Decision Making Model of Behaviour in Office Building Fire Evacuations.

by

Wendy Louise Saunders B.A., B.App. Sci., T.S.T.C.,
Grad. Cert of Education.

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Department of Psychology
Faculty of Arts, Victoria University of Technology
Australia

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DECLARATION

I verify that this thesis contains no material which has been accepted for the award of any other degree or diploma in any institute, college or university, and that, to the best of my knowledge and belief, it contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

Wendy Saunders

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ABSTRACT

The purpose of the research was to develop a model of decision making in office building fire evacuations. Data was collected by means of a questionnaire and short film. The questionnaire contained separate fire scenarios that corresponded to the order of cue presentation in the film. For each fire scenario, participants in the study responded to 36 items. The items represented seven constructs of action (continue normal activities, investigate/seek further information, alert/warn others, protective procedures, wait for assistance, fight the fire and evacuate).

The questionnaire and film underwent a multiple testing, modification and refinement and the final list of 36 items in the questionnaire comprised those considered cognitively possible for occupants of office buildings. The film was set in a modern high rise office building in Melbourne. To establish content validity, the film scenario (developed by the researcher) was evaluated by representatives of a number of fire-related professions and the final story, incorporating this technical advice, was based

on a number of real office fires in Melbourne and Sydney.

Two hundred and fifty four naïve participants (148 males and 106 females) recruited by word of mouth and convenience sampling, took part in the study. The sample comprised two groups: office workers and post-secondary students. There were 95 office workers (64 males and 31 females, aged 20 to 60 years) from a number of government organisations and private companies, located in high rise buildings in the central business districts of Melbourne, Canberra and Sydney. The 159 post-secondary students came from two post-secondary institutes in Melbourne (Victoria University of Technology and Swinburne University of Technology). The group comprised 84 males and 75 females aged 18 to 45.

The study investigated seven hypotheses. The first hypothesis predicted a measurable behavioural difference between different categories of cues in office building fire emergencies. Hypothesis 2 predicted that behaviour in response to ambiguous cues would exhibit a greater range of actions than behaviour in response to explicit fire cues, whilst the third hypothesis proposed that response to explicit fire cues (such as smoke and flames) would exhibit a smaller range of actions. Hypothesis 4 predicted that social decision making would dominate responses. The fifth hypothesis related to occupational differences in response to the building fire cues and hypothesis 6 contended that behaviour in response to cues defined as ambiguous (such as disturbances to building systems and equipment and non-informative building alarms) would consist predominately of ignoring the signs and continuing with the tasks at hand. Hypothesis 7 predicted that behaviour in response to explicit fire cues (such as smoke and flames) would consist predominately of protective procedures, preparing to evacuate and evacuation.

There was strong support for Hypotheses 1, and 5 and qualified support for hypotheses 4, 6, and 7. Hypotheses 2 and 3 were not supported. For both students and office workers the great majority of the actions demonstrated significant differences in response to the three visual scenarios. However there were significant differences between the two occupational groups (students and office workers) in response to particular fire cues. These differences were more pronounced in response to ambiguous cues than to explicit fire cues. For both the students and office workers the preferred constructs in response to the computer breakdown were to continue normal activities and to investigate/seek further information. With respect to smoke and flames both groups judged appropriate behaviour to be alerting/warning others, protective procedures and evacuation. Whereas waiting for assistance and evacuation were judged non-preferred or quite unlikely behaviours in response to the computer breakdown. In fact wait for assistance was not a preferred construct for any of the cues and office workers only selected evacuation in response to explicit signs of fire (smoke and flames).

Behaviour in response to explicit fire cues (such as smoke and flames) exhibited greater complexity than that in response to non-explicit fire cues. Responses also displayed stronger commitment to preferred actions in response to smoke and flames. " Social actions" , particularly in response to ambiguous cues, appeared to dominate decision making for both groups. Evacuation as a preferred behaviour increased with the increase in explicit fire cues.

The results of this study provide some support for the conflict model of decision making (Janis & Mann, 1977), task-induced cognitive processing (Hammond et al. 1997) and the impact of negative emotions on choice processing (Luce et al. 1997). There is evidence that problem-focused coping strategies governed cognitive processing in response to ambiguous and that emotion-focused coping strategies dominated cognitive processing of explicit and/or high threat fire cues. Finally as a means for collecting large amounts of reliable and valid data on decision making in building fires, the use of film and questionnaires appears to be a feasible and cost effective method.

Chapter 1

Human Behaviour in Building Fires

Introduction and Statement of the Problem

Research over the past two decades has led to various interpretations and explanations of human behaviour in building fires (Brennan, 1995, 1996; Bryan, 1985, 1986, 1988; Canter, 1980, 1985; Faye & Proulx, 1997; Keating & Loftus, 1984; Proulx & Passini, 1991; Proulx, 1995, 1996; Sime, 1984, 1985, 1988, 1994; Wood, 1972). The majority of fires studied, which form the basis for existing models of human behaviour, are those from which large numbers of fatalities resulted. These occurred mainly in residential, recreational and special accommodation buildings. Consequently the models are descriptive of the general patterns of behaviour observed in non-specific building fires and not of the special case of office building fires. Until relatively recently office building fires were not extensively studied because they were relatively rare and when they did occur, resulted in few, if any fatalities. However, an impetus for the greater understanding of the behaviour of office building occupants has come from international recommendations for the adoption of performance-based building regulations (Beck, 1983, 1991, Johnson & Maclennan, 1991; Mathews et al. 1997;

Proulx & Hadjisophocleous, 1994, Yung & Beck, 1995). These recommendations have stimulated both qualitative and quantitative research into the characteristics of building fire cues and the actions of people in response to these signs, for the purpose of quantification, risk-based assessment and computer modelling of many building classes, including office buildings.

Certain variables and actions which are important components of the general models have little bearing on decision making in an office building environment, where other factors such as role, familiarity with the building and its fire safety systems and training in emergency procedures, warden systems, etc, assume greater significance in determining the decision making processes. Despite the drawbacks of these models, when applied to an office building fire emergency, the database from the research into building fires has provided a comprehensive list of the cues and actions taken by occupants in the circumstances. Some of the models have also offered explanations, or premised their models of the decision making processes, in terms of psychological, sociological and environmental factors.

Traditional Physical Science Model of Behaviour on Building Fires

Historically, research into human behaviour in building fires was motivated partly by a reaction to the widely held views of the media, and partly by the behavioural models developed by engineers and building designers, to describe the response and movement of people in building fire emergencies. The traditional model of human behaviour in building fires (Canter, 1985; Sime, 1994; 1995; Stahl & Archea, 1977), known as the engineering, physical science or "ball-bearing" model, holds that people are non thinking, passive agents who respond to a building alarm by terminating any activity in which they are currently involved and immediately evacuating the area. It assumes that the occupant's primary goal is to escape, that there is no interpersonal communication or co-operation, that people primarily act alone (like individual ball-bearings) and that in extreme circumstances of potential entrapment people panic. Panic produces a competition for the available exits and leads to inappropriate, non-social or asocial behaviour such as trampling over others. In this model, the time taken for people to evacuate is dependent fundamentally on the time taken to physically negotiate their way to the nearest exit and the number of people present in the area (the equations and values used are derived from mathematical equations and numerical parameters from engineering hydraulic flow models). The physical science model does not allow for individual cognitive processes (perception and interpretation of cues, information processing and decision making in response to warning signs), social factors such as the effects of group dynamics and concomitant roles and responsibilities, or environmental cognition factors such as familiarity with the building and its egress systems. No provision is made for any individual differences (physiological or psychological) or external factors that affect the detection of cues or cause delays in the act of evacuation in response to initial warning signs.

Data Collection Methodologies for Human Behaviour in Fires

The first consideration in developing a model of human behaviour in office building fires was to review the literature on research in the area of behaviour in building fires. The findings and models which constituted the available knowledge of human behaviour in building fires were evaluated with respect to their relevance to the development of this model. Studies such as Wood (1972), Canter (1980, 1985), Sime (1984, 1988) Keating and Loftus (1984), Bryan (1985, 1986, 1988), Proulx and Passini (1991), Brennan (1995, 1996), Proulx (1995, 1996), and Faye and Proulx, (1997) have contributed significantly to the general understanding of behaviour in a building fire. Their models are based on general or specific questionnaires, interviews, fire incident reports, police witness statements, and case studies used for the reconstruction of events.

Each of the sources of data for the construction of models have their own strengths and weaknesses. Canter (1985) and Sime (1994), adequately summarised the data sources and their shortcomings. The sources include special commissions and coronial inquiries (such as the Summerland Inquiry, 1974; the coronial inquiry into the Jika Jika fire at Pentridge Jail, 1989; the Kew Cottages coronial investigation, 1997), fire incident reports (Bouchard, 1982), newspaper reports, technical studies (Beck, He, Luo & Stewart, 1995; Gaskin & Yung, 1993; Hokugo, Yung & Hadjisophocleous, 1994, Luo & Beck, 1995), case studies, (Brennan, 1995, 1996, 1997; Bickman et al. 1977, Bryan, 1976; 1983; Canter, 1980; Haber, 1980; Keating & Loftus, 1984; Lo, 1996), questionnaires, interviews, (such as Bryan, 1972, Bryan, DiNenno &

Milke, 1980, Proulx, 1995, 1996, Faye and Proulx, 1997; Wood, 1972), laboratory simulations of possible fire events (Proulx & Sime, 1991), and computer simulations of behaviour in fires (such as Fahy, 1991; Kisko, 1985; Levin, 1989; Ozel, 1985, 1992; Poon & Beck, 1995; Stahl, 1982).

For the purposes of this thesis a brief evaluation of the advantages and limitations of fire incident reports, media reports, technical studies and computer simulations, as sources of data for models of human behaviour in building fires will be included. Although the information from these sources is not discounted, their relevance, reliability and validity is questionable for a number of reasons.

Evaluation of methodologies of data collection.

Fire incident reports are conducted by attending fire brigades. The purpose of these reports is to provide details of the fire incident in terms of the number of fire fighters present and appliances used, times, dates, ignition factors, building classification, casualties, extent of damage, fire spread and other facts related to fighting the fire. Human behaviour is not considered to be (with the exception of criminal arson investigations or fatalities) the primary focus of fire incident reports. Occupant behaviour noted by fire fighters is usually restricted to the rescue and evacuation phases of the operation. Because fire fighters are not present during the early stages of the fire they are unable to witness the initial responses and behavioural sequences of the people involved. However the data from fire incident reports, when statistically analysed, and trends in behaviour identified and summarised, provided the basis of many technical models (for example Gaskin & Yung, 1993).

As a major source of public information on fires, media reports are highly influential but are possibly the least reliable and valid sources of information on human behaviour. Media reports are designed to sell a story and to create public interest. This is often achieved by concentrating on the most vivid aspects of the fire and couching the story in terms of extreme behaviour (panic), victims or heroes. Reporters are rarely present during the initial stages of fires and must rely for their information on selected eyewitness accounts. Time pressure on publication and broadcast deadlines prevents any in-depth analyses, consequently the stories suffer and subjective interpretation and distortion or omission by the witnesses, the reporters and the editors.

Sime (1994) provides an example of media misrepresentation of the facts concerning the Beverly Hills Supperclub fire (Kentucky, USA, 1977) in which 164 people died. British tabloid press headlines screamed "Panic kills 300" (The Sun) and "Panic and 300 Stampede to Death" (Daily Mail).

Technical studies (Beck, He, Luo & Stewart, 1995; Gaskin & Yung, 1993; Hokugo, Yung & Hadjisophocleous, 1994, Luo & Beck, 1995), focus on the physical aspects of building fires and include real and experimental fire tests, as well as investigations of the performance of safety systems and other hardware. Technical studies are concerned with providing data on the non human components of a building fire, the performance of building materials, the response of detection, alarm and suppression systems, and the way in which fire and smoke behaves. Attempts have been made to model human behaviour in these systems, but historically, the traditional approach was often based on engineering first principles (the ball bearing or fluid mechanics approach to human response and movement) and ignored the complexity of the individual and group psychological factors involved.

Computer simulations such as BGRAF (Ozel, 1992), EXIT89 (Fahy, 1991) EvacSim (Poon, 1994; Poon & Beck, 1995) have been used to simulate the physical aspects of a building fire with some provision for the interaction of human beings in the model. Most programs are concerned with the emergency egress behaviour of people in building fires. Data to model the fire environment comes from statistical analysis of fire incident reports, experimental results of fire tests, and the mathematical and physical properties of fire and smoke growth and spread. The human behaviour (responses and interactions) is derived from probability based decision making processes (based on conceptual models developed by fire safety researchers and empirical interview and questionnaire data). The advantage of this method of data generation is that large numbers of simulations, replicating the complexity of the fire event, can be run and consequences investigated. The limitations include the difficulty in establishing the validity of models upon which the simulations are based, (usually in terms of how well the simulation copes with the fire events) and the problem of the loss of descriptive psychosocial properties of the building occupants (such as the affiliation behaviour of occupants or the propensity to ignore initial warning signs), since specific behavioural factors, must by necessity, be in the form of numerical probabilities and times.

Special Commissions of Inquiry are instituted after major fire disasters in order to determine the nature of events and causes, Special Commissions of Inquiry

> " ... conform to judicial procedures, frequently being an adjunct to the coroner's investigation with the objective of apportioning responsibility and proposing measures to reduce the likelihood of similar tragedies in the future."

(Canter, 1985, p. 1)

Recent examples of Special Commissions of Inquiry into fatal building fires (in Victoria), are the coronial inquiry into the Jika Jika fire at Pentridge Jail (1989) and the Kew Cottages coronial investigation (1997).

According to Canter (1985), special commissions of inquiry are limited in their contribution to a more complete understanding of human behaviour in fires. Although they provide valuable and objective documentation of specific incidents or major disasters, the fact that they are such rare occurrences and "do not facilitate the development of a cumulative understanding that can be applied to general classes of event" (Canter, 1985, p. 1) can be seen as a weakness. These inquiries can be extremely influential in forming public opinion and stimulating regulations for improved fire safety, however they often concentrate on the technical aspects of fire events rather than the behavioural responses of those involved. Because they are so time consuming, special commissions of inquiry are not used for minor events such as residential or public building fires in which no or few fatalities occur. It is these minor events that in total, provide a broader description of human behaviour in fires.

In summary the problem of gathering information on the behaviour of human beings in office building fires is complicated by two factors. These fires are fairly rare events and in the overall context of fire research, until recently, the least effort has gone into predicting the behaviour of people in these fires. For the purposes of this review the evaluation of human behaviour in fire will concentrate on explanations derived from laboratory simulations, case studies, interviews, questionnaires and surveys. Media reports, technical studies and computer simulations will be omitted from the discussion.

Cues in Building Fires

An initial process in the development of the model of human behaviour was to identify the relevant and characteristic cues associated with office building fires. These cues were eventually incorporated into the questionnaire and film administered to participants in the study. The literature on cues in building fires revealed a number of approaches to the identification and description of the indications of a building fire. In one approach, researchers (Canter, 1980; Proulx, Pineau, Latour, & Stewart, 1995) presented the survivors of the fires with questionnaires or surveys containing lists of the possible signs that drew the participant's attention to the fire. The participants would be asked to select the signs that made them aware of a possible fire. Other researchers (Brennan 1995, 1997; Keating & Loftus, 1984) relied on survivors' subjective recollections of the fire experience (derived from structured interviews) to supply and describe the cues. The demands of pragmatism and simplification imposed constraints on details of cues in the summarised findings and models of behaviour.

Included under the term laboratory simulations are the experimental examinations of the response of subjects to smoke, warning signs and the visibility of certain signs through smoke (Latane & Darley, 1968; Sime 1983,), evacuation studies comparing response to informative and non informative building alarms (Geyer et al. 1988; Proulx & Sime, 1991) and movement times in building evacuations (Pauls, 1980, 1988). The main advantage of laboratory simulations is that the variables can be controlled and responses precisely recorded. However there are ethical barriers to the replication of certain conditions experienced in a real fire and the artificial laboratory environment does not reproduce the complexity and urgency of the actual event. Nevertheless these studies have provided valuable information on way finding behaviour and response to warning signs under simulated fire and smoke conditions.

Case studies (Bickman et al. 1977; Brennan, 1995, 1996, 1997; Bryan, 1976, 1983; Canter et al. 1980, 1983; Haber, 1980; Keating & Loftus, 1984; Lo, 1996) generally employ interviews to examine a fire incident in as much detail as possible. The advantages of the interview technique include the flexibility permitted to the interviewer in probing responses, clarifying questions or clearing up any misinterpretations. Interviews also provide a rich and spontaneous source of material on the interactive nature of any fire and its specific features and the reasons for certain behaviour in fires. As Canter reports

> "The advantage of this approach is that by taking a set of specific instances and

studying them in detail it is possible to capture, describe and enumerate the complexities underlying any particular incident."

(Canter, 1985, p. 3)

However there are limitations to the interview technique for generating data. Reliability and validity may suffer due to the subjective distortions inherent in reconstructing experiences, and the interpersonal and interviewer biases that may affect the objectivity of the material. Finally, the models constructed from interview data are only relevant to behaviour in specific instances (such as hospital fires, prison fires or domestic fires) and it is dangerous to generalise behaviour across all fires at any but a relatively abstract level.

In contrast the questionnaire or survey technique has the potential to capture, (relatively inexpensively in terms of time and money), large amounts of data on human behaviour in fires. The quality of the data, however, does depend on the soundness of the instrument. Considerable work must be put into the initial developmental stages to ensure that the purpose is reflected in survey design and that questions are clearly formulated to avoid misinterpretation by respondents. Canter (1985) remarks that despite rigorous attention to survey design, bias, reflecting the researcher's perspective on the important determinants of behaviour, or pre-empting of response, may be introduced. For a number of reasons an incomplete or oversimplified picture of behaviour may result. Often there is no opportunity for respondents to elaborate on experiences or introduce salient material into the survey. Surveys rely critically for their validity on the accuracy of people's recollections of a fire incident. When administered remotely, the researcher cannot check completion of responses nor clarify instructions. Finally the return rate for questionnaires varies. In the case of mail outs or where the respondent has responsibility for return of the completed questionnaire, the recovery rate for this method may be so small (reflecting a self-selected sample of the population) that the findings are open to question.

Bickman, Edelman, and McDaniel, (1977) used past research based on questionnaires, surveys and interview material (Breaux et al. 1976; Latane & Darley, 1968, Wood, 1972), to propose four broad categories of cues. The categories were defined as firstly the characteristic properties of the fire such as heat, smoke, flames, noise and the smell of smoke. Secondly were the non-informative alarms associated with a fire such as bells, sirens, or electronic tones. The third category related to the communications and behaviour of other people (such as running for exits) and warnings, telephone calls, public address system messages, shouts and cries for help. The last category was a combination of the previous two categories and included the alarm indications from others such as pre-recorded messages. Each category contains a reasonably comprehensive list of general building fire cues. One category omitted in their classification, is that describing the various disturbances in building systems and services that may be caused by a fire. These cues, including cessation or alterations in electrical, mechanical or communications equipment, may be particularly relevant in the initial stages of office building fires.

In Canter's model of behaviour in building fires (1980, 1985), the emphasis and subsequent classification of cues reside in the interpretation by people as either ambiguous or clear-cut indications of a fire. Based on earlier surveys and interviews (Bryan, 1977; Wood, 1972), Canter identified some specific cues such as: strange noises, smoke, flames, being informed by someone else and smelling smoke, however the model pertains to general building fires. Sime (1994) included alarm bells, non directive, pre-recorded public address messages, informative fire warnings, live directive public address and closed circuit television visual messages, incorporating most of the alarm systems found in office buildings.

The cues described by Keating and Loftus, (1984) included: sensing a noise, smell or change in temperature, smelling smoke or something burning; hearing a roar, unusual noises, the sound of crackling, glass crashing, and hearing the shouts or screams of others or someone knocking on their door and seeing lights flicker or go on and off. Derived from a large sample (357 interviewed survivors of mainly residential building fires in Seattle and New York), the list is a valid and comprehensive coverage of residential building fire cues. However certain cues relevant to office building fires, such as building alarms, equipment disturbances and instructions from fire safety teams or wardens, were not included.

A similar omission is evident in the model of resident response to a high-rise apartment block fire (Proulx, Pineau, Latour, & Stewart, 1995). Using a sample of 219 questionnaire responses from residents, the researchers identified the most frequently recalled cues as the sound of the fire alarm; being told of the fire by other occupants, seeing smoke, smelling smoke, seeing fire trucks, hearing the sound of movement, or the building alarm.

Finally, Brennan's study (1995), based on structured interviews with 29 survivors of an office building fire, divided cues into intrinsic (fire and building cues, personal resources) and explicit (the behaviour and communications of others) signs of fire. Both categories span sensory (smelling smoke and burning plastic, seeing smoke, hearing unusual noises from others) and sociopsychological cues (instructions to leave, observing the behaviour of others, awareness/fear of the danger of smoke and flames, anxiety associated with the physical problem of breathing and mobility, observing others retreating).

<u>Catalogue of Actions in Building Fires</u>

Identification and cataloguing of actions in building fires was pioneered by Wood, (1972), and augmented and refined by subsequent researchers (Bickman, Edelman and McDaniel, 1977; Bryan 1986; Canter, 1980, 1985; Proulx, 1991, 1995, 1997; Proulx & Sime, 1991; Sime, 1985, 1994) Wood compiled a list of 29 behaviours that summarised the actions of occupants in building fires. The actions or items of behaviour were derived from material collected from surveys and questionnaires. The identification of these actions was based on 2193 post fire interviews conducted by

British fire personnel at the scenes of 952 fire incidents. The data came from a wide range of different types of building fires (office fires represented less than one percent of 952 fires studied) and the purpose of his study was to examine behaviour at a general level with particular reference to two behavioural variables - evacuation of the building and movement through smoke. The analysis concentrated generally on frequency of occurrence of various actions and intensively on building evacuation and movement through smoke. Wood's study produced the first classification of actions in response to a building fire based on the most frequent first actions in response to fire cues. These were: (a) some fire-fighting action; (b) contact the Fire Brigade; (c) investigate the fire; (d) warn others; (e) something to minimise the danger; (f) evacuate oneself from the building; (g) evacuate others from the building.

Bickman, Edelman and McDaniel, (1977) used the term "coping behaviour" in their model (Figure 1.1) to categorise the 29 behaviours postulated by Wood (1972). The categories included: suppress/contain fire; warn/rescue others; activate alarm system/; protect self; remove property from the fire; seek information; preparation for further action; panic, no action; and escape.

Canter (1980) used the data from a UK sample of 578 questionnaires (261 males; 310 females; modal age 16 - 35 years) distributed by fire brigade officers to victims of the fires, to identify the actions of people during the development of the fire. Eighty percent of the fires surveyed were non-severe domestic fires. Office building fires represented 4% of the total. Response to the cues included the categories: investigation; continue previous activity; ask someone to look and no response. Frequency of response analysis yielded items such as: have a closer look, combat/contain fire, warn others; call the fire brigade, organise others, attempt to bring others to safety. His model (Canter, Breaux & Sime, 1980) condensed the diverse individual actions into the behavioural categories: ignore; investigate; instruct; explore; withdraw; evacuate; fight; warn; wait.

In a similar fashion, Bryan, (1983) used the data from 743 questionnaire responses (representing 394 fire incidents - a large number of which were health care occupancies), to develop a classification of actions (Table 1.1). His summary of the behavioural response patterns across all fires included the categories: investigation; alerting; fire fighting; evacuation; protective procedures.

Table 1.1

Categories of Behaviour in Building Fires (Bryan, 1983)

Category	Actions
1. Investigation	Investigated cues. Discovered fire. Searched for fire.
2. Alerting	Pulled manual fire alarm. Called operator. Called fire department. Alerted other staff. Notified others. Had others call fire department. Entered building. Went to fire alarm. Telephoned others or relatives. Woke up.
3. Fire fighting	Got extinguisher. Attempt extinguishment. Fought fire. Went to fire area. Removed fuel.
4. Evacuation	Rescued threatened patients. Evacuated patients. Attempted rescue. Got dressed. Left building. Got family. Left area. Got personal property. Tried to exit.

	Closed doors.
	Directed operations.
	Stood by.
	Ventilated (opened doors/windows.
5. Protective procedures	Performed first aid.
	Turned off appliances.
	Did nothing.
	Checked on pets.
	Await fire department arrival.
	Removed by fire department.

Keating and Loftus (1984) from their interviews with 357 survivors of residential building fires identified the most common early behaviours in the fires as misinterpretation or ignoring ambiguous cues, investigation, fetching things to fight the fire and searching for or checking on other people.

First Actions in Response to Fire Cues

Wood (1972), found that the order of most frequent general behaviour in building fires was: concern with evacuating oneself or other people; concern with fire-fighting or containing the fire; concern with warning or alerting others. The actions which were the most frequent first actions, in order were: (a) some fire-fighting action; (b) contact fire brigade; (c) investigate fire; (d) warn others; (e) something to minimise the danger; (f) evacuate oneself from the building; (g) evacuate others from the building.

