

Impact of Experience on Decision Making in Emergency Situation

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PREFACE

I am very thankful to my supervisor Mats Danielsson for his guidance and constant support throughout the study. I am also thankful to Räddningstjänst personnel for their all the help and facilities provided to me during the course of this study. Without their sincere involvement in the study it would have been much difficult to find answers to my research questions.

SUMMARY

Crises are an integral feature of our life. Crises are always sudden and never alike. It is interesting to know that whether the experiences from previous rescue operations and other emergency situation will help rescue men positively in their future missions. There are many factors that influence the decision making process in case of emergency situations. The purpose of this study is to find out how “experience” influences decision making process in emergency situation.

Research has shown that decision making process in emergency situation is different than that in business or normal situation. In such situation decision makers evaluates different alternatives but in emergency situation he selects the best course of action based on his experience and situation at hand. Recognition-Primed model (RPD) describes the decision making process in emergency situation.

Apart from experience other factors (for example, training and education, etc) also affect the decision making process by firemen under emergency situation.

This research study was done at fire and rescue stations in a city in Northern part of Sweden. Twenty firemen were interviewed to study the effect of experience on the decision making process by firemen under emergency situation.

We also study some other factors using questionnaire survey to study the effect of these factors during fire fighting mission.

The main conclusion from the study is that experience is one of the most influential factor that affect the decision making process under emergency situation. Other factors are education and training. Education and trainings give them a feeling of security in fire fighting and rescue operation where as experience facilitates correct perception of risk and rational decision-making. It was also found that the experienced firemen are more calm, cool and rational in planning of their mission after getting SOS alarm but not in hurry as compared to inexperienced firemen.

Keywords: *Decision making, experience, Recognition-Primed Decision model, Emergency situation, stress and Stressors, risk perception.*

SAMMANFATTNING

Kriser och hantering av nödsituationer är en oundviklig del av vårt liv. Kriser är alltid plötsliga och aldrig lika varandra. Det är intressant att veta huruvida erfarenheter från tidigare räddningsinsatser i nödsituationer kommer att hjälpa räddningsmän positivt i deras framtida uppdrag. Syftet med denna studie är att ta reda på hur "erfarenhet" påverkar beslutsfattandet i nödsituationer.

Forskning har visat att beslutsfattandet i en nödsituation är olik den i affärer eller normala situationer. I sådana situationer värderar beslutsfattare olika alternativ, men i nödsituationer väljer han det bästa sättet att handla på, baserat på hans erfarenhet och situationen tillhands. Recognition-Primed model (RPD) beskriver beslutsfattandet i nödsituationer. Bortsett från erfarenhet, påverkar andra faktorer (t ex träning, utbildning mm) också beslutsfattandet av brandmän under nödsituationer.

Den här studien gjordes på brand- och räddningsstationer i en stad i Norrbotten. Tjugo brandmän intervjuades för att studera effekten av erfarenhet på beslutfattningsprocessen av brandmän under nödsituationer. Vi studerade också några andra faktorer genom att använda frågeformulär till att studera effekten av dessa faktorer under brandbekämpning.

Den huvudsakliga slutsatsen från studien är att erfarenhet är en utav de mest inflytelserika faktorerna som påverkar beslutfattningsprocessen under nödsituationer. Andra faktorer är utbildning och träning. Utbildning och träningar ger dem en känsla av säkerhet i brandbekämpning och räddningsuppdrag, varav erfarenhet underlättar korrekt uppfattning av risker och rationell beslutfattning. Det upptäcktes även att erfarna brandmän är mer lugna, samlade och rationella i planeringen av deras uppdrag efter att ha mottagit SOS alarm, men inte i brådska som jämfört med oerfarna brandmän.

Nyckelord: Räddningsledning, igenkänningsbaserat beslutfattande, stress, riskbedömning..

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1.0 INTRODUCTION

Crises are characterized by unusual intensity of destructive events. All different kinds of crises have only one thing in common;- destruction and losses. Crises never give sufficient time to plan and act. To deal with such a situation, one has to be trained to work under time pressure (Mitroff, 2000). With a rapid growth of technology, new and unknown types of risk and dangers are also introduced to our physical assets in our daily lives due to volatile and inflammable goods in our household and in factories. The numbers of fire incidents have been reduced but consequences of such accidents have become more severe. (Danielsson, 2004)

To prevent and eliminate crises, we need experts who have knowledge about handling the situation. These people are rescue men/firemen. Firemen play a vital role in our lives. The very existence of their profession is based on the principle of saving lives and helping society during accidents, natural calamities and unforeseen dangerous events. In that process they often take risks and sometimes they put their own lives at danger. When people are in trouble like the traffic accident, drowning, out break of fire or natural catastrophe firemen are expected to be there to help in every possible way to save people and to prevent destruction of physical assets. Advances in fire fighting equipment and protective clothing in recent years allow modern fire-fighters to move further into burning structures and stay there for longer period. While the technological development generally allows fire-fighters to carry out their tasks with greater efficiency, it also makes it essential for them to have a greater understanding of fire behaviour and development patterns, particularly in regards to modern fire occurrences such as fire incidents due to toxic substances and chemicals. Understanding the nature of fire facilitates getting a clearer picture of various risks associated with a particular outbreak of fire or fire incident and thereby influences firemen's perception of risks. This in turn positively affects decision making process in emergency situations. (Herman, 2004)

Fire fighters need effective training methods to understand the stages of fire development, to perceive the associated risk and make decision under time pressure and uncertainty (Raffel, 1999). Most countries have well trained Fire and Rescue Services to deal with such emergency situations. In general, Fire and Rescue Service (FRS) provides a vast range of services including Rescue - road accident and other types of rescue

- Chemical and hazardous material management
- Community awareness and education on fire and road safety issues
- Fire scene investigation
- Alarm monitoring and response
- Commercial training in fire fighting, fire safety and evacuation procedure

The Fire and Rescue Service (**FRS**) provides these services as well as responding to

- Fires in homes and buildings,
- Road accidents - fire-fighters free victims from road accidents

- Floodwater incidents - swift water rescue
- High angle incidents - e.g. rescues from cliffs
- Building collapses - search and rescue for people trapped (<http://www.fire.qld.gov.au/about/>, 2004)

In short, firemen are needed in all kind of crises. Expertise in making decision in rapidly changing conditions and under time pressure is the most challenging task for a fireman because crises always contain complicated, unstable and uncertain events which give no time to plan the course of action. This leads to stressful situation due to time pressure. Furthermore, in firemen's work, it is very important that underlying risks are perceived and remedial actions are initiated instantly. The decision making process under emergency is different than the decision making process in business case, as in business people do evaluate strength and weakness of various alternatives before they make any decision. In the past many studies have been made to understand the process of decision making by firemen under emergency. Such decision making process is termed as a naturalistic decision making (NDM) process which describes the decision making process in field settings (Klein, 1997) which is different than the analytical decision making process practised by business managers (Orasanu, 1997). NDM is a new field initiated to understand the decision making process in field (Zsombok, 1997).

1.1 Purpose and Aim

The research problem considered deals with understanding the decision making process in emergency conditions by the firemen and how it gets affected by experiences gained by firemen through various missions. There are so many factors such as education, training and knowledge about equipment that affect the ability to take viable decision in emergency situation. There are other factors such as family situation, relation with other at work and at home, training, personal characteristics, information, control mechanism, and other resources also influence decision making.

In short the work is focused on studying the influence of experience on decision making process by the firemen.

1.2 Research questions

In order to fulfil the stated purpose, three research questions need to be answered:

- How does experience affect rescue operation under time pressure?
- Does experience affect decision-making process in emergency?
- What is the effect of stress on decision making process?

2.0 THEORETICAL FRAMEWORK

This chapter contains not only definitions, concepts and explanations relevant to this research but also theories connecting these concepts, and approaches adopted to achieve the goal.

It is very important to understand the various work processes involved in fire fighting and rescue operations and understanding how decisions are made under emergencies and what are the so called critical gate through which information flows. The information flow from SOS to fire and rescue service process can be depicted as shown in Figure 1.

