survey as a connection that allows everything to load almost instantly. For these people, videos would not present any problems. However, the remaining 35% had a moderate connection or slower, characterized as videos and images loading slower. For these individuals, videos may be a possibility, but if they load too slowly the users may become frustrated and choose to not view them. By offering the same information that is in the videos, but in a text and picture format instead, these users can be catered to. This would allow them to obtain the same information without the need to wait for the video to download. Also, if the user decided to view the video they could read the content with pictures and text while the video downloads. With the increase in connection speed and Internet technology over time, we expect that the number of slow connections will diminish. This will allow everyone to have the same experience when utilizing the Hub.

5.2 Industry Perception of the Hub

It will be valuable for FPA Australia to determine how the industry views the Hub and what can be done to improve upon it. Since the project team will be unable to work with FPA Australia after the Hub is released to the industry, we will provide recommendations on how they can obtain this information.

Recommendation 5: FPA Australia could survey and interview industry members regarding perception of the Hub as an industry-wide tool.

Benefit to FPA Australia: By determining the industry's view of the Hub once it has been implemented, FPA Australia can establish a useful benchmark of how further development and management of the Hub should proceed. Through the use of surveys and interviews of industry members, FPA Australia will be able to determine if the Hub will have had the desired effect on the industry of creating a more knowledgeable and skilled workforce. Also, any feedback will give FPA Australia evidence regarding the usefulness of the Hub . This may allow them to find

problems so as to make any necessary improvements. Also, data from these surveys and interviews may be used as support to secure any additional funding that the Hub may require.

Strategy: In order to determine how the fire protection industry perceives the idea of an information Hub, we recommend that FPA Australia release a survey to the industry population. Unlike the survey administered by our team, which asked how users would use the Hub, this survey could be aimed more at whether users find the Hub to be a beneficial tool. The goal of this survey is to provide FPA Australia with a better general understanding of how the industry uses the Hub and what benefit or detriment they believe it has for the industry.

As with previous surveys, this one could be sent to the fire protection industry in a mass email. By doing this, the survey will be received by more than 2000 individuals. The response rate for this survey may differ from our ten percent. This may be due to the responses being only from industry members who enjoyed using the Hub and found that it provided some benefit. We predict that if there is a significant decrease in response rate from the survey response we observed, the Hub should be re-evaluated and modified to cater to the needs of a wider variety of industry members if possible. However, from the positive response seen in our survey, as well as within our industry interactions, we predict that the Hub will be a success and any response rates to future surveys will be at a minimum of ten percent.

FPA Australia could also interview Hub users. This will give FPA Australia the chance to ask similar questions as seen on the survey, but to individuals who have used the Hub. With the mass email survey, FPA Australia will receive information they can analyze statistically. From industry interviews, FPA Australia can obtain the same information, but on a more personal level, which may lead to more thought-out answers. This will be possible since the interviewees will be allowed to freely elaborate on their opinions and the FPA Australia staff conducting the interview can further clarify and answer any questions that may arise. FPA Australia can use the data from these interviews to validate the data that they collect from their survey. Since the interview data will be more specific, it may raise issues not covered in the survey. FPA Australia could attempt to identify and match survey trends with specific statements made by the interview group. If both datasets are in agreement, they can then conclude that the data are accurate and can be used to evaluate the perceptions of the industry and areas in which the Hub could potentially be improved. If the datasets represent conflicting ideas, FPA Australia could conduct

more interviews to build up their dataset further. We suggest that they use the interviews as a primary method of data collection in this case because it is on a more personal level and allows for the FPA Australia staff to communicate easily and accurately to the industry member being interviewed. However, the project team realizes that these interviews take time and that funding for the Hub may limit the number of interviews able to be conducted. If this is the case some alternative methods for collecting more personal responses may be telephone interviews, one-on-one email correspondence, or Skype.

The combination of both surveys and interviews will ensure the best possible results and will clearly show how the industry perceives the Hub. Categories of questions for the survey and interviews could include, but are not limited to, the following: “tasks completed using the Hub”, “pictures vs. videos”, “educational value”, and “overall use and benefit”. The team expects that responses will contain positive information. Specifically, we expect that FPA Australia will discover that overall knowledge and work efficiency will have increased industry wide in direct correlation with the use of the Hub.

As was done by our team, we suggest that FPA Australia make use of the service provided by surveygizmo.com. When the team conducted the survey, we established that Survey Gizmo provided the most options in its free version. Also, it provided survey participants with an easily accessible survey that they could respond to quickly. It also allowed the project team to store data in an electronic format that could be analyzed quickly and easily. Based on experiences from our initial survey, we have three additional considerations for FPA Australia. First, we suggest they make use of the “reporting value” function of the survey software. This allows the responses to be organized based on pre-determined values instead of the full answer to the question. For instance, this could be used to show that the participant answered a question as “B” instead of “To use the Hub to check best practice examples”. This will keep the data organized and will make analysis easier within Excel. Secondly, FPA Australia may consider upgrading their Survey Gizmo subscription. The free version is limited to 250 survey responses. Our team’s survey did not reach this limit, but if FPA Australia believes their survey will exceed this limit, they can purchase upgraded versions that have an increased number of allowed responses as well as various added features. A survey with a limit of 1000 responses costs $19 per month (Survey Gizmo). Finally, we recommend that this survey should limit the use of

optional responses labeled as “Other” which allow users to input their own choice. Although the project team found that this yielded some valuable data, it also led to responses that produced redundant answers.

5.3 Hub Technology

The use of technology is vital to the success of this project. From conducting surveys and interviews the project team has determined that respondents and interviewees were generally skilled computer users. Even though the results are somewhat biased, the large number of responses means that even without a lot of advertisement or education, a large portion of the industry would be willing and able to use the Hub. Most members are capable of browsing websites, and a majority has been exposed to traditional social networking sites such as Facebook or LinkedIn. From our survey data we predict that a large portion of the industry will be able to use the Hub with little difficulty. To ensure the best possible user experience, FPA Australia should consider the following four recommendations.