Canter (1980), identified the most frequent first acts (from 578 questionnaires across all types of fires and cues) as: have a closer look; combat or contain the fire; warn others; call the fire brigade. Utilising Canter's British findings, Bryan, (1988) compared the most frequent first actions of a sample of 2193 British and 580 US responses from people involved in building fire incidents. He reported ten statistically significant differences between the British and US populations: The US population predominated in the following five categories of first actions: (a) notified others; (b) got dressed; (c) got family; (d) left the area; (e) entered the building. The British population predominated in a different set of first five actions: (a) fought fire; (b) went to the fire area; (c) closed the door to the fire area; (d) pulled the fire alarm; (e) turned off appliances.

Summarising two decades of UK research, Ramachandran (1990), reports that the findings support the observed tendency for people to initially investigate or seek further information about fire.

> "Early behaviour is characterised by uncertainty, misinterpretation, indecisiveness and seeking additional information for confirmation - the 'gathering phase'."

(Ramachandran, 1990, p. 154)

The predominance of primarily investigative behaviour by people in building fires is further supported by Proulx, Pineau, Latour, Stewart, (1995), who found that the first actions (in order of frequency) from a mailed questionnaire to 219 residents of a 30 storey apartment building, were: investigation (checked apartment/corridors, looked out of windows, felt the door); waited, sought information (called building management, talked to neighbours, or called 911); alerted others; took some form of protective action. In a later study (Fahy & Proulx, 1997) on the World Trade Centre plaza fire of 1993, (questionnaire responses of 406 occupant members of the fire safety team - wardens, etc) the researchers identified: seek information; alert or report; seek refuge; wait; assist others, investigate as the most frequent first actions. Similarly, Lo (1996), using interview responses of 64 families involved in a multi-tenanted high rise building fire, found that the most common first actions were: evacuation of self/others; investigation of the fire/contacting the fire brigade/warning others.

Effects of Cues on Behaviour in Building Fires

Perceived threat of the fire situation is often determined by the way in which the individual is alerted to the fire (Brennan, 1995, 1996; Bryan, 1985, 1986, 1988; Canter, 1980, 1985; Faye & Proulx, 1997; Keating & Loftus, 1984; Proulx & Passini, 1991; Proulx, 1995, 1996; Sime, 1984, 1988; Wood, 1972). Physical cues associated with fire such as the smell or presence of smoke, visible flames and excessive heat are usually regarded as indications of a serious threat. However in the early stages of a fire the cues are often ambiguous and may be disregarded or misinterpreted (Canter, 1980, Levin, 1985). The recognition of these cues as indicators of a serious fire emergency may also be inhibited by the presence and communications of other people. Social inhibition (Latane & Darley, 1968; Keating & Loftus, 1984), cause individuals to underrate the seriousness of the cues. This may be coupled with a lack of designation of responsibilities in an emergency resulting in confusing advice and directions. Sime (1994) had also identified the tendency of authorities to downplay the severity of a fire to building occupants, which further complicated interpretation of cues.

Keating and Loftus (1984) found in their study of residential fires that the most frequent initial detection of fire cues was by auditory rather than olfactory or visual means. This was more pronounced in the cases of more serious fires (as determined by large property loss) and when the respondents were asleep (alerted by smoke detectors). Keating (1985) contended that under increased anxiety the focus of attention narrows and the individual can only process the most obvious features of the environment. Where others are present and the situation is ambiguous, the individual may imitate the actions of significant others. High stress will cause reversion to the familiar, that is, the use of everyday or normal egress routes to escape from the emergency.

When the responses of two large samples were compared (Keating & Loftus, 1984), early behaviours were consistent. Ambiguous cues were frequently misinterpreted or ignored - people received warnings or requested information, investigated and noted the development of the fire.

Levin (1985) developed a classification of the levels of ambiguity of fire cues (Table 1.2), based on initial interpretations of the cues by survivors of residential fires, and relationship to first action (data collected by Keating and Loftus, 1984, from the interviews with 106 survivors of house fires). He proposed that the delay in response was largely a function of two factors. These factors were the level of responsibility of the person and the level of ambiguity of the cues. If the cue was ambiguous then the delay in response was greatest and the most likely response was to seek further information.

Table 1.2

Relationship of the First Action to the Interpretation of Fire Cues (Levin, 1989)

Ambiguity Class

Action	A	B	C	D	Sub-total	%
Seek Information	41	11	6	0	58	55%
(% of class)	87%	55%	35%	0%		
Call Fire department	0	3	1	4	8	8%
Alert Others	1	3	2	5	11	10%
Fight fire	0	0	1	11	12	11%
Evacuate incapable	1	3	4	2	10	9%
Other	4	0	3	0	7	7%
Sub-total	47	20	17	22	106	
%	44	19	16	21		100

A the respondent believes there may be a fire.
B the respondent believes it is likely there is a fire.

C the respondent is sure there is a fire and has seen enough smoke to believe it is a dangerous fire.

D the respondent has seen the flames and the fire may or may not be dangerous.

Levin (1989) concluded, from a purely outcome based approach, that if the cues were ambiguous, the first significant response would be to investigate. In situations where the cues became more defined, the probability decreased of investigation being the first response. This view was supported by Canter's (1980), summary of behaviour across many types of building fires. He reported that people became definitely aware of a fire due to the following factors (in order): upon investigation; they were told by someone else; they were interrupted by smoke and flames; they were present when the fire started, they accidentally noticed the fire.

Finally, Lo, (1996), determined from the interviews of 64 families involved in a multi-tenanted high rise building fire in Hong Kong, that the relationship between cue and first action was predominantly investigation to ambiguous cues such as others shouting and the fire alarm (Table 1.3).

Table 1.3

A Brief Comparison of the First Action of People (Lo, 1996, p. 21)

		First	Action	
Cue	Evacuate %	Alert others %	Search for information %	Ignore the cue %
Smoke	18	46	27	9
Shouting	-	-	100	-
Fire alarm	10	-	70	20
Informed by others	57	29	14	-

Alarm Systems (Informative and Non-informative) as Cues

Of particular relevance to the model of behaviour in office building fires is the occupants' response to building alarms. Numerous studies of the reaction of people to building alarm systems (Bellamy & Geyer, 1990; Breen, 1985; Fahy & Sapochetti, 1999; Gardner, 1996; Kahn, 1984; Keating & Loftus, 1977; Moore, 1988; Proulx, 1997; Proulx, 1998; Proulx & Sime, 1991; Proulx, Larouche, & Latour, 1995) have found delays in response (particularly evacuation), unless other cues (such as directive communications from staff, smoke or flames) were present. Delays were found to be associated with the tendency to ignore the alarm (Gardner, 1996), the need for more information and confirmation of evacuation (Gardner, 1996; Horasan & Johnson, 1995), or to answer questions regarding the interpretation of the alarm (Gardner, 1996). Short delays in response to building alarms in office building evacuations appeared to be a function of the training of the occupants, the audibility of the alarm and the presence of wardens to instruct and assist evacuation (Fahy & Sapochetti, 1999). Bickman, Edelman and McDaniel, (1977), and Ramachandran (1990), postulated that occupants of buildings are often equivocal about fire alarms indicating a real fire, believing them to be tests or false alarms.

Explanations of Human Behaviour in Building Fires

The earliest attempt to explain human behaviour in fires (Wood, 1972) defined behaviour as "what people did and what actions they took." This was an uncomplicated definition, however it relied on the accurate and honest recall of survivors. Although the study identified the number of buildings involved in fire incidents by their type of occupancy (domestic fires, office buildings, etc) this factor was not taken into account in most of the analyses of behaviours. Wood did however comment on an interesting similarity between behaviour at work and at home as indicated by the co-operative nature of actions shown in the work environment. The study approximated a normal distribution of the population involved in building fire incidents, (57% male, 43% female), with age skewed towards younger people (modal age 30 - 39 years old). Wood identified 29 coping behaviours

Wood (1972) acknowledged that he did not explicitly attempt to assess the adequacy of the behavioural response in relation to the fire and admitted a lack of satisfaction with the unstructured nature of questions relating to the courses of action. For the purpose of predicting behavioural response to specific cues (fire alarm, smoke, warning communications, etc) no qualitative or quantitative connections were made in the model. There were very few office fires in the sample (0.6%) and therefore it is difficult to draw any significant conclusions about the behaviour of people in office building fires from this general study.

Wood (1972) was aware of the limitations of the study and did not attempt to explain behaviour in terms of cognitive processes or to analyse the strengths of association between individual actions.

> "To construct a detailed model of behaviour in fires, future studies will

> be required to concentrate on other aspects, such as raising the alarm, contacting the Fire Brigade and fire fighting behaviour. However, it was not, nor will it be, possible to conduct a single large study on all these factors using the present method of data collection. It would be unreasonable to expect Fire Service personnel to conduct extensive and lengthy interviews at the scene of the fire, when the utilisation of men and machines is at such a premium."

(Wood, 1972, p. 2)

Bickman, Edelman and McDaniel (1977) incorporated some findings from the area of social psychology and adapted the coping behaviours derived from Wood's (1972) survey analysis, to produce a conceptual model of the logical flow of human behaviour in a fire emergency situation. The model (Figure 1.1), involves three stages:

1. Detection of the cues indicating a fire incident. These cues may be physical characteristics (smoke, smell, flames), alarms, and/or the actions and communications of other people.

2. Definition of the situation which depends on the nature of the cues and combinations of internal individual and external environmental factors.
3. Coping behaviour is a categorisation of the 29 behaviours postulated by Wood (1972).

The integration of an individual into this model is conditional upon detection of environmental fire cues. Definition of the situation as a fire develops is a function of new information provided by the fire itself or other environmental and social sources. The individual is depicted in this model as reacting to the environment with the emphasis upon the importance of perceptual stimuli and how they impact on the individual, rather than the cognitive processes involved in interpreting the situation and driving behaviour. The coping behaviours represent a reasonably complete list of those available in a fire emergency, but there is no provision within the model to connect them in any predictive way with the subjective appraisals of the situational cues.

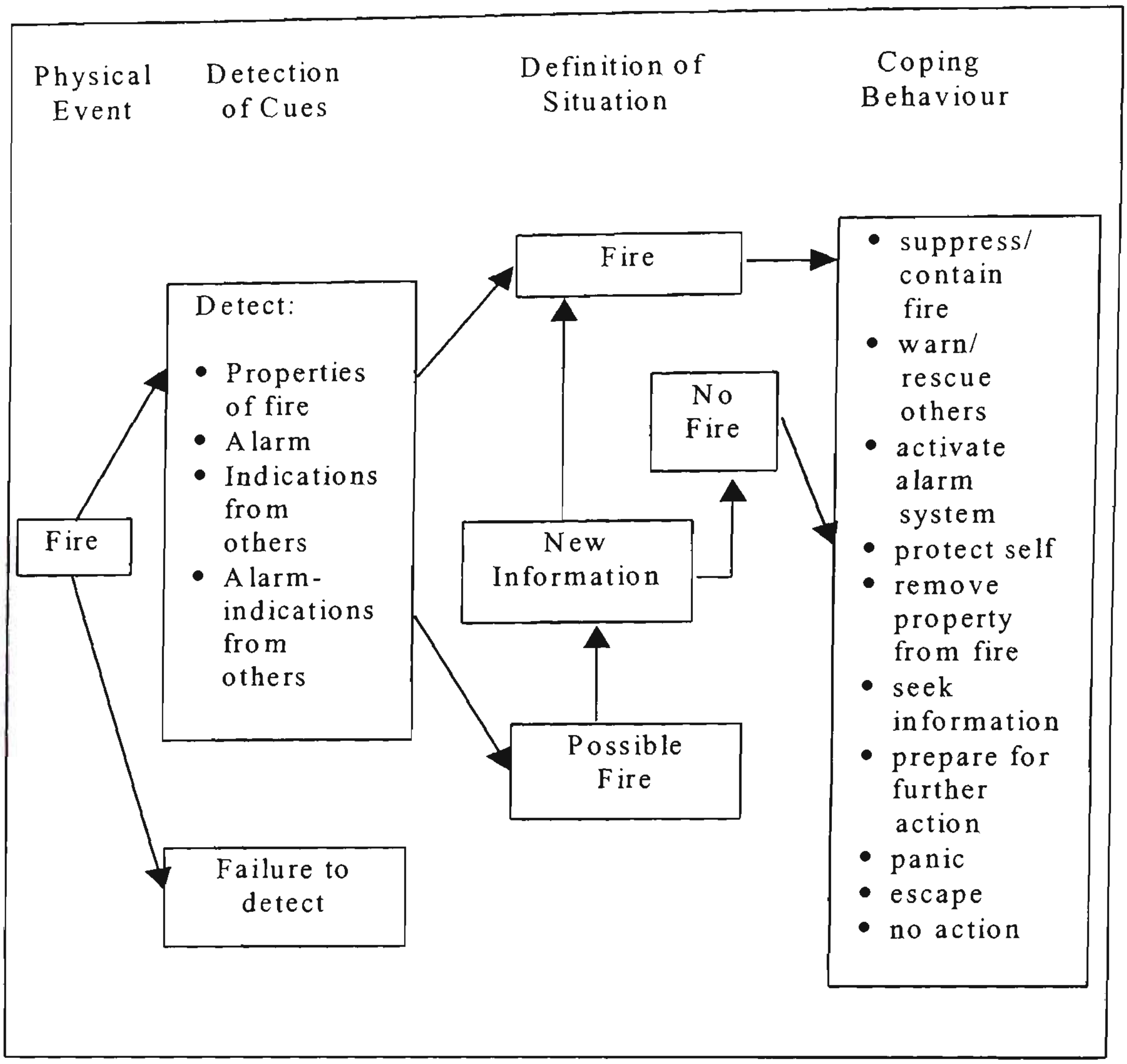


Figure 1.1

Model of human behaviour in a fire emergency Flow diagram (Bickman et al. 1977, p. 24)

Canter, Breaux, and Sime (1980) developed a broad model of behaviour in building fire emergencies based on structured interviews with survivors of building fires. A standard dictionary of acts was derived from the transcripts and a transition matrix (likelihood of each act giving rise to every other act) developed. Canter et al. (1980) were able to determine the sequences with which various groups ('equivalence' groups) of actions occurred and identified patterns common to all fires investigated. Their model distinguished nodal points (points of potential sequence change) and from this they proposed a general conceptual model of behaviour in building fires (Figure 1.2). The model suggested that an individual receives initial cues and in response investigates or misinterprets these initial cues. If, after investigation, a fire is apparent, the individual will try to acquire further information, contact others or leave. The individual will then confront the fire, interact with others or escape.

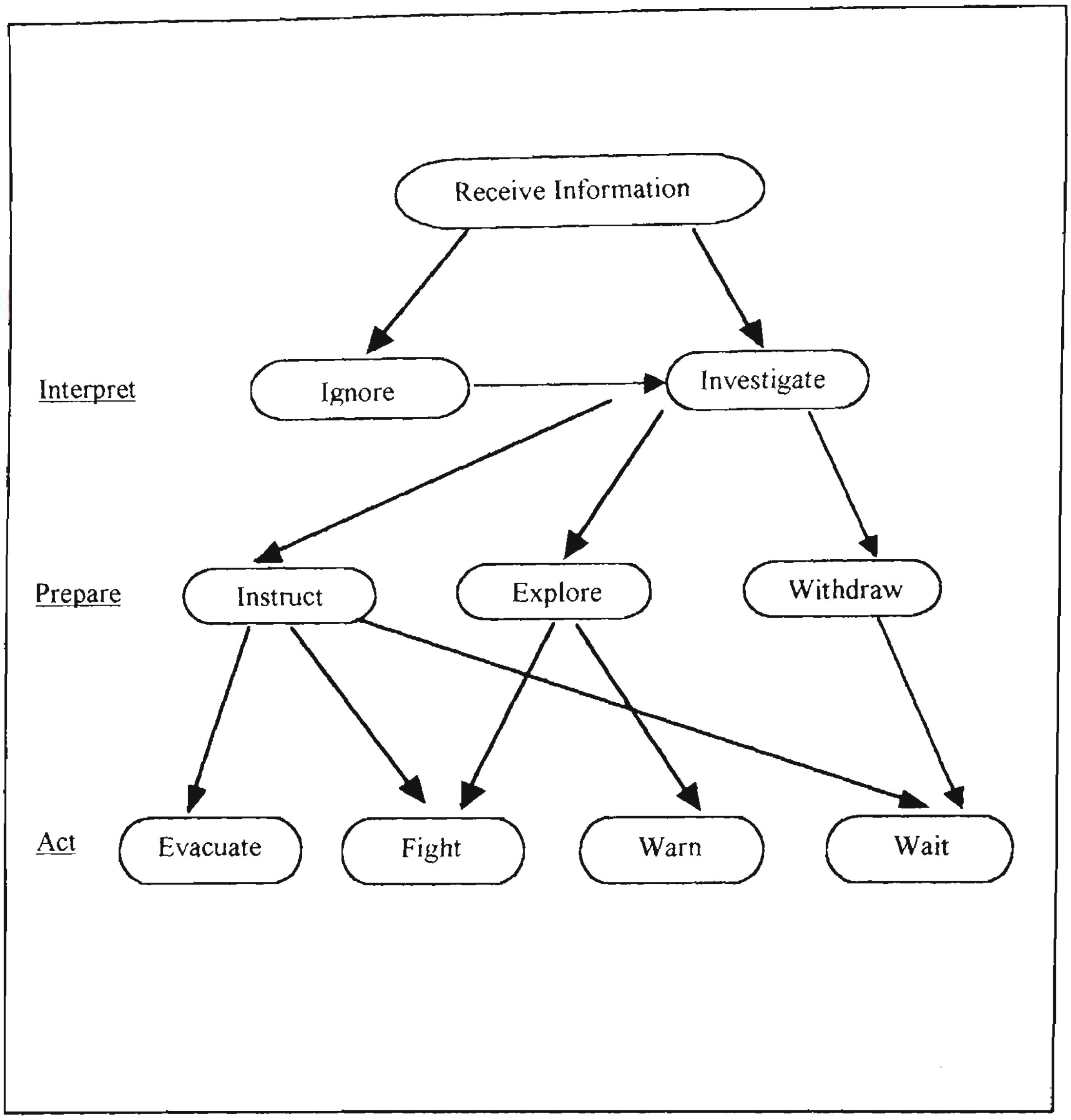


Figure 1.2

Summary of general model of human behaviour in fires. (Canter, Breaux & Sime, 1980, p. 134).

The cognitive processes alluded to in the model are recognition, interpretation and validation of the cues resulting in some kind of action (or in some cases - no action).

In an overview of studies of human behaviour in fires based on British data and supported by North American research, Canter (1985) refined the original model. The model incorporated action sequences as they related directly to behaviour in fires, thus establishing two broad ways of thinking about human behaviour in fires. The conceptualisation was in terms of the stages in the human responses to the fire development, the building's fire protection systems, the organisational structure, and the contribution of a person's role in the situation. He proposed that behaviour in fires is a rational attempt to cope with rapidly changing, ambiguous circumstances. The behaviour is characterised by the search for confirmatory information and the emergence of a series of actions, (that increased in variety as the experience of the fire event developed), each a consequence of an earlier decision. The model stressed that people act on *their* definition of the situation. If the cues are ambiguous or there is an assumption that other people are in charge, the response of individuals to a fire emergency will be affected.

Canter admitted that the findings were of general value only and listed many recommendations for future research. Although many of the physical, social and psychological factors that affect behaviour in building fires have been identified, the relative effects of these factors and their interactions, have not been quantified. This criticism also applies to identification of the cues used to recognise a fire and the effects of combinations of these cues on behaviour. Although alluded to in the model, the social mechanisms of decision making and cognitive processing involved in the misinterpretation of ambiguous cues are not sufficiently detailed.

Bryan (1988) attempted to incorporate a cognitive processing heuristic into human behaviour in fires. He adapted the model of individual cognitive processing model (discussed in a later chapter) originally proposed by Withey (1962) as representing critical factors in the perception of a fire incident. There is no attempt, however, to quantitatively connect these processes to his findings. Bryan's model is based on data collected from a large number of residential building fire incidents in Great Britain (Canter, 1980; Wood, 1972) and the United

States, laboratory studies (Kahn, 1984; Nober et al. 1981), research into inhibition of bystander reaction to emergencies (Latane & Darley, 1968) and conceptual models of decision processes in building fire emergencies (Breaux et al. 1976). Data was in the form of frequencies of first and subsequent actions of occupants, relative to country and gender. Comparisons were made between populations, sex and age, regarding fire fighting and re-entry behaviour, reasons for not evacuating and distances moved through smoke. Bryan offered some explanation of the social behaviour (such as the formation of convergence clusters to reduce the anxiety and stress of a life-threatening situation) of hotel guests in large fires (Bryan, 1985). Testing and subsequent scaling of the threat related variables (Figure 1.3) however, has not been operationalised. Bryan's model assumed that the reaction to fire emergency is related to the role assumed by occupants, their previous experience of fires, their education and personality, the perceived threat of the fire situation, the physical characteristics and means of egress available and the actions of others who shared the experience. He proposed that most behaviour in fires is determined by information analysis, resulting in co-operative and altruistic actions. Although there is an attempt to incorporate some cognitive factors into his behaviour dynamics model, there are no means for determining the values of the variables on the continua.

Bryan (1980) encapsulated the changing processes (as defined by Withey, 1962) of recognition, validation, definition, evaluation, commitment and reassessment in a behavioural dynamics model (Figure 1.3) that showed the escalation of stress with increases in the magnitude, velocity or intensity of a number of variables. The variables are:

1. Probability of the threat (from low to high)
2. Nature of the threat (from mild to severe)
3. Deprivation by the threat (from property to life)
4. Time available to escape threat (from indefinite to immediate)
5. Escape from the threat (from assured to doubtful)

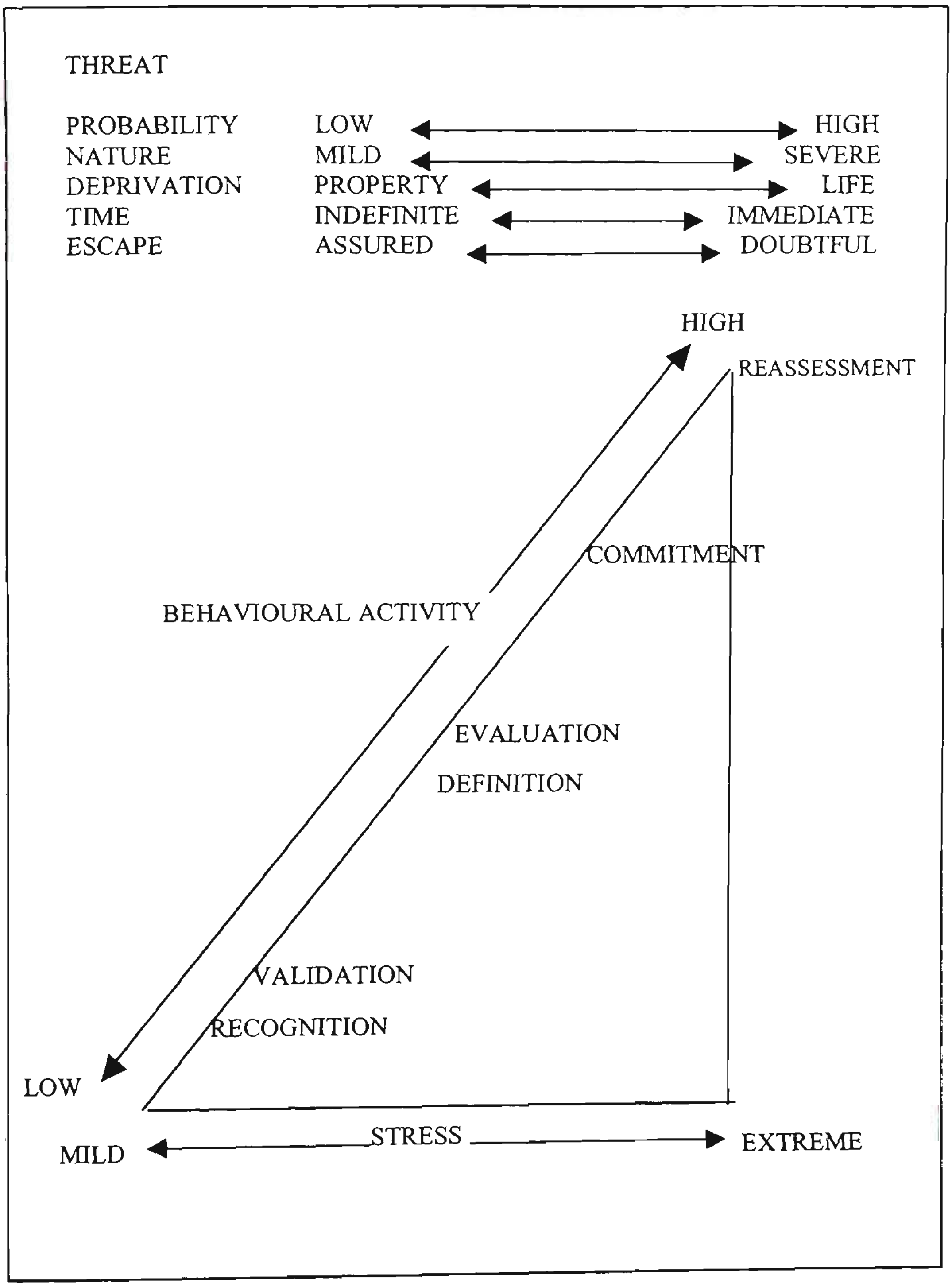


Figure 1.3

The behavioural activity dynamics of the individual in a fire incident (Bryan, 1986, 1-20).

