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Assessing Risks and Risk Management

A Interactive Qualifying Project

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WORCESTER POLYTECHNIC INTSTITUTE

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Degree of Bachelor of Science

by

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Abstract:

Risk management is presently possible to management by a number of techniques, whether it is personal, natural disaster, business, and computer risk. Risk management can be broken even further down to prevention, assessment, and contingency planning. Through research and development, this project details and tests a risk procedure that focuses on the previously mentioned tasks. This procedure will be tested with various on campus buildings. Conclusions will be mentioned on the potential risks of the buildings.

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Mathew Bielik and Michael Spencer contributed equally to the development, writing, and editing of this project. The following work is entirely our own, we have not misused any of our sources.

1.0 Introduction

Risk management is a key element to many businesses, schools, homes, etc. Preparing for the unexpected disaster is important in limiting the damages and losses caused during the time of disaster.. Disasters may take the form of floods, fires, hurricanes or even terrorist attacks. Certain precautions may be taken, however a great deal of time and effort must be focused on what is done during and after disaster. Implementing plans or strategies during peril or just after the fact could save large quantities of money and also the hard work and time invested in the effected areas. Business interruption can have tremendous effects on productivity in different settings; understanding and limiting the amount of down time can have positive impact on productivity.

The goal of this IQP is to develop a clear and concise way to analyze and assess the amount of possible loss in the event of a disaster. In order to do this a process was developed that defines possible problems, totals the amount of monetary loss possible along with intangible loss such as time, and introduces strategy to limit the loss. When limiting loss the goal is to limit the amount of down time, and increase productivity, in a sense returning the setting to its original state as effectively as possible. Again our purpose is not to try to prevent disaster but limits its effects through understanding the problem and managing post disaster effects.

In order to develop our procedure, we need to understand risk management. To do this an informational background of risk management was done, which will comprise the third of this IQP. The topics included in this chapter will be:

- What is Risk Management?
- Where is Risk Management used?
- What is the overall importance of Risk Management?
- Strategies involved in effective Risk Management.
- Factors limiting the effects of Disaster on certain organizations.
- Types of Insurance available for Business Down Time.
- Cases involving Business Down Time due to disaster.

In Chapter 4 a procedure will be developed based on the results of the lit review. The procedure will then be applied to certain buildings located on the WPI campus. These buildings will be Kaven Hall and Atwater Kent. Included in the procedure will be a spreadsheet that will aid in the efficiency in assessing both physical and intangible losses. The procedure will be a result of test runs and alterations made to previous assessment strategies that we have used. The basic procedure is as follows with detailed added to the process in Chapter 4.

- Produce floor plan of the designated structure.
- Analyze the purposes of the functions performed within the structure.
- Determine the Problem within the system if disaster were to occur.
- Assess the monetary and intangible losses possible using spreadsheet.
- Develop possible strategies to reduce and limit the effects of the disaster and the down time incurred.

In Chapter 5 the tests from applying the procedure to those various buildings and analyze the results. With this we will make decisions on whether our system needs to be modified or keep it the same. The following procedures will be used for developing this section of the IQP.

- Analyze the results from the tests
- Check to see if we covered everything possible for our procedure
- Develop ways of improving the procedure from the results
- Either come up with a modified procedure or stay with the present procedure

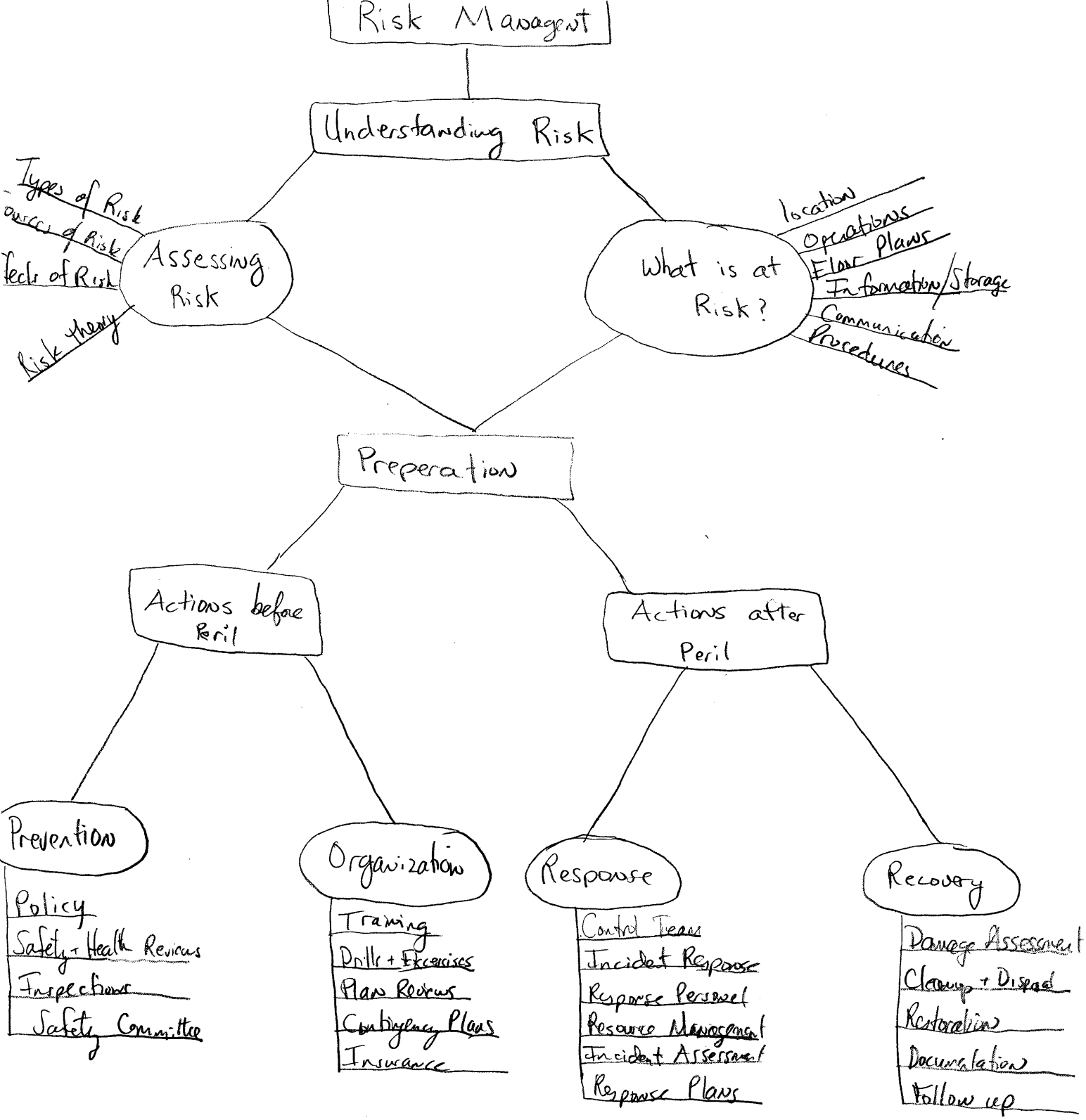
2.0 Risk Management

2.1 The Hartford's Phases for Risk Management

Use of a generic contingency plan can result in situations where the resources necessary to implement a required action are not available. Each business is different, and each has different concerns, and resources available. For this reason, a contingency program must be specifically tailored to each business and to the hazards most likely to occur. A comprehensive contingency plan consists of the following sequential phases:

- **Prevention**, which includes actions that can be taken to minimize the possibility of an occurrence that will create a major disturbance to your operation.
- **Preparedness**, which is manifested through the development plan, which identifies activities, resources, and responsibilities necessary to respond to a disabling contingency.

- **Response**, which includes actions that may reduce the consequences of an accident before it escalates in magnitude.
- **Recovery**, which embodies all the activities necessary to bring the facility back to normal or routine operations. Part of being prepared for a disaster is being able to rebound quickly from the event to resume normal operations as soon as possible. Preparation will make recovery less difficult and more efficient; this will translate into smaller losses and shorter "down" time. Recovery operations should be focused in *two* areas: *salvage of property and physical assets*, and *restoration of business operations*, including provision of health care.
  - *Salvage of property and physical assets* includes not only repairing or restoring property once damage has occurred, but also includes steps taken to prevent further damage. If the facility has sustained large-scale damage, prioritize equipment repairs based upon what is most needed to expedite recovery.
  - Quick *restoration of business operations* is paramount for minimizing losses. Extended down time can result in the loss of customers to competitors. Remember, no product or service is irreplaceable. The misfortune of one company can be another's opportunity. Once begun, construction projects are subject to disruption by weather, strikes, and other unpredictable events. Delays are common, and the availability of equipment and furnishings may be a factor in reopening. Advance preparation and planning can minimize controllable delays.


Risk Managent
Understanding Risk
Assessing Risk
Types of Risk
Sources of Risk
Tools of Risk
Risk theory
What is at Risk?
location
Operations
Flow Plans
Information/Storage
Communication
Procedures
Preperation
Actions before Peril
Actions after Peril
Prevention
Policy
Safety + Health Reviews
Inspections
Safety Committee
Organization
Training
Drills + Exercises
Plan Reviews
Contingency Plans
Insurance
Response
Control Team
Incident Response
Response Personel
Resource Management
Incident Assessment
Response Plans
Recovery
Damage Assessment
Cleanup + Disposal
Restoration
Documentation
Follow up

By looking at the Hartford's Contingency plan it can be seen that a few key features are not included. In order to develop a proper Risk Management plan, a knowledge of Risk should be included with the essential preparation. The addition of Risk Assessment and determining what is at risk is included in a picture of Risk Management in this section. Knowledge of Risk helps tremendously in the necessary steps in preparing for the occurrence of peril.