Recommendation 6: Make the layout of the Hub similar to that of Facebook.

Benefit to FPA Australia: From our survey we have found that 58% of our sample population has made use of Facebook. From this we can determine that they will at least be familiar with the layout and will likely find the Hub easy to use if its layout is similar. Since one of the Hub’s functions is to provide an interactive communication environment similar to that of Facebook’s, it is logical to design the Hub look and operate similar to Facebook. The Hub is undoubtedly of a more professional and technical nature than Facebook, but Facebook’s layout provides a good example for Hub development. Facebook has a simple layout with which our sample population is familiar. Even if they do not particularly like the layout of Facebook, they have become accustomed to it and thus should be able to navigate a site with a similar layout. This provides a good starting point. Once a functional Hub exists and members have access, it can then be re-evaluated and any necessary changes can be made.

Strategy: There are some unique elements that need to be considered in order to create a Hub layout that looks and functions similar to that of Facebook. The top banner for Facebook, which is blue and states the company name, could be replaced by the banner used on the FPA Australia website that includes the FPA Australia logo. Each page on Facebook includes a photograph of

the current user that links to their "profile" which includes information about them. The Hub could also give users the option of having a personal photograph, and could include that picture on each page and link it to their profile. This will allow users to easily navigate back to their profile page. Also, the menu that allows one to navigate Facebook is located on the left side, directly below the user picture. The menu by which one can navigate the Hub could be in the same location. This will allow users to navigate the site regardless of what page they are on; they will not have to search for links to the areas that they wish to view. This menu should include links to: the home page, skill areas, discussion forum, an area for uploading content, and a list of other users. Finally, the center column of the Hub should be similar Facebook's by being large and containing only content. There should be no menus or links to information in the center or right hand columns. This will separate site navigation and content and make it clear to users how to get to the pages they wish to view. Both Moodle and Wordpress are capable of having a layout similar to Facebook whereas Ning is not. This was a factor in our final decision on Hub technology.

Recommendation 7: Use on screen-support for troubleshooting user problems.

Benefit to FPA Australia: From the survey, we determined that the greatest percentage of respondents at 46%, prefer on screen instructions for making the Hub easier to use. This was a preferred method of troubleshooting. Also, using this method will allow FPA Australia to show members of the industry how to use the actual site, instead of attempting to explain procedures by a more difficult method such as by telephone. Also, this method has the potential to be less costly than alternatives such as a printed instruction manual.

Strategy: This can be accomplished through the use of screen sharing software such as "LogMeIn" or ShowmyPC.com. This software typically costs about $15 per month and would allow the FPA Australia Hub moderator to share their screen with a Hub user, or potentially "control" the user's computer in order to demonstrate how to use the site (ShowmyPC). Screen sharing could be done via the web, but controlling a user's computer would require the user to install the software. If costs prohibit this, or FPA Australia believes that the users will be unable or unwilling to install the software, we suggest an alternative solution. This alternative involves a recording of the screen of someone performing basic tasks on the Hub such as viewing a profile, reading a skill guide, or uploading a picture. Free software such as "Jing" or "Camtasia" are

capable of creating these recordings. These videos can then be linked to the homepage of the Hub for users to view if they become confused about how to perform tasks. While this is not as personalized as the above solution, we predict that it will address a variety of common problems or confusions with the site.

5.4 Final Hub Recommendation

Another main goal of this project was to recommend to FPA Australia the online technology that will allow for the development and implementation of the best possible Hub website as well as being user-friendly. Because this is the final recommendation and it concerns the technology best suited to create the Hub, it includes additional explanations. This recommendation details our selected technology, why it is ranked the best, the costs associated with implementing it, and additional considerations for its implementation. Through the analysis of the data we have collected about FPA Australia and industry preferences for the Hub, as well as feedback on the prototype Hubs, we have come to the following conclusion.

Recommendation 8: The best technology for FPA Australia to use to implement the Hub is Wordpress.

From all the data we collected from potential Hub users, as well as our own experiences in using each Hub technology, we believe that Wordpress would allow FPA Australia to provide the best possible Hub environment to the end users. Wordpress represents the technology that can best implement the features desired by the industry. In addition, it will provide the industry with the currently desired functionality as well as ample opportunity for expansions and further development. It is easy to use for both users and moderators. Finally, it can be implemented at reasonable cost inclusive of both software and server requirements. We have reached this final recommendation through our analysis of both the survey data and our industry interactions. Our conclusion is summarized through the use of the decision matrix shown in Table 4.

Criteria	Weight	Moodle		Ning		Wordpress	
		Score	Total	Score	Total	Score	Total
Ease of Use	5	3	15	4	20	5	25
Ease of Installation	2	3	6	5	10	4	8
Ease of Moderation	4	5	20	5	20	5	20
Cost	3	5	15	3	9	5	15
Astethics	4	2	8	4	16	5	20
Server Requirements	3	4	12	5	15	4	12
Functionality	5	3	15	3	15	5	25
Upgrade Capability	5	5	25	2	10	5	25
Security	5	5	25	4	20	5	25
		Total:	141	Total:	135	Total:	175

Table 4: Hub Evaluations

To create this table, we developed a list of the most important characteristics of an effective Hub. Each criterion was assigned a weight because not every aspect was as important as the others. A weight value of 5 indicates the most important criterion. Similarly, within each criterion, a score of 5 represents that the technology meets that criteria well while a score of 0 indicates it did not meet it at all. Based on everything discussed by the project team and Katharine Ebbs, we felt that “Ease of Use”, “Functionality”, “Upgrade Capability” and “Security” were most important for each technology. These scores were determined collectively by project team. Our rationale was based off of our survey data, industry experiences, informal interviews, general Hub feedback, and insight provided by Katharine Ebbs. It is necessary for the Hub to be easy to use, work as intended, and be able to be upgraded in the case that FPA Australia wants further functionality. Additionally, security is vital so that member access can be moderated and select content can be protected. We ranked how well each technology met our specified criteria. By comparing the advantages and drawbacks to each technology as it related to each criterion we determined the scores for each Hub relative to each other. Although this is not soley based on statistics, we believe it provides accurate information to differentiate between technologies. We believe that each technology was ranked with accuracy, and that the final scores have enough difference to draw a valid conclusion.