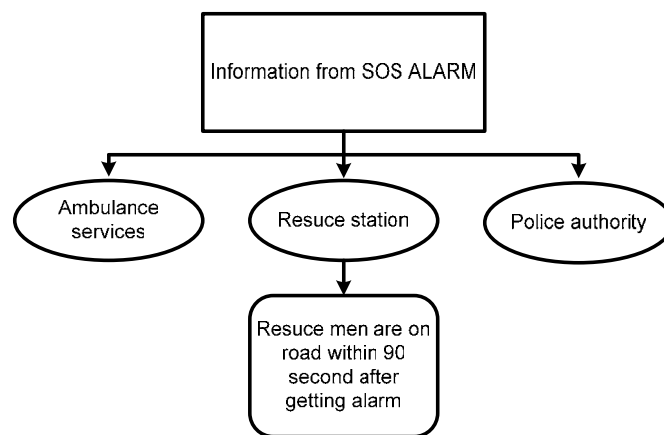


Figure 1. Information flow from SOS to various emergency management organisations

Figure 2 shows a simple schematic diagram of the various work processes involved in fire fighting or rescue operation. A careful analysis of the fire fighting or rescue work processes will reveal that a clear understanding of the problem (its form, size and intensity) is very critical for the success of the fire fighting or rescue mission with minimum requirement of resources. If the problem is understood correctly, the resource requirement can be optimized and also all available resources could be coordinated to get the best possible outcome with minimum loss of life and property.

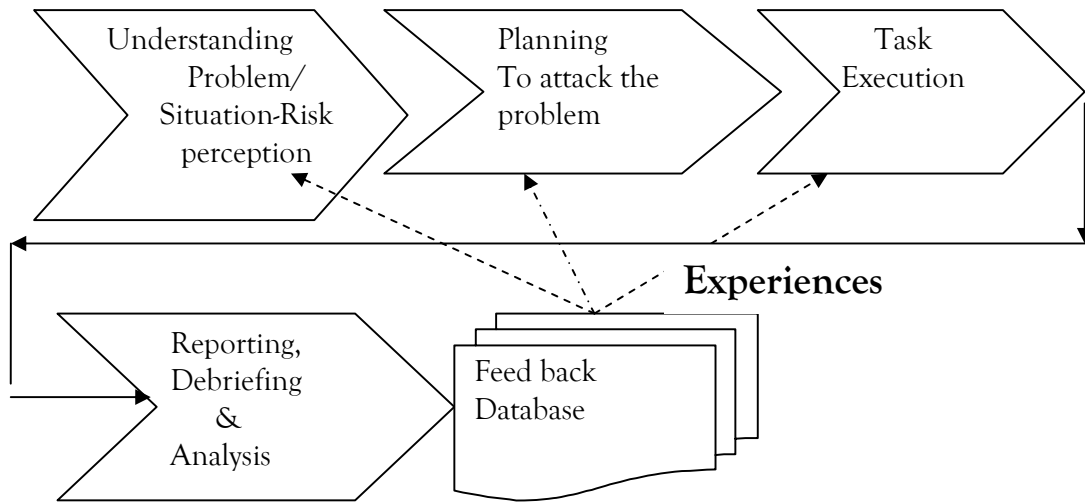


Figure 2. Work processes in fire fighting and rescue operation

Understanding a problem necessarily involves understanding the type and size of risk, its likelihood for control, etc. The available information about the tasks leads to the trigger point for risk perception process (Figure 3). Perception is a process which facilitates understanding the meaning of information processing in some form of knowledge about the situation. The very initiation of risk perception process is greatly affected by the firemen or rescue men's past experience. Based on experience with similar type of fire, rescue men select the most plausible approach for reaching their goal (Klein, 1993). In fact the research work in this area suggest that under condition such as time pressure, experienced decision makers are able prioritize attention and gather more high value information.

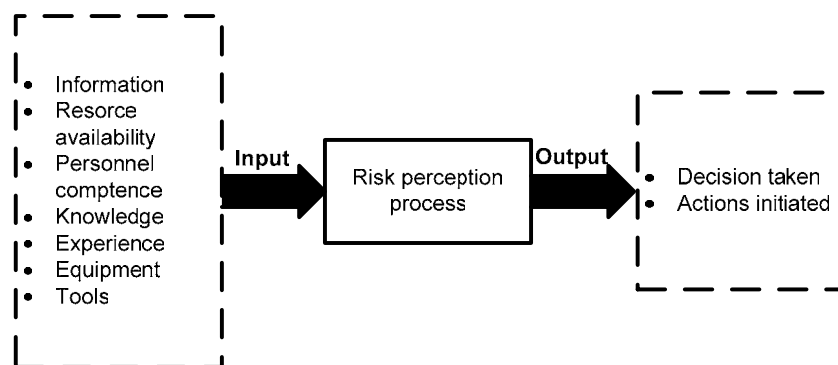


Figure 3. Risk perception process and decision taken

2.1 Decision making process

Decision making and decision theory is a popular topic for researchers in almost every discipline ranging from engineering, business, medicine, social sciences, military etc and there exists a vast amount of literature (Wickens, 1992; Johnson -Laird and Shafir, 1994; Goldstein and Hogarth, 1997; Glickman and Gough, 1993; Klein, 1993; Klein; 1997). Basic Components of decision-making can be:

- Understand the problem
- Select the action based on past experience
- Devise a plan
- Implement

Decision-making tasks vary in difficulties. Wickens (1992) presents a discussion on factors that affect decision making process both the perceived effort to make decision and the likelihood that decision will be correct. One of the most important influence factors is the number of sources of information that must be considered in making the choice. The limitation of information processing and memory especially under stress restrict the accuracy of decision made by fire fighting and rescue men. In addition, limits of attention and cognitive resources lead people to adopt decision making heuristics, or mental sort cuts which produce decisions that are often accurate but not usually precise as they could be (Wickens, 1992).

One of the most important aspects in R&D (Research & development) related to decision making is the study made to see how stress affects decision making capability of an individual or a group. Because most of the emergency situations (as seen in fire fighting and rescue operation) is expected to trigger high level of stress in decision makers, for example firemen and rescue men (Orasanu, 1997).

2.2 Stress and how does it affect decision making process

Stress is a defensive result of the brain's thinking process. Stress affects mental and physical health. The amount of stress that one can bear is dependent upon that individual's ability to cope. Stress is a demand made upon the adaptive capacities of the mind and body. Theories of stress typically are classified as stimulus-based, response-based or interaction-based (Fenz, 1975; Orasanu, 1997).

Stimulus based theories identify certain aversive stimuli as stressor and then determine their effects on subjects. Such stressors are classified as environmental, task oriented and social. In case of fire fighting task, oriented stressors can be perceived to play and affect decision making process. Such stressors are characterised by time pressure work load, or information load (Orasanu, 1997).

The response based theories define stress based on subject's responses: physiological, behavioural, or subjective. Response based theories most comfortably accommodate differences between individuals in the face stressors than stimulus-based theories (Orasanu,

1997). Such theories explain why an experienced fireman handles the situation and comes to viable action much faster and confidently than a novice.

In the third approach to stress, the interaction between potential stressors and a person's cognitive appraisal of the situation is considered. The stress in individual professionals who are expert may come from the situation that they perceive to generate demands beyond their ability to cope (Wickens, 1992).

Often subjects make more mistakes when stressed than when not stressed. One interpretation of the mechanism underlying these effects is that stressors produce physiological arousal (e.g. heart rate), which demands resources for self monitoring; this arousal then competes for cognitive resources available to meet the task demand (Orasanu, 1997).

The stressors influence, the quality of the input information, information processing and finally the performance as discussed in Wickens (1992). It is demonstrated through extensive review of research to study the effect of stress that stress produced perpetual tunnelling will usually degrade the performance (the decision making performance). In some exceptional cases it may facilitate decision making.

2.3 Working memory loss and long-term memory

Wickens (1992) also presents a discussion on working memory loss on the basis of survey of research literature and concludes that stress would not allow optimal or efficient encoding of new information into long term memory but it appears not to disrupt the retrieval of information from long term memory (if the information is well rehearsed or memorized).

The effects of stress on decision making have always been topic of great interest. To analyze the effect of stress on decision making, a componential approach can be adopted. Since different decisions may involve varying dependence on such components as working memory, attention, and long term memory retrieval, each decision will be affected differently by stress as a function of the components on which it depends (Wickens, Stockes, Barnett and Hyman, 1991). The prediction of stress effect on decision making is complicated by the fact that the effects of combinations of stressors are very complex and follow neither additive or multiplicative rules (Wickens, 1992). Training has been suggested as a medium for coping with the stress.