2.3 Picture Description

In Chapter 2 the general picture of Risk Management is analyzed. There are essentially three parts of effective Risk Management: Understanding Risk, Preparing for Risk, and limiting the effects of Risk. The three are closely tied together as preparing for risk involves a general knowledge of risk, and limiting effect factors of risk are generally developed in preparing for risk.

Understanding Risk involves two main factors. The first factor of understanding risk is developing a Risk Assessment. In doing this assessment, various factors of risk are analyzed; among these are the types of risk, the sources of risk and the effects of risk. Chapter 3 of this project will help in defining and giving examples of these factors. The other division of understanding risk is knowledge of what is at risk? In chapter 4 of this project, a procedure is developed that helps in answering this question. Some of the factors to consider are location, organizational goals, and communication structure. The floor plans of an organization are also a key element of this procedure.

Preparing for Risk is a vital element of the Risk Management Process. There are also two main factors of Preparing for Risks. Prevention is the initial stage of preparation. Some important stages of this portion of Risk management are appointing a safety committee, developing a policy, updating safety and health regulations, and inspections. Aligning an organization's safety and health codes with that of the governing bodies in the respective fields will automatically help to prepare for the event of an unforeseen peril. With timely inspections and analysis information and time can be saved in the event of a disaster, not to mention more importantly lives.

The prevention of risk is then broken up to three more sections, where it will help the company and risk managing. The three sections areas follows, organization, response, and recovery. These will allow anybody associated in a company, fraternity, college, etc., to learn and better understand something about risk and risk management.

The section that will be discussed is the organization aspect of preparing for the prevention of the possible risk. Some of the main factors that are set to help in the organization would be, training, plan reviews, updates, contingency planning, and obtaining insurance. The point of training and updates is vital because it keeps the organization aware and constantly updated to any new ideas or procedures that have been developed. The most important part of organization would be contingency planning. This is vital, especially for the upper management because if a plan is set for result of any kind of disaster, many people feel comfortable, because you know that the organization has a plan for response and recovery.

In the response of the of the risk deals asks the question, "How are we going to respond to a potential risk?" The following suggestions will help the response be more

efficient, such as, a control team, incident response, response personnel, resource management, incident assessment, and response plans. All these suggestions will aid in the response time of any kind of risk. The ways these will aid in the response time is that it would make the response quicker and more efficient. These cover all possible aspects within an organization. With a good and quick response, the recovery will be quick.

The recovery is a direct connection with the response of the risk. Basically, if the response is quick, the recovery will be handled in a quick and effective manner. If there is a recovery needed, the following are some ways to have a quick recovery: damage assessment, cleanup and disposal, restoration, documentation, and follow up. Each of these will make the recovery speedy and efficient. Where the company's down time will be minimized and the financial loss will also be at a minimum. The goal of this risk management tree is to help the organization minimize and control the possible risks and ways on how to reduce the fall out from that particular risk.

3 Risk Managing

3.1 Managing Risk

3.1.1 Introduction

Managing risk is a difficult task cause most risks are very unpredictable, especially when it comes to predicting the fallout of the risk. For example, business owners have to consider all the things that can go wrong with their business, especially when it is a start up company and is trying to grow. One thing that is done right away, is to insure your company, but that is left for a later section of the paper. So, the following section will help describe what managing risk entails, possible tips and guides to help the

risk manager through managing risk, and finally, looking at managing risk in a particular field.

3.1.2 Risk Assessment

Financial-services industry has one frequent problem and that is whether to assume risk and how much to charge for doing so. This is what we call risk assessment. A quick example of this can be a loan officer has to decide whether to grant a particular loan or deny the loan. If the loan is granted, he then must decide the interest rate to give to that particular loan and also to decide on the policy and premiums that will be included in the loan. These rules exist for making decisions mentioned in the previous sentences, but these rules have two problems; they are time consuming and are error prone. To prevent this, there are already situations that are handled by already produced formal rules, where the focus is on financial-services applications.

3.1.3 Meaning of Managing Risk & Risk Management

The main goal of managing risk is to minimize risk loss as much as possible. The meaning of risk management is as follows, "The control and management of the pure risks of any organization- business, governmental, charitable, educational, and so forth." (Denenberg, Eilers, Melone, Zelten, p.67-68) As expected, the term, "risk management", is very broad and complex. The only effective way to manage risk in a large company is to have a widely selected group of experienced employees with background in risk. With

a manager of risk that is a professional and expert in risk management better goals of risk management can be established.

In the business world of today, almost every major corporation has a risk management division headed by a well-experienced risk manager. "Pure risk managers usually carry other titles of an entirely different nature, such as Manager, Insurance and Real Estate; Manager of Insurance Safety; and Manager, Insurance Division." (Denenberg, Eilers, Melone, Zelten, p.66) Also it is not uncommon for a risk manager becomes an executive while having other risk managers below him. This is very common in the business world of today.

3.1.4 Functions of Risk Management

There are three things to consider when talking about the functions of risk management. The first is the disagreement over types of pure risks to be managed. There are a number of questions that can be brought up when discussing the different types of risk. For example, "Should the risk manager confine his operations to insurable risk only, or to all pure risks? And what about fundamental risks?" (Denenberg, Eilers, Melone, Zelten, p.66-67) The second is a question that is brought up many times, is whether the risk manager is to be considered a part of overall management or as an employee specialist. The majority of the time, the risk management has been considered a part of management. The third thing to consider is keeping in mind that risk management is now considered more of an art than a science.

There are three basic steps involved in pure risk management:

1. Discovering the sources from which losses may arise.
2. Evaluating the impact on an organization or individual.
3. Selecting the most effective and efficient techniques to deal with the risks.

In the following sections, these functions of risk, which seem simple but are very difficult to achieve, will be briefly discussed.

3.1.4.1 Discovery

Insurance agencies have been known to offer discovery of risk as a benefit that they include, so that they can attract clients to their firms. All firms follow certain tasks, so that they can discover the source of a risk. There are some common ways of discovering sources of possible losses are:

1. Surveys by insurance companies, and others
2. Analysis of accounting statements and use of flow charts
3. Analysis of information sent by other departments
4. Analysis of interdepartmental reports
5. Visit to other departments
6. Use of certain outside of special and technical information to help identify risks, including the laboratory and engineering facilities of insurance companies, the National Fire Protection Association, and the National Safety Council.

Often the agency uses these tasks to discover the risk so that they can apply their insurance to the problem at hand. "Unfortunately, information of this nature is of limited benefit to the risk manager because he has responsibility for all pure risks, not just these that can be treated readily by means of insurance or surety contracts." Denenberg, Eilers, Melone, Zelten, p.68)

The task of a risk manager is a difficult one. Because the business world is moving so fast theses days, a business is in constant change. With this constant change, the business is prone to new risks. There are a number of things that could bring rise to new risk, building of a new office, building of a new building, a new product being developed or manufactured, or the introduction to new equipment. Because of all these changes, the risk manager has to adjust to any new settings within the company.

3.1.4.2 Evaluation

The evaluation function has and is considered the most important function out of the three. With evaluating, the risk manager is able to provide proper planning, organization, and managing the possible losses that a business might encounter. "Often there are few or no rules to guide the risk manager. For example, in evaluating liabilities assumed under written agreements, help must be obtained from the corporate legal department; in evaluating possible losses from the liability hazards of a new product, help must be obtained not only from the legal department but also from the R&D department." (Denenberg, Eilers, Melone, Zelten, p.69) In general, the best way to get such productivity, is to have face-to-face interviews with personnel.

Top management often evaluates financial status of a company. Evaluating the financial status involves both an analysis of the financial structure and evaluation of loss costs. When there is change in the financial structure, the risk manager will step in and override the authority of his superiors and change the policy so that it compensates for the structure change.

Even though it seems that evaluation tends to lean more towards the financial structure, the emphasis is usually pointed towards the risk itself. In most cases, loss frequency and severity is integrated in the evaluation of the risk. "As a general rule, it is most desirable to transfer by insurance or other means the risks with high maximum possibility." (Denenberg, Eilers, Melone, Zelten, p.70) This says that even though these risks are remote, the risk will have a huge impact of the company's well being in the long run. It is recommended that a business should establish a planned out calendar where the business can schedule new research on the possible risks that might occur.

3.1.4.3 Selection

The last function is the most important one, this function is classified as the most efficient one. The following are five reasons why it is the most efficient:

1. Avoid the risk entirely
2. Retain the risk under self-insurance
3. Prevent the loss from occurring

4. Combine or increase a number of risks to get the benefit of greater certainty in predicting the loss occurrences through the use of the law of large numbers
5. Transfer the risk to others; through such techniques as insurance

(Denenberg, Eilers, Melone, Zelten, p.70)

Out of these five techniques, the avoidance technique is not often practiced, but is used often. A quick and simple example, would be, an individual might not move into a new home in a certain location because of the potential risks in that area. Many have pointed out that when avoiding a particular risk, there is a chance that others might arrive over time. Later in the paper, we will get into more depth on these five techniques.