Various models and theories have identified the importance of the social context in which a building fire occurs and the influence of the group on the perception and interpretation of cues and subsequent response. Latane and Darley (1968) noted the importance of group inhibition in influencing the interpretation of fire related cues. Their study involved American male undergraduate students given a questionnaire task to complete whilst the room gradually filled with smoke. The dependent variable was the length of time an individual remained in the room before leaving to report the smoke. The conditions were manipulated to study the effects of others on the decision making process. Three groups were observed. One group consisted of an individual subject alone in a room, the second group consisted of a single naive subject and two confederates (who showed indifference to the smoke) acting as naive subjects and the third group consisted of three naive subjects. The subjects were less likely to report the smoke when in the presence of passive others (10%), or in naive groups (38%) than when alone (75%). The naive subjects appeared to be have been misled by the apparent inaction of others into adopting a non-emergency interpretation of the cues. This resulted in passive behaviour. The explanations for this response include the effects of the presence of others in reducing individual fear and increasing the ability to cope with fire. Latane and Darley summarised this as diffusion of responsibility.

> "if an individual is alone when he notices an emergency he is solely responsible for coping with it. If he believes others are also present, he may feel that his own responsibility for taking action is lessened, making him less likely to help".

(Latane & Darley, 1968, p. 215)

Latane and Darley (1986) contended that the decision making processes of an individual, in an emergency, involve the following implicit or explicit preliminary steps. The person must perceive the event, they must interpret it as an emergency and finally the individual must decide that it is their personal responsibility to act. When faced with a possibly threatening event, an individual may look to the reactions of surrounding people. If others do not respond then the likely interpretation is that the situation is that it is not serious and hence the individual will not act. This was compared with their findings in the aforementioned experiment that individuals (male subjects in this case), attempted to appear more courageous in a threatening situation, when being observed, than when alone. The effects of the group on reducing fear, even in circumstances where the danger is not reduced, has been observed and the subjects reported that the presence of others increased their ability to cope.

Sime (1984, 1985) developed a model which predicted that in an emergency people are even more likely to be drawn towards the familiar than under normal circumstances. This was based on the premise (which he argued was supported by the results of his studies (for example the 1973 Marquee Showbar fire - Summerland Leisure Complex, Isle of Man, which killed 50 people), that because attachment has primary survival value it would take precedence over escape behaviour. He proposed that a serious fire threat does not involve a complete disintegration of affiliations to place or person and the pattern of human movement both towards and away from the danger will be mediated by the degree of familiarity of the individual to accessible persons or places. The most important factors influencing the direction of movement were a combination of a person's role (and by definition familiarity with a particular escape route), affiliative ties to individuals located elsewhere in the building and consequent proximity to one or other exit. An implication of this model was the important influence of group behaviour on individual decision making in a physically threatening situation.

Both Canter (1985) and Bryan (1986) proposed models that contained provisions for the understanding and prediction of human responses to building fires, based on expected behaviour as a function of roles and associated rules (obligations and duties which individuals are expected to carry out). Their models are founded on the assumption that people are goal-oriented and that these goals which motivate or explain behaviour, at a particular time, are a function of the individual's role in the organisation or social setting. Certain expectations or expected actions are associated with these roles.

> "These role or situation related expectations may be referred to as 'rules'. These are the principles of action which typically underlie behaviour in a given situation."
>
> (Canter, 1985, p. 20)

They suggest that behaviour in a fire is a rational attempt to cope with rapidly changing, ambiguous circumstances. Behaviour in this situation is characterised by a search for information and the sequence of actions which emerge are the results of a complex interaction of factors. These include physical aspects of the building and its fire protection systems, the nature of occupancy, organisational influences and previous experience and training in a fire situation.

Brennan (1995, 1996, 1997) based her explanation of human behaviour on information provided in detailed interviews (Behavioural Sequence Interview Technique as developed by Keating and Loftus, 1984) with a number of people involved in office building fires. Her technique relied on the recall of people's perceptions and reasons for behaviour using a two stage structured interview process. Brennan's research focused on behaviour in the period prior to evacuation, particularly the detection and assessment of fire-related cues and the social factors that influence decision making in office building fire emergencies. In contrast to previous outcome-based interpretations (derived from interviews and surveys) Brennan rationalised the observed behaviour in terms of the underlying psychological and social factors. In regard to the behaviour of office building occupants in a fire emergency Brennan (1995) reported that the most common behaviour was movement towards other people.

Brennan's (1995) findings concur with Keating and Loftus (1984) that the presence of other people appeared to have an inhibiting effect on identifying the situation as a threat, especially for people (staff) who do not have responsibility for others. Social or work groups, roles and responsibilities were identified as important behavioural determinants, with an observed preference for people to remain in work groups during the fire emergency and evacuation.

The presence of others and the concomitant process of social validation underlies many emergency decision making models and has been identified as being responsible for the formation of groups in threat situations prior to or during flight or fight situations (Bryan, 1985), for information seeking (Canter, 1985, Bryan, 1988), affiliation (Sime, 1984), formation of new norms in situations where traditional norms are disrupted (Perry, 1979), and social evaluation (Cialdini, 1988; Schacter, 1959). According to Brennan (1995) and Perry, (1979), communicating with others appears be an attempt to reduce confusion and make sense of a de-stabilised situation, allowing some individuals to evaluate their own responses through the use of peripheral social evidence based on the responses of others (such as comments, actions and instructions).

In emergencies, people rely on those in authority for directions (Brennan, 1996; Keating, 1984; Sime, 1983; 1985; 1994). In the case of office building fires there is evidence from interviews with survivors (Brennan, 1996), that role, responsibility, degree of formality and status difference determine people's decision making autonomy. In everyday circumstances there is conspicuous dependence on managerial/executive decision making often manifest in emergencies as a reluctance to begin evacuation until instructed by the employer.

Stress Models of Decision Making in Building Fires

Some models of behaviour in building fires have incorporated the influence of anxiety and stress on decision making. Proulx and Passini (1991) developed a stress model to account for the different stress stages experienced by individuals in a fire emergency. Their model drew from the literature concerning information processing, decision making and problem solving (Benzur & Breznitz, 1981; Bronner, 1982; Englander & Tyszka, 1980; Eysenck, 1983; Groner et al. 1983; Idzikowski & Baddeley, 1983; Janis & Mann, 1977; Kahneman & Tversky, 1982; Lazarus, 1966; Scholz, 1983; Schonpflug, 1983) and emphasised the disturbing effects of psychological stress on cognitive operations. The stress model consisted of four loops to accommodate the spiralling increase of unresolved stress due to the pressure of time, and the cognitive and emotional effort of resolving ambiguous or unexpected and unfamiliar circumstances.

Information processed by the individual was integrated along with their emotional state. The source of available information was provided by direct perception, inference, or prior knowledge of the situation. Proulx and Passini (1991) made general predictions of behaviour based on past research (Canter, 1980; Sime 1985) for each stage of their model. However the predictions are limited to the development and resolution of stress in ambiguous circumstances and do not delineate qualitatively or quantitatively expected actions, in later stages of the fire, other than information seeking. This was possibly explained by the underlying rationale of the authors who argued that provision of specific information on the current nature and location of the fire to building occupants, will reduce stress and ineffective decision making, to produce the desired outcome of efficient evacuation.

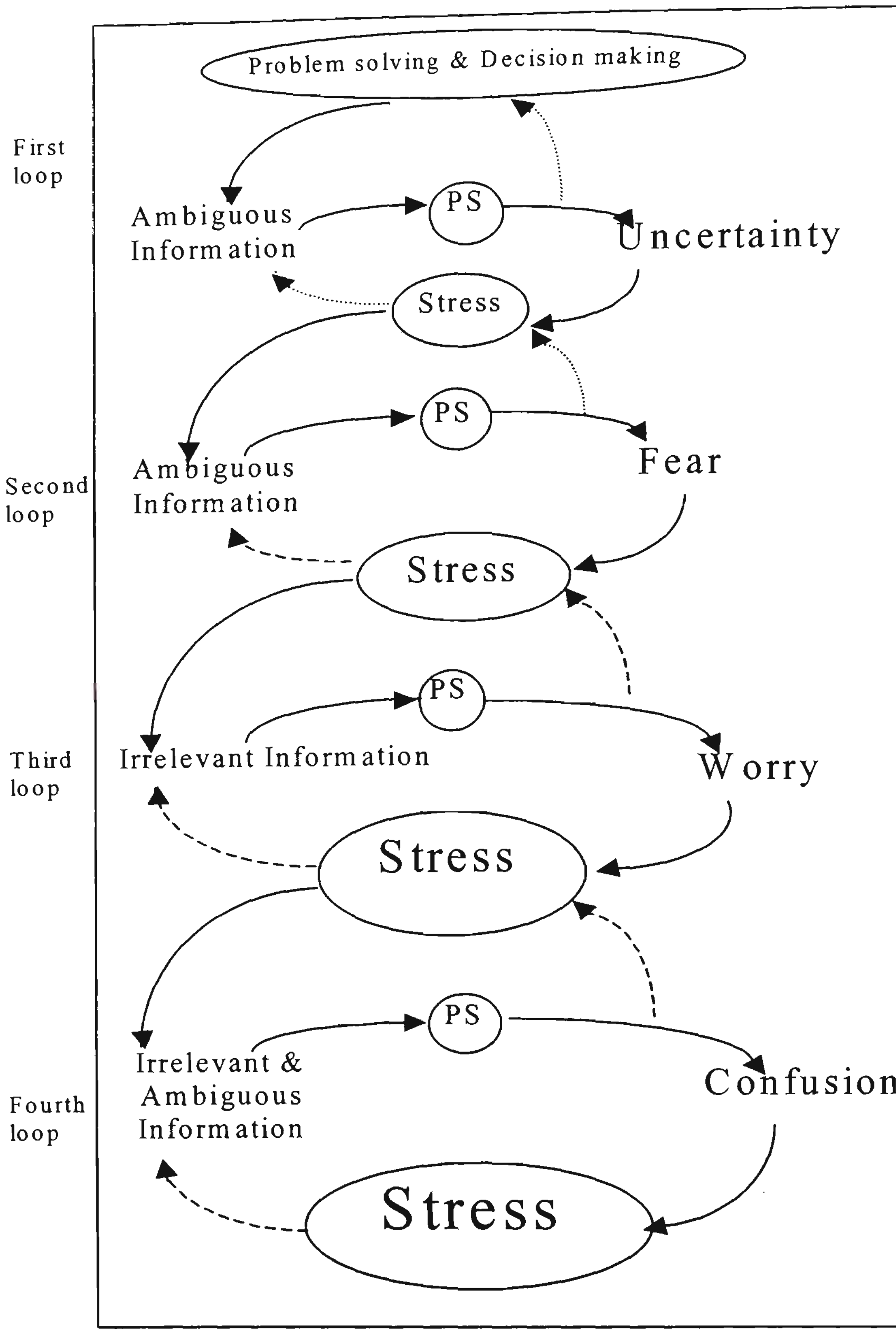


Figure 1.4

Stress Model (Proulx & Passini, 1991, p. 24)

Gender Differences in Behaviour

Gender differences in behaviour in building fires, have been found in some studies. Keating and Loftus (1984) reported that in some occupancies there was a tendency for males to approach and try to deal with the fire until it became too serious and females to warn or alert others of the presence of fire and call for help. This concurred with the findings of Wood (1972) and Bryan (1988) that females tended to alert others/call the fire department and call for help (most frequent responses were to receive or request information, followed by advise, instruct others) whilst males were more likely to approach and fight the fire (get fire extinguisher, fight fire), less likely to leave the building and more likely to return if they did.

Canter (1985) explained the variation in response to domestic fires in terms of male/female differences, where females were more likely to warn others and wait for further information or close the door to the room of the fire origin and leave the house. He found that females were more likely to seek assistance from neighbours, whereas male occupants were more likely to fight the fire, and male neighbours were more likely to search for people and attempt rescue. In contrast, Proulx, Pineau, Latour, Stewart, (1995) found no significant differences ($N = 219$, $\chi2\ (4) = 2.01$, $p = 0.73$) between the actions taken by males and females in a domestic (high-rise apartment) fire.

Summary

For the purposes of building a model of human behaviour in office building fire evacuations, the following findings are relevant:

1. There are three main stages of human behaviour. These are cue perception, response to cues to interpret the situation and response to the situation defined.

2. Cues may be divided into four broad categories: the physical indications of the fire (smoke, flames, heat, smell, noises).
Alarms such as bells, public address announcements, sirens, electronic tones, flashing lights.
The behaviour and communications of others (warnings, shouts, instructions, body language).
Mechanical disturbances (lights flickering/going on and off, changes in air conditioning, power supplies, communications and electrical equipment).

3. There are a large number of possible behaviours in response to ambiguous or explicit fire cues. These behaviours are a product of social, physiological, physical psychological and environmental factors, affecting individuals. The actions may be classified

into a number of behavioural constructs (ignore/continue normal activities, seek information, warn/alert, protect, evacuate, wait, fight/contain the fire)

4. Information seeking, waiting or continuing with the task at hand are the most common responses to ambiguous cues.

5. The presence of others is an important influence on behaviour. Communicating with others appears be an attempt to make sense of an uncertain situation and to evaluate individual responses in comparison with the emotions and attitudes of others.

6. Role and responsibility is an important behavioural determinant. It appears that in work environments only a small number of people analyse the situation, make decisions and give instructions. These people tend to be authority figures (such as managers) whose role or position includes responsibility for others.

7. Individuals use different cognitive processing modes in building fire emergencies. Many people react to the behaviour of others using heuristics such as "belief in the expert", "follow the crowd", etc. They prefer to process peripheral social information rather than analyse the complex information that relates to the fire emergency.

8. Evacuation is often delayed, even in circumstances (such as office buildings) that have building alarms and wardens in place. Explanations for the delay include the misinterpretation of cues (alarms), the corporate culture of the organisation and hierarchical structures and responsibilities.
9. Panic is rare in building fire emergencies.
10. There appear to be gender differences in response to fires.

Chapter 2

Human Behaviour in Emergencies

Interpretations and explanations of human behaviour in building fires owe much to the older field of research in emergencies and disasters. A number of studies have investigated decision making and proposed explanations for behaviour in emergencies and disasters (Fritz & Marks, 1954; Glass, 1969, 1970; Idzikowsky & Baddeley, 1983; Janis & Mann, 1977; Kelley & Condry, 1965; Latane & Darley, 1968; Perry, 1979; Perry, Lindell & Green, 1981; Quarantelli, 1977, 1978, 1991; Rubin & Cohen, 1974; Sime, 1994, 1997; Saunders 1998a, 1998b, 1999; White & Haas, 1977; Withey, 1962). Historically this body of literature has been accessed to explain behaviour in building fires (Bryan, 1986, 1988; Ozel, 1998; Proulx & Passini, 1993; Sime 1994, 1997). To develop a model of human behaviour in office building fires, it was desirable to review theoretical perspectives and empirical research in the area of decision making in emergencies and disasters.

Conceptualisations of disasters and emergencies encompass the impact of the event on communities and individuals. Disasters and emergencies are defined as sudden, unfamiliar and potentially dangerous circumstances "in which the established social life of a community or other type of social organisation abruptly ceases to operate" (Form & Nosrow, 1958) and which contain " .... serious threats to one's life or limb, family or loved ones ...." (Glass, 1969, 12) The most recent definition promulgated by the United Nations Department of Humanitarian Affairs is that a disaster is:

> ".... a serious disruption of the functioning of a society, causing widespread human, material or environmental losses which exceed the ability of affected society to cope using only its own resources."
>
> (UNDP, 1992)

The underlying rationale for the review of disaster research was that office building fires have many features in common with emergencies and disasters and thus identification of emergency cues, patterns of response and salient individual and social variables would contribute to the general understanding of behaviour in these circumstances. This chapter concentrates on the conceptual frameworks and variables underpinning emergency behaviour research and decision making models that have particular relevance to behaviour in a building fire emergency.

Panic

Before proceeding with the review of literature of behaviour in emergencies and disasters it is necessary to define the concept of panic and discharge some popularly held beliefs about behaviour in emergencies and disasters.

> "In summary, panic is an acute fear reaction marked by flight behaviour. Subjectively, there is an intense fear reaction, i.e., a strong impulse to flee from a threatening danger. Panic participants are seized by fear of a specific object perceived as involving an immediate and extreme threat to physical survival. Overtly, the flight behaviour always involves an attempt to remove one's self physically from the endangered area."
>
> (Quarantelli, 1977, p. 82)

Researchers have identified the essential cognitive components of panic as fear, real or perceived imminent threat, entrapment and limited access to escape routes, isolation in resolving the situation and helplessness (Quarantelli, 1977; Rubin & Cohen, 1974; Shultz, 1964). Observable features of panic behaviour include flight, non-social (as distinct from asocial) and non rational (as distinct from irrational) behaviours (Quarantelli, 1977). However studies of human behaviour in emergencies and disasters have largely questioned panic as the expected and prevailing response of people.

> "The consensus among disaster researchers at the human behaviour in fires conference in 1978 was that the popular belief in the widespread prevalence of panic in disasters is a 'myth'"

(Paulsen, 1984, p. 23).

Addressing commonly held, albeit incorrect beliefs, about the behaviour of individuals and communities in disasters, early researcher Pauls (1958) contended that mass panic occurred rarely and only in certain circumstances. Further affected communities were not dazed and helpless; instead performed constructive protective and rescue tasks and social organisation did not break down but was actually strengthened. In fact, some theorists (Withey, 1962) proposed that people utilised the same cognitive processes when making emergency decisions as they did when judging other important issues and that the cognitive assessment of people exposed to disaster warnings included estimates of the probability that the dangerous event would occur, the severity of personal losses if it did occur and the probable advantages and disadvantages of the alternative means available for avoiding or reducing the danger. Early studies on behaviour in life threatening circumstances (Turner & Killian, 1957) argued that rather than describing observed flight behaviour as irrational, when it was considered from the perspective of people confronted by certain death, it was probably their only rational choice in the circumstances. Furthermore, the flight behaviour persisted only for the duration of perceived danger (Quarantelli, 1977).

"When people attempt to escape from a burning building pile up at a single exit, their behaviour appears highly irrational to someone who learns after the panic that other exits were available. To the actor in the situation who does not recognise the existence of these alternatives, attempting to fight his way to the only exit available may seem a very logical choice as opposed to burning to death."

(Turner & Killian, 1957, p. 10)

In support of this view Sime (1984, 1985, 1994) observed that people retained self-control and utilised rational problem solving to deal with the situation rather than undisciplined individualistic competition. There have even been suggestions (Sime, 1994) that the panic myth may have been perpetuated by officials as a means of imputing blame on the public a posteriori, when major loss of life and injuries have resulted from disasters.

Behaviour in Emergencies: Empirical Research

Empirical research in emergencies and disasters comprised the behaviour of civilian and defence force personnel in wartime (Titmuss, 1950), community and individual response to flood (Perry, Lindell & Green, 1981; Sime 1997), tornadoes and cyclones (Fritz & Marks, 1954), earthquakes (Mulilis, 1999), gas and chemical explosions (Flin, Stewart & Slaven, 1996), and bushfires (Krusel & Petris, 1992; Luke & McArthur, 1978; Saunders, 1998a, 1998b, 1999), Classification of Cues in Emergencies

A similar rationale underlies the classification of cues in disasters and emergencies as in office building fires. Four broad categories of cues have been identified. These consist of the physical signs associated with the event, secondly the alarm and mechanical warning systems, thirdly social cues such as the communications and behaviour of others and finally infrastructure disturbances or collapse.

According to the type of emergency, the physical signs associated with the event include indications such as smoke, flames, heat, noise, explosions, vibrations, pungent odours, rising flood waters, breathing difficulties, etc. The cues associated with alarm systems include sirens, loud hailers, and other mechanical community warning devices. The social cues consist of media reports, official or emergency service warnings, community warning sources and messages from friends, family and neighbours. Perry et al. (1981), using Drabek's (1969) classification, identified four types of social warnings. These were authoritative warnings (police, fire brigade, other emergency services), mass media communications (television, radio broadcasts, newspapers), and the warnings from friends or neighbours as distinct from those received from relatives. Infrastructure disintegration and collapse include power blackouts, telecommunications breakdown, building collapse, washed out roads and bridges, damaged transport systems, etc.

Response as a Function of the Clarity and Timing of Cues

> "Disaster responses are almost always normal responses to abnormal experiences and are misunderstood and mistreated if not recognised as such."
>
> (EMA, 1996, p. B1)

Disasters are rare and unexpected experiences. The consensus (Auf Der Heide, 1989; Perry, 1979; Perry et al. 1981; Sime 1997) is that cues are ambiguous rather than clear cut in the initial stage of an emergency, the typical reaction to warning is disbelief (Auf Der Heide, 1989) and that it is unusual for people to evacuate after hearing a single warning (Perry, 1979). In an American study of flooded communities, Perry, Lindell and Green (1981) found that ambiguous messages resulted in lower levels of perceived threat (in infrequently flooded communities) whereas clear messages produced higher levels of perceived threat (in frequently flooded areas). Residents from all communities specified the sight of high water and face-to-face warnings as the most persuasive cues determining evacuation (Perry et al. 1981, p158). Sime (1997) in a review of community response to bushfires and flooding supports the notion of the inherent ambiguity of early warning signs and the reluctance of people to evacuate or take other protective measures until there is direct and obvious evidence of a hazard.

"In general it has been found that patterns of response are influenced to a considerable extent by the knowledge people have of a fire in its early stages, which is often ambiguous. People rarely respond with any great urgency unless they are aware of a threat."

(Sime 1997, p. 161)

Response in emergency circumstances depends on the establishment of a belief in the threat. This belief appears to be the most important factor affecting the level of credibility of warning signs or other cues as harbingers of danger (Latane & Darley, 1968; Perry et al. 1981). With respect to the warning structure, the researchers discovered that warnings received from different sources produced different responses in those being warned. Observations of differential response as a function of information received and warning source was supported in an independent study by the author of community evacuation during a major bushfire (Saunders, 1999).

In terms of access to information, those who evacuated the entire household during the fire generally accessed, and reported being influenced by, fewer sources of information and were more influenced in their decision making by family, friends or neighbours. The issue was further complicated by the fact that by far the greatest reason for evacuating was that they were ordered to do so by police or other emergency services personnel. Those who remained or evacuated part of the household did not rank being ordered as a significant reason.

A significant determinant of response to disasters is the amount of warning time people receive before impact. Sime (1994, 1997) identified delays in warning the public as precursors to crowd disasters in an emergency. Late or delayed evacuation due to insufficient warning time has also been identified as the reason for most civilian deaths in Australian bushfires (Krusel & Petris, 1992; Luke & McArthur, 1978). Fritz and Marks (1954) in their study of the effects of the amount of warning time for tornado impact on casualty rates found that there was a strong association between last minute warnings and inappropriate behaviour and that families who received a very brief warning time (less than one minute before impact), suffered a greater casualty rate (in terms of loss of life and severe injury) than those who received longer forewarning times and those who received no warning. Lack of time and explicit information about an evolving hazard were also identified by Sime (1997) in his discussion of factors responsible for increasing the risk to the public in emergency circumstances.

> "Disasters are characterised by poor communications and delays in warning the public....there has been growing concern that the

public are inadequately warned about the imminent possibility of a flood in a way which provides them with sufficient time to protect property and/or avoid a flood hazard. .... despite the fact that a flood may have been forecast and detected with a reasonable degree of accuracy, the public in the impacted area are not warned beforehand.

(Sime, 1997, p. 155)

Behaviour in response to first warnings during flood disasters has been classified (Perry et al. 1981) as: 1) continuation of normal activities, 2) attempted confirmation of warning, 3) family-oriented behaviours such as warning other relatives or assembling household members, 4) undertaking some protective action to person or property without the intention to evacuate, and 5) beginning preparations to evacuate (Perry et al. 1981, 47). Many researchers (Latane & Darley, 1968; Quarantelli, 1980) have identified the pre-eminence of attempted warning confirmation as an initial behavioural priority during emergencies

"Almost everyone ... discusses these warnings with others, especially those with whom they have close family ties."