Stressors can be internal or external factors in the organism they are affecting. Common stressors are

- time pressure
- changing environmental conditions
- lack of information
- too much information (information overload)

Common effects of time pressure and stress on decision making

- find viable course of action based on past experience
- inability to perceive new information
- lack of initial planning actions
- hasty decision making

Figure 4 illustrates a model for relationship between emergency event, stressors and stress. For example, perception regarding high speed at which fire is spreading activates stressor “Time pressure” which leads to stress.

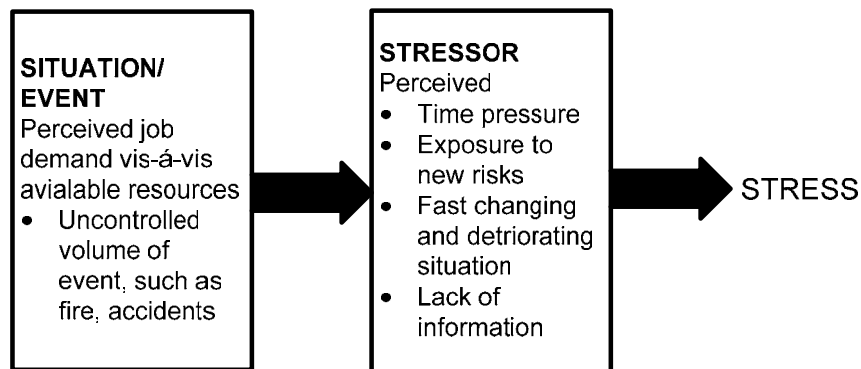


Figure 4. Relationship between dynamic event, stressor and stress

Often when stressed, one suffers from temporary loss of memory, A novice experiences more stress than experienced and expert in dynamic decision making situations characterised by high risks, time pressure, uncertain goals, ambiguous information and team work (Fenz, 1975; Orasanu, 1997). Working under time pressure or emergency situation leads to stressful condition. As reported, stress has many side effects on the body both mentally and physically (Massa, Watkin and Partridge, 2002).

2.4 Experience and decision making under stress

It has been reported that many times experts with experiences take more time in decision making than the novice decision makers (Kobus, Proctor and Holste, 2001). However, the expert executes the tasks more effectively as compared to a novice person. It has also been reported in Wickens (1992) that experts with experience cannot guarantee a better performance.

Experience can be explained as:

“Do I recognize this situation as I have seen before?”

Under time pressure we are not able to access stored information quickly (if at all). So the firemen are more likely to recognize a situation as a typical. Thus problem understanding gets impaired and every situation seems unique even though they are more or less similar in nature. When we are under time pressure in emergency situation (stressor) our mental capability of processing information is not as accurate as it would be when we are not

under stress. When formulating a rescue/fire fighting plan under stress, they are unlikely to come up with a new solution and because of stress they focus on only those courses of actions which they have in their long term memory. Figure 5 illustrates some of the influencing factors in decision making and feed back from outcome and result analysis.

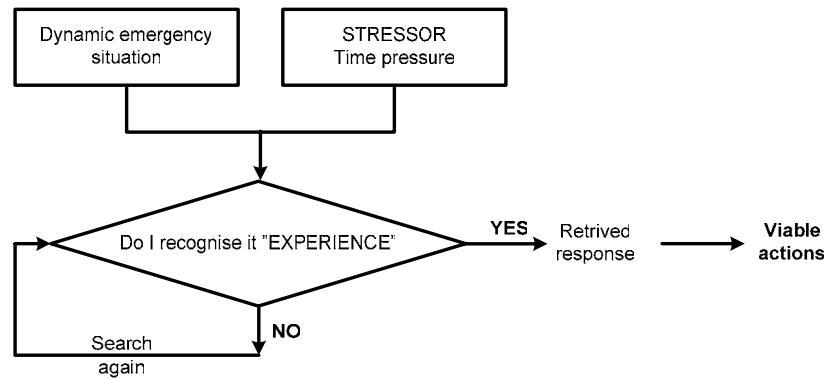


Figure 5. Emergency situation, stressor, experience, and search for viable action.

Previous research shows that an expert recognises the situation and use memory to retrieve suitable responses. A common opinion about stress is that it has got negative impact on decision making. This is true for novice decision makers performing an unfamiliar task but when experienced decision makers perform similar tasks, the resulting pattern of stress effect becomes less uniform (Flin, 1997). In a study by Klein (1993) of decision making by fire ground commanders, it is reported that they were not “making choices,” “considering alternatives” or “assessing probabilities”. They saw themselves as acting and reacting on the basis of prior experience.

In fact the data suggest that under conditions such as time pressure, experienced decision makers are able to prioritize attention on the sources of stress and related stressors and gather more high value information from memory to initiate action based on past experience to deal with emergency situation (Klein, 1997). In such situation it is difficult to consider new alternative

With proper experience and training, human error (this includes error introduced in decision making process) can be reduced dramatically. The literature survey clearly shows a relationship between experience and quality of decision made in stressful situation like fire fighting (Reason, 1990).

Research has shown that decision making process in emergency situation is different than that in business or normal situation. In such situation decision maker evaluates different alternatives but in emergency situation he selects the best course of action based on his experience and situation at hand. The making of decision, in emergency situation both big and small is often difficult because of uncertainty and conflict (Shafir, Simonson and

Tversky, 1993). We are usually uncertain about the exact consequences of our action/decision. Timely and effective decision making is essential for any rescue or fire fighting operation.

In general, decision making methods can be classified into two groups, namely analytical decision making process and intuitive or naturalistic decision making (Kobus, et al., 2001). In this study we are not concerned with analytical decision making and we will only focus on naturalistic decision making process which is relevant to decision making process under emergency situations. There are at least four key features of naturalistic decision making, namely dynamic and constantly changing conditions, real time reactions to these changes, ill-defined goals and ill-structured tasks and knowledgeable people (Klein et al., 1993).

2.5 Naturalistic decision making process

In fire fighting and other emergency situation decision is made under dynamic situation and often referred to as dynamic decision making. This is a form of Naturalistic Decision Making (Klein, 1997; Zsombok, 1997) and aims at control of an environment that changes both spontaneously and as an effect of the decision made by the subject. In dynamic decision making a series of decisions need to be made and these must be made not only in correct order but also at the correct point of time. These two requirements make a dynamic decision making task very stressful (Klein, 1993; Danielsson, 2002). Decision making process during the fire fighting operation more or less falls under this category i.e. under dynamic decision making. In disasters and large rescue operation, dynamic decision making takes the form of distributed dynamic decision making as it requires cooperation between a large numbers of decision makers cooperate to achieve a common goal (Danielsson, 2002). Some examples of the types of decision the firemen have to make include if to initiate search and rescue, whether to initiate an offensive attack or concentrate on defensive precautions and where to allocate resources. Research by Klein (1993) shows that fire ground commanders' accounts of their decision making do not fit into a standard decision-tree framework choosing the best alternatives rather all decision in such situations are based on experience. Study concluded that fire commanders do not assess alternatives; they often act on the basis of their experience. The commanders often generate monitors and change plans to meet the needs of situation continuously. This strategy for decision making is called Recognition Primed Decision (RPD) models. RPD and NDM are not the same. RPD is a form of NDM (Klein, 1997).

Orasanu and Connolly (1993) have identified eight important factors that characterized Naturalistic decision making (NDM) in emergency situation

- 1 ill-structured problem
- 2 uncertain dynamic environments
- 3 shifting, ill-defined or competing goals
- 4 action/feedback loops
- 5 time stress
- 6 high stakes
- 7 multiple players
- 8 organizational goals and norms

Klein (1993) interviewed fire ground commanders and developed a model to describe the decision making process during fire fighting operation. The model was called Recognition-primed Decision (RPD) making model. It has got three phases:

- A. Situation recognition: Typical situation leads to typical solution but novel situation brings challenge along with it. Every event could be unpredictable.
- B. Serial option evaluation: In this phase commanders evaluate action alternative by mental simulation. They evaluate only one at a time.
- C. Mental simulation: When commanders find satisfactory alternative, they act accordingly.