Despite the fact that Wordpress ranked second in the evaluations completed by the test group, overall, we feel it is a better choice than Ning. It is important to note that the results of the evaluations may have been skewed due to a minimal number of Ning evaluations collected. Also, we note that Ning is easily configured and takes little time for initial setup. However, it is not

open-sourced and lacks the ability to be upgraded or extensively modified. Wordpress, alternatively, is open-source and allows for everything to be modified by an administrator with the appropriate technical knowledge. This allows for many possibilities in terms of site design and layout. One drawback to Wordpress is that it must be installed on a web server. This would pose an ongoing cost to the Hub project, as the server must be paid for to ensure that it stays supported and is accessible online. However, many of the problems with Wordpress were minor and simply necessitated a change of wording or layout. Overall, respondents generally thought that Wordpress was easy to use and was aesthetically pleasing.

Wordpress is the best choice for implementing the Hub but as stated previously, it does have some drawbacks. It is primarily a Content Management System (CMS) and blogging software. Thus it is primarily used for chronologically sorted articles. It is perfectly capable of implementing the type of repository that FPA Australia desires, however, additional work is necessary so that the content is arranged as is desired by FPA Australia. Another limitation is that much of the functionality desired by FPA Australia is not a core part of Wordpress and is instead implemented through the use of plug-ins. These plug-ins are easy to install but it is necessary for FPA Australia to be aware that it takes time and server storage to implement these plug-ins. In some cases more professional plug-ins cost money. However, there are thousands of plug-ins available for free download that vary in terms of functionality. This is not a major drawback but it should be noted. Also, there are some technical limitations regarding the layout of the site. Thousands of pre-made themes exist which will change how the site will look, but FPA Australia may find that they wish to create their own. If FPA Australia desires a layout customized to exact specifications, it will need to be custom made. This is done through the use of Cascading Style Sheets (A method of HTML programming) and the PHP programming language. Many resources exist that aid in the learning of these languages, but in the interest of saving time it is something that FPA Australia should consider hiring an expert for. Finally, the user dashboard, a private space used to upload content, has many options and is a bit difficult to understand. A large body of documentation exists on Wordpress.org for how to use this feature. FPA Australia should provide visible links to this documentation for first time users and/or should publish a video of how users can upload their own content. However, if a technical consultant is hired by FPA Australia, the user dashboard may be completely modified or even eliminated.

Some cost considerations need to be made if FPA Australia is to enact this recommendation. These are summarized in the Table 5 shown below.

Function	Price	Terms	Reason
Wordpress Software	$0	N/A	Open- Source available for free at wordpress.com
Bluehost.com Web Hosting	$7	Per Month	Unlimited Storage Space and Bandwidth
Memberwing.com Membership Plugin	$150	One Time Cost	Allows for customizable levels of membership as well as charging for use of content
Layout Design/Programming	Varies	N/A	Graphical Designer and/or CSS/PHP Programmer

Table 5: Wordpress Cost Summary

Since Wordpress is freely available open-source software, there is no cost associated with downloading and installing it. The software needs to be hosted on a server with at least 128mb of server space and one that supports PHP and mySQL (website programming and database support respectively). Our recommendation is that FPA Australia makes use of Bluehost.com. They are a known and respected web-host recommended by the Wordpress community. Their servers are capable of supporting the software, and they provide a free domain name as well as unlimited bandwidth and server space. This means that no matter how many people log onto the Hub per month there will be no additional charges. The project team does not recommend that FPA Australia make use of Wordpress.com as a web host. As shown in the background, their costs are much higher than those associated with Bluehost and other private companies. The process of installing Wordpress on a web-server is easy, well documented and should pose no problem to FPA Australia staff.

A number of plug-ins could be used by FPA Australia to obtain the desired functionality of Wordpress. One such plug-in is “Memberwing’s Membership”. Installing this would allow FPA Australia to set levels of access for different content areas of the site. This plug-in also integrates with Paypal, giving FPA Australia the option to charge for access to various areas of the site. Since FPA Australia is considering paid membership as a future way to support the site, this is an important feature to note.

Finally, as mentioned above, FPA Australia may wish to develop a custom theme for the Hub. This would require PHP and CSS programming skills and the possibility of graphic design. Since such a process would be too lengthy for a novice to take on it is recommended that FPA Australia hire a consultant to do so. Since the cost would be on a per hour basis, and involves many variables such as quality and difficulty of design, there is no way to provide an accurate assessment of cost. FPA Australia should research the Australia based Wordpress consultants "Finding Simple" and "Instinct" if they believe significant customization is necessary.

Finally, FPA Australia could implement the following plug-ins, summarized in Table 6 to provide the hub with some of the desired functionality.