(Quarantelli, 1980, p. 107, as cited in Scanlon 1997, p. 3)

Behaviour in Emergencies: Theoretical Frameworks

The theoretical perspectives of behaviour in emergencies may be classified into two broad areas. One position interprets and explains decision making from the point of view of the individual (Glass, 1969; Janis & Mann, 1981; Latane & Darley, 1968) whilst the other locates itself in a community-focused, social systems approach (Perry, 1979, Perry, Lindell & Green, 1981). The first position emphasises the importance of individual physiological, emotional and cognitive factors in governing response. These factors include the perceptual acuity (clarity of reasoning or power of detection) of the individual and their ability to understand and act on these perceptions, the pre-set attitude of the individual towards emergencies and their perceptions of the nature and intensity of the danger. In contrast the theoretical basis of the community-focused, social systems model of decision making (Perry, 1979), identifies group norms and collective behaviour as the determining factors of interpretation and response to emergencies. This approach also known as the systems-emergent norm perspective concentrates on the situation-specific norms and expectations that emerge as a function of some crisis or change in the social or physical environment where traditional norms would not be appropriate.

Behaviour in Emergencies: The Individual Perspective

Individual factors include age, gender, past experience with emergencies or disasters (Perry, Lindell & Green, 1981;

Saunders, 1998; Weinstein, 1989; White & Haas, 1977) and cognitive factors such as the perceived magnitude of loss and the concept of personal risk (Fritz & Marks, 1954; Janis & Mann, 1977; Perry, Lindell & Green, 1981). According to Glass (1969) an emergency is subject to differential individual perception. Although the threat is shared its perception of the degree of inherent danger depends on many individual factors.

> "So, threats may be considered mild, moderate or severe, depending upon the individual concerned. A mild threat to one may be deemed severe by another. Moderate to severe uncertain threat produces corresponding degrees of apprehension, concern or tension ..."
> (Glass, 1969, p. 12)

<u>Age</u>

An assumption in disaster research has been "that the aged have been and are noncooperators - people who do not usually evacuate either because of assumed social inflexibility or physical infirmity." (Perry et al. 1981, p. 156). Later studies scrutinised this assumption. Perry et al found in their study of 553 residents of flooded communities that there was generally a positive (albeit U-shaped) relationship between age and evacuation (those under 30 and those over 60 years of age were more likely to evacuate). However they cautioned against generalisation due to the small numbers of residents in each category. Saunders (1999) in a study of resident response to bushfire found that the households of those who did not evacuate in response to warnings, consisted predominantly of more than one adult and no children. The households of those who evacuated some members generally comprised two adults and a number of children, whereas the group comprising those who evacuated the entire household contained significantly more single adult households with no children. A speculative link between household composition and age (where it was provided by questionnaire respondents in this study) suggested that the majority of single households (and hence evacuees) comprised older people (over 60 years of age) and the members of other households who were evacuated were described variously by respondents as children, young babies/mothers of babies or older members of the families. These findings provide some support for the positive U-shaped relationship between age and response to recommended evacuation in emergencies or disasters.

Gender

There has been a lack of rigorous research concerning gender differences in emergency behaviour (Mulilis, 1999, Scanlon, 1997). Along with the myth of panic, gender stereotyping of behaviour in disasters and emergencies dominates both popular and official conceptions of response to disasters and emergencies. Scanlon (1997) in a review of literature identified the perpetuation of unsubstantiated claims about the passivity and helplessness of females in the face and wake of disasters made by early researchers (Le Bon, 1969; Prince, 1920) as partially responsible for the perceived sex differences in behaviour. The reviewers further contend that this belief manifested itself practically in the lack of acceptance and formal involvement in (predominantly male dominated) disaster management organisations. They identify the historically relative social positions of males and females and associated traditional societal roles, status and division of labour as the rationale for sex-typing of behaviour and the continuance of the idea that females play passive and dependent roles in emergencies (Mulilis, 1999; Scanlon 1997).

More recent studies and critical reviews of historical research have offered different interpretations and explanations for observed gender differences (where they exist). Mulilis (1999) suggested that there may be gender differences in disaster-related activities but that these differences may be a function of sex-linked psychological outlook and cognitive appraisal. Research indicated that females may be involved more in mitigation and preparedness (particularly activities centred about domestic preparedness) whilst males may take a more active role in post-disaster recovery and activities external to the home. In terms of individual psychological variables, there is evidence (see

Mulilis, 1999 for a complete discussion) to suggest that males and females may differ in terms of their psychological perspectives. It has been proposed that males exhibit a more egocentric or autonomous focus and females a more sociotropic or connectedness attitude reflected in sex-differentiated behaviour in emergencies. In the same review Mulilis (1999) claimed that behaviour differentiation in emergencies and disasters may be a function of gender differences in the cognitive appraisal of threat - whereby females judge both natural and human-made disasters to be more serious than males.

> "Furthermore recent research by Lindell and Whitney (1998) indicating that females tend to appraise the risk of a major earthquake as greater than males would be consistent with this approach as would be the growing body of disaster research ... that indicates that females tend to appraise disasters as more threatening, more serious, and more riskier than males for a variety of natural and man-made hazards (e.g. earthquakes, tornadoes, volcanoes, nuclear power issues, chemical pollutant issues, etc)."
>
> (Mulilis, 1999, p. 42)

Some empirical studies of disaster response have indicated that where men are absent women often perform most of the initial rescue work (Scanlon, 1997), that gender is not a significant determinant of evacuation behaviour (Perry, Lindell & Green, 1981), but may be a determinant of both the assessment of threat and preparatory behaviour in the face of an imminent danger such as earthquake (Mulilis, 1999). Although both males and females equally institute protective preparations the types of preparations may differ according to traditional sex-linked division of labour or gender-based psychological perspectives.

<u>Experience</u>

Prior experience with a disaster has been shown to play an important role in the way that people define the situation (Perry et al. 1981; Saunders, 1998; Weinstein, 1989; White & Haas, 1977). In a similar way that a warning message provides immediate information past experience provides information upon which an individual may act.

> "The distinction is that a warning message provides current information on the threat and available adaptive behaviours, while past experience affords similar information based on the individual's history of experience."

(Perry et al. 1981, p. 68).

From empirical studies of natural disasters and research reviews, a relationship between perceived personal risk, past experience with flooding and response has been identified (Perry et al. 1981; Weinstein, 1989; White and Haas, 1977). White & Haas in their review of risk taking behaviour across different cultures suggested that those with no experience of a hazard may have difficulty assimilating information about the probability of the hazard (leading to ineffective response), whereas those with frequent hazard experience may minimise its impact. Moderate experience of severe hazard appeared to be associated with a more accurate perception of hazard risk and effective response. Supporting these findings Perry et al. (1981) discovered that when perceived personal risk was low, the probability of evacuation increased with experience while the proportion of other protective actions declined. When risk was deemed high, the proportion of evacuees declined with experience and the proportion engaging in protective actions increased.

In empirical flood, earthquake and bushfire research those with prior experience of the hazard may continue normal activities as a first response (Perry et al. 1981) or continue to reside in the disaster prone area (Whittow, 1980). In a separate study by the author (of resident response to a serious bushfire), a high percentage of 220 residents surveyed after the fire reported that they had lived in a house that had been threatened by bushfire. However there was no significant difference (with respect to prior experience with bushfires) between those that remained in their houses and those who evacuated (Saunders, 1999).

It appeared that previous experience with bushfire neither increased nor decreased the tendency to evacuate. It may be argued that the behaviour chosen when previously confronted with a bushfire threat was successful in terms of survival and the residents chose to repeat this behaviour in the recent fires. 44% of the sample said that they had lived in a house that had been threatened by bushfire. They had survived the experience and had some idea of what to expect. This is further substantiated by the number of residents who listed personal experience as a reason for not evacuating and as a useful source of information about preventative and protective actions.

Methodological Limitations of the Research

Methodological issues in establishing a link between personal experience and response to warnings of imminent danger (in studies of natural disasters) were identified by Weinstein (1989). Problems associated with controlling for confounding/intervening variables (such as age, sex, socio-economic class, etc), the unpredictable nature of disasters, the vagaries of subjective recall of disaster victims, the lack of consistency relating to definitions and degrees of experience had implications for a conclusive relationship between experience and response. Reviewing the literature on individual response to earthquakes and flood, Weinstein contends that although there was support for a positive relationship between experience and preparedness, the majority of studies do not report that experience determined actions in response to warnings (such as recommended evacuation).

Personal Risk

Personal risk has been defined as a cognitive estimate or belief about the damage or destruction to person or property, resulting from the impact of a disaster (Fritz and Marks 1954; Withey, 1962). It depends upon assessing the probability and severity of personal and material loss (Fritz and Marks 1954; Withey, 1962), the perceived nature and intensity of the traumatic agent (Glass, 1969) and the perceived level of threat (Perry, Lindell and Green, 1981). The importance of perceived losses as a consequence of the emergency and decisions made, underlie the conflict decision model of Janis and Mann (1977), the evacuation model of Perry et al. (1981), the explanations for behaviour proposed by Saunders (1998, 1999), White and Haas (1977) and Withey,(1962) and has been identified (Perry et al. 1981) as the most influential factor in decision making in emergencies.

Perceived degree of personal risk as an important determinant of behaviour was identified by the author in a study of 220 residents threatened by a major bushfire (Saunders, 1998). Household composition at the time of the bushfire and its implications for personal safety, the safety of others and feeling able to defend the property were recognised by residents as significant factors in their decision to evacuate or remain. The residents who remained cited the high confidence in their ability to defend the property and the perceived low level of threat to their own or others' personal safety possibly due to the presence of at least one other capable adult and the absence of vulnerable members of the household.

Behaviour in Emergencies: The Social Systems Perspective

> "In examining people's reactions to evacuation warnings, we have isolated three important components or aspects of the evacuation decision making process that must be understood. First, social factors related to evacuation behaviour must be examined. These factors relate both to the individual's reasoning - for example, his perception of the threat as real. The extent of personal risk - and to the individual's involvement in social networks - family, extended kin, and friendship - which influence his definitions of the situation. Second, it is necessary to understand how the warning message itself and the channels through which it is communicated influence the evacuation decision making process. Finally, one must examine ways in which evacuation plans can be created or amended to include incentives or motivation to comply ..."
>
> (Perry, Lindell & Green, 1981, p. 8)

According to the systems-emergent norm perspective (see Perry, 1979 for a complete discussion), human behaviour in an emergency is conceptualised as atypical behaviour in response to a capricious social and physical environment. The emergency warning indicates some change in the environment and detection of this change causes a redefinition of the situation if traditional situational norms are deemed inappropriate. The process of redefining the situation underlies the nature of decision making and subsequent responses in a social context. Involved in the restructuring process are a number of activities (Figure 2.1). An initial communication process focuses on the confirmation of the warning in order to gain more information and establish a degree of credibility in the warning (perceived threat). Next is the process of assessing personal risk once the threat has been established as real. This involves further confirmatory behaviour. Personal risk is defined in terms of proximity to the disaster and perception of its certainty and severity.

Latane and Darley (1968), contended that the decision making processes, of an individual, in an emergency, involve the following implicit or explicit preliminary steps. The person must perceive the event, they must interpret it as an emergency and finally the individual must decide that it is their personal responsibility to act. When faced with a possibly threatening event, an individual may look to the reactions of surrounding people. If others do not respond then the likely interpretation is that the situation is that it is not serious and hence the individual will not act. The

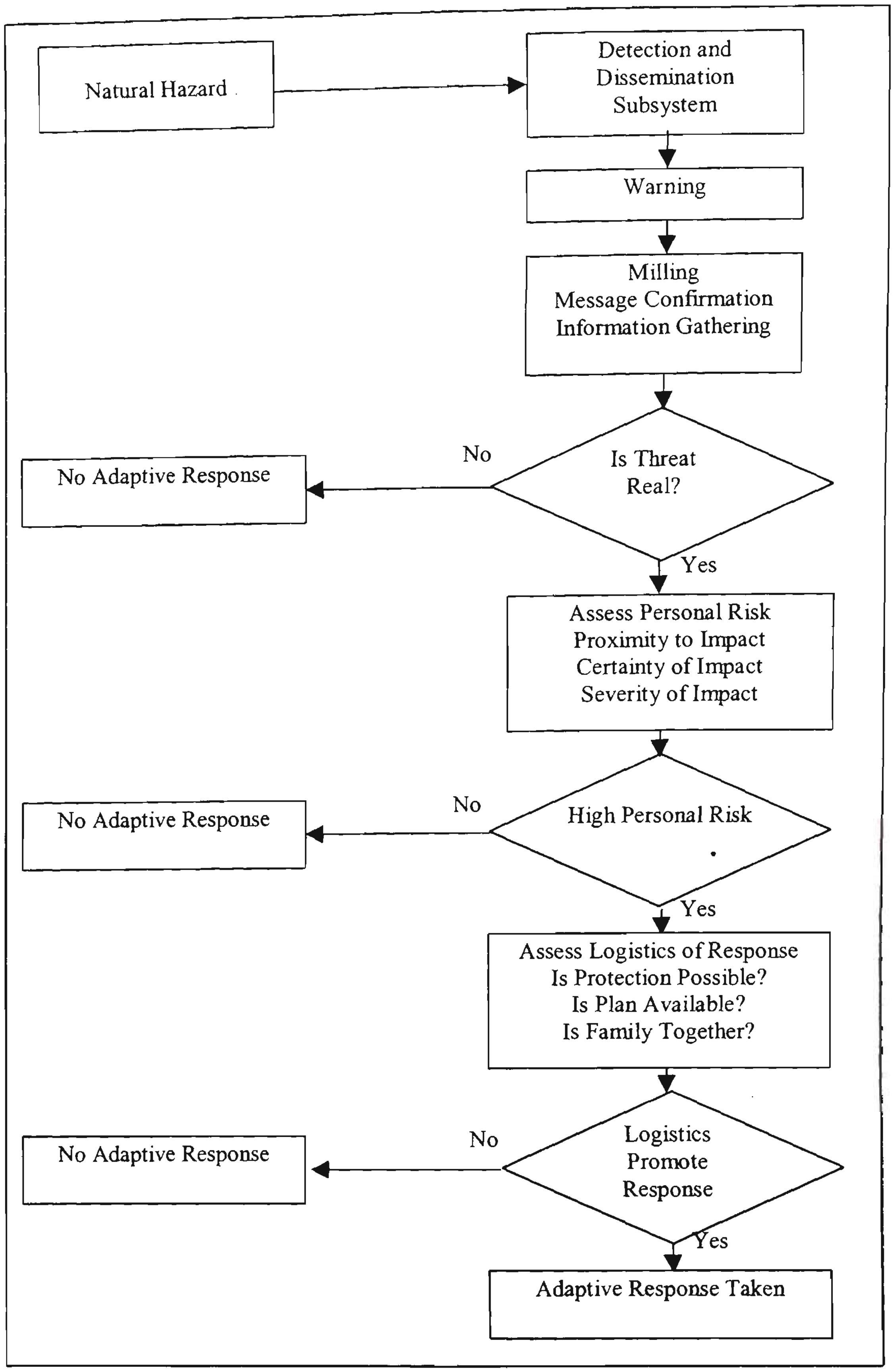


Figure 2.1

Individual's warning response behaviour: Flow diagram of systems-emergent norm issues (Perry, Lindell & Green, 1981).

effects of the group on reducing fear, even in circumstances where the danger is not reduced, has been observed and the subjects reported that the presence of others increased their ability to cope.

In the rare instances of identified panic behaviour during emergencies the role of social interaction has been identified as a fundamental determinant of behaviour (Quarantelli, 1977)

> "In the case of collective panic, it is through individuals interacting with one another that there occurs a cognitive clarification of what the situation is and what can or cannot be done about it. Social interaction is basic in bringing about the definition of the crisis situation as a threatening one. It plays a major part in reinforcing the definition of the situation as one in which only flight is possible. Finally, panic flight frequently terminates as a result of the interaction among the participants, leading them to perceive themselves as out of the danger area. And possibly most important of al, it is frequently the presence and response of other persons that motivates individuals to control their fears,

consequently diminishing the possibility of panicky reaction."

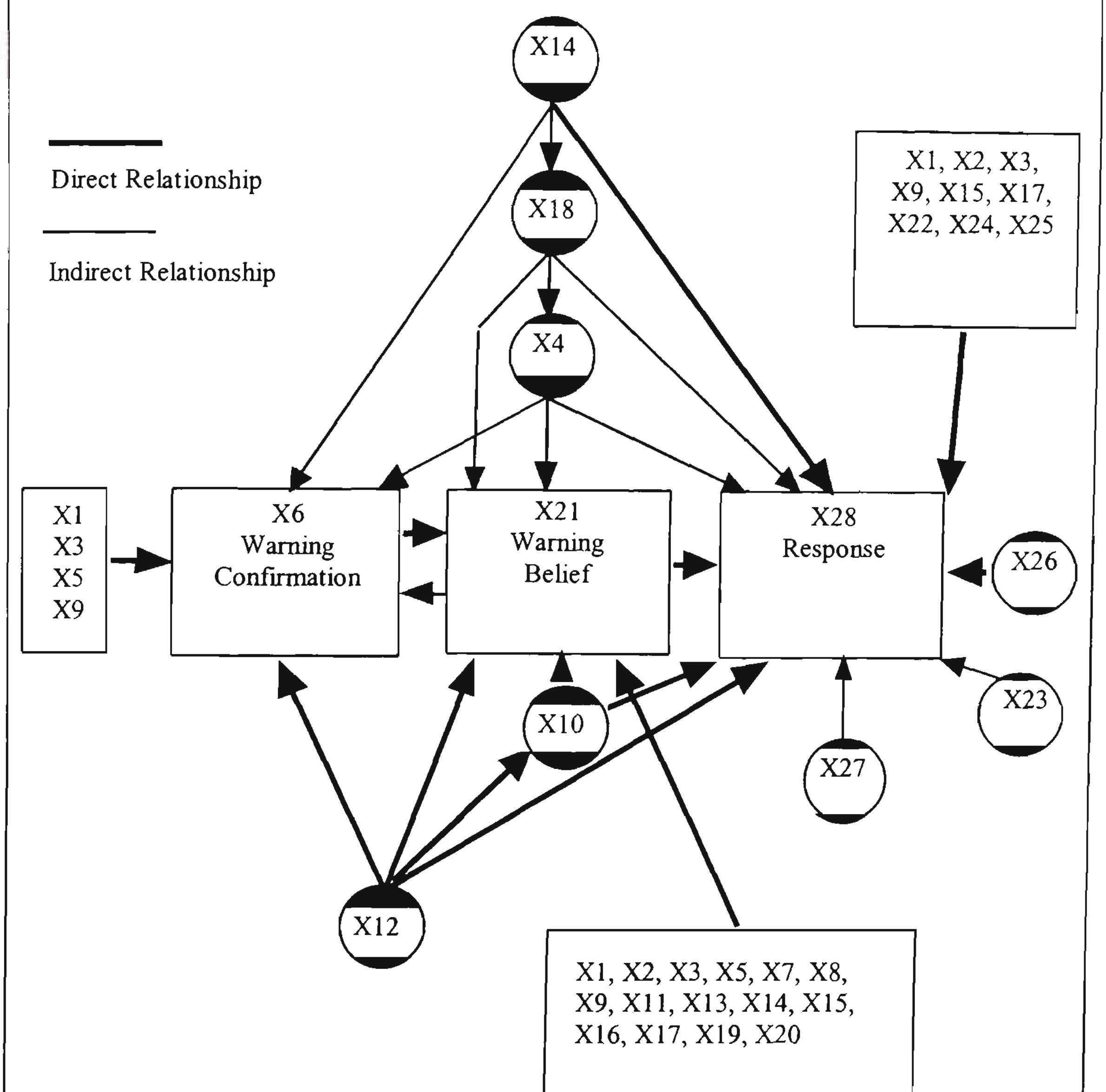
(Quarantelli, 1977, p. 23)

Models of Decision Making in Emergencies

The models of decision making during an emergency chosen to be the most suitable starting points for the development of a cue response decision making model for building fire emergencies were:

1. The model of response to pre-impact hazard warnings (White & Haas, 1977).
2. The theoretical model of cognitive evaluation of emergency situations (Withey, 1962).
3. The conflict theory of decision making (Janis & Mann 1980)
4. The evacuation decision making model (Perry, Lindell & Green, 1981).

From a review of disaster research White and Haas (1977) identified a number of ways in which people respond to hazard warnings and proposed 28 statistically significant variables that influence response to natural hazards (Figure 2.2). The researchers concluded that where the same warning was received by a group of people, individual differences affected message interpretation and levels of belief. They also determined that subjective interpretation of the message resulted in



X1 = warning source, X2 = warning content, X3= communication mode, X4 = number of warnings received, X5 = perceived warning, X6 = warning confirmation, X7 = interpretation of environmental cues, X8 = observed actions of others, X9 = primary group context, X10 = situational hazard perception, X11 = previous hazard perception, X12 = personal experience, X13 = experience of others, X14 = geographical proximity, X15 = socioeconomic status, X16 = organisational membership. X17 = sex, X18 = age, X19 = urban/rural residence, X20 = race, X21 = warning belief, X22 = normative context, X23 = perceived time to impact, X24 = role conflict, X25 = ethnicity, X26 = psychological locus of control, X27 = fear, X28 = response

Figure 2.2
Model of response to pre-impact warnings suggested by research review (White & Haas, 1977, Figure 9-3, p. 189).

variations in response and that individuals reacted differently, depending on their role, group membership and the presence of others. Their model is an aggregation of the important factors identified in previous research and does not quantitatively evaluate the strengths of relationships between the variables and warning belief in a hazard. For the purpose of constructing a model of decision making in office fires, the model of response to pre-impact hazard warnings represented one source for the

Identification of variables and research consensus of behaviour in dangerous circumstances. The authors recommended further study into exposure to warnings, people's understanding and misinterpretation of warnings, their knowledge of appropriate behaviour and action, the connection between the number of warnings issued, the specificity of warning content and psychological factors such as warning belief, fear and perception of danger.

Withey's (1962) theoretical model (Figure 2.3) was concerned mainly with the internal individual processes in an emergency situation and did not draw on quantitative data. It was a cognitive evaluation of a threat situation and incorporated six processes. The following description relates these processes to a behaviour in a fire:

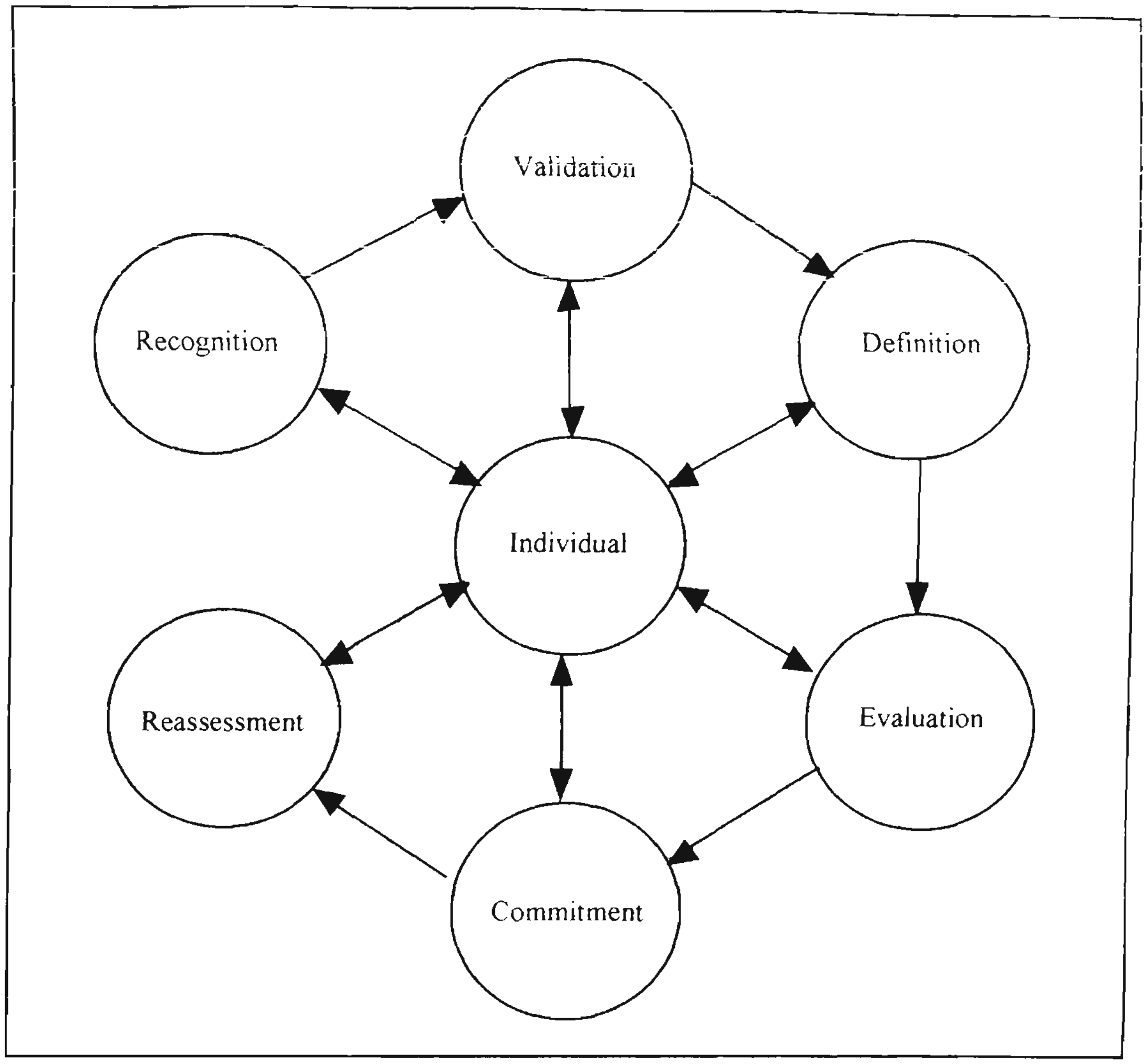


Figure 2.3

Adaptation of Withey (1962) : Decision processes of the individual in a fire incident (Figure 1-2A. Bryan, 1986, pp 191-19)

1. Recognition which is defined as the recognition and awareness of a fire in terms of the immediate cues. Because the cues may be ambiguous and changing, identification of the threat may not occur. Withey proposed that the recognition process is a product of an optimistic wish fulfilment (dependent on an assessment of personal vulnerability) and past experience (subjective probability of a severe threat in terms of the cue presented).
2. Validation, which is an attempt to validate initial perceptions of the fire cues and determine its severity. This is an extension of the optimistic wish and involves reassurance on the part of the individual as to the insignificance and improbability of the threat. Where cues were quite ambiguous this process involves seeking additional information (direct perceptual evidence or the verbal reassurances of others).
3. Definition, or relating the perceptual information about the fire, to some of its characteristics, to assess its proximity, severity and the amount of deprivation, in a temporal context. The most important factors in this process are the physical aspects of the cues with respect to the intensity of smoke, flames and heat. Stress and anxiety are most severe at this stage if the individual fails to impose meaning or structure on the situation.