RPD model describes how an experienced person can make rapid decisions. Experienced firemen use their experience to choose a proper option in emergency situation. If the first option turns out to be wrong, then the case becomes very complicated. Since evaluation is so important, a decision is primed by the way situation is recognized. RPD model focuses on situation assessment and how people use their experience in making decision. The model considers four important aspects of situational assessment (Klein, 1993):

- Understanding the types of goal that can be reasonably accomplished in the situation (*Plausible goals*)
- Increasing the salience of cues that are important within the context of the situation (*Relevant cues*)
- Forming expectations which can serve as a check on the accuracy of the situation assessment (*Expectancies*)
- Identifying the typical actions to take (*Actions*)

The RPD model asserts that experienced decision makers can identify a reasonably good option as the first one they consider, rather than treating option generation as a semi-random process requiring the decision maker to generate many options. The RPD model relies on satisfying rather than optimizing- finding the first option that works not necessarily the best option. This Model focuses on serial evaluation of options and thereby avoids the requirement for concurrent deliberation between options that marks the focus on the “moment of choice”. The RPD Model asserts that experienced decision makers evaluate an option by conducting mental simulations of a course of action to see if it will work, rather than having to contrast strengths and weaknesses of different option (Figure 6).

Recognition is crucial element of the model. Danielsson (2002) also uses RPD model to describe the decision making process by Fireman based on a study in Sweden and states there is lack of analysis of the recognition process and not much literature exists to support how information is retrieved from the memory. Furthermore, in fire fighting operation not all emergency situations are dynamic. Some crises situations are static but unstable and in such cases the issue of risk assessment becomes more dominant. Based on the assessed risk, actions are initiated where as in dynamic decision making case; decisions are taken based

on recognition and mental simulation. Some emergency operations concern static situations where the rescue leader confronts a fait accompli. For instance, a case of a transport of hazardous materials can be associated with such situation. Here the situation is static, but unstable and the decision making task basically involves assessment of risk related to various options. The seizing of such a situation means diagnosis and prognosis based on cues such as fragility of the containers, (in case of gas release) distance to residential areas, etc. (Danielsson, 2002).

In fire fighting operations more or less every one has to deal with a dynamic decision making situation and decisions are made at least at two levels, namely one by the chief of the fire fighting team and other by the firemen. The only difference is that rescue chief makes decision based on a holistic approach, he monitors and allocates resources and changes strategy based on the situation at hand. By observing situation, he selects the course of action based on his experience which often changes continuously. He leads the fire fighting operation. This decision making process can be characterised as dynamic decision making.

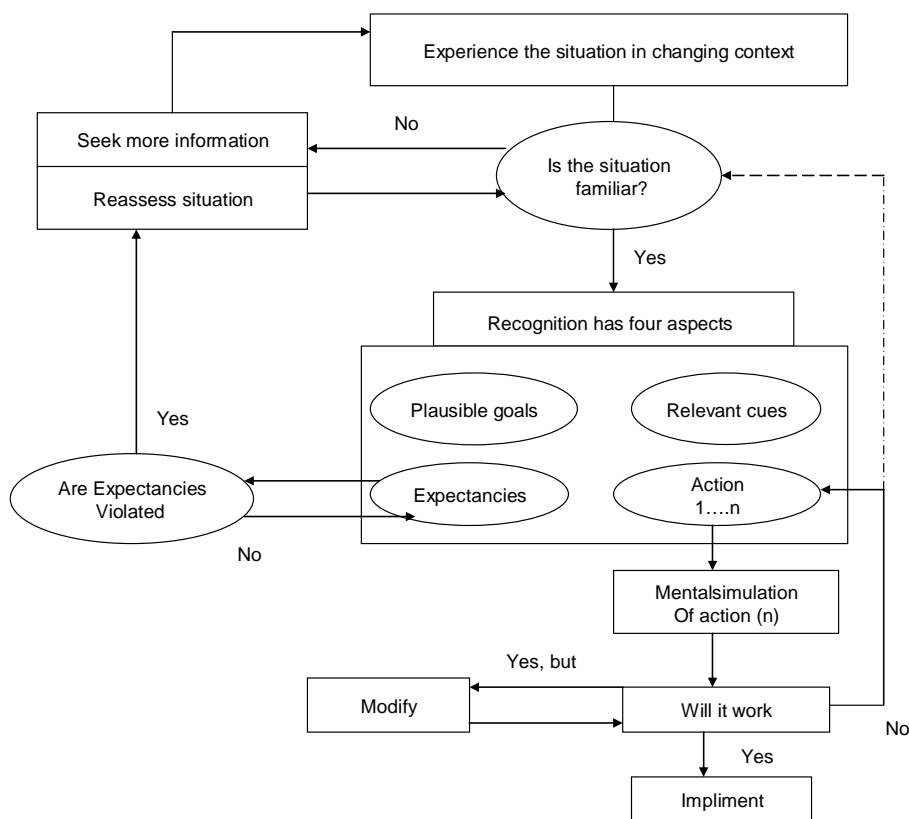


Figure 6. Recognition primed decision model for dynamic situation such as fire fighting (Klein, 1993).

3.0 METHOD

Research work was performed at fire stations in Northern Sweden. Approximately 60 persons are employed at the main Fire station and 18 in a substation. Fire stations are equipped with very sophisticated and advance equipment. They work in two shifts and 7 days a week. First shift starts at 7:30 in the morning and shift change takes place at 17:30. In each shift 7 persons are at work, namely 2 firemen, 1 fire ground commander, 1 head of firemen and 3 vehicle drivers. Office work is five days a week. They start their job with training and education related to their profession, i.e. fire fighting and rescue work. They get trained to deal with all kind of crises and emergency. Their main work is to rescue people and property.

For the purpose of interview, 20 firemen were selected from all level of responsibilities including the chief of the rescue station and 3 personnel from the Fire protection dept (Brand skyddsavdelning), 4 fire ground commanders, 2 foreman, 8 firemen and two retired person from rescue station were also interviewed. In addition, 2 retired personnel from fire and rescue services were also interviewed to understand the process of decision making during emergencies and under time pressure. Interviewing them was a short of journey through development of fire fighting organisation for the last four decades and provided various aspects of fire fighting where decision making becomes extremely critical for own safety and safety of other people and assets.

Table 1B shows that rescue men from different age groups have been selected for the purpose of interview. Youngest one is 24 and oldest one is retired.

Table 1.A Respondents and their level of responsibilities

	Level/Category	Number Interviewed
1	Chief	1
2	Fire protection dept	3
3	Fire ground commanders	4
4	Forman	2
5	Firemen	8
6	Retired	2

Table 1B Age Group of respondent

S.No.	Year of birth	No. of persons
1	1941 to 1950	4 Persons
2	1951 to 1960	6 Persons
3	1961 to 1970	6 Persons
4	1971 to 1980	2 Persons
5	Retired	2 Persons

Name of the participants are not given to maintain the anonymity of the subjects. Interview was recorded with permission of the participants which was made in Swedish language. Subjects are given code name from A-P. See Appendix A for semi structured questionnaire and APPENDIX B for the excerpts from the individual interview.

Qualitative method on the basis of the information collected through interview of the firemen (focus group) was used in this study. For this, a set of semi structured questions for oral interview is suitable. Semi structured questions are more suitable when there is expectation of wide variation in the behaviour of respondents. In this kind of interview with no time limitation, respondent can take time to express themselves in a better way. The interview proceedings were recorded if the interview objects had no objection to it. All details were documented because documentation provided source of evidence (Yin, 2003.)

Observation of firemen's work, routines and if possible to see their work on accident's spot in emergency situations will be part of this study

For the purpose of this study independent (influence factors such as experience, education, etc.) and dependent variables (decision making).are defined.

Semi structured interview and questionnaire were prepared (Appendix A and B). Semi structured interview is very useful when one has to interview many people. It helps the respondents to express themselves.

The average time of interview was 60 min with the shortest one being 30 min where as the longest one being 120 min. The interviews were conducted within a span of three months

3.1 Direct observation

An accident site was visited to observe the fire fighting process and firemen in real working situation. A room with machine was under fire. Firemen got control on fire within few minutes but they spent time in searching for any trace of remaining fire.

3.2 Survey questionnaire

A survey questionnaire was prepared containing 15 influencing factors in a Likert scale of 1-5 to study and analyse the impact of these factors in decision making as perceived by fire men.

4.0 RESULTS AND ANALYSIS

4.1 Analysis of the recorded interview

Table A describes the categories of firemen selected from various levels of responsibilities for different categories for personal interview and surveys (Table 1A & 1B).. From Table 1A we can see that people from all type of responsibilities have been interviewed..

In Interview respondents were asked about decision making process as experienced by them during their fire fighting mission. Fire ground commanders and firemen have their different role and duty. They all try to understand the problem, make a plan and implement it as soon as they reach the site of event. On way to the site, they collect information and try to imagine the situation so when they come to the spot they are not surprised by anything.