Plugin	Functionality	Website
Memberwing Membership Plugin	*Allows for custom paid membership levels as well as free "teaser" content. This will allow FPA Australia to show what the Hub is about and still obtain paid memberships*	http://www.memberwing.com/
WP Sentry	Allows customized levels of access for separate groups. Necessary to implement groups such as CFA and Swinburne	http://www.peteholiday.com/wp-sentry
Simple Press Forum	Basic Discussion Forum Plugin	http://simple-press.com/
Buddy Press	**Enhances the Social Networking aspects of Wordpress. Allows each user to have a custom profile**	**http://buddypress.org/**

Table 6: Summary of Useful Plug-ins

Overall, Wordpress represents the best solution for current Hub needs as well as the most capable technology to adapt to future Hub requirements. Its open source nature and community support lead to a near infinite amount of plug-ins and thus functionality. It can be used by the industry and moderated with relative ease. Ning satisfies part of FPA Australia's requirements; however it is limited in the long run. Moodle has nearly as many functions as Wordpress,

however, it is more suited to be a learning environment than a quick reference and industry networking tool that the Hub should be. Wordpress will serve both of these functions to the Fire Protection Industry of Australia as well as having the possibility to function as a leaning environment. Minutes from the meeting in which this data was presented to FPA Australia's Hub project team are within Appendix F.

5.5 Conclusion

The main goal of this project was to provide recommendations to FPA Australia regarding the technology and content that would comprise the online information Hub. The implementation of the Hub will hopefully lead to increased competency and knowledge of industry members, a positive image of the industry as highly knowledgeable professionals, and an increase in the overall level of fire safety in Australia. Our research provided a profile of the industry to which the Hub was tailored. The prototype testing provided feedback on which aspects prototypes were useful and which were not. This allowed us to discover problems before the prototypes were released to the industry for further evaluation. This information allowed us to recommend that FPA Australia use Wordpress when creating the final Hub website. This software will allow them to easily create a site that will meet their needs as well as those of the Hub users. Additionally the project has provided a good starting point for FPA Australia in terms of determining and creating content. We have also recommended ways FPA Australia can use to ensure that the Hub is useful to the maximum number of industry members. Overall, we believe that the Hub will be a vital tool to the industry and will evolve and improve after it is initially released to the entire fire protection industry.

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APPENDIX A: FPA Australia Membership Survey

1. From the list below, select five Fire Protection skill areas that you would find most beneficial to your work. Then rank each selected skill area using the numbers 1 to 5 with number 1 being your highest ranking.

- Inspect and Test Fire Protection Equipment in the Field _____
- Maintain, Test and Refill Extinguishers in the Workshop _____
- Inspect, Test and Maintain Pre-engineered Fire Suppression Systems _____
- Inspect and Test Water-based Fire Suppression Systems _____
- Inspect, Test and Maintain Gaseous Fire Suppression Systems _____
- Inspect, Test and Maintain Passive Fire and Smoke Containment Products and Systems _____
- Inspect and Test Fire Detection and Warning Systems _____
- Recover, Reclaim, Fill and Store Scheduled Gaseous Fire Extinguishing Agents _____
- Install and Commission Pre-Engineered Fire Systems _____
- Install Containers and Actuators for Gaseous Fire Suppression Systems _____
- Conduct Complex Servicing of Fire Protection Systems _____

2. What is the reason why you selected your first preference? (more than one response is acceptable):

a. You would like to have a better understanding of this skill area
b. You feel that skills in this area are difficult to perform
c. You feel that skills in this area are used frequently

3. If necessary, use the space below to elaborate on your response to question # 2.

_____

_____

_____

4. How would you use the Hub? (more than one response is acceptable):

a. To view information about industry procedures and best practice examples
b. To store evidence of tasks for future use and assessment
c. To communicate with other fire protection industry workers
d. Other:_____

5. How many years have you worked in the fire protection industry?

a. (1-5)
b. (6-10)
c. (11-20)
d. (20+)

6. What is your position title?

a. Engineer
b. Technician
c. Other:_____

7. How have you learned your trade? (more than one response is acceptable):

a. Face to face classes
b. On the job training / Apprenticeship
c. Online learning
d. Other:_____

8. Your age group:

a. (16-24)
b. (25-34)
c. (35-44)
d. (45-54)
e. (55+)

9. Do you bring a laptop to work?

a. Yes
b. No

10. What best describes the population of your primary work region?

a. Capital city
b. Regional city (10,000+ people)
c. Town (250-10,000 people)
d. Rural (< 250 people)

11. In what state or territory is your organisation based?

a. Western Australia
b. Northern Territory
c. South Australia
d. Queensland
e. New South Wales
f. Victoria
g. Tasmania
h. Australian Capital Territory
i. Other:_____

12. Approximately how many people does your organisation employ?

a. 1-5 people
b. 5-15 people
c. 15-50 people
d. 50+ people

13. Your competence in using the Internet is:

a. Basic - I can perform simple tasks
b. Intermediate - I can perform a fair amount of tasks
c. Advanced - I can perform almost any task

14. My Internet connection at work is:

a. Slow (Pages take over a minute to load)
b. Medium (Pages load quickly but pictures and/or videos take long)
c. Fast (Everything loads almost instantly)
d. Doesn't Exist

15. The amount of time you spend using the Internet in an average week is:

a. 0-3 hours
b. 3-5 hours
c. 5-10 hours
d. 10 or more hours

16. The primary source of Internet frustration for you is:

a. Unfamiliar terminology
b. Lack of instructions
c. Difficulty reading text
d. Site navigation issues
e. Other:_____

17. Please indicate any social networking sites you use (more than one response is acceptable):

a. Ning http://www.ning.com/
b. Facebook http://www.facebook.com/
c. Myspace http://www.myspace.com/
d. Twitter http://twitter.com/
e. LinkedIn http://linkedin.com
f. Other:_____

18. Please indicate any fire protection industry websites you use (more than one response is acceptable):

a. FPA Australia http://www.fpaa.com.au/
b. SAI Global http://www.saiglobal.com
c. Your company website
d. Other

19. Which of the following would make using the Hub easier?

a. A printed instruction manual
b. On-screen instructions
c. Online help desk support
d. Phone help desk support
e. I do not need extra help
f. Other:_____

Thank You!