4. Evaluation, a class of cognitive activities necessary to respond to the threat and dependent on the individual's ability to reduce stress and anxiety levels. Evaluation relies upon information about the physical environment and escape routes, as well as the proximity, actions and communications of others. Cultural influences, role and the familiarity of the environment and threat will influence decision making.
5. Commitment, the process by which the behavioural responses formulated in the evaluation stage, are initiated by the individual to accomplish the defence plans. If the individual succeeds, stress and anxiety are reduced even when the threat increases in severity. If these responses are not completed the cognitive process of reassessment is employed.
6. Reassessment which is the stressful cognitive process by which the individual must attempt another strategy because of the failure of prior formulated responses.

The conflict theory of decision making (Janis & Mann, 1980) derived from an individual perspective recognised the physical threat to, and personal survival of, the decision maker and the time pressure on the decision maker to make a choice before crucial options are lost. The term "hot cognitions" was used to describe those processes induced by warnings that require emergency decision making in the face of oncoming disaster and

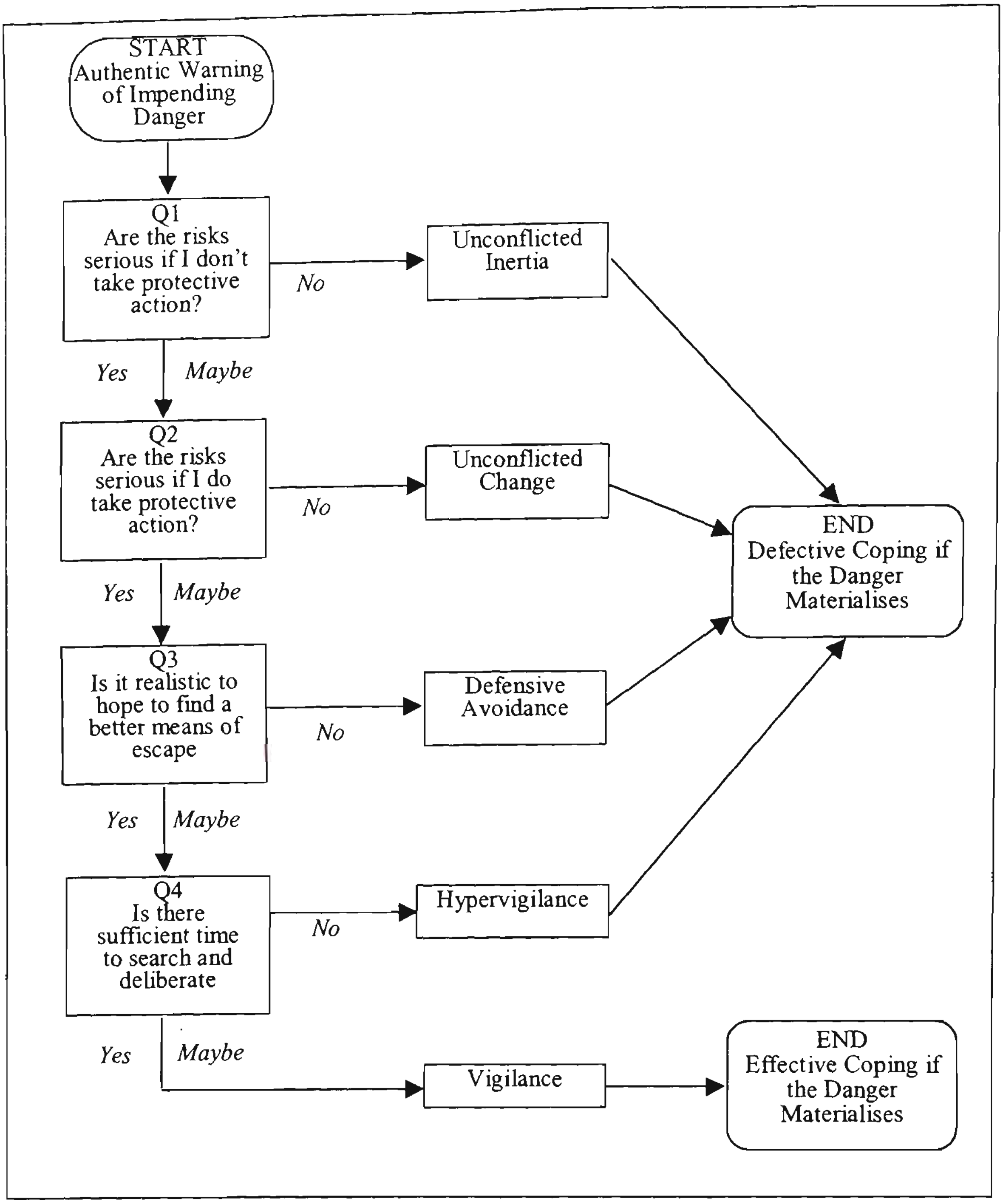


Figure 2.4

A conflict-theory model showing basic patterns of emergency decision making evoked by messages of impending danger (Janis & Mann, 1977) fear-arousing messages. Five basic assumptions (Figure 2.4) are proposed with respect to the functional relationship between psychological stress and decisional conflict.

The five basic assumptions of the conflict theory of decision making encompass:

1. The concept of stress as a direct function of the number and importance of unachieved goals.
2. The direct relationship between the degree of generated stress and the degree of commitment to a particular course of action when new threats or opportunities impel a decision maker to contemplate a different response.
3. The severity of decisional conflicts arising when the decision maker is faced with unpalatable or life threatening alternatives and no hope of better options. This may result in denial of threat cues.
4. The concept of hyper vigilance resulting from a severe decisional conflict in circumstances where the decision maker perceives important threat cues and judges that there is not enough time to avoid loss of life or injury.
5. The notion of vigilance (producing a moderate degree of stress) that occurs when the decision maker has time to contemplate alternative courses of action and anticipates a satisfactory solution.

According to the model the lowest level of stress implies that the coping pattern of the decision maker is to ignore or misinterpret the warning signs and continue with business as usual (unconflicted inertia). At the other extreme, where the levels of threat are high engendering high levels of stress due to the prospect of severe losses, cognitive processing may be severely disturbed as the decision maker experiences hypervigilance (the impact of strong emotions on judgement). This state is encountered when the options are reduced for escaping and time is running out to make an effective decision. The model predicts the following consequences for behaviour:

1. When levels of stress (and hence personal risk and perceived threat), are low, and the decision maker experiences low conflict, there is insufficient motivation to give the decision a high priority and little reason to institute protective actions.
2. For moderate levels of stress the decision maker still perceives many options for behaviour, and will draw on social and environmental resources in order to gain more information about the situation. In the situations of low to moderate threat it is most difficult to predict decision making because of the wide range of individual cognitive assessments that are possible.
3. For high levels of stress resulting in high emotional arousal and impaired cognitive functioning the decision maker may embark on desperate appraisal and search

strategies to relieve or escape the danger. The most extreme form of hypervigilant behaviour is panic.

Another model considered relevant for behaviour in office fire emergencies was the evacuation decision making model of Perry, Lindell & Green (1981). This model derived from extensive interviews of flood-threatened communities in North America employed a path analysis technique to identify warning response as a function of certain antecedent variables (Figure 2.5). The antecedent variables include:

1. Perceived threat.
2. Personal risk.
3. Warning content.
4. Number of warnings.
5. Warning source.
6. Past experience.
7. Social contacts.

Perry et al. (1981) focused on voluntary as distinct from forced evacuation and isolated perception of threat and perceived personal risk as being the most significant cognitive variables contributing to the decision making process in this situation. The researchers found that underlying the subjective assessment of personal risk were proximity to the threat and assessment of the possible severity of the threat. The level of personal risk had a direct effect on the nature of an individual's response to a warning. Those who perceived personal risk to be high would evacuate regardless of their belief in the credibility of the warning signs (Table 2.1).

Table 2.1.

Perceived personal risk by warning response (Perry et al. 1981, Table 3-5, p. 36)

		Personal Risk					
		Slight		Moderate		Severe	
Site	Warning Response	N	%	N	%	N	%
	Normal routine	18	28.6	1	3.3	0	0.0
1	Protective action	27	42.8	2	6.7	4	16.0
	Evacuated	18	28.6	27	90.0	21	84.0
	Normal routine	24	30.0	2	4.3	0	0.0
2	Protective action	37	46.3	13	27.7	2	7.1
	Evacuated	19	23.7	32	68.1	26	92.9
	Normal routine	19	41.3	0	0.0	0	0.0
3	Protective action	12	26.1	8	28.6	2	7.4
	Evacuated	15	32.6	20	71.4	25	92.6
	Normal routine	26	32.5	1	2.1	1	4.8
4	Protective action	42	52.5	14	29.6	4	19.0
	Evacuated	12	15.0	32	68.1	16	76.0

> " ... for an individual to begin thinking about making any adaptive response, the threat described in the hazard warning must be believed to be true ..."
>
> (Perry et al. 1981, p. 30)

Perry et al suggest that perception of the threat as real is higher among those who achieved confirmation of a hazard warning, than among those who failed to get confirmation.

They found that the correlation was not perfect and proposed that this was connected to the dual nature of the act of confirmation (Perry et al. 1981, p. 33). The first aspect related to the credibility of the confirmation source in establishing the level of warning belief. The second aspect concerned the acquisition of new information about personal risk. Behaviour of the respondents was consistent with predictions of their model and the data across four communities that the proportion of those who evacuated generally increased with the increase in perception of threat as real. For each community, those who reported that they "totally disbelieved" the warning message tended to continue their normal routine whereas those who "totally believed" the warning evacuated.

The interrelationship between the variables of perceived threat, personal risk and evacuation indicated that as threat increased so did the probability of evacuation with the probability of evacuation being much higher when the level of threat was moderate or high than when the threat was low (Table 2.2).

Table 2.2

Modal warning response for different combinations of perceived personal risk and threat (Perry et al. 1981, Table 3-7, p. 39)

	Low Threat	Moderate Threat	High Threat
Low Risk	Normal routine	Protective action	Protective action
High Risk	*Evacuation	Evacuation	Evacuation

* The authors explain the unlikely combination of high risk and low threat as due to the responses of 12 (2%) of the 553 residents.

Perry et al. (1981) concluded that the relationship between personal risk and the probability of evacuation was stronger than the relationship of perceived threat to evacuation and that perception of personal risk as high is a necessary and sufficient condition for evacuation Table 2.3).

Table 2.3

Probability of evacuating pooled across all sites, by perceived personal risk and threat (Perry et al. 1981, Table 3-9, p. 41)

	Low Threat	Moderate Threat	High Threat	Row Effect
Low Risk	.15	.21	.27	.23
High Risk	.58*	.76*	.78	.77
Column Effect	.23	.35	.52	

* The authors note that the low N values upon which these probabilities are calculated make them less stable than the other probability estimates.

Figure 2.5 isolates and specifies the relationships between the network of variables important in emergency decision making. This process was achieved by investigating via contingency tables the interrelationships of a maximum of five variables at a time. Path analysis was used to evaluate the total system of eleven variables.

Perry et al. (1981) found that the relationship (for all communities studied) between the first warning source and the perception of threat was that people who were warned by an authority tended to perceive threat as high more often than when this warning came from any other source. The researchers explained this finding in terms of the ability of the individual to judge the credibility of the warning and hence assess the level of threat. With regard to warning content, the information and its specificity provided the data which individuals used to define the situation. Warnings which contained specific information about probable severity and impact location were more likely to lead to an adaptive response. More specific messages produced higher levels of perceived

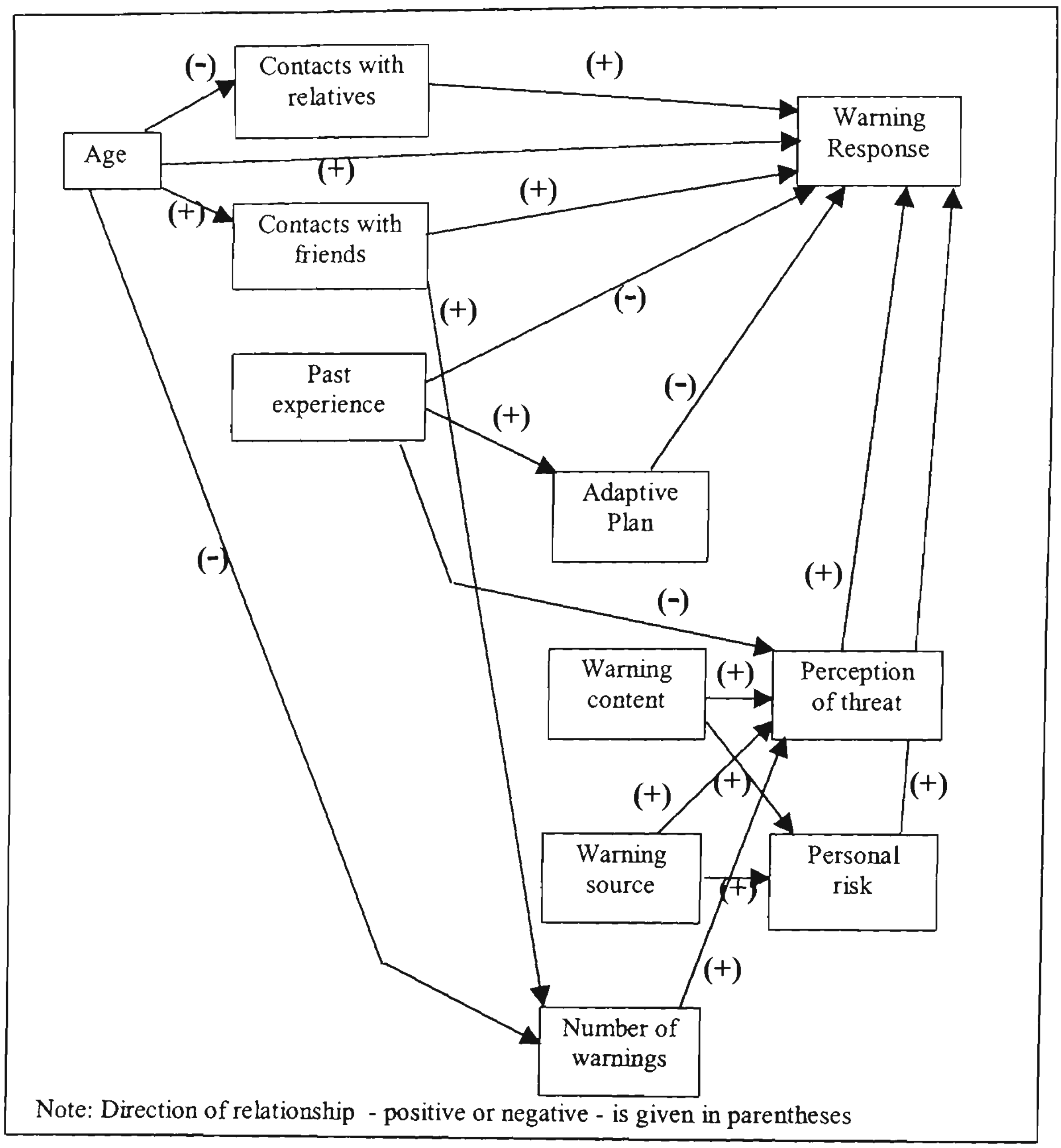


Figure 2.5

Revised framework of statistically significant factors in evacuation decision making (Perry et al. 1981) threat whereas vague messages corresponded to lower levels of perceived threat. More specific messages also provided individuals with information with which to assess the level of personal risk (damage or destruction to person or property). As the message specificity increased, so did the probability of evacuation. Their findings also supported past research on emergency decision making that mostly demonstrated a positive correlation between the number of warnings received and perception of the threat as real.

"The data for all four sites generally support the hypothesis that level of perceived threat increases with multiple warnings."

(Perry et al. 1981, p. 67)

The researchers point out that evacuation was related to having correct and clear warning and that where the initial signals were unclear or ambiguous, additional messages acted to clarify this. Other studies (Drabek, 1969) indicated that a frequent response to a first warning was disbelief. Moreover, although subsequent warnings may contain no new information, repetition appeared to increase the extent to which an individual believed the threat described in the message.

The social network variables such as contact with relatives and/or friends correlated slightly with warning response (evacuation). A complex relationship existed in

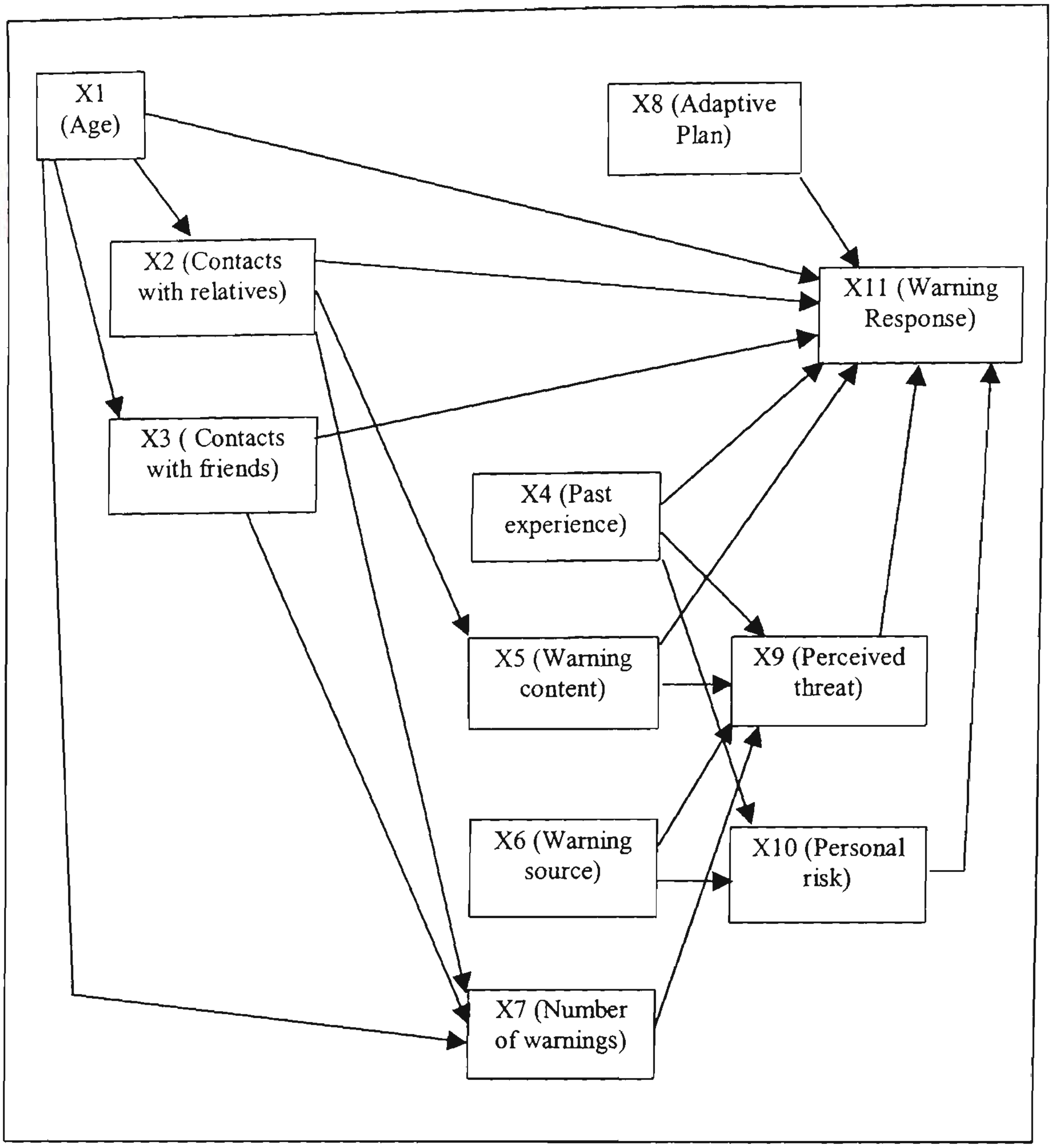


Figure 2.6

Path diagram of variables important in evacuation decision making (Perry et al. 1981) this case with the explanation that increased social contact probably increased the number and specificity of the warning message. The relationship between social contact and perceived threat and level of personal risk was described as an indirect connection via the nature of the warnings. However Perry et al (1981) point out that family roles and context were important determinants of response in emergencies. Citing evidence from other studies (Killian, 1952; Quarantelli, 1960) they suggest that when people are faced with conflicting responsibilities during emergencies, loyalty to the family and ensuring protection of family members dominate other considerations. Sime (1984, 1985) predicted that in an emergency people are even more likely to be drawn towards the familiar than under normal circumstances and that one of the most important factors was affiliative ties to other individuals (particularly family members).

The strength of the influence of family allegiance on behaviour was also found in a recent Australian study of bushfire evacuation (Saunders, 1998). Household composition at the time of the bushfire and its implications for personal safety, the safety of others and feeling able to defend the property were recognised by residents as significant factors in their decision to evacuate or remain. From the small number of interviews with residents it appeared that many who evacuated did so because they were concerned for vulnerable members of the household (babies, young children, elderly family members or pets) and were the only means of transporting others from the danger. Had they not been in that situation, the majority indicated that they would have remained with the house. For those who remained the high confidence in their ability to defend the property and the perceived low level of threat to their own or others' personal safety could be due to the presence of at least one other capable adult and the absence of vulnerable members of the household.

Figure 2.6 summarises the findings after a path analysis of the eleven variables. Using eight structural equations to represent the interrelationships between variables, calculation of the regression coefficients established the statistically significant relationships, and direction of this relationship, as indicated in parentheses. The two models shown in Figures and, closely resemble each other. The two areas of difference are: (1) the path analysis discovered a statistically significant path leading from past experience to adaptive plan and (2) the relationship of contacts with relatives to warning content and number of warnings were found to be not statistically significant.

Summary of Decision Making in Emergencies and Disasters

1. Panic

Studies of human behaviour in emergencies and disasters have largely questioned panic as the expected and prevailing response of people.

2. Decision Making Processes

People utilise similar rational problem solving processes when making emergency decisions as they do when judging other important issues. The cognitive assessment of people exposed to disaster warnings include estimates of the probability that the dangerous event would occur, the severity of personal losses if it does occur and the probable advantages and disadvantages of the alternative means available for avoiding or reducing the danger.

3. Cues

Four broad categories of disaster and emergency cues have been identified. These consist of the physical signs associated with the event, secondly the alarm and mechanical warning systems, thirdly social cues such as the communications and behaviour of others and finally infrastructure disturbances or collapse. The consensus among researchers is that cues are ambiguous rather than clear cut in the initial stage of an emergency.

4. Response

The typical reaction to warning cues when they are ambiguous rather than clear cut is disbelief. Response in emergency circumstances depends on the establishment of a belief in the threat. This belief appears to be the most important factor affecting the level of credibility of warning signs or other cues as harbingers of danger

With respect to the warning structure, warnings received from different sources produce different responses in those being warned. The more specific the warning content is in indicating the severity of the situation, the more probable is evacuation, the less specific the warning content, the more likely that people will respond with other behaviours which stop short of evacuation. In general those warned by an authority (such as members of the police force) are less likely to be skeptical of the warning, whilst those warned by their peers are more likely to seek other sources for message confirmation.

The number and timing of warnings affects response. Evacuation seems to be related to having correct and clear signals and to additional warning sources that clarify an unclear message. A significant determinant of response to disasters is the amount of warning time people receive before impact. Late or delayed evacuation due to insufficient warning time has been identified as the reason for most deaths and serious injuries and there appears to be a strong association between last minute warnings and inappropriate behaviour in disasters and emergencies.