4.1.1 Experience and stress

Jobs such as those of fire fighters cannot be without stress. They make decision under time pressure and their work is stressful. But in the Interview all respondents talked about stress as important factor that influence decision making. In interview out of 20 only one said that he felt stress only first year of his job and now he does not feel any stress. He said “*I know now that what I have to do and what I can do*”. Rest of respondent described their stressful situation in different way. They do not experience the stress in same way. For example some new firemen said that they were not so aware about the danger and do not experience any stress in operation. However same was for some experienced firemen. They did not experience stress as they could recognise the situation.

One respondent said incomplete information gives stress. He gave an example for this. A office building with many corridors and rooms is under fire and if numbering system is not good. It becomes difficult to know the layout in such cases we do not know whether we are going in right direction or wrong. Such situation increases stress level.

Another respondent said that in the beginning for a couple of years he felt stress because he was not confident about his actions during the fire fighting.

“*Now after 5 years I am more confident*”. One of the respondents said in night shift when they sleep at fire station they can not sleep as they do at home. Any time alarm can come. This stress is there even in their sleep.” However another young fireman said he sleeps with no problem.

So it seems stress is also dependent on physical and psychological state of mind.

One respondent said that a survey has been made by a Fire Station has shown that firemen were in much stress till alarm comes. But after alarm more or less firemen accepts. The condition and stress gradually releases. He further added that Stress is always in body even though they did not realize it.

It also came out that an alarm from a hotel or factory gives more stress than an alarm from a residence. To control the fire in a hotel is not an easy task as firemen have to understand the hotel layouts quickly before initiating actions. Fire fighting in factories is more dangerous due to the more likely presence of dangerous chemical and explosives substance. Sometimes the presence of media and on lookers public etc during the course of action can create more stress.

Most the respondent says that when year goes we feel less stress or different kind of stress as we are experienced and we can perceive the risk correctly then we know how dangerous it could be. Some of them said that when we get alarm we imagine worst kind of scenario but after arrival at the spot in reality it does not look so bad. Then it reduces some stress.

We have stress when we perceive the risk but stress of not knowing the situation - going into unknown becomes less and less with experience. But at the same time with experience we get knowledge of danger which creates other kind of stress.

4.1.2 Experience and human error

In interview several firemen said *“when we are new we cannot perceive the risk correctly and we do mistakes. As a new recruit in fire fighting and rescue profession, most of us either overestimate the risk or underestimate the risk. If we overestimate the risk then we can come out of the building or house instead of me staying little longer and if we underestimate then we will risk our own lives. With experience we recognise the situation which is often dynamic and take decision instantly”*

One fireman described this in form of a scenario:

“First I stood at door to decide whether I should take left or right side. It was full with smoke and dark. I went in a room crawling and I got to touch a leg some one was on sofa and I took the person out. I could have taken wrong direction.” He continued “we have to take decision very fast but we can not stand and think of many alternative, most of the time there are no other chance and we have to take decision dynamically. A delay of a second can cause great loss.”

One fireman while telling his experience told “what ever I did when I was new in job I would never do it again. I was young and new in this job with no experience and I did underestimate the danger”. Furthermore he said to perceive a risk correctly they must gain experience.

During interview an incident was cited by two of the respondents to highlight the role of experience.

Once fire breakout in a residential area, rescue team first tried to make a hole in the roof but it was a difficult task and was taking more time than expected. After a while they brought a tractor to pull down the roof and it worked very quickly and smoothly. A similar fire incident took place in a similar type of flat in the same area after a week and luckily the same team was there. This time they did not take time in thinking what to do. Roof was

pulled down without loss of any time. This resulted in a reduced loss (6 MSEK) that was almost half than the earlier incident (11 MSEK).

During an interview with a retired fireman I got some other example which showed that how experiences affect risk perception and decision making. One respondent who was retired said that once they got an alarm from steel plant. During their mission when they went inside the building an explosion took place causing injury to three of the firemen. Such events provide valuable experience for future mission and force them to be extra careful when they go inside a factory. This kind of unexpected incident can increase stress and subsequently influence decision making process.

One respondent expressed that “young people in their profession think they can do everything but the more we have experience the more we know that how little we can do”. His version reflects that with experience we learn to perceive the risk very correctly and we know our limits. As young rescue men they are not able to perceive the hidden risk and this either delays the mission or leads to injury and loss of assets and life.

A new rescue man cannot perceive the risk in one room full with smoke in same manner the way as an experienced person does.. It means ability to perceive the risk was affected by experience and they could see the danger now which they were not able to see when they were new at work. From every rescue operation they learn something and this is the way they get experience.

Senior firemen with many years of association with fire and rescue operation expressed unambiguously that all crises are different in nature, and as a human being are reminded by such incidents/accidents of our limitation. Sometimes experience and education of many years seems not much of use.

In short, experience makes firemen to perceive the risk correctly so they make decision very fast that what equipment they need how they have to work go through the door or make a hole in a roof since we have no time to think of many alternatives so there is no wrong decision we take. We take decision dynamically and work on it.

From interviews, it was made clear that firemen do not evaluate various alternatives at emergencies. Only actions are initiated based on past experience and most plausible course of action is selected. Interview results of firemen and fire ground commanders showed that there was no time to think about many alternatives. “A large number of them said “*We just initiate actions as a routine and using our past experience. Experience helps us in correct decision making and taking action as fast as we can.*” They said that they always gave first priority to saving lives. They say that they do not initiate similar type of actions every where because attacking a fire in a burning house is different than that quenching the fire in a garage. Fire in a garage can be more dangerous due to usual presence of gas cylinder or can filled with gasoline etc.

4.2 Analysis of answers to survey questionnaire

Analysis of answers to questionnaire confirms that experience plays an important role in decision making during emergency. However, the analysis also revealed that some other factors such as the fire fighting equipment and training has more or less same influence on decision making and selection of course of action. In fact during discussion it became clear that if fire men are equipped with right type of equipment they perceive less risk and feel less stressed as they can control the situation.

Analysis of survey data shows that experience, training, education, equipment has got more or less same high score as illustrated in Figures 7. One person did not answer However, during the interview more or less all the respondents put experiences from the fire fighting missions as the most critical factor that influence decision making under pressure. Out of a population of 30 firemen only 19 firemen came back with answers. One fireman did not give any preference regarding night shift and another person did give any preference for education. The survey questionnaire and the returned answer answers are given in Appendix C.

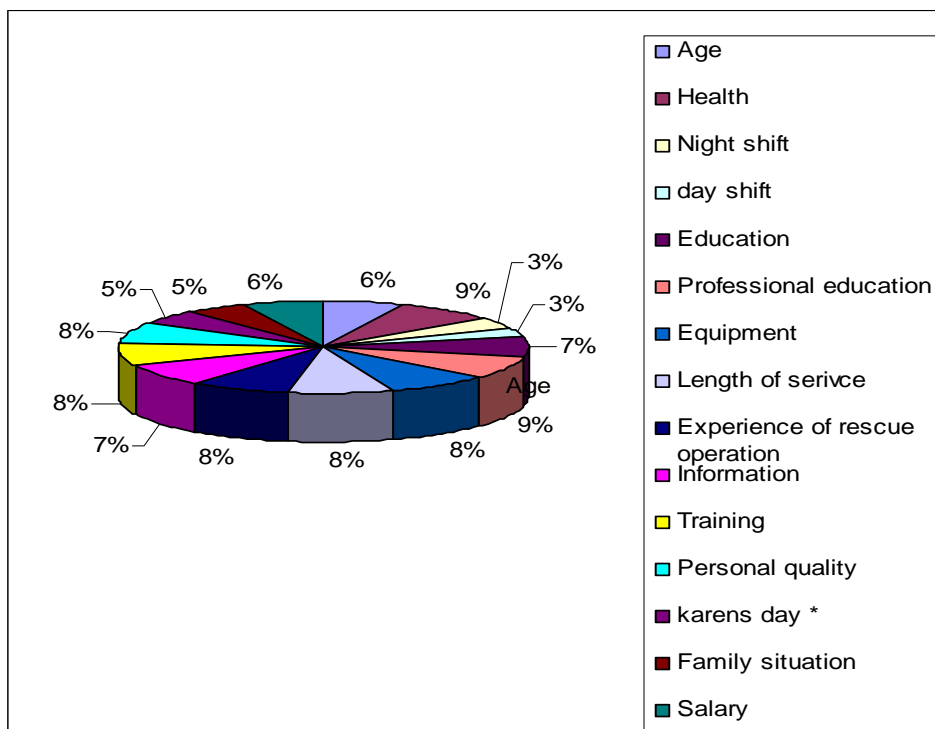


Figure 7. Illustration of perceived effects from various factors that have influence on decision making under time pressure

4.3 Analysis of observations.

The way firemen planned and executed the fire fighting tasks, it can be said that they knew very well the nature of fire and way to control it. They got control of fire very quickly and without any injury to any human being. They took measures to prevent any restart of fire. During the whole process the firemen were calm and did the job in a routine manner. There was no sign of stress in the entire process. It seems they were aware of the tasks (in practice all fire incidents are unique). This kind of knowledge comes only through experience.