"It should be pointed out that the evaluation of the most desirable method is a difficult task."(Denenberg, Eilers, Melone, Zelten, p.71) There are constant decisions that must be made to any given risk on whether it should be retained or transferred to the companies insurance. If you look at retaining the risk yourself, then decisions have to be made as to the desirability of loss prevention and the degree at which expenditures prevention is worthwhile. If you decide to transfer the risk to an insurance company, you have to ask the following questions:

1. How much effort should be made to prevent a loss from occurring?
2. Should the loss prevention program emphasize the engineering or the personal approach?
3. What type of insurance organization—stock, mutual, reciprocal—should act as insurer?

4. What specific company should be selected?
5. Should experience rating devices be used were available? If so, which plan is most desirer able?

(Denenberg, Eilers, Melone, Zelten, p.71)

As usual, the risk manager is the one who makes this decision. Because these techniques cost money, the upper management keeps a close eye on the risk manager. Because he/she is being surveyed, they have to keep up a good job as well as a low income to the company. That is why the job of a risk manager is a difficult one.

3.1.5 The EAST Formula

Group in the Ebasco Risk Management Consultants has devised four sound methods. They devised this method because they noticed that not all risks can be covered by insurance, because the drain of the insurance premium gets to expensive on the budgets of the company. So the risk manager has to decide how much protection is needed for the company's liabilities. The method that has been developed is known as the EAST formula. The elements for the formula is:

1. Elimination or reduction of risk
2. Assumption of risk
3. Self-insurance of risk
4. Transfer of risk

(Pfaffle, p. 9)

Elimination of risk is the first step in the avoidance of risk, is to have a well planned safety and loss prevention. To get to this first step, a risk manager should have quality plans of the building (in detail), safety education programs, fire prevention inspections, and provision for installation of equipment to prevent personal injury or property damage. This part of the formula tends to get costly at times, so it is advise that when the risk manager to develop his ideas, he should consult the engineers, managers, and top management, so that everybody is on the same page, financially.

The next step of the EAST formula is the assumption of risk. Since risk can be easily insured, it better, economically, to analyze the risk and decide which types of risk should be assumed by the company. Careful analysis of risk here can end up creating new areas of risk and can lead to saving for the company instead of costs.

The third step in the formula is the self-insurance of risk. This element basically sums up as the method where it is ideal to keep funds reserved separately from other funds, so that it can be used for any kind of payments toward risk or losses. There are three good reasons why this method should be used. "First, for risks of a magnitude exceeding normal maintenance budget items, it can often provide adequate protection at lower cost. Second, there may not be an insurance market for items I question. Third, self-insurance may help secure the confidence of employees or the public." (Pfaffle, p. 10-11) The risk manager should take a look at the possible savings and expenses involved with this element.

The very last element of the EAST formula is the transfer of risk. Here other parties may assume the risk that is at hand. Such means of assumption can be in the form of a written agreement, lease, or even legal action. Of the four steps, the last is the most

traditional. If a risk manager intelligently combines these four elements will enable the company to meet risks in much more economical fashion than commercially by use of insurance.

3.1.6 Risk

Risk is the chance of something going wrong or the danger that injury, damage or loss will occur. Risks take on many different forms and can affect a variety of different areas in a multitude of ways. The extent to which the event of a proposed risk effects an organization, such as a business or even a home, is innumerable. Not all risk can be accounted for; risks can be overlooked, making them even more detrimental in the event of their occurrence. Managing risks is important but in no way is it a simple task. Examining different types of risks, sources of risk, organizations facing risks, and methods for handling risks will help in understanding risks and their ramifications.

3.1.6.1 Theory of Risk

Risk is essentially the occurrence of a deviation from expectation. In most situations the expectations are positive and until these expectations are realized to be less than certain events they are unperceived risks. When an expectation becomes an uncertainty, it causes insecurity and stimulates attention. Whether or not there is awareness to a risk, it still exists; awareness to a risk allows for a planned reaction and a certain amount of preparedness to its occurrence. The occurrence of a risk would be an

unfavorable deviation from expectations and would be regarded as a loss. The term loss implies the ability to attain some kind of measurement or value. Losses are generally defined by a certain number of dollars, as most losses involve the loss of property or capital.

3.1.6.2 Causes of Risk

Perils and hazards are the two main factors that work together in the causes of risk. Perils are actual events that cause immediate risk because they force an unfavorable deviation from expectation. A list of perils would include floods, fires, earthquake, death, and many other risks that are present in the environment. A peril is not a risk in itself, however perils give rise to risk and are sources from which losses can occur.

Hazards on the other hand, lie behind the occurrence of losses stemming from a peril and increase the likelihood of loss. Particular occupations or situations may be classified as hazardous. For example, working with certain chemicals may be hazardous as there have been cases of personal injury or property damage arising from the usage of some of the more harmful chemicals.

There are two types of hazards: 1) Physical and 2) Moral. Some may argue that there is another hazard, which is morale hazard. Distinguishing between moral and morale is difficult because it is hard to determine accidental and intentional causes for loss. Physical hazards are those hazards that affect property and enhance the likelihood of damage and/or destruction. Location, construction, and use are physical hazards that may increase the likelihood and affects of perils on certain property. For example,

buildings on the west coast are more susceptible to earthquakes, while buildings on the east coast tend to be more available for hurricanes and tropical storms.

Moral hazards are more difficult to gage. They include such personality traits as loyalty, honesty, dedication and integrity. This hazard can be classified as any attribute of an owner or operator that may be detrimental and hazardous to the function of an organization. With examples ranging from arson, to carelessness, to even smoking, it is hard to determine the overall outcome of moral hazard.

3.1.6.3 Classification of Risk

Risk fall into one of two very broad categories: pure risk or speculative risk. Speculative risk involves the possibility of both a loss and a gain. In many situations, deviation from the expected can move in one of two directions, a favorable deviation or an unfavorable deviation. Speculative risks can generally be associated with investments or gambling. In these two situations the goal is not to lose money or even to break even, the ultimate goal is to generate profit through the investment or bet. A risk is normally defined as the possibility of loss but with speculative risk that is not the case as this type of risk can yield a gain.

Risks that involve only the possibility of loss with no possibility of gain are categorized as pure risks. In pure risk the only deviation from expectation is in the form of a loss and can be unfavorable only. Although there cannot be a gain realized through a pure risk the possibility of an absence of loss can occur. The possibility that the risk does not occur causes a situation where there is no loss, but there is no deviation from expectation. An example of a pure risk would be the event of a fire destroying a

building. If the event does not occur then there is no deviation from expectation, however if the fire does occur then there is a loss. As defined by pure risk, this situation does not offer a possibility of gain, only loss, making it a pure risk.

A major difference between the two risks, pure and speculative, is that a speculative risk can be guarded against. Most speculative risks involve an option, whether or not to assume the risk for the possibility of a gain. Pure risks do not allow for an option or any form of avoidance, however the results due to the occurrence of a pure risk can be protected by insurance. Insurance coverage is not usually available on speculative risks, whereas there is many types of insurance that safeguard against pure risks. Profit is considered to be the reward for bearing a speculative risk, a favorable deviation results in a financial gain in most speculative risks.

Pure and speculative risks can then be classified into one of two categories: fundamental risk or particular risk. Fundamental risks are associated with losses caused by a group, completely dissociated with the effected organization. These groups are usually economic, political, or social groups. Some examples of possible fundamental risks are technological advancement, war, political transition, and inflation. Also, some physical risks would include events such as earthquake, volcanic eruption, floods, and windstorms.

Particular risks arise from events that are completely based on individual organizations actions. The consequences of these losses are completely localized and effect the particular organization only. Some of these risks include robbery of a bank, the burning of a house, the stranding of a ship, and the explosion of a boiler.

These risks may shift from one classification to the other, fundamental to particular, as certain conditions change. Some conditions include knowledge, technology, and social factors, as it is the judgment of society that determines the category in which a risk will fall. An example of this is the classification of industrial accidents. Accidental injury of an employee was once believed to be the fault of the employee or the employer itself. It is now viewed as an inevitable occurrence in the industrial system, hence the implementation of workmen's compensation system which is regulated by government policy.

3.1.6.4 Organizations Facing Risk

Most people have two major and distinct aspects of their lives. These two groups that most people belong to are family and business. These divisions are very distinct in the functions that they provide to an individual and are usually quite distant in their goals and tasks. Even though business and family are meant to be separate, they do often face the same risks. Although both entities may be available to similar risks, the losses that ensue and the situations that they may arise from are quite different. Before looking at the affects that some risks may have on both family and business, it will be helpful to explain the three types of risk that they both may incur.

All risks whether speculative or pure, fundamental or particular fall into one of three types of risk. The reason for the division is once again to clearly define differences and similarities between risks. These three types of risk faced by both family and business are property, liability, and personal. These three risks take into account all

physical and organizational hazards associated with working within business and managing a family.

Property risks are risks associated with the loss of physical possessions and other capital investments. The backbone of many families and businesses is the property that they own and operate. Property is easy to define; losses of houses, buildings, automobiles, and land are examples of property risks. An example of losses due to property risk is the event that a car is stolen or a hurricane causes damage to a warehouse.