On behalf of FPA Australia and the WPI Hub Project Team, thank you for taking the time to complete this survey.

APPENDIX B: Survey Email to Industry

Dear, Industry Member

In collaboration with FPA Australia, we are developing an informative and interactive online environment for the fire protection industry known as the "Hub". FPA Australia has received funding from Multimedia Victoria for the website's development. Partners to this project are the Country Fire Authority – Fire and Equipment Maintenance Division and Swinburne University of Technology.

The Hub website will serve as a repository of best practice examples for the installation and maintenance of fire protection systems and equipment. It will also serve as an industry networking site for the fire protection industry of Australia so that members can communicate with each other and comment on both the examples and information uploaded by individual users. Also, the Hub has the potential to be utilized as part of an online assessment process where users may demonstrate competency to assessors over the internet. Overall, the purpose of the Hub is to promote the professional development of technicians and other industry members.

To ensure the Hub meets the industry requirements and contains relevant information we are forwarding you a link to a short survey (see below) to assess the common needs of the industry. Your participation will be greatly appreciated and will help ensure that the Hub will be of maximum benefit. Please note all responses are for internal use only and will be kept confidential inline with Australian privacy laws.

The survey is located at: http://www.surveygizmo.com/s/262770/fpa-australia-hub-survey

Please complete the survey by Tuesday March 30th.

Thank you in advance for your time,

Worcester Polytechnic Institute Engineering Students:

Eric Camiel
Gerard Libby
Greg Trumbull

Fire Protection Association Australia:

Katharine Ebbs – Training and Research FPAA

APPENDIX C: Survey Data

Question 1 : rankings

	1st	2nd	3rd	4th	5th
1	98	35	25	20	14
2	19	21	18	16	25
3	23	28	29	28	31
4	36	33	31	25	22
5	12	22	20	20	29
6	29	26	33	22	30
7	62	35	38	27	27
8	4	5	13	5	27
9	29	13	20	31	29
10	3	5	10	11	28
11	22	22	28	17	37

Question 2 : reason for first preference

a	b	c
89	23	169
31.67%	8.19%	60.14%

Question 3 : Elaboration

Question 4: Hub Use

a	b	c	other: See quote sheet
223	88	132	
50.34%	19.86%	29.80%	

Question 5: Experience

(1-5)	(6-10)	(11-20)	(20+)
34	45	67	91
14.35%	18.99%	28.27%	38.40%

Question 6: Position Title

Engineer	Technician	Manager	Education	Surveyor	Other
53	46	98	6	9	29
21.99%	19.09%	40.66%	2.49%	3.73%	12.03%

Question 7: Method of Learning

a	b	c	other
117	198	59	58
27.08%	45.83%	13.66%	13.43%

Question 8: Age

(16-24)	25-34)	(35-44)	(45-54)	(55+)
5	26	65	76	66
2.10%	10.92%	27.31%	31.93%	27.73%

Question 9: Laptop

Yes	No
165	70
70.21%	29.79%

Question 10: Population

capital	regional	town	rural
172	51	14	2
71.97%	21.34%	5.86%	0.84%

Question 11: Geographical

		%
WA	16	6.69%
NT	0	0.00%
SA	10	4.18%
QLD	36	15.06%
NSW	86	35.98%
VIC	65	27.20%
TAS	5	2.09%
ACT	4	1.67%
Other	17	7.11%

Question 12: company Size

(1-5)	(5-15)	(15-50)	(50+)
84	41	37	76
35.29%	17.23%	15.55%	31.93%

Question 13: Internet competence

basic	moderate	advance
13	104	122
5.44%	43.51%	51.05%

Question 14: Internet connection

slow	medium	fast	none
5	75	157	1
2.10%	31.51%	65.97%	0.42%

Question 15: Internet Time weekly

0-3h	3-5h	5-10h	10+
28	66	72	73
11.72%	27.62%	30.13%	30.54%

Question 16: Internet Fustration

terminology	instructions	reading text	navigation	other
20	24	7	137	40
8.77%	10.53%	3.07%	60.09%	17.54%

Question 17: Social Network site use

Ning	Facebook	Myspace	Twitter	Linkedin	other
1	88	6	12	30	50
0.53%	47.06%	3.21%	6.42%	16.04%	26.74%

Question 18: Website use

FPAA	SAI	Company	Other
214	171	112	61
38.35%	30.65%	20.07%	10.93%

Question 19:Make Hub easier

Printed manual	on-screen	online help	phone help	none	other
23	112	0	28	25	48
9.75%	47.46%	0.00%	11.86%	10.59%	20.34%

APPENDIX D: Prototype Evaluation Sheet

Criteria and Ratings

Ratings **5** - Excellent, works extremely well.
4 – Very Good works well
3 – Good. Works quite well but improvements needed.
2 – Limited Works but major improvements needed.
1 – Unsatisfactory

Please rate each prototype out of 5 according to how it satisfies each criteria.

Where you have comments to make about the website, please include them.