Besides these, direct observation of the testing procedure of fire fighting equipments was also made one time.

4.4 Some other factors influencing decision making

All respondents admitted during interview the importance of education and training but at the same time they all agreed that experience is very important.

It was stated many times by respondents:

“Its not only experience, education and training are also important. Training and education is a routine in our profession. Education and training make us learn to know what to do and how to do. But for correct perception of risk one needs experience. We also learn through experience where to take additional risk especially when it comes to life saving. To perceive the risk correctly one learns only in real rescue operation. This is the reason, in a rescue operation; we prefer to work in a team with different age group and different level of experience.”

5.0 DISCUSSIONS AND CONCLUSION

5.1 Discussion of results and conclusion

Based on the interview, outcome of the survey, direct observation on site during action and my discussion with senior fire ground commanders and some veteran fire fighters it is very clear that experience plays a vital role in their decision making process. Experience helps in reducing the acute stress that is situational and affects the decision making process. The responses from survey and out come of the interview results demonstrate that the RPD model proposed by Klein (1993) ideally describes the decision making process. In fact the study was started with a hypothesis that experts use their knowledge to recognise the problem situation as an instance of a type and then retrieve from their memory (described as mental simulation in Klein's RPD model) an appropriate and viable solution associated with that type of problem. If the selected solution is found wanting another interpretation of the situation is made or second level of response is retrieved and evaluated (Orasanu, 1997).

Rescue operation leader or the fire ground commander has more responsibilities. He is focussed on avoiding loss of life (both from victims and from his own rescue team). If he thinks the risk is too great for the members of his rescue team, he orders them to come out or take a safe position. In rescue operation fire commander is involved in many activities at the same time - talking on radio with those who are inside the burning house, helping them with equipment, collecting more information, observing the situation carefully so he knows what else can be done to control the situation or if its getting dangerous for firemen. He makes decision under time pressure which can be described by naturalistic decision making (NDM) process. Firemen work on the spot to save people and property. They do as they are trained and get order by commander who is standing out side. But since firemen are inside the house and trying to control the situation so they take decision there what to do, how to do and when to come out. Firemen takes decisions based on situations at hand on local basis as they perceive them and their experience Fire commander and firemen all have to make decisions which can be classified as NDM and dynamic decision making.

Furthermore it was made clear during interview that fire men never evaluate various alternatives during action as is the case in business or analytical decision making scenario where various alternatives are evaluated for arriving at the best solution. In fact firemen select/retrieve the response based on his past experience (mental simulation) and that is the viable action. After every mission they have debriefing session to discuss and analyse actions to find out any other better options were available. But during operation firemen take into consideration all available information instantly and select the viable course of action based on experience and information retrieved from memory (mental simulation) instantly. It was clear from the outcome of the interview that actions are initiated mostly based on experience. All actions initiated under emergency conditions are the viable choice to deal with situation and firemen assume that the decisions taken are the most viable decision for the situation.

Education and training is a base for firemen to build up the ability to deal with crises. The fire station where study was performed has highly trained and educated staff and equipped with sophisticated equipments. Based on the results obtained from the study, it can also be said that education and training also influence decision making in emergency situation.

From previous section on analysis of results it is obvious that education and training are also very important but they are not a substitute for experience. The experience gained through fire fighting mission and rescue operation helps in understanding various aspects of fire and fire fighting process. This helps in perceiving all risks in right perspective and helps retrieving the right responses to meet the situation. In interview and survey, most of the respondent said that we always do training and always have courses but when it comes to real event then things are very different. Only real event gives them ability to perceive the risk correctly and work more effectively. A novice person will underestimate or overestimate the risk.

To have correct risk perception of an incident in general one must have experience from similar events. However, in real life most of the crises are different in nature. To gain experience, therefore firemen get trained by using simulated situations. But one cannot simulate all possible type of events. Furthermore simulated events do not generate the same type or level of stress that may affect the risk perception process as working under time pressure in real situation.

The analysis of the interview responses clearly shows that there are different reasons for stress as perceived by the rescue or firemen. However, my study was concerned with understanding the relationship between stressor typical of emergency situation such as outbreaks of fire and its possible influence on decision making. As discussed earlier, under stress one can be affected by short term loss of memory (making it difficult to retrieve the right response to situation based on mental simulation-memory). However, experience provides protection against such acute stressor triggered either under time pressure or by situation where firemen perceive demand generated by dynamic situation beyond their ability to cope. First of all, crises itself is a stress creator because lot of known and unknown dangers are associated with them.

It was found that the demand generated by the fire fighting tasks on firemen is often perceived to be beyond their capability and means in spite of training and education when they are new at work. Many of them expressed that they experienced less stressed after a few years in this job. After experience of a few years in fire fighting, they recognise the situation and retrieve the response based on their memory similar to that described by Klein's RPD model which is a form of a naturalistic decision model, different from the analytic model used by business community.

Experience helps the fire and rescue planner to perceive the risk correctly and evaluate them more accurately based on their actions and outcomes in the past. It reduces stress and helps them in making correct decision by correct perception and understanding of

risks and danger. This provides critical input to decision-making process which essentially provides input to rescue and fire fighting tasks execution. It also became clear (through our questionnaire) that education, training and mode of information flow is also critical for selecting right course of action in fire fighting. In emergency situation, all the involved personnel (fire ground commanders and individual firemen in action) make decisions which can be classified under decision making under dynamic conditions.

To observe events to know the effect of experience one must observe many events and with the same team (which includes a mix of experience and newly recruited firemen). It was not possible within the time frame of this study and so “interview” was adopted as the main source of studying the decision making process.

From the study of the debriefing report, it seems it was not easy for the firemen to recall and describe the fire event in detail afterwards, and therefore the way decisions were taken is not documented. They discussed the every event in depth afterwards but did not document their discussion. Therefore, these reports were not very useful. That’s why its important that after every event firemen should made a detailed documentation of their every action taken. They should also record the process of decision making for every incident to facilitate others to learn from their experience.

Furthermore, as it was also found that all emergency conditions are not dynamic. For example, once I observed that after quenching the fire in a large machine room, firemen did not leave the place but started checking if any “live fire” is left in that room, if they found any they sealed it off or quenched it so that it should not get ignited again. Such situation can be characterised as static because firemen are not working under time pressure but situation is unstable.

The main conclusion drawn from this study is that experience influences decision making in emergency situations.

5.2 Self criticism: Strength and weakness in study

Only 20 firemen from different age group and from different level of responsibilities were selected for interview. Several methods were used in study for example direct observation of rescue operation and observation of testing of fire fighting equipments. Semi structured questionnaire was used in interview. Interview took around three months. Observation I did in the summer of 2003. For the purpose of survey, structured questionnaire was used. Debriefing reports for a period of one year was studied. All the time focus was to find answer to research questions. This shows the construct validity is proven. If this interview is to be done again, quality of interview would improve. A lot was learnt during the course of this work about the decision making process in emergency situations. Debriefing session was not studied. It is felt that studying the debriefing session would have given more insight into the process of decision making under time pressure.

5.3 External validity

For testing the external validity I should have taken interview from different groups of firemen but the time frame and available resources did not allow me to do this and therefore indirect method was adopted. In this approach finding of this research is compared to the findings of other researchers. The finding in this research work is similar to those reported by Danielsson (2002) and Klein (1993). This establishes the external validity of my work

I studied the debriefing report available in their data base about their rescue operation. It did not deal with role of experience .It was not of much help to this study.

5.4 Reliability

The main purpose of reliability assurance is to minimize the errors in measurement and biases in all science study.

The major reliability problem in my project came from subjective assessment and interpretation of face to face interview or answers to my questionnaires.