Claims involving negligence resulting in personal harm or property damage are considered liability risks. This risk is much greater for the business than it is for the family as a business incorporates more likelihood of a negligent occurrence. Claims stemming from negligent action can result in extremely large settlements because many claims take into consideration the value of a human life. A good example of liability risk is workmen's compensation; here an employee injured on the job has the ability to earn money while unable to work.

A family feels personal risk much more personally than does a business. The unexpected death of a family member is not an even that can be estimated by any given value. In business, personal risks can severely stunt economic progress depending on the member lost. Personal risks include death, disability, retirement, and unemployment. The affects of these occurrences on a family are more devastating because families are once again smaller than businesses and replacement of members is not an option as it is in business.

3.1.6.5 Origins of Risk

Now that causes and classifications of risk have been defined and discussed, the sources of risks can be introduced. Sources of risk are not to be confused with causes of risk. The causes of risk are the factors that can introduce uncertainty of expectation, whereas the sources of risk are the outlets from which these causes can be stimulated. The three main sources of risk are physical, social, and economical as discussed under the factors effecting the classification of particular and fundamental risks.

Physical sources include the obvious perils of fire, weather, earthquake, and landslide. The social sources are a little less predictable and planned for. Theft, vandalism, strikes, arson, and, of course, accidents all fall into this category of sources of risk. Economic trends that are also sources of risk are inflation, deflation, local fluctuations, and market fluctuations.

There are five classes of risks that can be classified according to these origins of risk, as presented by Charles O. Hardy.

1. Risks of destruction of property through the physical hazards of nature, such as a storm, a flood, or a fire.
2. Uncertainties in the production process, such as variations in the strength of materials or the effectiveness of labor.
3. Social risks caused by deviations of individual conduct from what is expected, such as theft, or negligence, and by the impossibility of predicting the behavior of social groups, such as strikes, riots, wars, and tax reforms.

4. Risks caused by the failure or inability of individuals to use knowledge, which is accessible to them or their competitors, such as failure to use market research information.
5. Market risks, such as price reductions between the dates of purchases and sale of commodities.

This classification does not separate the sources of risk or cause any independence between them. The action of negligence of an employer could lead to a fire or a loss in market reserves. The point of this method of categorization is to establish clear origins and to also show that there can indeed be a link between all three sources of risk, physical, social, and economical.

3.2 Managing Risk in Computer Systems

3.2.1 Computer Systems & Subsystems:

Computer Importance:

The computer is an instrument that can provide quantitative analyses of problems. A computer is a tool that has been considered to replace the irrational and frail human decisions. Where most humans are over-dependant on the computer system. Because of this, there is always a threat to a computer system. Whether it is a natural disaster or just a common computer virus, there are many companies taking precautions in developing ways to prevent certain things from happening. But at the same time there are computer

specialists devoting more and more time in improving systems to make it more and more based on sounder premises.

Systems and system in organizations:

Here is a brief description on systems and subsystems and the organization of systems done by companies. Most (actually all) companies have some sort of computer system. This is a very important to a most company's survival in the competitive industry world. Once one company's system go down then the domino effect occurs, first production declines then if the problem occurs over an extensive amount of time, soon business will decline then there will be cut backs, and if worse comes to worse, the company may go bankrupt. So, computers systems are a very important tool to have when it comes to surviving in the industry of today.

Here is a description the implications of systems in organizations (companies). Systems are one of the most responsible tools to have. The systems presume an open rather than closed organization, interactions at numerous points, dynamic responses to a changing environment, etc. The use of the systems approach is intended to reduce the degree of uncertainty and to add rationality to decision-making. Also the systems approach can help improve the effectiveness of the organization and provide an opportunity for increased human expression and self-fulfillment.

With this, it can be said that there can be problems in the computer field.

3.2.2 Problems of the Computer Field

In the computer field, there can be occurrence where you will run into problems. In the computer industry's short 25 years, there was always the common element of constant obsolescence of products, where the users would do constant upgrades of their systems. In the following text, there are some sited examples of highly articulated problems:

1. Several hundred users of IBM computers expressed serious concern about the reliability, availability, and serviceability of their systems.
2. The engineering of computer equipment leaves something to be desired in a number of areas: noisiness, security and privacy protection, complexity of operations, difficulty to program, inadequate standardization and inter-equipment and services that border on the chaotic.
3. New computer products, which obsolete older equipment, frequently require that the user redesign computer applications to a considerable extent.
4. The industry has an apparent habit of introducing and marketing goods and services that are not thoroughly checked-out for flaws.

Computer Errors:

Computer errors plague management, consumers, and employees. Here are some examples:

1. An employee who had a weekly check for $150 was issued a check for $1,500.

2. The stockholder of one company was paid a dividend of $1.20 a share rather than 12 cents a share declared by the board of directors.

As you can see here, these flaws will cost companies many problems and can lead to disaster, and some of these problems above are mainly cause by one thing, a computer virus.

3.2.3 The Virus

Viruses are extremely obvious and are a serious problem for businesses, academic, and government decision-makers, and this problem will not go away. Many companies are at risk when it comes to computer viruses. These viruses can be entered to the system by any kind of hacker and spell doom for any company. Many companies don't look at things like natural disasters, cause they plan for viral infection, so therefore, they would build a backup system, just in case, so it can be said that they "killed two birds with one stone", that's if they took that precaution. Most experts of risk assessors know that viral infection ant its consequences represent an unacceptable risk. They cannot even quantify it with any reasonable degree of accuracy. But with this threat, many companies are preparing for security and protection of their systems.

3.2.4 Physical Security

"The physical protection of computing systems is a field for specialists, and it has reached an advantage stage of technology proficiency. Systems can be made acceptably safe against flood, fire, physical attack, and other conventional disasters."[1] A good example of this is the Northwest Bank in Minneapolis. The bank recovered quickly from a fire that destroyed much of its data processing capabilities because essential software was kept at a separate location. Establishing such a reserve has become more and more important because of such threat as viruses or natural disasters.

3.2.5 Summary

Computer systems are an important part in companies' survival and are play an important role in people's lives. Because of this there is always a threat by nature or other individuals that would want to corrupt one's system. Therefore there is always an effort in creating ways of protecting their system from any outside interference. It has been made clearly obvious that the biggest threat to computer systems, in the virus. This is something that can spell utter doom to a company who relies everything on computers. In all, the risk involved with computers is at an all time high, cause as time passes, computers become an instrument that everybody relies on and is under constant protection so that the worst-case scenario will never happen. Companies try to develop or even upgrade their protection of their systems so they can stay in business and please the growing world.

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[1] McAfee, John, Computer Viruses, Worms, Data Diddlers, Killer Programs, and Other Threats to your Systems, St. Martins Press, N.Y., N.Y., 1989.

3.3 Business Interruption Insurance

Business-interruption insurance is a type of property insurance that is intended to protect the profits that a policyholder would have earned had there been no interruption in the course of business. It is typically bought as part of a package of property insurance. Business-interruption insurance protects businesses from two different types of loss: 1) loss of income as a result of interrupted business operations, and 2) additional expenses incurred as a result of efforts to continue business operations.

A rider or endorsement usually adds business interruption insurance to an existing property insurance policy. The coverage provides that the insurer is not liable except for losses caused directly by a covered cause of loss, for example a hazard or peril insured against as written into the contract signed by the insurer and policyholder. Actual profits and business expenses covered by the policy are usually determined in a way that gives consideration to the character of the business along with the method in which it conducts its business activities.

Coverage is generally provided for the "period of restoration", which is usually considered to be the time period which would be required to rebuild, repair or replace the damaged property at the insured property with similar quality. It usually commences with the date of such damage or destruction and it is not usually limited by the date of expiration of the policy.

Some businesses, like a consulting service business, may be able to resume operations relatively easily when business is interrupted from natural disasters. In this situation, business-interruption insurance should cover the policyholder's additional expenses incurred in relocating employees; rental of temporary facilities; and

procurement and installation of computers, telephones, and other necessary office equipment. Other businesses, like computer or other manufacturing businesses, cannot relocate so easily. In this case, business-interruption insurance protects the company against both a direct loss of income and the extra expenses incurred in paying fixed costs, retaining important employees, and replacing machinery.

3.3.1 Details of Business Interr0uption Coverage

"All-Risk" -"Covered Peril": Like other property policies, business-interruption insurance can be written on a named-perils or an all-risk basis. Business-interruption policies written on an all-risk basis are more common. These policies cover "all risks of direct physical loss or damage."

Exclusions: Business-interruption policies, like other property policies, may be loaded with exclusions. Exclusions that arise frequently in insurance coverage disputes include the so-called faulty workmanship or "inherent vice" exclusion, the defective-design exclusion, and policyholder's product exclusion.

"Cessation" of Business - Mitigation of Damages: Insurance companies often argue that business-interruption insurance does not apply unless the policyholder cannot operate any part of its business, the complete cessation of business. This issue often depends on the policy terms, such as "interruption," "necessary interruption," or some other term. The policy also may require the policyholder to "mitigate" or reduce its losses. That requirement is inconsistent with the argument that a "complete cessation" of business is necessary.

Most business interruption policies limit the insurer's liability to the extent that the business' charges and expenses would have been earned if the loss causing the interruption had not occurred. Partial business interruption limits the insurer's liability to a proportion of the liability that would have been incurred by a total suspension of business. Further, the policy typically limits the period of recovery to the time required to repair, rebuild or replace the destroyed or damaged property with due diligence. As noted previously, the insurer is generally liable for the "actual loss sustained" by the insured, resulting directly from necessary interruption of business, but not exceeding the reduction in gross earnings less charges and expenses which do not necessarily continue during the interruption of business.