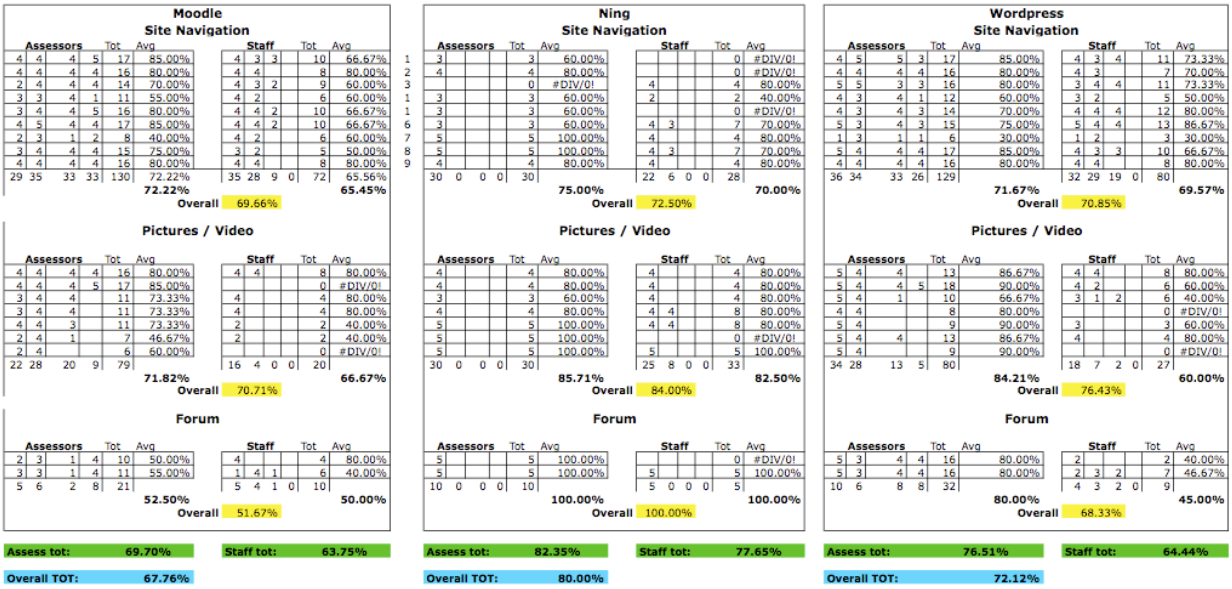
Criteria	**Prototype 1 Moodle**		**Prototype 2 Ning**		**Prototype 3 Wordpress**	
	Rating	Comments	Rating	Comments	Rating	Comments
Site navigation and organisation						
It is clear from first viewing what the site is about						
The user is clear how information on the site is to be used. (That they have or don't have permission to download materials from the site.)						
It is easy to see the different sections of the website so that you can find what you want.						

It is easy to see an overview of the different skill areas covered in the website Eg an overview menu on the homepage.						
The site is aesthetically pleasing						
The site looks clean, simple and easy to use.						
It is easy to see where different groups are on the site. Eg CFA, Swinburne etc.						
When you click into a skill area, the different tasks inside are clearly organised and labelled.						
When you go to a particular task, the photos are arranged clearly.						
Photo and videos on the site						
The photos are good enough quality to clearly see what is happening.						
The photos are clearly labelled.						

When a user goes to a particular task, the videos are arranged clearly.						
The videos are of good enough quality to clearly see what is happening.						
The videos are clearly labelled.						
It is easy to add comments or questions to the photo/video material on this website.						
The photos and videos can be tagged so different search tags can be used.						
Forum/ discussion						
There is a discussion/foru						

m space on the site that is organised into skill areas.						
It is easy for a user to start a discussion/forum on this site.						

APPENDIX E: Hub Selection Data



Moodle

Site Navigation

Assessors				Tot	Avg	Staff				Tot	Avg
4	4	4	5	17	85.00%	4	3	3		10	66.67%
4	4	4	4	16	80.00%	4	4			8	80.00%
2	4	4	4	14	70.00%	4	3	2		9	60.00%
3	3	4	1	11	55.00%	4	2			6	60.00%
3	4	4	5	16	80.00%	4	4	2		10	66.67%
4	5	4	4	17	85.00%	4	4	2		10	66.67%
2	3	1	2	8	40.00%	4	2			6	60.00%
3	4	4	4	15	75.00%	3	2			5	50.00%
4	4	4	4	16	80.00%	4	4			8	80.00%
29	35	33	33	130	72.22%	35	28	9	0	72	65.56%
					72.22%						**65.45%**

Overall 69.66%

Pictures / Video

Assessors				Tot	Avg	Staff				Tot	Avg
4	4	4	4	16	80.00%	4	4			8	80.00%
4	4	4	5	17	85.00%					0	#DIV/0!
3	4	4		11	73.33%	4				4	80.00%
3	4	4		11	73.33%	4				4	80.00%
4	4	3		11	73.33%	2				2	40.00%
2	4	1		7	46.67%	2				2	40.00%
2	4			6	60.00%					0	#DIV/0!
22	28	20	9	79		16	4	0	0	20	
					71.82%						**66.67%**

Overall 70.71%

Forum

Assessors				Tot	Avg	Staff				Tot	Avg
2	3	1	4	10	50.00%	4				4	80.00%
3	3	1	4	11	55.00%	1	4	1		6	40.00%
5	6	2	8	21		5	4	1	0	10	
					52.50%						**50.00%**

Overall 51.67%

Assess tot: 69.70% **Staff tot:** 63.75%

Overall TOT: 67.76%

Ning

Site Navigation

Assessors				Tot	Avg	Staff				Tot	Avg
3				3	60.00%					0	#DIV/0!
4				4	80.00%					0	#DIV/0!
				0	#DIV/0!	4				4	80.00%
3				3	60.00%	2				2	40.00%
3				3	60.00%					0	#DIV/0!
3				3	60.00%	4	3			7	70.00%
5				5	100.00%	4				4	80.00%
5				5	100.00%	4	3			7	70.00%
4				4	80.00%	4				4	80.00%
30	0	0	0	30		22	6	0	0	28	
					75.00%						**70.00%**