To guard against such biases I prepared protocol for investigation giving details of goals, research problems, conceptual framework and possible ways of data collection, research design etc. This helped me in anticipation of several problems which are likely to occur. I formulated questionnaires in such a fashion (multiple questions to verify the answer in more than one way) so that fuzziness in answer is removed. This will remove the error introduced due to ambiguity of answer.

In short it can be concluded that experience has a great influence in decision making under emergency conditions. The outcome of my study is in line with those of Danielsson (2002) and Klein (1993, 1997). My conclusion is based on my interview survey and direct observations confirms the validity of the RPD model of Klein (1993) which describes the decision making process under emergency situation

Most of the participants were of the opinion that there is no substitute of experience in rescue and fire related operations. However, there were some who expressed that experience is important but there are other factors such as education and training more useful for planning of a successful fire fighting or rescue operation. Interestingly these respondents were in possession of University education and were on chief position.

Thus, it could be concluded that education and training are very important for an effective fire fighting job but it becomes more effective and efficient if experience is also integrated in the profession.

6.0 RECOMMENDATION FOR FUTURE RESEARCH

6.1 Future research work

Training is useful in creating a conditioned pattern of behaviour. It will be interesting to study the role of education and training vis-à-vis experiences from real mission to see if the lack of experience on real mission can be compensated through some form of training or simulation away from actual rescue and fire station. This will save scarce resources and make rescue operation more effective and efficient. This will improve the quality of decision making and help the firemen to recognised the situation fast and pick the actions that best fits to their mental simulation.

Furthermore it is also of interest to study the quality of out put from Naturalistic Decision Making (NDM) process. Does the out from NDM process always is of acceptable quality or are they always the best possible solution under time pressure?

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APPENDIX A Semi structured questionnaire for interview

Questions:

Some of the questions were formulated using, Interview Schedule from Danielsson (2002)

Personal questions-

1. Age
2. Family situation? (Married/Unmarried, Children, etc.)
3. Education

Professional questions

4. Years of experience in this job.
5. Your main responsibilities.
6. What kind of problem usually do you get under rescue operation?
7. The most difficult moment of your responsibilities.
8. Do you get problem because of defected routine or training, lack of sufficient information or due to equipment?
9. Which age group is more effective and efficient?
10. What source of information you trust most?
11. How often do you people get hurt?

Role of experience

12. Importance of experience
13. Describe a rescue operation you have been
14. In what way experience from a rescue operation helps you in next rescue operation?

Stressor

15. List some critical stressors in your tasks i.e. emergency situation.
16. How do you deal with such stressor in emergency?
17. How these stressors affect your decision making in emergency?
18. Time pressure or “going into unknown” which one is more stressful in your work?
19. Can experience help in dealing with stressors while decision making under emergency situation?

Role of Training and Professional Education

20. Do you think that training and professional education facilitates decision making during emergencies?
21. Do Training and Professional education complementary to experience or a formidable alternative?
(Can training and education be as effective as experience in decision making in emergency)

APPENDIX B

Summary of individual Interview (Details are based on audio recorded Tape and my notes). Recording of interview was done with permission from individual.

1- Respondent A Working for the last 25 years)

There are so many things which are important to learn to become a rescue man. Education gives knowledge about danger however by training we learn the techniques to handle the emergency situation. Through experience we develop a quality which helps us to react rationally in emergency situations and one learns new things every time. To join a rescue team one has to get education and training in simulated situation. It's stressful and tough when we have to make decision under time pressure. We do have a certain routine and rules. The moment alarm comes; we start working by our rules and order. But once we are inside the house which is under fire then *we have to assess the risk and take decision at our own, based on our knowledge and experience* as there is no time to discuss or even to consult a colleague. This moment our experience becomes very helpful in decision making. Making decision in such situation gets easier with passing years. Experience reduces stress and makes us able to take correct decision and make it faster. We always get tough situation when stress affect our ability of making right decision. Sometimes not complete information can create stress as we go in to a building with many corridors and many - many rooms and there is not numbering direction system and not knowing how to reach faster on the spot, gives stress. This kind of stress is intensive because often we do not have enough time to collect information.

2. Respondent B (Working for the last 5 years)

Even though we have education and knowledge but only after a couple of years we feel confident about our tasks. In the beginning lack of experience gave me stress. As years passed in this job, it became easier for me to take decision under time pressure and in emergency. Education gives knowledge about crises but experience gives confidence in working in emergency situation and it makes easy to perceive the risk. He gave a good example about advantage of experience. In one area one flat caught fire. Rescue team first tried to make a hole in the roof but it was difficult and was taking time then they got an idea. They brought a tractor and pulled down the roof. It was quick and smooth. By chance the week after in the same area another flat caught fire. This time also it was the same team. This time they did not waste time and pulled down the roof. This resulted in a Loss (6 MSEK) that was almost half than the last week incident (11 MSEK)..It shows that experience is always helpful one or the other way.

3. Respondent C (Working for the last 25 years)

Education and experience both are important in our profession. Education gives us feeling of security; experience makes us better in our job. Our job is to rescue people in crises and to eliminate or prevent the spread of crises/problem as soon as possible. For stress he said an alarm from a hotel or a factory gives more stress than that an alarm received from a

house/flat. More danger and unexpected event we can expect in factories. We do have our certain rules which we follow but all crises are unique in nature. This means that every mission induces some form of stress but past experiences make it easy to work in emergency situation and keep cool. Our work needs people from all age group, from 20 to 60 because we need energy to perform the tough job (This requires young and strong people) we need experience to know how to perform the job efficiently and effectively (experienced personnel).

4. Respondent D (Working for the last 10 years)

What we learn during training and in courses, cannot be compared to real rescue operation. Every accident and crises gives some experience and knowledge. How we perceive a risk can be different from one person to another. An inexperienced person can underestimate or overestimate the risks associated with crises even though he has education. However, after a few years of experience, we start to perceive the risk more correctly and once we perceive the risk correctly it helps us in making viable decision under time pressure. I find myself more confident and less stressful after being 10 years in this branch. Of course we work as a team and in team we try to have young person with energy and person with experience. Education, training and experience all are needed for a successful mission accomplishment.

5. Respondent E (Working for the last 10 years)

We have always courses, education and training. All are very important. Since our job is to help in crises and in emergency situation so stress factor is always there more or less. We also get stressed if accident place is too near and we do not get any time to think and plan before we get there. When we reach at the site without proper plan, see the fire in full size, our stress increases even more there are many situations where experience of many years in this branch helps us to stay cool and calm and do our job in the best possible way. We get education and training but its a big difference between training in simulated situation and facing fire in very unknown and dark place and you have no idea where you are standing in this dark room full with smoke, whether there is a big hole in the floor or any part of roof is going to fall on you, it's a always a great risk. Many rescue operation gives us experience and ability to make suitable decision and work in better way.

6. Respondent F (Working for the last 25 years)

When you are young firemen, you have no idea about the risks associated with fire fighting. This we learn with years of experience. We do training and we always test our equipments to test how effective it is, But real test always comes in real situation. He recalled "Once we were on a fire fighting mission in a high rise building (seventh floor), during the work we realised that we are not getting water with needed pressure to deal with fire. This experience made us to understand the limit of our equipment. It is not good enough for all kind of rescue operation. We need equipment that can deliver water with more force even at higher level. What equipment we have is not good enough to deal with fire in tall and high rise buildings. This knowledge gained through many years of work triggers less stress during fire fighting even if our equipment do not perform as we expect

them. After many years of work and experience, we can think about our own safety also and make decision accordingly.

7. Respondent G (Working for the last 10 years)

We have routines and some standard rules which we have to follow during our mission, we work in a team and we always discuss afterwards to evaluate our actions called debriefing. We imagine for worse scenario so when we get at the site, it does not look so bad and we do not feel stressed so much. During the fire fighting tasks, we must stay calm and take decision based on experience to minimise losses t lives and assets because we do not get chance/time to correct the decision. Often it goes faster when we are calm and we know how to deal with situations. This maturity comes only with experience. One more important thing we learn with experience that if something goes wrong then we can guess what could be the consequences. I think the age between 30 to 50 years is best time to work in this branch as we can combine both energy and experiences. We learn a lot of things in theory and training courses but our profession demands “life long learning” which is synonymous with experiences from various tasks we perform in real rescue operation.