3.3.2 Requirements of the policy and policyholder

There are three separate components that must be connected in order to satisfy the requirements of the typical business interruption insuring agreement:

1. A covered cause of loss must cause direct physical loss of or damage to the property at the described premises;
2. The covered loss must cause a necessary suspension or interruption of operations; and
3. The business income loss must be caused by the suspension or interruption.

In the event of a loss, the insured business is required to complete certain tasks in order to maintain the coverage that is described in the policy. Many insurers adopt the tasks that are listed under the Insurance Services Office (ISO) Business Income Coverage Form, as listed below:

1. Notify the police if a law may have been broken.
2. Give prompt notice of the direct physical loss or damage. Include a description of the property involved.
3. As soon as possible, give a description of how, when, and where the direct physical loss or damage occurred.
4. Take all reasonable steps to protect the Covered Property from further damage by a Covered Cause of Loss. If feasible, set the damaged property aside and in the best possible order for examination. Also keep a record of expenses for emergency and temporary repairs for consideration in the settlement of the claim. This will not increase the Limit of Insurance.
5. As often as may be reasonably required, permit inspection of the property proving the loss or damage and allow examination of books and records. Also permit to be taken samples of damaged and undamaged property for inspection, testing and analysis, and permit copies from books and records.
6. Send a signed and sworn proof of loss containing the information requested to investigate the claim. You must do this within 60 days after request. We will supply you with the necessary forms.
7. Cooperate with the investigation or settlement of the claim.

8. If you intend to continue your business, you must resume all or part of your "operations" as quickly as possible.

3.3.3 Value of Business Interruption

There is no defined or accepted formula for the determination of the actual loss of net profits and business expenses covered by business interruption insurance. The method used should test the past experience and the probabilities of the future, and the loss should be determined in a practical way, taking into account the nature of the business and the methods used in its operation. It should also consider the intentions of the parties, and the purpose of the insurance, as established in the contract by the terms, conditions, and provisions of the policy. The insured's books and accounting system are not controlling in determining the recoverable loss under a business interruption policy of insurance. However, they are not irrelevant and should be given some weight in determining the value of interruption.

The business interruption policy may be either "valued", in which case the value of the loss is agreed upon in advance and fixed by the policy, or "open", in which case the amount of any loss sustained is to be determined by competent proof. It is also possible for a policy to be partially valued and partially open. Open policies have commonly provided for the recovery, during the time of the business suspension, of the insured's actual loss consisting of (1) the net profits thereby prevented from being earned (or gross earnings, less the cost of production or less the cost of the merchandise sold); (2) fixed charges and expenses necessarily continuing during the suspension period to the extent that they would have been earned, and; (3) expenses incurred to reduce the loss.

When the policy is open and the agreement of the insurer is to cover the insured the burden is on the insured to prove the amount of loss that it has sustained.

"Actual loss" = Lost Net Sales – Cost of Goods Sold – Preparation Costs – Administrative Expenses

3.3.4 Recover y Time

Business interruption policies typically provide that the insurer will be liable, within policy limits, for the insured's fixed charges and expenses necessarily continuing during the period following a total or partial suspension of business. Generally, however, coverage is provided only to the extent that income would have been earned if the contingency causing the suspension had not occurred. Thus, it should be noted that the ISO Business Income Coverage Form, CP 0032 (1091), states the following (Once again, many insurance organizations have adopted this method for determining recovery time.):

Resumption of Operations

"We will reduce the amount of your Business Income loss to the extent you can resume your "operations," in whole or in part, by using damaged or undamaged property (including merchandise or stock) at the described premises or elsewhere. If you do not resume "operations," or do not resume "operations" as quickly as possible, we will pay based on the length of time it would have taken to resume "operations" as quickly as possible."

"Operations" means:

a. Your business activities occurring at the described premises; and
b. The tenant ability of the described premises, if coverage for Business Income including "Rental Value" or "Rental Value" applies.

3.3.5 Helpful Tips

At the second Asia-Pacific Risk Management Conference Brian O'Neil, assistant vice-president in the claim department of Frank B. Hall of California, reviewed some very helpful tips for risk managers who are looking into business interruption insurance during a workshop

1. Call the broker or agent, who needs to involve the insurer immediately;
2. Make decisions in the company's best interest, regardless of whether they fit into insurance coverage;
3. Assign an account number to the loss so that all costs can be captured;
4. Provide the insurer with access to the people that know the impact of the loss and what needs to be done to restore operations;
5. Determine the potential loss of sales, which the insurer will need to estimate loss reserves;
6. Identify the extra expenses that could reduce the loss of sales. These could include the cost of continuing production at the current site, moving to a temporary location, using other company facilities, contracting out work and paying overtime and bonuses;

7. Evaluate what must be done to get back into business, either at the current location or a temporary location. Also, determine what products are most important to get back into production and identify the extra expenses already being incurred;
8. Gather all documents to submit the business interruption claim;
9. Continue to provide all necessary and relevant documentation to the insurer.

4.0 Procedure

The development of the procedure in this chapter to determine what is at risk is an addition to the plan that was first analyzed in Section 2.1. The determination of what is at risk can save organizations time and money when developing a complete Risk Management Plan. This procedure would be very helpful if done before the preparation phase of risk management as it is just a piece of the entire risk management picture.

4.2 Purpose for the Procedure

The Hartford's methods for contingency planning were very in depth and covered a great deal of risk management. In addition to this method, a procedure that assesses business interruptions and losses on a piece-by-piece basis may be helpful. This procedure is a step in preparation for potential disasters. Looking at a building and doing a room-by-room analysis can help in understanding the possibilities that can result from an unanticipated disaster. The procedure will assess the values of each room and from

this determine the effect losses to the particular room will have on operations. The value of any particular item is difficult to determine, particularly when it is an intangible amount.

One of the main problems with risk management is to determine what is at risk. In any given building, there are certainly the physical risks and the direct financial risks that can result from the physical risk. An effective part of risk management is the inclusion of assessing what the potential operations loss may be. For example, a salvage yard makes its profits by selling used auto parts. The salesmen are all located in the same room and rely heavily on phones as the main method of communication with customers. All of the information on sales are recorded on the companies network and is backed up on an outside source. What happens if the room is destroyed? What happens if the phone line is damaged for a period of time? The problem with these situations is the determination of what is at risk and how much risk is assumed.

4.3 Development of a Procedure

1. Produce floor plans
2. List the purposes of each category of rooms.

   - Includes intangible value of the room: information storage or other features that are unique to the room's function.
3. Determine the major problems associated with losses to these rooms

- What are the effects on operations due to this interruption?

4. Managing the losses

   - Developing possible plans to help minimize losses

5. Overall physical value of each room, made in order to assess the financial loss

   - Can be done in three ways

     i. Estimation

     ii. Replacement Value

     iii. Professional Appraisal

6. Conclusions

   - What is at Risk?

4.4 Description of Procedure

The Procedure in Section 4.3 is a method for determining major problems associated with the loss of different components of an organization. The difficulty is overlooking any important functions while completing the second step of the process. The major importance of the process lies in steps three and four because that is where the determination of impact on operation is assessed and minimized. Step 5 can for the most part be handled with property insurance. The main goal of the entire assessment is determining the problem; that is determining what is at risk.

5. Applications of Procedure

5.1 Impact on WPI

5.1.1 Risk Management for WPI

Risk management plans are very valuable to universities such as WPI. The purpose of a college is to provide education for enrolled students who are paying tuition for that service. WPI uses very advanced methods in computer technology to teach its students. By using this method of relying as heavily as the faculty and students do on the WPI network everyone is open to tremendous loss. Losses could range from a minor loss of personal files on a personal computer to a major loss of the entire network going down for great lengths of time. WPI does not just run computer risks or risks of losing information. There are many other aspects of the school that are at risk just like anywhere else. The loss of information is important but it is also important to assess risks associated with housing and other areas that effect the entire WPI community.

The WPI campus has different types of buildings used for different things. Some are more important that others when it comes to the possible loss of stored information, but all are important when it comes to general risk prevention. It is easier to view the school in categories. The first category will be the dorms: Morgan, Daniels, Stoddard, Institute, Riley, and Founders Hall. The second category will be the buildings that devote most of the time and space to classes: Alden, Olin, Goddard, Stratton, Salisbury, Washburn, Kaven, Higgins and Atwater Kent. Thirdly will be the gymnasiums and fitness center: Harrington and Alumni. Fourth will be the specialized buildings, which

deal with students' personal information: Career Development Center and Boynton Hall. Fifth will be the buildings, which store the most information on campus: Fuller and Gordon library.

5.1.2 WPI Student Living

Student housing is very important to campus life at WPI for obvious reasons. Other than just giving the freshman a place to live, it promotes a sense of security unlike living in an apartment in Worcester and also allows students to easily access the WPI network from their rooms.