Overall 72.50%

Pictures / Video

Assessors				Tot	Avg	Staff				Tot	Avg
4				4	80.00%	4				4	80.00%
4				4	80.00%	4				4	80.00%
3				3	60.00%	4				4	80.00%
4				4	80.00%	4	4			8	80.00%
5				5	100.00%	4	4			8	80.00%
5				5	100.00%					0	#DIV/0!
5				5	100.00%	5				5	100.00%
30	0	0	0	30		25	8	0	0	33	
					85.71%						**82.50%**

Overall 84.00%

Forum

Assessors				Tot	Avg	Staff				Tot	Avg
5				5	100.00%					0	#DIV/0!
5				5	100.00%	5				5	100.00%
10	0	0	0	10		5	0	0	0	5	
					100.00%						**100.00%**

Overall 100.00%

Assess tot: 82.35% **Staff tot:** 77.65%

Overall TOT: 80.00%

Wordpress

Site Navigation

Assessors				Tot	Avg	Staff				Tot	Avg
4	5	5	3	17	85.00%	4	3	4		11	73.33%
4	4	4	4	16	80.00%	4	3			7	70.00%
5	5	3	3	16	80.00%	3	4	4		11	73.33%
4	3	4	1	12	60.00%	3	2			5	50.00%
4	3	4	3	14	70.00%	4	4	4		12	80.00%
5	3	4	3	15	75.00%	5	4	4		13	86.67%
1	3	1	1	6	30.00%	1	2			3	30.00%
4	4	4	4	17	85.00%	4	3	3		10	66.67%
4	4	4	4	16	80.00%	4	4			8	80.00%
36	34	33	26	129		32	29	19	0	80	
					71.67%						**69.57%**

Overall 70.85%

Pictures / Video

Assessors				Tot	Avg	Staff				Tot	Avg
5	4	4		13	86.67%	4	4			8	80.00%
5	4	4	5	18	90.00%	4	2			6	60.00%
5	4	1		10	66.67%	3	1	2		6	40.00%
4	4			8	80.00%					0	#DIV/0!
5	4			9	90.00%	3				3	60.00%
5	4	4		13	86.67%	4				4	80.00%
5	4			9	90.00%					0	#DIV/0!
34	28	13	5	80		18	7	2	0	27	
					84.21%						**60.00%**

Overall 76.43%

Forum

Assessors				Tot	Avg	Staff				Tot	Avg
5	3	4	4	16	80.00%	2				2	40.00%
5	3	4	4	16	80.00%	2	3	2		7	46.67%
10	6	8	8	32		4	3	2	0	9	
					80.00%						**45.00%**

Overall 68.33%

Assess tot: 76.51% **Staff tot:** 64.44%

Overall TOT: 72.12%

APPENDIX F: FPA Australia's Hub Project Team Meeting Minutes

FIRE PROTECTION ASSOCIATION AUSTRALIA
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Ph: (03) 9890 1544 *Fax:* (03) 9890 1577 (International +61 3) ABN 30 005 366 576

MEETING AGENDA

CIIF PROJECT TEAM

Date: **Tuesday April 27, 2010**

Location: **FPAA office, Box Hill.**

Time: **11:00am**

Member attendance:

Name	Organisation
Bill McIntosh	CFA
Russell Stork	Swinburne University
John Parrot	CFA
Virginia Krumins	FPAA
Katharine Ebbs	FPAA

Guests

Name	Organisation
Eric Camiel	Worcester Polytechnic Institute
Gerard Libby	Worcester Polytechnic Institute
Greg Trumbull	Worcester Polytechnic Institute

1. Content needs of the website

1.1. Results of FPA Australia survey

WPI students presented the results of the survey responded to by 242 fire protection industry members. Survey participants included FPA Australia members, who completed the survey online, Swinburne University students and CFA volunteers who completed the surveys face-to-face.

The main findings of the survey were as follows:

- The five content areas ranked as desirable on the website in order of % of people who listed it in their top five include:
    1. Inspect and Test Fire Protection Equipment in the Field (81%)
    2. Inspect and Test Fire Detection and Warning Systems (79%)
    3. Inspect and Test Water-based Fire Suppression Systems (61%)
    4. Inspect, Test and Maintain Passive Fire and Smoke Containment Products and Systems (60%)
    5. Inspect, Test and Maintain Pre-engineered Fire Suppression Systems
- Survey participants selected their content areas mainly because they felt the skills were used frequently.
- Most participants felt they would use the interactive website to view information about industry procedures.
- Most survey participants were over 35 years in age, had worked in the fire protection industry for 11 years or more and described their job role as a manager. Most participants had learned their trade on the job and only 26% had used online learning.
- Most survey participants worked in capital cities and worked for very small organisations (1-5 people) or large organisations (50+ people). Responses from people in NSW and Victoria made up more than 50% of the survey cohort.
- Most survey participants brought a laptop to work, were confident or moderately confident users of the internet and used the internet for more than 5 hours per week. Of the social networking sites, most respondents used Facebook and used the FPAA and SAI global websites more than others.
- The biggest source of internet frustration for users was site navigation issues. When asked what would help them use the interactive website more easily, 46% of users indicated that they would prefer on-screen instructions, 17% nominated online help-desk support, 12% asked for phone help desk support and 10% said they would like a printed instruction manual. 11% of respondents indicated that they would not need any help with the website.

Discussion amongst Project team members during the meeting indicated that as the survey was largely delivered online, that it is logical that those who answered are quite confident internet users. It was noted that as this project aims to encourage fire protection technicians who are not confident with online use to use the interactive website, that they will need to be contacted another way to start this process.

The project team officially thanked Eric, Gerard and Greg for all their excellent work to contribute to the development of the website. The students' time with FPA Australia ends on May 3. The team wished the students well for their return trip and for the future.