5. The Individual Perspective on Response to Disasters and Emergencies

These include age, gender, past experience with emergencies or disasters and cognitive factors such as the perceived magnitude of loss and the concept of personal risk.

There has been a lack of rigorous research concerning gender differences in emergency behaviour. Along with the myth of panic, gender stereotyping of behaviour in disasters and emergencies dominates both popular and official conceptions of response to disasters and emergencies.

Previous assumptions that older people do not respond effectively to disaster warnings have been questioned and more recent studies propose a positive U-shaped relationship between age and evacuation (those under 30 and those over 60 years of age were more likely to evacuate).

6. Personal Experience with Disasters and Emergencies

Due to methodological issues claims of cause and effect relationships between previous experience with disasters and emergencies and response are questionable. In the case of evacuation previous experience neither increases nor decreases the tendency to leave in response to recommendations.

7. Personal Risk and Level of Threat

Personal risk and perceived level of the threat have been identified as the two most important cognitive determinants of behaviour. Personal risk is defined in terms of a subjective assessment of proximity to the hazard, its possible severity and its consequences for damage to life or property. Perception of the threat as real depends fundamentally on the nature of the warning source (or sources), the content and the validity of this content in indicating a real threat, to the individual.

8. The Social Systems Perspective

When faced with a possibly threatening event, an individual may look to the reactions of surrounding people. If others do not respond then the likely interpretation is that the situation is that it is not serious and hence the individual will not act. The effects of the group on reducing fear, even in circumstances where the danger is not reduced, has been observed and people have reported that the presence of others increased their ability to cope.

9. Models of Decision Making in Emergencies

The models of decision making during an emergency chosen to be the most suitable starting points for the development of a cue response decision making model for building fire emergencies were: (a) the model of response to pre-impact hazard warnings (White & Haas, 1977); (b) the theoretical model of cognitive evaluation of emergency situations (Withey, 1962); (c) the conflict theory of decision making (Janis & Mann 1980) and (d) the evacuation decision making model (Perry et al. 1981).

Chapter 3

Decision Making in Ambiguous and Threat Provoking Circumstances

The aims of this chapter are to review selective literature on decision making in ambiguous circumstances, to review the effects of anxiety, fear and stress on cognitive processing and decision making and to discern modes of cognitive processing employed in these circumstances. The final aim is to explore the possibility of positioning the findings within a behaviour economics framework (with a specific focus on cognitive congruence in cognitive processing) and establish its suitability as an explanation for decision making in office building fires. The task requires identifying relevant theories that describe the effects of a continuum of stress or anxiety and offer explanations for their impact on decision making and behaviour.

In developing a model for decision making in fires it was necessary to understand the effects of fear, stress and anxiety on cognitive processes. It was also essential to be aware of the effects of both extremes of the stress continuum (non-existent or very low to very high) on behaviour. Existing fire research models do not adequately cover predicted behaviour in the extreme cases. This is not to suggest that the current opinion, that all behaviour is rational, even under the most life threatening circumstances, is erroneous, but it does suggest that behaviour under extreme pressure has not been tested. The stress continuum must incorporate ambiguous and low threat situations to moderate or highly threatening circumstances (typical of a building fire emergency). The task therefore is to describe and critique theories of decision making in circumstances that extend from the ill structured or ambiguous to structured and clearly defined, *and* that initially contain no threat or danger to a state of affairs in which moderate to high threat is clearly present.

There is a great deal of literature on cognitive processing and decision making in stressful, threatening or dangerous situations(Baddeley, 1972; Ben-Zur & Breznitz, 1981; Bower, 1983; Bower, Gilligan & Monteiro, 1981; Broadbent, 1958, 1971, 1982; Butler & Mathews, 1983; Drabek, 1986; Easterbrook, 1959; Eysenck, MacLeod, & Matthews, 1987; Eysenck, 1988, 1990; Foa & Kozak, 1986; Gilligan & Bower, 1984; Hamilton, Hockey & Rejman, 1977; Hebb, 1949; Hockey & Hamilton, 1983; Idzikowsky & Baddeley, 1983; Janis & Mann, 1977; Keinan, 1987; Keinan, Friedland & Ben-Porath, 1987; Kelley, 1965; Lazarus, 1966, 1982; MacLeod, 1990; MacLeod & Rutherford, 1992; Mahan, 1994; Miller, & Starr, 1967; Oatley & Johnson-Laird, 1987; Schonpflug, 1983; Shaham, Singer & Schaeffer, 1992; Simon, 1957; Tversky & Kahneman, 1982; Tversky, Sattath & Slovic, 1988; Woodworth & Sells, 1935). Consensus among researchers suggests that at least some cognitive processing precedes anxiety (Eysenck, 1988) and that cognitive processing is affected by constructs such as anxiety, fear and stress induced in emotionally, psychologically or physically threatening circumstances.

Resulting behaviour depends on how individuals interpret the level of threat, their perceived level of control over the situation, the adequacy of their response repertoire and the possible choices available. The decision making process then relies on perception of the cues or warning signs, cognitive interpretation of the situation, assessment of the degree of threat and risk and decisions to take actions that will reduce these levels.

<u>The Effects of Anxiety, Fear and Stress on Cognitive Processing: Theories and Experimental Evidence from Laboratory Experiments</u>

Anxiety has been described as an aroused emotional state (Easterbrook, 1959), an unpleasant and aversive state (Eysenck et al. 1987; Eysenck, 1988, 1990), a state of increased physiological activity (measured in terms of skin conductance, increased heart rate, etc) (Averill, 1973; Schonpflug, 1983; Lang, 1968 as cited in Foa & Kozak, 1986), and, from a bioinformational perspective, a program activated to flee or avoid danger (Foa & Kozak, 1986). The attributes of anxiety are adequately summarised as "a transitory emotional state characterised by subjective consciously perceived feelings of tension and apprehension and heightened autonomic nervous activity."(Spielberger, 1966, as cited in Idzikowsky & Baddeley, 1983, p. 124). Stress is characterised as subjectively experienced feelings of apprehension, a desire to escape, intense physiological and psychological symptoms (Janis & Mann, 1977) and an unpleasant emotional state evoked by threatening environmental events or stimuli inducing high levels of unpleasant emotions.

Stress or anxiety can vary from very low levels to extremely high levels, depending on the perception and subjective appraisal of inherent danger, the degree of severity of the threat and the available personal resources and options to deal with the threat. Stress or anxiety can also be elicited by ambiguity or uncertainty (Hammond, 1981; Hammond, McClelland, & Mumpower, 1980; Hammond, Hamm, Grassia, & Pearson, 1997; Ingram & Kendall, 1986, Lazarus, 1982; Mahan, 1994). Anxiety, fear and stress are elicited by the perception of personal threat (Eysenck, 1990), the processing of threatening events (Butler & Mathews, 1983), the interruption of organised response sequences, perceived lack of control over certain situations and inadequacy of response repertoire (Averill, 1973; Sherrod, Hage, Halpern, & Moore, 1977) and time pressure (Janis & Mann, 1977; Keinan, 1987; Keinan et al. 1987). Anxiety results in avoidance behaviour (Dorner et al. 1983; Eysenck, 1990), bias in favour of processing threatening stimuli (Eysenck, 1987), changed cognitive strategies (Mahan, 1994; Shaham, Singer & Schaeffer, 1992,) and reduction of cognitive processing efficiency (Keinan, 1987, Keinan et al. 1987).

Performance on almost all tasks is adversely affected at extreme levels of stress or anxiety. Effects of highly stressful situations on the individual decision maker include cognitive effects such as hypervigilance or over exaggeration of threat (Janis & Mann, 1977; MacLeod &

Rutherford, 1992), modification of judgement processes (Shaham, Singer, & Schaeffer, 1992), shifts to intuitive cognitive strategies (Mahan, 1994), narrowed attention and failure to detect peripheral or occasional stimuli (Kiernan, 1987; Kiernan et al 1987), increased autonomic functioning, disruption of general muscle tone and concomitant effects on manual dexterity and co-ordination (Baddeley, 1972), and psychological and emotional effects such as increased arousal levels in preparation for some sort of action (Hebb, 1949). In a situation containing the threat of imminent danger, an individual may concentrate on a limited number of alternatives (Baddeley, 1972; Hockey, 1983; Janis & Mann, 1977) fail to systematically scan all relevant alternatives (Keinan, 1987; Keinan et al. 1987), fail to devote adequate time to each alternative (Janis & Mann, 1977) and demonstrate a processing bias towards threat-related information (Ben-Zur & Breznitz, 1981; Eysenck, 1987; Eysenck & May, 1991; Kelley, 1965; Matthews & MacLeod, 1985; Mogg, Matthews).

Underlying many explanations for the effects of anxiety, fear and stress on decision making are the cognitive, emotional and physiological demand and effort hypotheses. Anxiety appears to induce competition among the demands of external or task relevant variables, internal physiological or increased autonomic activation and the cognitive awareness of these demands on attention (Easterbrook, 1959) Anxiety (Baddeley, 1986) captures working memory system resources causing demands on cognitive processes particularly for complicated tasks which take a greater toll on the short term memory than simple tasks. Negative emotions stimulate emergency reaction of the cognitive system (Dorner et al. 1983) resulting in an externalisation of behavioural control that diminishes thought processes, restricts analytic ability and degrades decision making processes.

High emotional arousal induced in situations of high threat and time pressure (Easterbrook, 1959) disrupts execution of complex cognitive tasks that require assimilation of many cues and multivalued consequential decisions. Support for this hypothesis has been inferred from observations of laboratory situations designed to measure reactions to imminent entrapment (Kelly, 1965; Monat, Averill & Lazarus, 1972), simultaneous auditory and visual cue processing accompanied by electric shocks (Bacon, 1974), solving problems under threat of electric shocks (Kiernan, 1987; Kiernan et al. 1987), naturally distressing situations such as public speaking (Mano, 1992) and dangerous environments (Baddeley, 1972). In one study (Kelly, 1965) male and female students were confronted by the threat of painful electric shocks and a limited amount of time to escape. The necessary conditions for escape involved pressing escape buttons one at a time. It was observed that the greater the perceived danger and the higher the level of fear in this situation of potential entrapment, the smaller the percentage of people who made full use of the available information to choose an effective course of action.

Another laboratory study (Monat, Averill & Lazarus, 1972) involving the threat of painful electric shock found that the more imminent the perceived threat the higher the level of stress. The term "temporal uncertainty was used to describe the narrowing of time perspective caused by the reduced cognitive functioning efficiency accompanying high emotional arousal. Further evidence for reduced efficiency of cue utilisation due to competing demands between the threat and internal reactions was found by Bacon (1974) and Kiernan et al (1987). Bacon claimed that the limitations on short term memory capacity and processing caused reduced sensitivity in the participants to simultaneously presented auditory and visual cues (accompanied by electric shocks). In an experiment involving multi-choice decisions accompanied by the threat of electric shock (Kiernan et al. 1987), the results indicated that psychologically stressed individuals demonstrated poorer decision making compared to an unstressed control group. The impaired decision making manifested itself as constricted attentional focus (attention confined to a limited number of data dimensions), difficulty in assimilating all information and unsystematic scanning of alternatives. Polarised evaluations and less complicated decision tactics were also observed in participants about to speak publicly (Mano, 1992). The selection of decision strategies was viewed as a function of an arousal-induced (anxiety) limitation of attention brought about by the imminent prospect of public speaking.

The nature of fear and its effects on cognitive processing and performance have been explored in experiments conducted in controlled dangerous environments - such as parachuting and diving (Baddeley, 1972). Evidence collected from individuals in situations of physical danger and interpreted within a general arousal framework (Hebb, 1949) supports divided attention (Easterbrook 1959) between self-relevant variables (worrying thoughts, etc) and task-relevant variables (external demands of the situation). Observed physiological and subjective effects of fear in these situations include trembling (due to the failure of gross motor control), strong reaction to anxiety provoking words, poor reproduction of instructions, deterioration in filling out complicated forms, missed peripheral stimuli, and impaired performance on peripheral tasks. In summary, fear-inducing situations cause a deterioration in the efficiency of performance, especially in tasks involving sensory-motor skills or divided attention. The magnitude of an individual response to a hazardous situation depends on their predisposition towards feeling anxious (trait anxiety), their assessment of the degree of danger of the situation and their ability to cope with it, along with effects of previous experience or exposure to the situation.

Methodological Issues

Support for the validity of observations of the effects of anxiety, fear and stress on cognitive processing and performance has come from experiments conducted in controlled dangerous environments (parachuting, deep sea diving) and observations of decision making during natural disasters (Flin, Stewart & Slaven, 1996; Fritz & Marks, 1954; Krusel & Petris, 1992; Luke & McArthur, 1978; Perry, Lindell & Green, 1981; Saunders, 1998a, 1998b, 1999; Sime 1997) and wars (Titmuss, 1950). Proponents of the validity of this approach argue that to survive hostile or dangerous environments, active and correct responses are necessary. There are however serious methodological and ethical problems related to data collection. Idzikowski and Baddeley (1983) discuss the ethical problems of placing naive subjects in experimental situations designed to produce fear. They further believe that the information from studies of natural disasters are of limited value. Although natural disasters are suitably dangerous environments the circumstances are usually inaccessible and unpredictable and rarely permit clear objective measure of performance as they affect the observer as much as the victims.

Critics of theories that assume that the consequences of anxiety on performance are always detrimental and that the effects be explained by general arousal theory (eg Hockey & Hamilton, 1983) quote experimental evidence of stressors improving performance as well as reducing efficiency. They maintain that there is a need to distinguish between the effects of stressors peculiar to the task situation and its demand characteristics (*strategic* variables) and those which reflected fundamental changes in the operating parameters of the system (*structural* variables). The observed alterations in attentional focus and organisation of internal thought sequences may be more a function of the task than of the assumed anxiety.

Theories of Cognitive Processing

Cognitive appraisal and the reciprocal influence of cognition and emotion have been identified as playing a crucial role in emotional experience including anxiety (Lazarus, 1982). Clinical studies using anxiety provoking films report that the manipulation of denial and intellectualisation palpably diminished anxiety, as indexed by psycho-physiological measures. Affect-congruent processing models contend that an emotional state stimulates a corresponding emotional node within memory which activates affect-congruent information (Bower, 1983). This implies facilitation of information compatible to the current mood state. Mood congruity (Bower, 1983; Butler & Mathews, 1983) suggests that emotionally laden information (such as anxiety-provoking events) or ambiguous events tend to produce a hypothetical processing bias partial to threatening stimuli. This may result in activation of schemata encompassing a wide range of threatening information that favour selective schema-congruent processing of threat-related stimuli (Beck, 1976; Bower, 1983; Butler & Mathews, 1983; Gilligan & Bower, 1984).

In support of this theory Oatley and Johnson-Laird (1987) claim that emotions act as primitive signals within the cognitive system, imposing a distinctive pattern of cognitive organisation with resulting characteristic processing biases. Anxious individuals are characterised by more rapid detection of, increased attentional orientation towards, and reduced ability to ignore, threat-related information, in the initial processing stages. From an information processing framework (Ingram & Kendall, 1986) anxiety is represented or considered in terms of propositions containing themes of danger or harm to the individual and the risk of injury or death (anxious schemata). Anxiety-specific cognitive processing produces cognitive distortions evident as temporal distortions and task-irrelevant thought.

Decision making in ill-defined, unclear situations may produce anxiety. Theories explaining the role of ambiguity versus clarity on cognitive processing emphasise the importance of cognitive appraisal, cognitive or affect-congruent processing (Hammond, 1981; Hammond et al. 1980; Ingram & Kendall, 1986; Lazarus, 1982; Schonpflug, 1983), and shifts in cognitive strategies (Mahan, 1994). Some studies have shown (Schonpflug, 1983) that ambiguous, unfamiliar knowledge-poor situations (and those that contain perceived or actual threat) induce a state of psychological tension or stress. In problem solving the resulting mild to severe cognitive disorganisation may lead to inappropriate assessment of, and coping with, the problem situation. In contrast to this, higher anxiety was observed in tasks that were more clearly defined than those of a highly uncertain nature (Mahan, 1994). The underlying assumption is that the decision making under low uncertainty makes use of an analytical cognitive approach that demands more time and cognitive resources (energy). Under higher uncertainty conditions, the individual rejects this approach in favour of a more energy efficient and less stressful intuitively-oriented judgmental strategy. Explanations for these tactical shifts in cognition include changes in arousal or the employment of more complex and subtle decision strategies. Energy conservation strategy shifts have been observed in response to prolonged cognitive loading such as the stress accompanying long hours of continuous work load (Mahan, 1994).

Behaviour Economics and the Cognitive Continuum

Behaviour economics theory proposes that organisms are governed principally by energy conservation strategies. Behaviour economics theory also integrates the effects of ambiguity, anxiety and fear on cognitive processing. As a paradigm, behaviour economics views the individual as an economic system with limited resources (Schonpflug, 1983). The individual is governed by the desire to ration energy by saving effort. In an attempt to regulate the demands of internal states and external stressors the individual endeavours to minimise psychological costs (activities that burden physical and mental health or exhaust internal and external resources) and maximise psychological gains or achievements. Behaviour economics lends itself to knowledge-poor (ambiguous, uncertain, ill-defined) decision situations as well as to clear cut, certain and well-defined environments and accommodates the stress (non-existent to high) continuum.

Decision criteria depend on the resolution of information and behaviour economics proposes that to conserve energy an individual may employ short cut routes in experience and knowledge-poor situations. The strategies engaged are generally heuristic ("rule of thumb") searches followed by means-end analyses such as calculating the payoff between effort and predicted outcomes or distributing the effort over time (Newell & Simon, 1972). This search strategy results in executing an action if it is the obvious choice, but when the choice is not clear employing strategies that will diminish the difference between the current state and intended objective.

Cognitive continuum theory (Hammond, 1981; Hammond et al., 1980; Hammond et al., 1997) is a judgement theory based on the psychological appraisal of information. As an explanation of decision making, cognitive continuum theory is a comprehensive and robust interpretation of cognitive processing in which both cognitive processes and task conditions are arranged on a continuum ranging from intuition to analysis. The principles underlying the cognitive continuum approach are compatible with a behavioural economics explanation of the allocation of cognitive resources used in processing. As an "anxiety neutral" theory cognitive continuum theory is a viable explanation of decision making in emergencies - applicable to situations in which anxiety is absent as well as to those in which various levels of anxiety exist.

The theory proposes an intimate relationship between environment (task conditions) and cognition, encompassing principles of information organisation and how they relate to the properties of a given task. The approach evolves from Brunswik's (1952) theory of perception whereby perception is regarded as an intuitive or logical integration and combination of information from incomplete and fallible sensory cues. The cognitive continuum theory amplifies this theory incorporating the processes of perception and deductive thinking within a continuum that extends from intuitive to rational cognition. Analytic and intuitive processing are defined in terms of certain properties (Table 3.1) and are generated by different task characteristics. Between the extremes of the continuum are the quasi-rational or common-sense processes (Hammond et al., 1997) that include properties from both analytic and intuitive cognition.

Cognitive efficiency and thus performance is a function of the congruence between the properties of the task and the cognitive organising principles employed by the decision maker (Figure 3.1). The cognitive continuum theory offers specific predictions for task-driven cognitive behaviour and specific methods for testing various organising principles (Hammond, 1981). It differs from other conceptions of information organisation (e.g. schemata) that do not lend themselves well to operationalisation and empirical verification and instead offers predictions of cognitive behaviour independent of task definitions.

The extremes of the cognitive continuum are at one pole - intuitive cognition and at the other - analytic cognition. Intuitive cognition is defined as a fundamentally inferential, informal reasoning process ("using one's imagination") that is generally employed in natural decision making environments.

> "The intuitive cognitive mode tends to be associated with a holistic, implicit organising principle executed quickly and with lower overall accuracy when compared to some external normative standard. ...as a result the individual is less aware of how he or she is actually processing the pattern of information."
>
> (Mahan, 1994, p. 91).

In contrast, analytical cognition is a highly proceduralised, systematic and deductive serial process that obeys the tenets of various logical systems. Depending on the circumstances and nature of the problem the individual may apply the laws of mathematics, statistics, propositional logic, science or expert opinion (Hammond, 1981). The individual demonstrates awareness of organising principles used and believes that these principles will ensure valid solutions.

Various properties of a task induce a particular mode of cognition that may lie somewhere between the analytical and intuitive poles of the cognitive continuum. Cognition is presumed to be more efficient when there is a close congruence between the properties of the task and the best mode of cognition for the task.

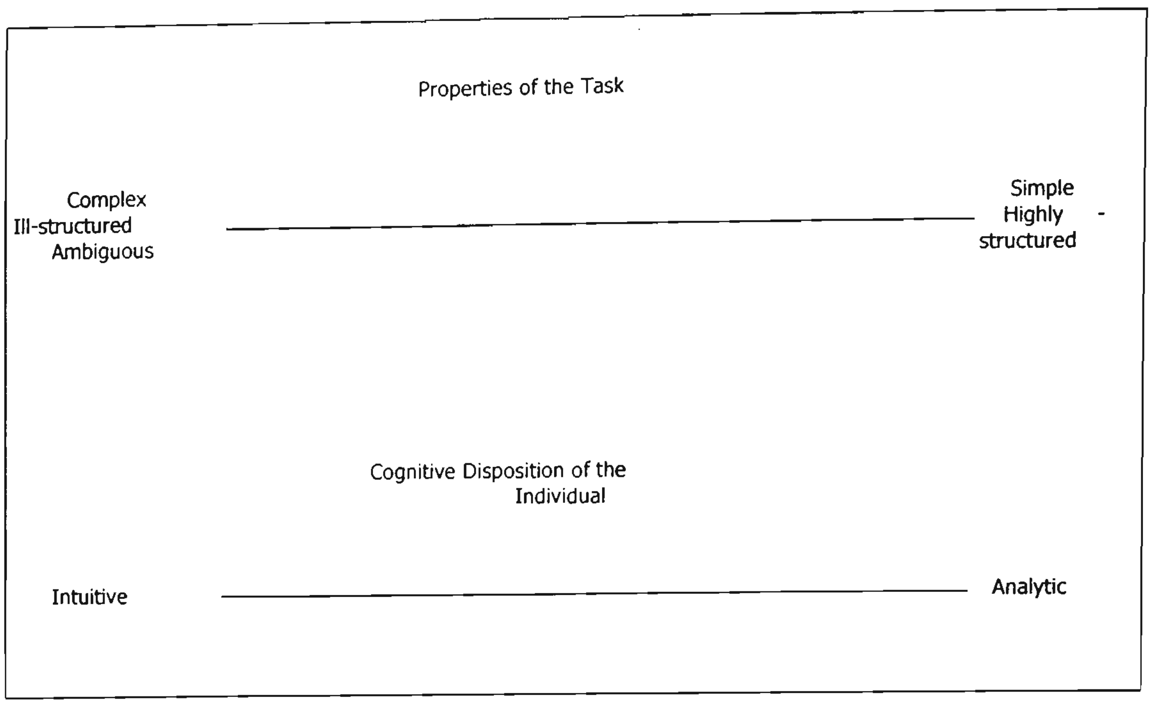


Figure 3.1

The relationship between properties of the task and cognitive disposition of the individual

Task uncertainty induces intuitive cognition (Mahan, 1994). The more uncertain the task, the more probable that approximation strategies will be used in judgement and performance. If the situation is not fully comprehended, and an individual is presented with complicated or ambiguous tasks he or she is likely to temper the approach by simplifying the problem and effecting approximate solutions (Hockey, 1983). When dealing with complex or uncertain task problems the decision maker may resort

Table 3.1

Properties of intuition and analysis, (adapted from Hammond et al. 1997, p. 148)

	Intuition	Analysis
Cognitive control (consistency in apprehension or cognitive processes)	low	high
Rate of data processing	rapid	slow
Conscious awareness (of cognitive process used)	low	high
Organising principle	weighted average	task specific
Errors	normally distributed	few, but large
Confidence	high confidence in answer; low confidence in method	low confidence in answer; high confidence in method

to "bounded rationality" (Simon, 1957), ill-structured problem solving (Newell & Simon 1972), "quasi-rationality" (Brunswik, 1952), "satisficing (Simon, 1976), "heuristics" (Tversky & Kahneman, 1982), "elimination by aspects" (Tversky, 1972) or "incremental judgement" (Miller & Starr, 1967).

Decision making is highly contingent on the demands of the task (Hammond et al. 1997). The properties of tasks that induce analysis or intuition are summarised in Table 3.2 According to the cognitive continuum theory the extent to which a task contains either intuition-inducing or analytic-inducing properties will determine the degree of induced quasi-rationality.