There are risks involved with living in the dorms, however the major risk is losing housing. Burglary isn't much of a factor because of the amount of security that guard the dorms and locks on each individual door. Most theft would come from fellow students at WPI. The types of loss would be mostly asset loss, clothing, CD's, books, etc. These things are replaceable and WPI does offer an insurance system for identifying personal items in case of theft so that they might recover stolen items. Theft of a computer or the information on the computer would be the most threatening type of theft, from the education standpoint. Papers, projects, laboratories, and other personal information could be taken which would definitely disrupt work. If the information were not saved on an outside source then the amount of work put into the original would have to be duplicated, very time consuming in some cases. This can be avoided by saving work to discs, on outside computers, or on the network.

As mentioned above, loss of housing is the most threatening loss. Possible ways to lose housing totally would be from fire or possibly structural damage caused by storms. If one of the dorms were to be effected in one of these ways then there would be major problems. In the case of a fire lots of personal items could be lost but insured items could be replaced without extra money being spent. If there were to be a terrible storm and the dorm as effected in some way the items could be moved and kept intact. These are minor losses when compared to the thought of hundreds of students without a place to live. What could be done with these students who now have no where to live and can't commute because they live to far away? It is possible to create more space in other dorms by possibly turning some doubles into triples and triples into quads but that would definitely create spacing problems for students.

Two of the dorms, Founders and Daniels have cafeterias in them. If one of these dorms were lost, students would have to eat at the other facility, which could also cause spacing problems. In case of spacing problems, extra tables and chairs could be moved so that there were more eating areas available to students. Morgan also contains the bookstore and mailroom depending on when the facility was lost could cause a lot of problems. Purchasing books would then have to be done at other bookstores or on the internet and mailing could be done at the post office or by sending mail through the postal boxes that are located in certain areas.

To prevent possible fires no smoking is allowed in the dorms and candles aren't allowed either. There are smoke detectors in every room, in the hallways, bathrooms, and entrances to all the dorms. There are also sprinklers and fire extinguishers to help

limit the amount of fire. The firefighter response is very quick as the alarm, when set off, sends a signal to the fire station.

5.1.3 Educational Buildings

Buildings in which students have classes are very important to receiving an education. Most buildings don't have just classrooms because they are also laboratory buildings. Also, most buildings have some sort of computer lab, however any work done on these computers could also be done at Fuller or another lab. These buildings have professors' offices in them, along with all of their course information. In some of these buildings there is specialized equipment used to perform laboratories or for use by project teams.

This equipment is both expensive and in some cases very difficult to replace, and without the specific conditions met the item may not be effective.

In the case that there were a fire in one of these buildings there would be major impact. Classes in these buildings could not be held in them obviously, and thus would have to be scheduled in a different building. Depending on the demands of the class, over head projector, network access, etc, it may be difficult to find availability in other classrooms. For laboratory work, it is possible that area schools would have the same equipment needed to perform the lab and that students could travel to that school to work. As for the teacher's offices, some personal items could be lost but more importantly grades and class information could also be lost. This could be avoided by saving all of the information to disk and keeping that disk with you, so that it also is not lost in a fire.

All other losses would be in the asset category and could be covered by insurance so that they may be replaced with more ease.

The prevention and reduction policies are basically the same in these buildings as far s smoking and pen flames are concerned; however laboratories are different. Sometimes they require flames and the use of electrical currents. The sights of these laboratories are restricted and have their own safety measures to reduce risk.

5.1.4 Gymnasiums

The use and importance of the gyms at WPI vary depending on who you talk to. Some students like to work out at the fitness center, or swim in the pool in alumni gym. Varsity athletes need the use of these two facilities because they store equipment there and also have practices and games in them. Physical education offices are in Harrington, and these offices do have important information for crediting students in physical education classes.

In times when these facilities may be down, there are plenty of things that can be done. Home games or matches could be held at neutral gymnasiums, as can practices. Personal equipment will have to be stored personally by the athletes however and this could cause problems in the dorms as far as space is concerned. For students and faculty who enjoy going to the fitness center or just to play basketball, there are area fitness centers and it cold also be possible to use the facilities of another area college if a deal could be worked out. Like before any information could be stored on discs and kept separate from the building that houses the computer system.

5.1.5 Career Development Center & Boynton Hall

WPI has many buildings; all vital to this college, but the two that are the important buildings are Boynton Hall and the Career Development Center (CDC). They both are considered that important because this college would lost without them and disarray if we lost them to some kind of disaster. This is where the risk element comes into play.

It can be said that if WPI lost Boynton Hall to any kind of disaster, the school will fall with it. We first have to ask, "What can be lost if something should happen?" Boynton Hall has the majority of all major offices on campus. The building holds the offices of admissions, financial aid, registrar, president's office, accounting, and historical landmarks within the building, heck, the building is historic. So now we know what we can lose. Next we have to ask, "What kind of risks Boynton Hall in vulnerable too?" Going by the location of the building, since it is on a hill, you can rule out flooding, but it is vulnerable to high winds, lighting striking (since it's high up), fire, and possibly electrical problems from harsh winters. This is probably the hardest and most uncertain question that needs to be asked, "How much down time the school can expect if either one of the offices is lost or the whole building itself?" The reason behind this question is that there is a lot of uncertain elements that go into the repair and restoration of the building or office(s). The most common uncertain element is if the construction

workers can accomplish the job in the expected time that it should be completed. Finally we come to the question, "How can we prevent the risk and how can we keep the down time to a minimum?" This is where WPI gets a risk manager to develop ideas to prevent the risk. For example, if one wants to prevent a fire from happening, one would want to get the proper fire protection systems, like sprinkler system, fire extinguishers, and an alarm system. On ways to keep it to a minimum, since everything is on computer, a good thing is to have a back up system in another building, so if the building was lost.

The CDC is a vital building. This is the location of every students' chance to get their resume out into the business world in hopes to get interviews and then onto jobs. The CDC along with Boynton Hall has their own computer systems. Along with Boynton Hall, the CDC has to take precautions so that they don't lose their information along with all the students' information and resumes. If this building is lost due to fire or any other reason, it could mean the end to student's hopes to get a job goes down in flames. The down time for this department is not that long with the proper precautions, the department can move to another building and quickly get back on track.

5.1.6 Gordon Library & Fuller Laboratory

Now, these two building are quite vital buildings to WPI. The two buildings supply WPI with loads of information and services. One is the school's library and the other is the computer laboratories and center for WPI.

Gordon Library is of course the school's library. This is where students may go to either do research or go to get a quiet place to study and get work done. The location

of the library is significant because it is located on the side of the hill. What this means is that there is additional risk to the building that now many other buildings on campus has. This risk is the possibility of structure failure and half the building falling down. This risk is highly unlikely from happening but it is always a good idea to have the structure of the building checked annually. Since WPI is located in an environment where the weather changes four times a year and also has some of the fiercest winters, so the building itself takes quite a few wear and tear during the year. But the library is prone to many other risks like any other building. It is definitely prone to fire, and of any other building on campus, it should have the top fire safety system because there is a lot of flammable items in the library, namely, books. With this building there is not necessarily down time. The only part of down time to the library is just getting it built back up and getting the books replaced. Yes, it unfortunate to lose the library, but if it is lost, students would now have to travel to other libraries in the area to get they're researching done. This is really the one of the few inconveniences to losing the library. Possibly some methods to keep this from happening is of course have an excellent fire safety system, make sure the electrical wiring is safe, and have rules like no smoking while in the building. Other than that, there is really nothing much that can be done, but to have a plan, just in case something devastating happens to the library.

Fuller Laboratories is the central location of WPI's network. The network goes to all points of WPI, including all the fraternities and sororities. The first thing that has to ask is if something happened to this building or in any other room, what would be the consequences. Well, first off, the school would lose all abilities to the network, e-mail, Internet, and possibly most of its programs and systems. Also the costs for and type of

damage to any room in the building would cost the school fortunes. The expected down time can be significant. First of all, getting these systems replaced isn't a walk in the park. It takes careful work and patience to get the system up and running as it was before. One way to reduce the down time, is to have a back up system on another part of the campus. Also it would be a good idea to have a complete schematic of the main system that runs the entire network, so that it might give the experts a hand in repairing the system as fast as possible. One thing WPI has done well is have various computer laboratories located all over campus, in which students will still be able to use that buildings own little system.

5.1.7 Atwater Kent Laboratory & Higgins Laboratory

These two buildings are centers for two majors that students will be pursuing at this school, Electrical Engineering and Mechanical Engineering. These building are significant because they both have their own purposes. Atwater has many computer laboratories in which students use every minute of the day. It also has it's own recently upgraded networking system within the building. These two building are still prone to same risks as every other building at WPI.

Higgins is the location of the mechanical engineering department of WPI. This build has some of the most significant tools that this institutes as to offer. First of all it has a little satellite that sends the network information to any build of the hill, as in fraternities. Also the laboratories in this lab are some of the best on campus. So in general, this building has a lot to lose. Along with Boynton Hall, it is prone to electrical

storms. The good thing about this building is that the risk managers of the school anticipated this so the built a lighting rode at the top of the building in which it grounds any lighting that might strike the building, in which prevents this risk from happening. Let's say that something does happen, how much down time would there be? Like the others, the down time could be significant. Again, it all matters on where the incidents occurs, whether it is located in a room or the whole building itself.