1.2. Resource collection visits by WPI students

WPI students visited Swinburne University on March 26 and CFA training in Castlemaine on April 10. At both sessions, the WPI students were able to survey session participants and take photos and videos of fire protection tasks for the website. The students thanked Swinburne University and the CFA during their presentation and showed some examples of the resources they had collected.

2. Website features needed

2.1. Results of the website prototype testing

WPI students displayed each of three website prototypes developed in March and April using Ning, Wordpress and Moodle.

The students also summarised results of the prototype testing done with FPA Australia Assessors shown below:

Ning

- Good Appearance
- Good Picture and Video
- Homepage too Busy
- Limited Customizability
- Advertisements
- Good Forums
- Good Tagging Ability

Moodle

- Needs the use of server to operate
- It is a Learning Software
- Open Source
- Layout Not as User Friendly
- Limited Tagging/Searching
- Had to convert video files to Flash files
- Good Potential for E-Portfolio

Wordpress

- Needs the use of server to operate
- It is a Blogging/ Content Management Software
- Open Source
- User Friendly with Easy Navigation
- Good Tagging and Commenting
- Very Customizable

2.1 Results of the website prototype testing cont.

The Project team came to consensus that the Ning website should be considered only in terms of a possible e-portfolio. Wordpress and Moodle will be compared in more detail to ascertain which is the best choice for the interactive website.

Overall needs of the website from prototype testing and project team discussion

Website needs to be very user friendly
Keep things simple (KISS principle)
Tagging needs to be investigated so searching is very easy.
Terminology needs to be clear and explained when there are unfamiliar terms
Clarify instructions and purpose of site
Create clean and simple pages
Make navigation very simple
Make sure videos are in a standard format (Flash (.flv) files)
Create clear group pages
Need easier tagging and commenting
The site needs to be able to be updated and maintained easily.
Need clear instructions for uploading photos.
Better to be able to download videos than streaming them.
Mouse-over terms would be helpful for menus on side.
Better to use titles for content than course codes as users often won't know codes.

Further research to be done on the website features

Clarifying focus of Hub: Resource vs. Learning

Combine strengths of individual Hub Prototypes

Investigate additional software

Link different Hub prototypes

Evaluate effectiveness

Determine best Hub technology or technologies

Determine the costs of Wordpress and Moodle with IT companies who can provide technical support and use their servers to host the website.

3. Approval process for website content

Actions taken to set up this process so far are as follows:

- Katharine presented an outline of the cIIF project and interactive website to FPA Australia Training Special Interest Group on March 15.
- A written description of the project and timeline was emailed to all Training SIG members with the minutes of the meeting.
- Katharine emailed a Proposed method of validation for material on the Hub website to Rod Rolfe (chairperson of FPA Australia Training Special Interest Group) who gave approval to the process. A general outline of the is below.

A Member of fire protection industry uploads photos with text, video or audio to the appropriate technical section of the interactive website. The cIIF project co-ordinator will also assist in gathering and uploading unvalidated material to the website.

B Volunteer member/s of technical committees and Training SIG allocated to each section are alerted by cIIF project co-ordinator that there is content in that needs validating.

C Validator checks if material is accurate.
- If not accurate, validator alerts cIIF project co-ordinator who makes corrections or sends material to appropriate FPA Australia technical committee for correction. Corrected material is sent back to cIIF project co-ordinator.
- If material is accurate, validators alert cIIF project co-ordinator.

D cIIF project co-ordinator uploads validated material to the website.

Katharine contacted members of the FPA Australia Training Special Interest Group in late March to ask for support with website content validation. Members who agreed to validate content are listed in the table below:

Name	**Business**
Rod Rolfe	Tyco Fire and Safety
Bill McIntosh	CFA
Dennis Dinse	Fire & Essential Services Consulting
John Parrôt	CFA
Kim Langton	Complete Risk Management International
Aaaron Struhs	City Facilities
Michael Allan	Alliance Alarms Fire Systems
Michael Cory	Firestorm Fire Protection
Michael Hutcheson	Emergency Consulting Services (Aust)
Mike Donegan	Red Men Fire Protection
Roy Marshall	MFESB Community Education
Russell Stork	Swinburne University of Technology
Shaun Williams	Automatic Fire Protection
Simon Roylance	4th Alarm Fire Protection
Trevor Pillinger	Salamander Fire Australia

Darin Evans, from Hyder Consulting Pty Ltd, who is part of the CPSISC Co-op training group also expressed interest in being a validator at the CPSISC teleconference on April 21st.

- The project team gave approval for the suggested validation process. The next step is to contact the validators and ask them to nominate the content areas that they are happy to validate. The aim is to have a few validators for each content area so that the workload is spread. As well, the FPA Australia technical committees need to be contacted to ask for members to be involved in the validation process.

4. Project working group members

Katharine contacted members of the industry during March and April to ask if they would be part of the Project Working Group. People who agreed to be part of it are listed in the table below. Gordon Hill Technical & Q.A. Manager, Fire Equipment Services, (Business arm of Metropolitan Fire Brigade) agreed to be part of the group but is currently seeking approval from managers to do so).

Roy Marshall	MFESB Community Education (on leave).
Daniel Wilson	Kidde Australia
Bill McIntosh	CFA
John Parrôt	CFA
Russell Stork	Swinburne University of Technology
Rod Rolfe	Tyco Fire and Safety
Ray Walton	Kidde Aerospace and Defense (KAD)

The project team requested that a couple more representatives from small to medium sized companies from States or Territories other than Victoria and New South Wales also be contacted to join the group. The team agreed that a meeting once every four months would be appropriate for the Project working group to oversee the fulfilment of the project outcomes.

5. Project timeline

Katharine reported that the interactive website project is operating within budget and according to the timeline.

The quarterly report is due to completed by the end of May.

The project team planned to meet again in August 2010 with the specific date and time still to be arranged.