8. Respondent H (Working for the last 25 years)

“Many people are stressed before alarm comes and due to this many get heart deceases” he said. Many of us think that there is no stress but we have stress all the time in our body and mind. We are worried all the time even if we do not realize it.

When one is young, one thinks he can do anything but as we get experience we know our limits. A newly recruited young person has energy and enthusiasm to perform hard work, and person with experienced have not much energy because of age. Both can work in team more effectively. Respondent H thinks 30 – 40 years age is the best period for this work. Combination of both is best. In this job we need people from all ages.

9. Respondent I (Working for the last 25 years)

I was stressed only during the first year of my job and afterwards I never felt such stress. I have never experienced such stress that I am doing something which I should not do. I know what I should do and what I can do. We all are different and see risk in different way. When you are busy in rescue job you have no time to think anything else but focus on the tasks. I have worked so long so now I can evaluate the risk correctly and work accordingly. We have routine and education but experience helps us. When we are young we see risk in other way. As a rescue men young people has difficulty in retreating back in case of danger but after many years experience its easier to retreat back when we see danger

10. Respondent J (Working for the last 25 years)

In this job information, education training and experience all are important. But courses and training are not the same as real event. Education and training makes us understand what to do in an emergency situation and experience gives us ability to perceive the risk and make decision under pressure. I have been here so long and have learnt from our

experience that what we can do and what we cannot do. Time is valuable. We always work under time pressure and experience helps us in making viable decision. Now we have less number of fire accidents but with worse consequences.

11. Respondent K (Working for the last 30 years)

We have so many things to learn to become a rescue man. Education and equipment and training every thing are important. But we gain experience with work. Young people can work hard but to work with efficiency one need experience also so we need both.

12. Respondent L (Working for the last 25 years)

Now we get more alarm but less fire accident. We have routine to follow, every one knows his task. We have education and training and with years we get experience. Age 35 to 45 years is the best time when we have both energy and experience. We always analyse the incident after wards. We must learn to admit that we did a mistake if we did one. Because if we think every thing we do is right then it's a dangerous for our profession. I believe that experience improves our performance (helps us in correct decision making). This is true for every profession. When we are young and no experience then we have difficult to perceive and judge the risk. One can trust his own experience in emergency situation.

13. Respondent M (Working for the last 25 years)

The more you work more you learn. Experience is very important. It helps in perceiving risk and trained us to stay calm and make decision correctly. However, there are many others factors that affect decision making in our mission. Like a novice cannot be as effective as an experienced one. If some friend or relative involve in accident then also it affect our ability. We work in team and education and training is also important.

14. Respondent N (Working for the last 25 years)

When we were young and new at the job, we did such things like underestimating the danger, which we will never do now. I have done such things, which I would never do it now after experience of so many years. With experience I have got ability to perceive the risk more accurately and act accordingly. This helps us in making decision correctly. With passing years we know what is happening and what could happened. It gives stress in different way as we are able to perceive the risk more correctly. To be more effective we always do training and take courses related to this job. To Work under time pressure in emergency situation, we must learn to work and take decision correctly faster, because losing time means losing life and property.

15. Respondent O (Working for the last 25 years)

Education, equipments and training all are very important. But we get better in using all these knowledge and equipments with passing years. Experience reduces stress and gives confidence. We always work in team. In team we are from different age group. People with experience are always in any rescue operation. With experience we learn to perceive the

risk correctly and it helps in taking right decision. All crises situation is different from each other but experience gives us knowledge that how to deal with emergency situation.

16. Respondent P (Working for the last 25 years)

We start with standard routine. And every one knows what his task is but when we are on fire fighting mission and we encounter unknown situation then past experiences become very important for making fast and correct decision. We need to have experience to meet the challenges in future. Even though crises and accidents are never the same but experience helps. We feel less stressed in similar type of rescue operation compared to when I was new in this job.

17. Respondent Q (Working for the last 22 years)

In this job training and education is very important. People think that after many years in job one can do job better. But it's not always true with rescue job. Crises are so different from each other. We work under time pressure and have no time to think. In such situation experience helps in taking decision faster. This is the reason experience is very important in this job. Experience helps us in perceiving the risk and taking decision. Experience makes us understand that what we can/should do or what we can not do. It means experience matters a lot.

18. Respondent R (Working for the last 25 years)

Experience is very important that's why we must work a certain years before we become team leader. Emergency situations are unknown for us in the beginning of this job and we feel stress due to lack of knowledge about the danger. Experience reduces this kind of stress with passing years. With experience we are able to perceive the risk correctly and this knowledge gives stress but at the same time due to experience we know how to deal with the situation and also know our limitations.

Education and training is important as well. Till nine years ago ambulance and rescue department was combined so who ever started the job at the fire station, they had to drive ambulance and handicap bus in the beginning of job and it was a good education to work as a rescue man because then we used to see the injured people and sick people and we learned how to handle them. When we were on rescue operation and saw injured people then it was no shock for us. It means all educations related to emergency situation are good for us.

19. Respondent S (Retired)

We work in a team. We have our routines. Experience is very important in this job. All these crises are never the same but one can learn to decide the tactic from previous experience from same type of event. Experience reduces the kind of stress which we have when we start working as fireman. Training and education we should have continuously. All rescue operation has one form of stress. Education, training and experience are very important to handle the situation under stress and under time pressure. One learns gradually with experience.

One has to perceive the risk correctly and realize the danger before make any decision. When risk is very high and obvious then we do not send people inside for rescue work. This kind of decision can be different from one case to another. If one flat is in fire and some people are inside then we can take bigger risk to save them. But if one factory is in fire then we know that may be gas cylinder or explosion material could be there and then instead of going in we try to block the area

20. Respondent T (Retired)

Stress can increase when something happen suddenly at the accident site or some unexpected events take place

Once we got alarm and we went to the site. We were inside the building, an explosion took place and three of our colleagues got injured. It was stressful moment because there were so many things to be done and it was difficult to decide what to do first. So we followed the rule “life saving is always first”. One should be calm and cool and take viable decision to save life and assets.

In short, I find that almost all the respondent said that experience plays an important role in their day to day tasks of fire fighting or rescue operation. They emphasised that experience at work facilitate correct and fast decision making. Experience also helps them in dealing with stressful situation by providing a picture of the danger and the associated risks.

APPENDIX C

Survey questionnaire

Hur mycket påverkar följande faktorer dina arbetsinsatser?

	Inte alls	Mycket
1: Ålder	1-----2-----3-----4-----5	
2: Hälsa	1-----2-----3-----4-----5	
3: Nattskift	1-----2-----3-----4-----5	
4: Dagskift	1-----2-----3-----4-----5	
5: Utbildning	1-----2-----3-----4-----5	
6: Utbildning inom brandkår	1-----2-----3-----4-----5	
7: Utrustning	1-----2-----3-----4-----5	
8: Erfarenhet inom brandkår	1-----2-----3-----4-----5	
9: Erfarenhet från insatser	1-----2-----3-----4-----5	
10: Information	1-----2-----3-----4-----5	
11: Övning	1-----2-----3-----4-----5	
12: Personlig egenskap	1-----2-----3-----4-----5	
13: Karensdag	1-----2-----3-----4-----5	
14: Familj	1-----2-----3-----4-----5	
15: Lön	1-----2-----3-----4-----5	

Egna kommentarer:

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Tack for medverkan

Renu Sinha

Table 2 Responses from survey questionnaire

Factors that influence decision making under emergency situation

	Influencing Factors	Total points*	1	2	3	4	5
1	Age	60	1	3	8	6	1
2	Health	78		1	1	11	6
3	Night shift	34	7	9	1		1
4	Day shift	32	10	7	1		1
5	Education	68		1	5	9	3
6	Education about rescue job	78		1	4	6	8
7	Equipment	77			4	10	5
8	Experience rescue job	78			3	11	5
9	Experience of rescue operation	78		1	2	10	6
10	Information	71		1	6	9	3
11	Training	79		1	2	9	7
12	Personal quality	72		2	4	9	4
13	No Salary(Karens) day	44	7	3	5	4	
14	Family	48	4	6	5	3	1
15	Salary	63	1	3	7	6	2

How the total points are calculated:

Example: Age

Total points for row 1 (F = Weightage allocated to influence Factor, P = No of persons)

$(1 \cdot P \times 1 \cdot F + 3 \cdot P \times 2 \cdot F + 8 \cdot P \times 3 \cdot F + 6 \cdot P \times 4 \cdot F + 1 \cdot P \times 5 \cdot F) = 60$ points