Atwater Kent is a building with a lot of electrical wiring, but yet this building has taken every precaution to keep the wiring as safe as possible. Again the possible risk is one of these wires shorting out and starting a fire. The possible down time for this building is a significant as Fuller. Along with Fuller, Atwater has a large computer system and it would be difficult to get the system up and running and fast as possible, it will take time as would Fuller. But if this build would go down, it would mean moving to another building and starting up all over again, and this is not what this school needs, it's just to much work to get a department up and going after a devastating blow as a major fire. But with the proper safety precautions, this risk and down time can be minimized.

5.1.8 Conclusion

It can be concluded that WPI along with many other universities and colleges, has a lot to lose and needs to have a plan of attack for any type of risk scenario. The first thing that would make the job of risk manager is to have some one in charge of risk for every department, build, dorm, etc. Therefore they can assess the risk, down time,

prevention, and expenses for one area instead of many. This will enhance the risk prevention methods when all they have to do is worry about their area of the college. In each area, it is their job to assess every possible scenario that they're prone to. The best way to about this is to name the possible risks, way to prevent them, anticipate down time, come up with methods to prevent and/or reduce down time, anticipate the possible expenses, and finally, learn from mistakes and the devastating events.

5.2 Kaven Hall

5.2.1 Introduction

Kaven hall is the civil engineering building at WPI. Like all other buildings it is comprised of classrooms, offices, and laboratories. In order to analyze this building you first have to develop a process for room by room evaluation. This entails dividing rooms up by purpose, understanding what each room is used for, and then assessing the value of the room. By doing all of this we can gain an understanding of the amount of loss that may be realized in the case of disaster. Disaster can take on many forms: fire, natural disaster, terrorism, electrical malfunctions, or various internal problems such as pipes bursting. All of these things can have a tremendous impact on the overall operation of Kaven. Through this analysis we shall see where the effects may be most abundant and where more attention and care should be placed.

The procedure we shall be using to prepare the analysis is outlined in the following steps:

1. Produce the floor plans of Kaven

2. Categorize rooms by type (classroom, office, lab or storage)
3. List the purposes of each category of rooms.

    - Includes intangible value of the room: information storage or other features that are unique to the room's function.

4. Determine the major problems associated with losses to these rooms

    - What are the effects on operations due to this interruption?

5. Managing the losses

    - Developing possible plans to help minimize losses

6. Overall physical value of each room, made in order to assess the financial loss

    - Can be done in three ways

        iv. Estimation

        v. Replacement Value

        vi. Professional Appraisal

In order to complete the first part of our procedure we did not have to do much work. A copy of the floor plan was made from Professor Fitzgerald's copy. If this were not available to us one would have to go to the plant services office, which is what was done for the floor plans of Atwater Kent. The floor plan is very important as it gives the layout of the building with locations of all the rooms and their room numbers. Later in the analysis of the building the floor plan can also be used to show the break down of values for each room, so that these values can also be easily attained.

For the second part of the procedure you would go to Kaven and physically take an inventory of where each room was, what each room was and what category it should be placed in. This was not hard since rooms are clearly labeled and there are only four

different types of rooms. The types of rooms are classrooms, offices, laboratories and storage. The contents of each room were difficult to estimate as some rooms were locked and some of the equipment in the rooms is foreign to us.

5.2.2 Classrooms

The classrooms in Kaven are no different than any other classrooms on campus. They are used primarily for undergraduate classes and sometimes graduate classes and also meetings. The classrooms possess the usual learning aids at WPI; they have blackboards, over-head projectors, desks, and student seating. The rooms do not have any computers or any other forms of information storage so that is not a worry for these areas of the building.

The problems associated with losing these rooms are minimal. The only major loss is class space. This may present problems for class arrangements but can most likely be handled quickly. Mostly losses of a classroom consist of physical loss and when combined with the inconvenience of losing a classroom, do not pose extraordinary loss potential.

To minimize the problems associated with losing a classroom and the time associated with learning all that would have to be done is to move into another classroom in another building.

5.2.3 Offices

The offices located in Kaven are primarily faculty offices. These offices hold all of the professor's teaching material such as books, class notes, and other useful

information used in teaching. All of the offices contain computers that professors use for personal work and research an also course information such as grades, attendance, etc. There is also lots of other personal items in the offices that vary by professors. Some professors may have their career work in the office; others may have items that have sentimental value. In general the offices are extremely important to the faculty, not only for there use for meetings but also for many intangible values that sometime may not be replaceable.

The obvious problems of asset loss apply to the offices but the major loss potential comes from the information that the offices contain. The information that is used for classes could range up to a seven week loss of work combined with the preparation of all of the course material (quizzes, tests, homework's, laboratories, etc.) this poses a tremendous loss of time and effort by professors. Aside from the current information loss, some professors have research for other projects and there lives work contained in the office. Depending on the stage of the professor's career there could be some serious effects that would a tremendous detriment to their career.

To avoid all of these losses information could be stored on outside sources that are kept away from the location of the office. Although the impact of losing an office may be extremely hard to get over and may take months to recover from, operations could be run smoothly from another area, as long as there were proper computer and phone systems.

5.2.4 Laboratories

There are several laboratories in the civil building. These laboratories are also used for classes, which makes learning much more accessible using the computer access. These laboratories are used by many students who don't have their own computers and who need to use the WPI network to aid in the completion of laboratory assignments and homework. These laboratories are not used only by Civil Engineering majors but by all majors. Some outside classes such as statistics are taught in KH 207. This lab offers free printing for statistics laboratories so it is very helpful in that regard. The laboratories on the bottom of Kaven have specialized equipment used exclusively for civil laboratories.

The problems with losing these laboratories is the loss of computer aided learning. Also students to work on laboratories use these laboratories quite frequently and homework, so there will be less area for this work to be done. Loss of these rooms creates the same problem as loss of classrooms. The loss of a lab can be very expensive because of all of the technical expenses involved with setting up a lab for online teaching services. Other laboratories possess mostly physical equipment that could be replaced but at an expensive cost if not insured.

Managing these losses would be hard because of the computing system, however these classrooms exist elsewhere on campus and classes may be moved to these rooms. The lab equipment can be found elsewhere on campus, copies may not be free but the work can be done just as easily. As for the other laboratories, the equipment used in these laboratories may be available at other schools at other sites in general; researching alternate sights would be helpful.

5.2.5 Storage

It isn't difficult to determine the contents of the storage rooms. These rooms located on every floor store various equipment. The room on the ground floor stores mostly lab equipment for the laboratories located across the hall and adjacent to it. The attic is the largest storage room in the building storing about 80% text books, lab manuals, course notes, i.e. general course material. These items are not used that often stated by professors that I interviewed.

If lost these rooms present mostly asset loss. Since the attic contains material that is used quite infrequently the loss may not have a tremendous effect toward the operation of the classes held in the building. There may be information of importance stored in these rooms which could cause a little more concern than the loss of the older class materials. The lab equipment may be difficult and expensive to replace causing some inconvenience with overall lab performance.

Prevention of these losses is hard to control, since it is just storage. There is moist likely very little information loss so insurance will cover most of the losses. If something is found to be more important than something else it could possibly be stored in safer place, although there is no safety from natural disaster. For the most part insurance would be the best measure against loss.

5.2.6 Professor Interviews on Kaven

It is possible to gain some valuable information by interviewing some residence of Kaven, particularly the professors. In the interviews you should ask several general questions and then ask some more personal questions. The question format that should be followed is as follows:

1. If Kaven hall were lost, what would the major operational effects be?
2. Are there any rooms in the building that would cause more problems if lost than others?
3. Where would the major problems be (classes, laboratories, projects, etc.)?
4. What would the personal effects be?
    A. Losses of information
    B. Effects on career and teaching
5. Are there any precautions that are taken to prevent these losses?
6. In your best effort, can you try to evaluate the emotional loss of this disaster?

The two professors that was interviewed were Professor Hart and Professor Ray. It was also possible to use Professor Fitzgerald as an example since there was a knowledge of his situation as it has been talked about these situations.

5.2.6.1 Professor Hart

In talking to Professor Hart we found many interesting notions. He felt that Kaven being such a basic building would present minimal loss problems in the case of a disaster. Prof. Hart uses a lot of computer aids in teaching his classes and these files are backed up on his personal computer at home, there is a three week delay at some times but a large majority of work is stored on the computer. In his estimation there would be a large monetary loss as far as personal items are concerned, but most of the items were insured. The large part of our conversation was based on the emotional loss and somehow trying to quantify this type of loss, which is no easy task. Professor Hart felt as though if the office were to be lost in a disaster effecting the building, it would take about 6 months for him to return to normal working environment. Emotionally he felt he would be sub standard and that would effect his ability to teach.

5.2.6.2 Professor Ray

The discussion with Prof. Ray went a little bit differently. He was more concerned with the effects that the loss would have on his career. Professor Ray does not back up his work on a different computer so a loss would have tremendous impact on his career at its relatively early stages. He also uses a web based teaching system that is saved on the WPI network, so in most cases it can move on without interruption. When asked about emotional downtime, he felt as if he could start teaching right away without any effects. However he felt that Kaven had some unique rooms that if lost would cause

problems for lab work and projects. These problems exist because laboratories and projects would have to be altered in a way that may not be helpful to students who are looking to gain physical experience.

From these interviews I was able to get a better understanding of the building and some of the key components. Some of the possible losses are difficult to quantify, as they have to do with measures that can't be calculated without seeing the actual results of the disaster. Everyone is different and losses can effect people in different ways. Also every situation is different, techniques such as information storage vary and can cause assorted problems depending on the case.