> "We say that certain task properties induce intuitive or analytical cognition to avoid implying that the relation between task properties and cognitive properties is inevitable or fully deterministic. Certainly analysis can be applied to intuition-inducing tasks (e.g. if there is time), and intuition can be applied to analysis-inducing (e.g. if time is limited)."
>
> (Hammond et al. 1997, p. 150)

Table 3.2

Inducement of intuition and analysis by task conditions, (from Hammond et al. 1997, p. 149)

Task Characteristic	Intuition-inducing State	Analysis-inducing State
1. Number of cues	large (>5)	small
2. Measurement of cues	perceptual measurement	objective reliable measurement
3. Distribution of cue values	continuous highly variable distribution	unknown distribution; cues are dichotomous; values are discrete
4. Redundancy among cues	high redundancy	low redundancy
5. Decomposition of task	low	high
6. Degree of certainty of task	Low certainty	high certainty
7. Relation between cues and criterion	Linear	non-linear
8. Weighting of cues in environmental model	equal	unequal
9. Availability of organising principle	Unavailable	available
10. Display of cues	Simultaneous display	sequential display
11. Time period	brief	long

Summary

1. Anxiety, stress and fear are emotional states characterised by feelings of inefficiency, tension, apprehension and heightened autonomic nervous activity. They are most typically elicited in situations associated with the risk of personal harm or lack of control over a situation and commonly lead to the avoidance of such danger.

2. The physiological, emotional and cognitive effects of anxiety and fear include, trembling, failure of gross motor control, deterioration in performance and decision making proficiency, missed peripheral stimuli ("tunnel vision"), poor performance on marginal tasks, over exaggeration of threat related stimuli, increased distractibility and reduction in the use of environmental cues.

3. Anxiety and stress may also accompany decision making in ambiguous situations. Some studies have shown that ambiguous, unfamiliar knowledge-poor situations (as well those that contain perceived or actual threat) induce a state of psychological tension or stress. In problem solving the resulting mild to severe cognitive disorganisation may lead to inappropriate assessment of, and coping with, the problem situation.

4. The mechanisms of appraisal and decision making may be evaluated within the framework of behaviour economics whereby the individual is defined as an economic system of limited cognitive, physiological and emotional resources. Theoretically the individual tries to minimise

costs and maximise benefits. When individual resources exceed the demands efficient decision making occurs. When demands outweigh capacity inefficient decision making results. Behaviour in stressful situations is directed towards the regulation of the demand/capacity ratio. This ratio can be improved by increments in effort and/or lowering of demands.

5. According to the cognitive continuum theory, cognitive efficiency and thus performance is a function of the congruence between the properties of the task and the cognitive organising principles employed by the decision maker. The cognitive continuum theory offers specific predictions for task-driven cognitive behaviour and specific methods for testing various organising principles. It incorporates the processes of perception and deductive thinking within a continuum that extends from intuitive to rational cognition. Analytic and intuitive processing are defined in terms of certain properties and are generated by different task characteristics. Between the extremes of the continuum are the quasi-rational or common-sense processes that include properties from both analytic and intuitive cognition.

Chapter 4

A Model of Decision Making in Office Building Fire Evacuations

Office buildings are complex physical and social entities. They are hierarchically organised, task oriented environments often with an emphasis on security and supervision of occupants. The people in office buildings, whether employees or visitors are generally involved in purposive activities. Within this environment the model of human behaviour in office building fire evacuations describes a fire emergency. The cues contained in the model range from ambiguous to explicit indications of a fire and the predicted behavioural responses are those that are cognitively possible in the circumstances. The model is based empirically on data collected from pilot studies, and theoretically on accepted theories of decision making in fires (Bickman, Edelman & McDaniel, 1977; Breaux, Canter & Sime 1976; Bryan, 1983, 1985, 1986, 1988; Canter, 1980, 1985; Levin, 1985, 1989; Sime 1984, 1985, 1988; Wood, 1972) and emergencies (Perry, 1979; Perry, Lindell & Green, 1981), decision making in situations of fear and anxiety (Janis & Mann, 1977) and theories of task-induced cognitive processing (Hammond, Hamm, Grassia, & Pearson, 1997; Luce, Bettman & Payne, 1997). The model objectifies the building fire emergency, adequately incorporates the range of expected cues and behaviours, predicts behavioural response to fire cues and sheds light on time dependent locations of occupants.

Fire Cues

The fire cues selected for the model derive from those identified in research into human behaviour in fires (Bellamy & Geyer, 1990; Bickman, Edelman, & McDaniel, 1977; Breaux et al. 1976; Breen, 1985; Bryan, 1977, 1983, 1985, 1986, 1988; Canter, 1980, 1985; Gardner, 1996; Geyer et al. 1988; Haber, 1980; Kahn, 1984; Keating & Loftus, 1977; 1984; Latane & Darley, 1968; Lo, 1996; Moore, 1988; Proulx, Larouche, & Latour, 1995; Proulx, 1997; Proulx & Sime, 1991; Proulx, Pineau, Latour, & Stewart, 1995; Sime, 1994; Wood, 1972) The fundamental criteria for inclusion into the model was relevance to office building fires and for the purposes of testing the model, suitability for realistic, visual simulation (via a film). The cues represented the four categories of cues (physical properties of fires, alarms, communications and behaviour of other people, mechanical interruptions or disturbances of building systems or services) and embraced both ambiguous and explicit fire cues.

Cues satisfying the criteria were incorporated into the model for empirical testing. These cues were: a computer screen freezing (ambiguous fire cue representing a mechanical breakdown of building infrastructure); an electronic tone (representing a standard office building alarm); the smell of smoke (portrayed by actors in the film); the visible presence of smoke (smoke appearing from under a closed door, smoke emerging from an air-conditioning vent, a smoke filled corridor) and flames (issuing from a photocopying room).

Actions and Constructs

Actions selected for inclusion into the model were a representative but restricted inventory of those cognitively possible in office building fires. Thirty six actions representing seven constructs were derived from interpretations of behaviour in building fires (Bickman, Edelman & McDaniel, 1977; Breaux, Canter & Sime 1976; Bryan, 1983, 1985, 1986, 1988; Canter, 1980, 1985; Levin, 1985, 1989; Sime 1984, 1985, 1988; Wood, 1972), case studies, incident reports and interviews with observers and survivors of office building fire emergencies (Brennan, 1995, 1996, 1997; Keating & Loftus, 1984, 1985; Latane & Darley, 1968). The behavioural constructs represent seven categories of action (continue normal activities/ignore, investigate/seek further information, alert/warn, protective procedures, wait for assistance, fight the fire and evacuate) identified in past human behaviour in fires research.

Predicted Responses to Cues

In accordance with fire research (Canter, 1980, 1985; Keating & Loftus, 1984; Levin, 1985; Lo, 1996; Proulx & Passini; 1991) the model predicts that people will either disregard ambiguous cues (such as interruptions to electrical supply, communication or mechanical breakdowns) or search for additional information in order to establish a clearer picture of the situation. In response to building alarms and based on past findings (Bellamy & Geyer, 1990; Bickman, Edelman & McDaniel, 1977; Breen, 1985; Gardner, 1996; Horasan & Johnson, 1995; Kahn, 1984; Keating & Loftus, 1977; Moore, 1988; Proulx & Syme, 1991; Proulx, Larouche, & Latour, 1995; Ramachandran, 1990) the model predicts that people will seek further information or advice, wait for some form of instruction or assistance and initiate pre-evacuation responses such as gathering together personal possessions, closing doors or windows, etc. For more informative cues (such as direct emergency warnings or instructions from other people) or explicit fire cues (such as smoke and flames) it is anticipated that people will alert/warn others, embark on protective behaviours, fight the fire and evacuate. In contrast to earlier models of human behaviour in fires (e.g. Canter, 1980) this model predicts that as the number of cues increase the range of behavioural options (constructs) will diminish.

To describe and explain decision making in dangerous circumstances the model predicts various task-induced cognitive processing strategies. These derive from the conflict decision making model (Janis & Mann, 1977), elements of the negative emotion and effort-accuracy processing hypotheses (Luce, Bettman & Payne, 1997) and task-induced cognitive processing (Hammond et al. 1997). Consistent with the principles of behaviour economics (Luce et al. 1997; Schonpflug, 1983) the model assumes that individuals will select the decision strategy that minimises psychological costs and maximises psychological benefits. In accordance with Luce et al (1997) cost is defined in terms of the cognitive effort demanded by a particular strategy and benefit is synonymous with the accuracy afforded by the cognitive strategy.

> "Consistent with Simon's (1956, 1978) notion of bounded rationality, the effort-accuracy framework argues that decision makers exploit environmental structure to attain reasonable decision accuracy offered by more normative decision strategies, such as weighted adding, with the increased effort savings offered by more heuristic strategies such as lexicographic or EBA (elimination by aspects)."
> (Luce, Bettman & Payne, 1997, p. 386)

The very general findings of the effects of anxiety, fear and stress on decision making include avoidance behaviour (Dorner et al. 1983; Eysenck, in MacLeod, 1990), cognitive biases in favour of processing threatening stimuli (Eysenck, MacLeod & Matthew, 1987), changed cognitive strategies (Mahan, 1994; Shaham, Singer & Schaeffer, 1992,) and reduction of cognitive processing efficiency (Keinan, 1987, Keinan et al. 1987). Cognitive effects of anxiety on decision making also include hypervigilance (Janis & Mann, 1977; MacLeod & Rutherford), modification of judgement processes (Shaham, Singer, & Schaeffer, 1992), shifts to intuitive cognitive strategies (Mahan, 1994), narrowed attention and failure to detect peripheral or occasional stimuli (Kiernan, 1987; Kiernan et al 1987) concentration on a limited number of alternatives (Baddeley, 1972; Hockey & Hamilton, 1983; Janis & Mann, 1977) failure to systematically scan all relevant alternatives (Keinan, 1987; Keinan et al. 1987), failure to devote adequate time to each alternative (Janis & Mann, 1977) and a processing bias towards threat-related information (Ben-Zur & Breznitz, 1981; Eysenck, 1988; Kelley, 1965; Matthews & MacLeod, 1991; Mogg et al. 1991).

However with regard to specific processing strategies a complication has been identified (see Figure 4.1) concerning the impact of negative emotions on the choice of specific decision making strategies (Luce et al. 1997). On the one hand, negative emotions such as anxiety and fear flag situations that necessitate accurate decision making (usually in the form of the more laborious, normative or analytic processing strategies) whilst on the other hand research indicates that emotional arousal reduces the amount of attention available for decision making (Baddeley, 1972; Ben-Zur & Breznitz, 1981; Eysenck, 1988; Eysenck, MacLeod & Matthew, 1987; Hockey & Hamilton, 1983; Janis & Mann, 1977; Keinan, 1987; Keinan et al. 1987, Kelley, 1965; Matthews & MacLeod, 1991; Mogg et al. 1991) resulting in the use of the faster, less effortful and less accurate heuristic strategies. According to Luce et al. (1997) negative emotions encourage processing modes and decision making strategies that are inconsistent with the effort-accuracy framework. They predict that negative, task-induced emotions will result in cognitive strategies that whilst aiming to minimise negative emotion intend to maximise accurate decision making. This contradicts the many findings (above) that negative emotions add to decision complexity and hence decision load and should therefore be addressed by resorting to less burdensome, less accurate and simpler heuristic strategies.

In other words, Luce et al (1997) predict that task-induced negative emotions such as fear, anxiety and stress will encourage cognitive processing strategies that initially aim to maximise accuracy by invoking more extensive, analytical and alternative-based processing modes. That is - investigating and processing *all* relevant information in pursuit of accuracy *and* processing information about a number of alternatives on one attribute before considering information about another attribute. However the researchers warn that as the decision situation becomes more emotionally laden, decision makers may revert to less extensive, simpler and more conservative strategies when presented with new alternatives. In fact the stronger the emotional impact on decision making, analogous to the 'hot cognitions' described by Janis and Mann (1977), the more probable the shift towards less extensive, more selective non-compensatory attribute-based processing.

How then can these findings predict the cognitive strategies and coping behaviours in office building fires? It is assumed that the initial stages of office building fires are ambiguous situations with few explicit fire-related cues. The exception to this would be the perceptions of those individuals intimately connected with the fire start or in close proximity during ignition. Early cues such as the failure or interruptions to power

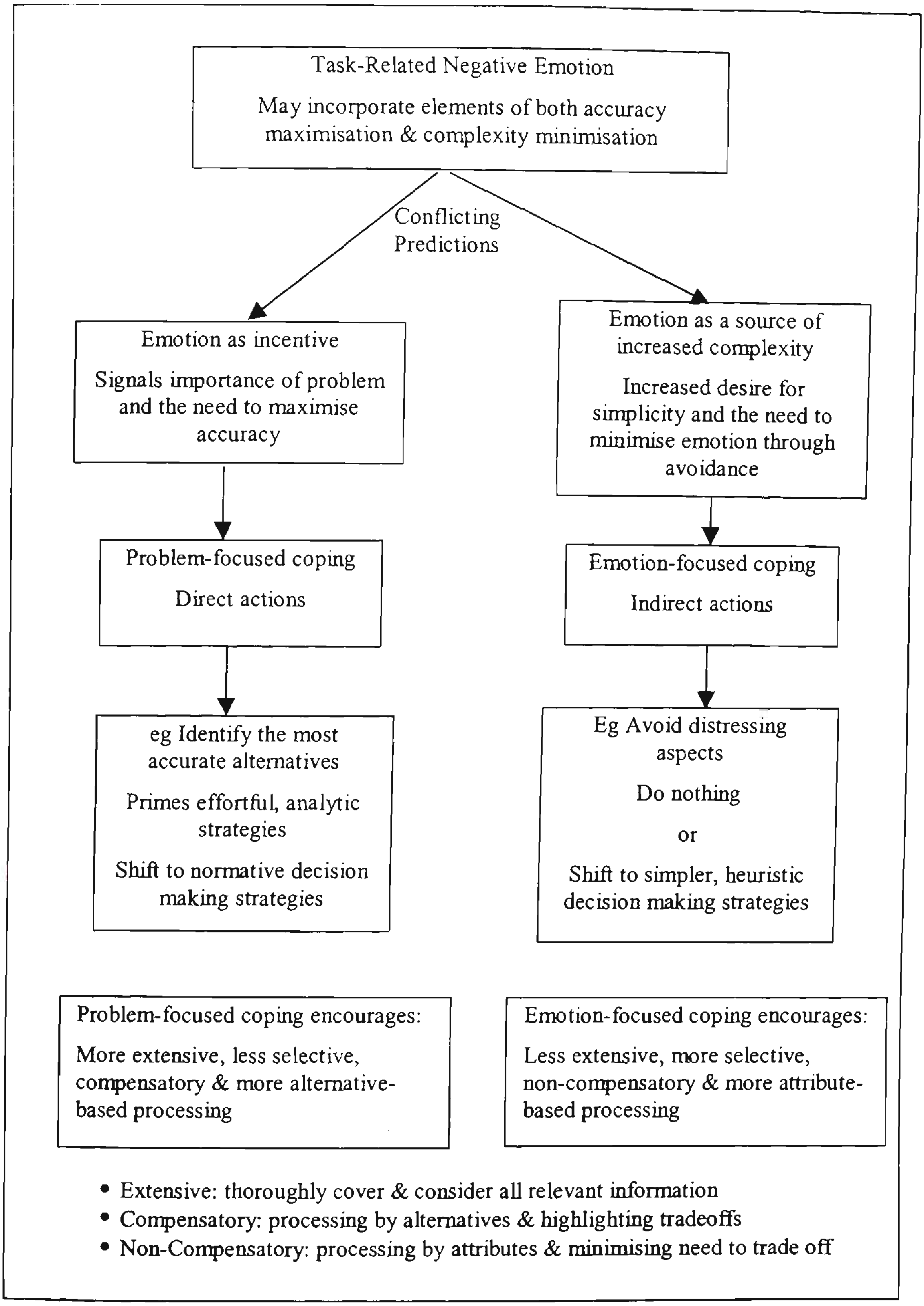


Figure 4.1

Cognitive strategies and coping behaviour for dealing with task-related negative emotion (adapted from Luce et al. 1977)

or communications equipment and supply would encourage the use of problem-focused cognitive strategies. These signs would not necessarily signal a dangerous situation. Emotional involvement would be at the level of regarding the interruption as a nuisance or bothersome delay in performing or completing certain tasks. The predicted behaviour includes ignoring the interruption if committed to the tasks at hand, continuing with activities if possible, and investigating or seeking further information about the interruption if it is not possible to discharge the immediate assignment. Invoked decision making strategies would be of the extensive normative, compensatory kind - searching through or changing to other alternatives (under minimal time pressure) until the problem is resolved on one level - seeking out the advice or information from others on another level.

For building alarms the predicted behaviour varies according to the existence of training in emergency procedures and the assignment of warden or safety officers. To some occupants building alarms alert them to prepare for a change in conditions. Occupants in organisations with integrated warden systems and regularly practised emergency response procedures will resort to problem-focused cognitive strategies - retrieving the algorithm for emergency procedures from their evacuation drills. In a sense they have little choice in subsequent behaviour - their decision making has been taken care of and a particular sequence of activities triggered by the alarm dominates response until they are instructed otherwise.

However the building alarm cue may not always be as clearly interpreted and uniformly responded to. Disregard for alarms happens in organisations with safety and emergency procedures - particularly after a series of false alarms. For whatever reasons, occupants may chose to ignore the signal and persist with the immediate tasks. For organisations without training in emergency procedures and regular evacuation drills - it is predicted that most occupants will resort to emotion-focused coping strategies. Occupants may favour selective, non-compensatory, attribute-based decision strategies. They may cease what they are doing or interrupt their activities to investigate or seek more information and advice about the cause of the alarm signal and what to do about it. For people who are temporary occupants (visitors, transients) or new to the organisation, the prediction is that they will select cautious strategies and endeavour to find someone who is familiar with the procedures in these circumstances in order to obtain information and advice on appropriate response.

Explicit fire cues such as smoke and flames should invoke emotion-focused coping strategies. The occupants would choose selective, non-compensatory, attribute-based decision strategies. In most cases the individuals will experience severe time pressure and heightened negative emotions (fear and anxiety) and will not have the time to extensively consider all alternatives nor new (and presumably untried and untested options). Individuals would not be prepared to entertain trade-offs in attributes and should resort to conservative strategies and familiar heuristics (follow the crowd, safety in numbers, etc).

> "We speculate, however that our processing results indicate that decision makers will be less accurate as task-related emotion increases. Recall that the degree to which processing is extensive and the degree to which it attempts to accurately resolve trade-offs between attributes, are considered to be two important aspects of normatively accurate decision processing..."
> (Luce et al. 1997, p. 402)

In terms of task-induced cognitive processing (Hammond et al. 1997) fire emergencies in office buildings will be characterised as "tasks" whose particular properties will invoke particular modes of cognitive processing (Table 4.1). Consistent with this the model predicts that individuals or groups will employ analytic or quasi-rational cognitive processes (slower inductive/deductive processes such as procedural logic, etc) when the task characteristics include a small number of clear cut cues which can be objectively measured, a familiar or recognised situation and no time pressure. Analytic processing should also be induced when the task characteristics make cognitively accessible explicit strategies (such as procedural manuals, emergency instructions, etc) available to deal with the emergency. For occupants, other than trained emergency responders (wardens, security staff, safety officers) the model predicts a tendency to employ a faster, less accurate, fundamentally inferential and informal reasoning process. Induced intuitive cognitive processing should result in employing heuristic strategies such as belief in the expert, following the crowd, etc.

Table 4.1

Comparison of fire cues in terms of task-induced cognitive processing

Task Characteristic	Intuition-inducing State	Analysis-inducing State
Number of cues	large: building alarm computer breakdown + buildin alarm smoke and flames computer breakdown + buildin alarm + smoke and flames	small: computer breakdown preceded by various office activities
Measurement of cues	perceptual measurement: building alarm auditory smoke and flames visual, auditory	objective reliable measurement: computer breakdown, building alarm (if these are common occurrences)
Distribution of cue values	continuous highly, variable distribution: smoke and flames rapid changes and exponential development of cue	unknown distribution; cues are dichotomous; values are discrete: computer breakdown, building alarm
Redundancy among cues	high redundancy: building alarm, smoke and flames (many cue attributes available)	low redundancy computer breakdown,
Decomposition of task	low: smoke and flames (due to inexperience, lack of preparation, awareness)	high: computer breakdown, building alarm (preparation, planning, training facilitates task analysis and strategic response)
Degree of certainty of task	low certainty: smoke and flames (ambiguous, unfamiliar situation)	high certainty: familiarity computer breakdown, building alarm (recognition through training, familiarity, experience)
Relation between cues and criterion	linear	non-linear
Weighting of cues in environmental model	equal: inexperience causes difficulty in allocating degrees of importance	unequal: possible to discern and weight more important cues if trained or prepared

	unavailable:	available:
Availability of organising principle	smoke and flames no explicit principle if no prior experience with fire emergency, no education or training for emergencies	computer breakdown, building alarm preparation, prior experience, community education, training permits recognition and response
Display of cues	simultaneous display:	sequential display
Time period	brief:	long lead in time

The task-induced cognitive processing predictions (Hammond et al. 1997) accord in principle with those hypothesised decision making strategies invoked by task-related negative emotions (Luce et al. 1997). In general terms it is predicted that strategies chosen to minimise negative emotions will be reflected in behaviour.

Table 4.2

Cognitive processes invoked in office fire emergencies adapted from Hammond et al. 1997

Task Character	Intuition-inducing State	Analysis-inducing State
1. Number of cues	large: O, O_T, e.g. mechanical malfunctions, alarms, sirens, social communications and behaviour, physical cues (smoke, flames, heat, smell noise)	small: fire emergencies are generally characterised by multiple cues
2. Measurement of cues	perceptual measurement: O, O_T e.g. visual, auditory, olfactory, tactile	objective reliable measurement: O_T possible when there is recourse to advance warnings or strategic information
3. Distribution of cue values	continuous highly, variable distribution: O, O_T e.g. rapid changes and exponential development in some cues	unknown distribution; cues are dichotomous; values are discrete: rare in fire emergencies
4. Redundancy among cues	high redundancy: O, O_T many cue attributes available	low redundancy
5. Decomposition of task	low: O due to inexperience, lack o preparation, awareness	high: O_T preparation, planning, training facilitates task analysis and strategic response
6. Degree of certainty of task	low certainty: O ambiguous, unfamiliar situation	high certainty: O_T familiarity - recognition through training, advance warnings, strategic information
7. Relation between cues and criterion	linear O, O_T	non-linear

8. Weighting of cues in environmental model	equal: O inexperience causes difficulty in allocating degrees of importance	unequal: O_T possible to discern and weight more important cues if trained or prepared
9. Availability of organising principle	unavailable: O no explicit principle if no prior experience with fire emergency, no education or training for emergencies	available: O_T e.g. preparation, prior experience, community education, training permits recognition and response
10. Display of cues	simultaneous display: O, O	sequential display
11. Time period	brief: O, O_T	long lead in time

Key for Table 4.2

O: Office building occupants (includes visitors and naive or non-emergency trained office workers)
O_T: Office building occupants (emergency trained occupants)

In terms of task-induced processing, the task properties of mechanical/electrical or communications equipment interruptions or breakdowns include a small number of objectively measurable cues (such as those associated with a computer breakdown). The task conditions exhibit low redundancy amongst cues and the problem is uncomplicated, possibly familiar and appears to have an immediate and specific cause (something to do with the computer). Task decomposition is straightforward and the decision maker would normally have recourse to a specific organising principle (or mode of cognition) such as continue with the tasks at hand if possible - i.e. other office activities that do not involve the computer. The model predicts that the properties of the task will invoke analytic or quasi-rational cognitive processes to address the immediate problem - fix the computer or find some other job to do. When there are no other fire cues present occupants rarely infer that a building fire is the cause of equipment or infrastructure malfunctions. However disturbances to electrical, communications and mechanical equipment generally accompany building fires and in the early stages of a fire these interruptions are often the only perceptible environmental changes for people who are remote from the fire or not intimately connected with it. Thus mechanical interruptions, although inherently ambiguous or tenuous fire cues (that should invoke intuitive decision making processes) in fact induce quasi-rational cognitive processing that respond to the effect (specific and concrete consequences of the malfunction) - the computer screen freezing rather than the cause - a fire.

For cues such as building alarms and in particular non-informative alarms (electronic tones, sirens, bells, etc), occupants can reliably and objectively measure the alarm (audible sounds or visual presence) and although often familiar with the alarm may attribute the signal to a range of causes. Speculation would include whether the alarm was a false alarm, a drill, a test, a malfunction or a real emergency. Consensus among researchers (Canter, 1980; Levin, 1989; Lo, 1996) holds that if cues are ambiguous, the first significant response will be to investigate. Based on numerous studies of the reaction of people to building alarm systems, (Bellamy & Geyer, 1990; Breen, 1985; Fahy & Sapochetti, 1999; Gardner, 1996; Kahn, 1984; Keating & Loftus, 1977; Moore, 1988; Proulx, 1997; Proulx, 1998; Proulx & Syme, 1991; Proulx, Larouche, & Latour, 1995), the model predicts delays in response (particularly in evacuation) to a building alarm, unless accompanied by other cues (such as directive communications from staff, smoke or flames). The model predicts that many people will ignore the alarm. The majority will search for more information to assist their interpretation of events, or to confirm the need to prepare to evacuate.