5.2.7 Conclusion

After going through the procedure on Kaven Hall some conclusions can be drawn in determining what is at risk. Before discussing the results it may be helpful to review the plan used. First, a set of floor plans was produced to provide information on the layout of the building. Once the floor plans were analyzed a classification of the rooms was given, classrooms, laboratories, offices, and storage. Listing the functions of the rooms was done next in order to attain an idea of what the major uses of each room was within the system of the building. The major conclusions are drawn next, as the problems associated with the losses of each room are then analyzed and possible plans are discussed.

The physical value of the building is very important, however of greater importance are other values such as lost time and interrupted operations. The greatest

physical impacts that Kaven Hall could experience would be in the loss of the laboratories located on the second floor and in the basement. Many computers are located on the second floor and these rooms are also classrooms and losing access to computer-aided learning has quite an impact on the WPI education. The basement contains many of the apparatus that are unique to civil engineering, unlike the computer laboratories, they cannot be found anywhere else on campus Also the loss of these basement laboratories creates a time problem as the equipment may be difficult to replace.

As mentioned earlier, losses to general classrooms are not as detrimental. Classes can be moved to other buildings on campus with minor time conflicts being adjusted for. As far as offices are concerned, the professor interviews gave some insight as to what were the risks. Of major importance is the career work of the professors, unsaved information is very risky. Also, any work or information that is not saved on a computer and is written only is a major risk.

In general the major risks are as follows:

- Physical Damage to Laboratory equipment (Computers and Civil Apparatus)
- Loss of unsaved information of professors (Career Work and Class Work)
- Operations down time impacting education

Kaven Hall being a building of WPI, a school of higher education, its primary function is to provide for an optimal environment for learning. The major problem with the loss of this building, along with other buildings on campus, is the impact on education. The financial impact as far as property loss is concerned is minimal

because of the use of insurance. Physical damage leading to interruption and time loss is the major problem. The main risk is the loss of an effective area to provide for education.

5.3 Atwater Kent

5.3.1 Introduction

Atwater Kent is mainly the electrical engineering building, but also houses the offices for the social science department. This building is comprised of laboratories, offices for professors and TAs, lecture halls, classrooms, storage rooms, and a lounge area. To analyze the rooms of this building, it is recommended to develop a procedure that would classify each room into separate categories. Where you can identify the purpose of the room and then assessing the value of this room. With this you can identify the potential loss and the potential disasters that can occur in that particular room. Any kind of disaster can fully affect this building's operations. This building, like many other buildings, has the common disasters, like fire, flood, electrical shortage, any natural disaster prone to its location, and many other small problems that can have a major affect on the building. With the following procedure, the effects that may be most abundant can be seen and attention can be placed accordingly.

The following procedure will help us prepare this analysis:

1. Produce the floor plans of Atwater Kent
2. Categorize rooms by type (classroom, office, lab or storage)

3. List the purposes of each category of rooms.

   - Includes intangible value of the room: information storage or other features that are unique to the room's function.

4. Determine the major problems associated with losses to these rooms

   - What are the effects on operations due to this interruption?

5. Managing the losses

   - Developing possible plans to help minimize losses

6. Overall physical value of each room, made in order to assess the financial loss

   - Can be done in three ways

      vii. Estimation

      viii. Replacement Value

      ix. Professional Appraisal

The first part of the procedure was simple, all you have to do is to go to plant services and got a copy of the original floor plan for Atwater Kent. The reason behind having a floor plan is that it gives you a picture of what the each room is like and located in the building. Once you are able to categorize these rooms in common groups, you will then be able to have a break down of each room and figure out the values of each room

The second part of the procedure is categorizing each room in the building. By taking a look at the floor plans that we have obtain, you can put the rooms under the categories of laboratories, offices (professor's, TA's), shop, lounge, class rooms (lecture halls), and miscellaneous rooms (study rooms, conference rooms). The only obstacle that

can be detected before starting is getting the specific value of the contents of the room. So instead you should mention the significance of specified rooms in each category.

5.3.2 Offices

In this building, there are two kinds of offices, one are the offices that is possessed by a professor and the other are the one's possessed by the TAs (Teacher Assistants).

The professor's' offices mainly contain such items as a personal computer and computer equipment. In most cases it holds the professor's personal notes and research results along with the professors lecture notes for their classes. Other items are simple things, like books and any work that might be obtained through teaching of his classes. The importance of the professor's office is that most of the professor's lifetime work is located in their office and most do not have either back-ups or copies at another location, so in this case, the potential loss is significant.

Again, the potential loss for this office is major. For example, in this office, he/she can loose their class notes and research material, and right there, that's seven weeks worth of work, because that's how long a class lasts. Contained in this example are the quizzes, tests, laboratories and homework assignments. Even though this can spell disaster for many professors, many professors usually hire student to come to their lectures and take notes, so that they can improve on their own notes for future classes. But also the professor can loose research results from past projects or side activities that might not be able to be replicated again, in which makes this stuff priceless.

Ways to avoid such a mishap, we suggest that the professor might make an effort in copying their most valuable information and store it at a second location where it will be safe.

As for the Tas' offices, it is simple because it's basically an empty room where they might do homework corrections or test corrections. All that could be lost is the TA's personal items and a couple of phones and office supplies.

5.3.3 Classrooms (Lecture Halls)

Atwater Kent has three major classrooms. They are the tow lecture halls located on the second floor, and Newell Lecture Hall. The two lecture rooms on the second floor are used for most of the electrical engineering classes that do not exceed 50 students, both of them are also used for outside classes. Newell Hall is a key lecture hall because of its enormous size and ability to have a high capacity. This room is a place for many outside classes that are big in size. These classrooms contain the basic items, overhead projector, screen, blackboard, tables and chairs. Newell hall also a computer video projection that the other two rooms do not contain.

The potential problems that these rooms are associated with are minimal. The only major loss would be the loss of the space and then finding another classroom on campus to have the class in. This is kind of a pain but doesn't take long to do. The losses in these rooms are basically physical losses that can be fixed and/or replaced.

5.3.4 Laboratories

Atwater Kent is known for it's many and expensive laboratories. Each of the three floors of Atwater contains some kind of lab that is associated with electrical engineering. These rooms are the most important rooms in this building. The loss of any one of the laboratories will affect many professors, each hitting them in three different ways. One is that they loose a lab for personal research, a place to teach, and department operations. Also the loss of a lab will hit the department and the school a huge financial problem. Also the contents of these laboratories have some of the most expensive equipment on campus. In reality, the only department that will be affected by any lab loss is the electrical engineering department, because all of the laboratories in the building are for electrical engineering usage only.

5.3.5 Conclusions: Using the procedure

The first step in the procedure was to obtain and/or draw up a floor plan, in this case, the floor plans for Atwater Kent was obtain from plant services and has been implemented into this report in the appendices section.

Categorizing the rooms is the next sufficient step in this risk procedure, basically to make the rest of the procedure a little easier and more efficient. Since this project has been focused on an university, categorizing rooms in these building will be easier and simpler. For Atwater Kent, there are three major categories, offices, laboratories, lecture rooms. A brief description of these rooms, have been mention earlier in this section.

In looking at the first of the three categories, offices are basically refers to the professors and teaching assistants. Both the teaching assistants and professors, share a common element, the fact of loosing any kind research that they have done during their time in this building. They loose all their work they help provide for the class that they are teaching. But between the two, the professors have a lot more to loose than the teaching assistants. The some professors, tend to keep all their life's work in their office. For example, they keep all notes the kept from advising projects and also loose notes and past syllabuses from all the classes that they have taught during their career.

Atwater Kent has some of the most expensive laboratories on the WPI campus. This category can be broken up into subcategories. These subcategories can be categorized into laboratories such as the analog lab, digital lab, computer lab, communications lab, and the microprocessors lab. Now the student can be affected by the loss of any of these laboratories. Here the student can loose any type of work being done at the time, as well as any professor who keeps any kind of equipment in any particular lab. The big thing here, is the lab equipment that is used in laboratories and/or projects being done. Each lab has some common equipment, but also have unique equipment for that particular lab.

The third category is the lecture rooms. The only intangible things that are located in these rooms, are the various teaching equipment located in the lecture rooms. For example, the overhead projector, video projector, screen, and the computer in the room, to display any type of power point presentation. Plus the building looses rooms that has the size to hold a large group of students.

Losses of these three types of rooms will not be too devastating, but it will cause problems to the building and the departments that are located in Atwater Kent. Even the institute itself can be affected. For example, if you loose a lecture room, your now looking at a class lost, or even developing new schedules for fit the class in an equal size of another lecture room. In Atwater Kent, the loss of a lab posses problem to the classes that hold laboratories in that particular lab. Cause as mentioned before, each lab in Atwater has certain particular equipment suited for different tasks. Here the certain class, looses a lab which in most cases, needs to help teach the class.

Ways to manage the losses is basically having the funds and time to go through the building and evaluate the losses and develop ways to prevent it. The best way is to bring in a team of qualified professionals in risk assessment to give their professional opinion and suggestions to help the building be more risk efficient. Another thing that can be done, is to assess the physical value of the room. To develop this assessment, the person who is in charge of this part of the procedure should consider all ways taking the physical value. They should come up with an estimate and then get in contact with the various manufacturers of the lost products and come up with the replacement values and come up with a total cost and get second opinions from other appraisal companies.

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