It is predicted that although smoke and flames are explicit fire cues, they will induce (according to Table 4.1) in most respondents intuitive cognitive processing.

> "Since most people have little or no experience dealing with a hostile fire, they will have to rely on other sources of information and experience to identify the nature of the situation and manage their response."
>
> (Chubb, Groner, Shephard, 1998, p. 207)

According to Hammond et al (1997) uncertainty is a catalyst for inducing intuitive cognition. People who are unfamiliar with building fires and/or have no training in recognition and fire emergency response will be required to make decisions in an environment whose characteristics are difficult, often unfamiliar and uncertain. The model predicts a shift towards intuitive cognition invoked by the task characteristics with greater reliance on individual solutions (such as guessing or approximation strategies) that result in increased diversity of predicted behaviours.

Most occupants of office buildings have no previous experience with building fires. Fires in office buildings are relatively rare and are characterised by fairly brief development phases with multiple and simultaneously presented cues that are perceptually measured. Lack of experience or preparation in the situation limits access to a suitable cognitive organising principle. After perception of and reaction to the initial ambiguous cues, a process of gathering and conferring with others occurs as people attempt to define the situation. If warden or emergency response structures are activated occupants will acquiesce to instruction from trained responders or other authority figures such as managerial staff. Occupant decision making is then essentially controlled and the organising cognitive principle becomes reliant on and the expectation that, wardens or management will provide advice and guidance in the situation.

The model also incorporates elements of the consequential decision making model proposed by Janis & Mann (1977). Both Janis & Mann and Luce et al (1997) suggest that high emotional levels diminish decision making unless the decision maker is confident that they can identify an alternative that is better than the status quo and there is adequate time to search for and consider other options.

> "... extremely low stress and extremely high stress are likely to give rise to defective information processing whereas intermediate levels of stress are associated with vigilant information processing."
>
> (Janis & Mann, 1977, p. 52)

Salient recommendations from this model include the prediction of a wide range of behaviours in response to the perception of low or non-existent threat and the concept of unconflicted inertia that may produce a "business as usual" approach to ambiguous or indiscernible fire cues. In response to clearer cues (such as the building alarm) but with no accompanying time pressure, the conflict model would predict some change in behaviour (unconflicted change) with individuals investigating the cause of the alarm, instituting some alerting and protective procedures and conceivably

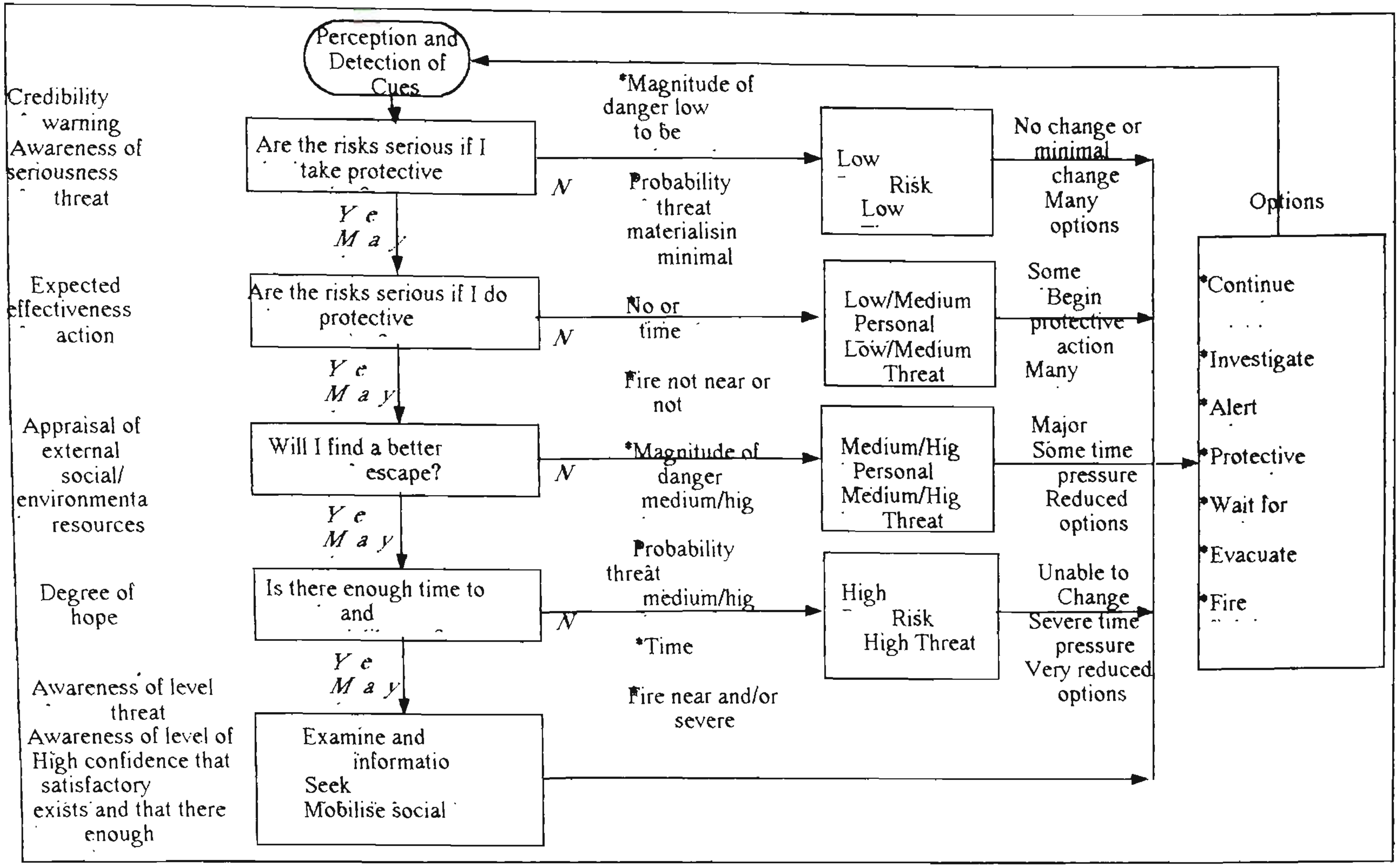


Figure 4.2

<u>Adaptation of the conflict-theory model of decision making (Janis & Mann, 1977) to decision making in office building fires</u>

preparing for evacuation. For threatening fire cues (thick smoke and flames or frantic communications and warnings from other people) and dependant upon appraisal of external social or environmental resources, consequent assessment of the degree of danger generates various coping patterns. During defensive avoidance an individual may ignore or avoid consideration of unpleasant threats. Hypervigilance may result when decision makers fear imminent entrapment and engage in frantic and often inappropriate actions - in the case of building fires these actions would include fleeing towards the nearest exit. For those who believe that a better option exists, and that for example protecting property extinguishing, or escape from, the fire are possible options and they have enough time to examine and appraise the information, vigilant decision making in terms of rapid cognitive assessments of the situation and options takes place.

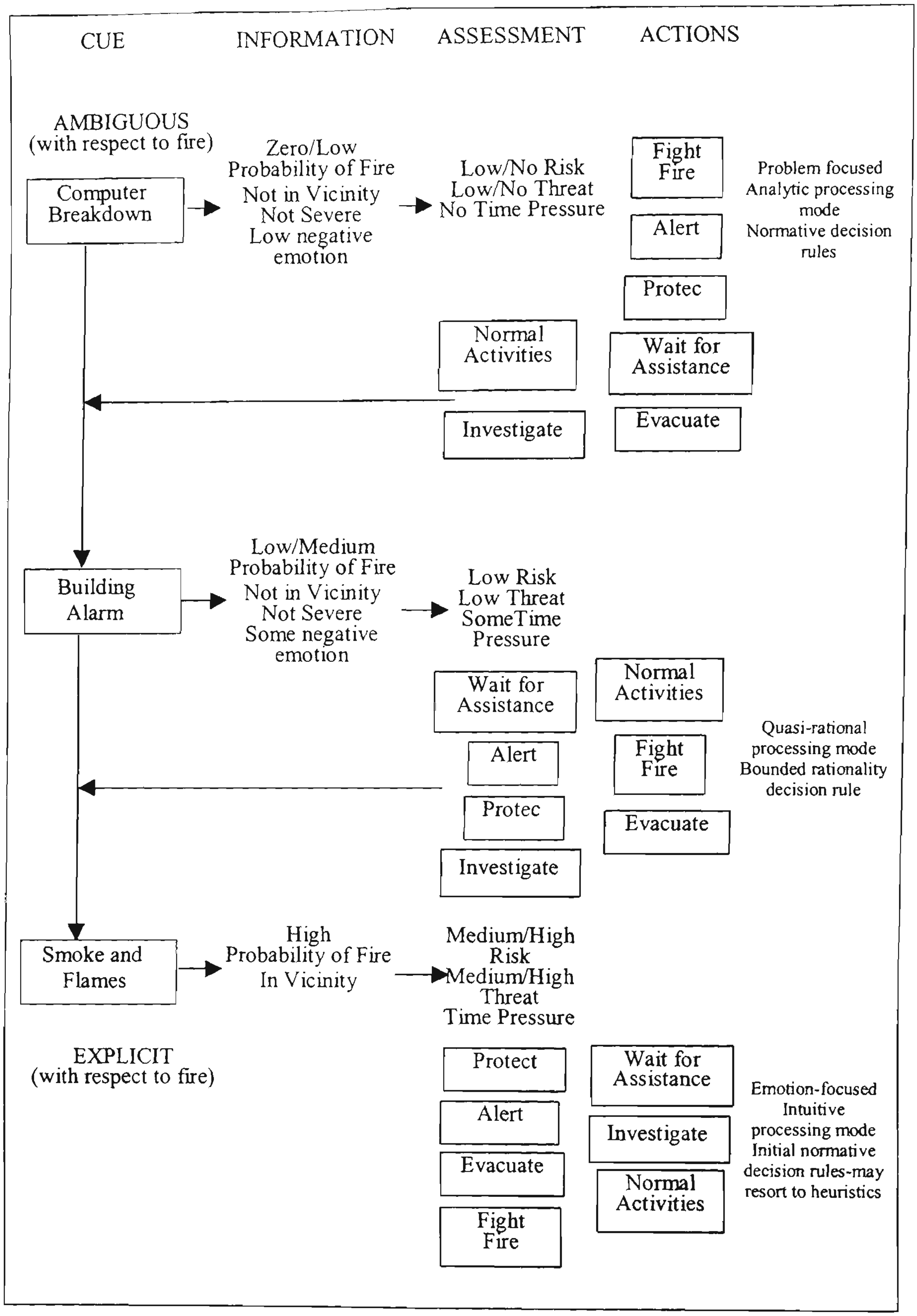


Figure 4.3

Decision making model of behaviour in an office building fire

Summary of the Decision Making Model in Office Building Fire Emergencies

1. The decision making model of behaviour in office building fires owes much to three models of decision making. It integrates the concepts of vigilance, hypervigilance and "hot cognitions" involved in consequential decision making (the conflict model of decision making, Janis & Mann, 1977), the notion of the cognitive continuum and task-induced cognitive processing (Hammond et al. 1997) and the assumptions underlying the impact of task-related negative emotions on decision making (Luce et al. 1997).
2. The ambiguity of mechanical disruptions and lack of discernible fire cues in the initial stages of building fires induces problem-focused coping and cognitive strategies that are directed to discharging the task at hand rather than contemplation of a possible fire. Cognitive processing will be slower - normative and analytical in nature and behaviour will include continuing where possible with current activities or searching for more information and advice regarding the situation.
3. Negative emotions induced by uncertainty, anxiety or fear will encourage the use of attribute-based, non-compensatory strategies at the initial stage of decision

making. Cues such as smoke and flames may cause a shift in problem-focused processing strategies to emotion-focused non compensatory techniques in which individuals are unwilling to entertain trade-offs and the decision strategy employed will be selective and attribute-based. In other words there will be a shift from attending to alternatives to concentration on those attributes that promise risk-averse outcomes.

4. When powerful emotions are combined with pressure to act quickly, a faster, less effortful intuitive processing mode will be favoured and heuristics employed (evacuate, follow the crowd, belief in the expert, etc). It is predicted that strong emotions such as fear and anxiety will diminish the accuracy and efficiency of decision making unless the decision maker is confident that they can identify and have the time to consider options better than the current path of action. In extreme cases high emotions may result in hypervigilance (panic and other desperate actions) or defensive avoidance in which individuals ignore or avoiding unpleasant information.

Aims

The aims of the research were:

1. To identify the dominant behaviours of occupants in response to particular cues in office building fire emergencies.
2. To describe decision making in office building fire emergencies in terms of seven behavioural constructs (continue normal activities, investigate, alert/warn others, protective procedures, wait for assistance, fight the fire, evacuate).
3. To offer explanations of behaviour in terms of decision making theories such as the conflict model of decision making (Janis & Mann, 1977), task-induced cognitive processing (Hammond et al. 1997) and impact of negative emotions on choice processing (Luce et al. 1997).
4. To predict behavioural responses in terms of decision making theories such as the conflict model of decision making (Janis & Mann, 1977), task-induced cognitive processing (Hammond et al. 1997) and impact of negative emotions on choice processing (Luce et al. 1997).

Hypotheses

Summary of the Hypotheses

Hypothesis 1.

There will be measurable behavioural discrimination between different categories of cues in office building fire emergencies.

Hypothesis 2.

Behaviour in response to cues defined as ambiguous (such as disturbances to building systems and equipment and non-informative building alarms) will exhibit a greater range of actions than behaviour in response to explicit fire cues.

Hypothesis 3.

Behaviour in response to explicit fire cues (such as smoke and flames) will exhibit a smaller range of actions than behaviour in response to ambiguous fire cues.

Hypothesis 4.

Social decision making (people oriented actions) will dominate responses.

Hypothesis 5.

There will be occupational differences in response to the cues in office building fire emergencies.

Hypothesis 6.

Behaviour in response to cues defined as ambiguous (such as disturbances to building systems and equipment and non-informative building alarms) will consist predominately of ignoring the interruption, attempting to continue with tasks at hand, seeking further information and advice.

Hypothesis 7.

Behaviour in response to explicit fire cues (such as smoke and flames) will consist predominately of protective procedures, preparing to evacuate and evacuation.

Chapter 5

Methodology (Pilot Studies)

Pre-validation

Participants.

The participants consisted of a convenience sample of 20 office workers recruited by word of mouth. No detailed demographic details were collected. The sample contained both males and females and the age range was approximately 20 to 45 years.

Apparatus.

The pre-validation questionnaire (Appendix A) consisted of an evaluation page and three sections. The evaluation page explained the purpose of the questionnaire and requested an evaluation of the clarity of instructions, the comprehensibility of the questions and the representativeness or appropriateness of the actions listed and suggestions for improvement.

Section A comprised five activities relating to fire cues. Four of the activities required scaling responses on a five point Likert scale. The activities required scaling in terms of the likelihood, severity, proximity and perceived threat of a fire.

Section B consisted of 42 items with six items - the minimum requirement for statistical purposes, chosen to represent each of the seven construct categories. The 42 items represented seven constructs derived from existing models of behaviour in building fires (Bickman, Edelman & McDaniel, 1977; Bryan, 1983, 1985, 1986, 1988; Canter, 1980, 1985; Canter, Breaux, & Sime 1980; Levin, 1985; Sime 1984, 1988; Wood, 1972), case studies, incident reports and interviews with observers and survivors of office building fire emergencies (Brennan, 1995, 1996, 1997; Keating & Loftus, 1984, 1985; Latane & Darley, 1968). The constructs described seven categories of action (continue normal activities, investigate/seek further information, alert/warn, protective procedures, wait for assistance, fight the fire and evacuate). The sources referenced also provided a number of the single items representative of each construct. Accompanying each action was a five point Likert type scale (Extremely Unlikely, Quite Unlikely, Neither, Quite Likely, Extremely Likely). There was an option for participants to suggest other relevant items. Accompanying each action was provision to indicate the approximate time that it would take.

Section C requested the gender, age, and (open ended suggestions such as: Year 12, certificate, TAFE, etc) information on qualifications and training of the participant. The normal duties undertaken by the participant, were selected from typing, word-processing, filing, photocopying, meetings, client/public interaction, deliveries. lunch and tea break or other.

Procedure.

Participants were asked to read through the questionnaire and comment on the clarity and unambiguity of instructions, comprehensibility of the questions, the appropriateness of the items listed and to give suggestions for improvement of the questionnaire or inclusion of additional information. The purpose and methodology were briefly explained and participants were assured that their responses would be kept anonymous and confidential. Participants were instructed *not* to scale their responses or complete demographic details and there was no time pressure during pre-validation of the questionnaire.

The participants in the pre-validation exercise were informed that an office building fire scenario (in the form of a film) would accompany the final version of the questionnaire. Responses to the questionnaire were collected and suggestions and comments incorporated in the face validation questionnaire. Participants were thanked for their contributions.

Face Validation

Participants.

The participants consisted of a convenience sample of 15 office workers recruited by word of mouth. No detailed demographic details were collected. The sample contained both males and females and the age range was approximately 20 to 45 years.

Apparatus.

The face validation questionnaire (Appendix B) comprised four sections. The first section (face page) informed participants of the purpose and gave instructions for completion of the questionnaire.

The second section (similar to the pre-validation questionnaire) comprised activities that required scaling in terms of the likelihood, severity, proximity and perceived threat of a fire.

The third section contained three stages designed to represent the development of an office building fire. A written description of each stage preceded the list of 42 items. Each stage had an identical list of items. The items were similar to those comprising the pre-validation questionnaire. Amendments to the items were the result of the suggestions and comments of pre-validation participants. An example of the change in wording "Continue typing/word-processing" was replaced by "Continue with computer work". Accompanying each action was a five point Likert type scale (Extremely Unlikely, Quite Unlikely, Uncertain, Quite Likely, Extremely Likely). There was an option to suggest other relevant items. In the interests of comprehensibility and clarity the option "Neither" in the pre-validation questionnaire was replaced by "Uncertain". Use of the word "Neither" on the Likert scale caused some confusion and provoked comments such as: What does "Neither" equate to?

The stages described of the developing fire were the activation of a smoke detector or alarm (Stage 1), the visual presence of smoke (Stage 2) and a smoke filled corridor (Stage 3).

The final section consisted of questions relating to demographic details such as gender, age, qualifications and training, normal duties undertaken in the organisation, experience of building fires and evacuation mobility.

Procedure.

Participants were asked to read through the questionnaire and comment on the wording of instructions and questions, the questionnaire design and the representativeness of the list of items presented as possible in an office building fire. They were asked to comment on the clarity of the description of the office scenario and the credibility of the fire development, and to make any suggestions for improvement. The text for the instructions for the face validation is found in Appendix B. The purpose and methodology were briefly explained and the participants were asked to assess the questionnaire in terms of the clarity and unambiguity of instructions, relevance to an office fire emergency and to suggest any other behavioural options or activities. Participants were assured that their responses would be kept anonymous and confidential. They were instructed not to scale their responses, nor answer the demographic section. There was no time pressure on participants during face validation of the questionnaire. Participants were thanked for their contributions.

Pilot 1

Participants.

The participants were a group of 29 office workers, recruited by convenience sampling, and came from a modern high-rise office building in the central business district of Melbourne. The organisation concerned had a high emphasis on building safety and emergency procedures. There were 15 males and 14 females aged between 20 and 60 years, and only one person had been involved in a building fire.

Apparatus.

The Pilot 1 questionnaire (Appendix C) consisted of three sections. It was almost identical to the face validation questionnaire, with the exception of the removal of section 2 (questions on the perception and interpretation of the fire cues).

The three written fire scenarios presented to participants were the same as those in the face validation questionnaire: the first scenario was an activated smoke detector or alarm (the alert signal), the second scenario contained the alarm ringing and smoke visible from an unknown source, the third scenario was a smoke logged corridor. Each fire scenario was followed by the same list of 42 items.

The section requesting demographic information (age, gender, normal duties, disabilities, etc) was identical to that of the face validation questionnaire.

Procedure.

The questionnaire was given to a senior manager in the organisation to administer to the 29 participants. Participants were asked to scale each of the 42 items for the three scenarios using a five point Likert type scale (Extremely Unlikely, Quite Unlikely, Uncertain, Quite Likely, Extremely Likely). It was explained to the participants that a film showing a simulated office fire would accompany the final version. Participants were requested to be honest and spontaneous in their answers ("To describe your *immediate reaction* tick the box showing how likely it would be for you to take the following items *at this stage*. Please tick *one* box only for *every* action listed"). Confidentiality and anonymity were assured in the administration and collection of the questionnaires and there was no time pressure on the participants to complete the questionnaire.

The questionnaires were collected, coded (Extremely Unlikely = -2; Quite Unlikely = -1; Uncertain = 0; Quite Likely = +1; Extremely Likely = +2) and analysed for descriptives and response discrimination between the three fire cue presentations.

Pilot 2

Participants.

The 24 participants, recruited using convenience sampling, were from a government high rise building in the central business district of Melbourne. The sample included males and females ranging in age from 20 to 60 years.

Apparatus.

The Pilot 2 questionnaire (Appendix D) was an amended version of Pilot 1. Inspection of items that generated low frequency responses, or that yielded high uncertainty, and statistical evaluation of the results (one-way analysis of variance) to assess the discrimination of items in response to the cues presented, suggested changes in the questionnaire. These changes included altering the fire scenario for the second fire scenario (smoke present on the floor of occupancy was replaced by the activation of the evacuation signal). The cues for scenarios 1 and 3 remained the same for both questionnaires.

The item "wait for assistance" in Pilot 1, had the words "to evacuate" added in Pilot 2. This was done to clarify the meaning of the response.

Demographic information was identical to Pilot 1.

Procedure.

The researcher administered the questionnaire to the participants. The purpose of the questionnaire was explained and it was stressed that honesty and spontaneity in response was important ("To describe your *immediate reaction* tick the box showing how likely it would be for you to take the following items *at this stage.* Please tick *one* box only for *every action* listed"). Participants were assured that their answers would be confidential and anonymous. Participants were requested to mark their answers (the probability of each response for each stage of the scenario) on a five-point scale Likert type scale as for previous questionnaires (Extremely Unlikely to Extremely Likely). Participants were asked to mark each item for the three fire scenarios. There was no time pressure to complete the questionnaire and participants were thanked for their time and co-operation.

The questionnaires were collected, coded and analysed for descriptives and response discrimination between the three fire cue presentations.

Pilot 3

Participants.

The participants consisted of 33 post-secondary students from two different metropolitan Melbourne institutes (Outer Eastern TAFE and Swinburne University of Technology). The first group comprised 18 males, aged 19 to 25 years who were studying a fire-related course and in most cases were volunteer fire fighters. The second group of 15 students contained almost equal numbers of males and females, aged 19 to 25 years, studying a business course. They were not volunteer members of fire or emergency services and their course did not include fire-related subjects).

Apparatus.

The two versions of the questionnaire differed only in the last fire scenario. This was done to compare responses to the different cues.

The Pilot 3 questionnaire (Appendices E1 and E2) contained three sections. The first section explained the purpose of the survey and contained instructions for completion of the questionnaire.

The second section contained three fire scenarios with the same list of 36 items for each scenario. Six items were deleted from previous versions of the questionnaire. The deleted items were: "Telephone the switchboard for more information"; "Ask someone else to raise the alarm or report the situation"; "Telephone the switchboard for assistance"; "Open doors and or windows to ventilate the area"; "Prepare others for evacuation"; and "Ask others for assistance in fighting the fire." These items were omitted because analysis of previous questionnaires indicated low probabilities of these responses, high uncertainty and lack of discrimination (one-way ANOVA) in response to cues.

The two versions of the questionnaire differed with respect to the cues for the third fire scenario. The first fire scenario cue "Alone in your office when the building alarm (alert signal) goes off" was the same for each group. Smelling smoke was introduced as a cue for the second fire scenario for both of the versions ("smell smoke but unsure of origin"). There was an emphasis on thick black smoke in the third fire scenario for one of the versions ("You open the office door to find thick black smoke in the corridor."), whereas the third fire scenario described in the other version was the sound of the building evacuation signal. The stress in the Pilot 3 version of the questionnaire was on individual decision making ("alone in your office").

Demographic information was the same as previous versions.

Procedure.

The researcher administered the questionnaire to both groups. Eight individuals in group one and ten individuals in group two were given one version of the questionnaire to complete. Seven individuals in group one and eight in group two were given the second version of the questionnaire. The purpose of the questionnaire was explained and it was stressed that honesty and spontaneity in response was important ("To describe your *immediate reaction* tick the box showing how likely it would be for you to take the following items *at this stage*. Please tick *one* box only for *every* action listed"). Participants were assured that their answers would be confidential and anonymous. Participants were requested to mark their answers (the probability of each response for each stage of the scenario) on a five point Likert type scale as in previous questionnaires (Extremely Unlikely to Extremely Likely). Participants were asked to mark each item for the three scenarios. Time pressure on participants to complete the questionnaire was introduced at this stage of the piloting procedure. The rationale for this was firstly to emulate the time constraints of a rapid decision making situation and secondly to determine the minimum time in which participants could reasonably be expected to select responses for the 36 items using the Likert scale. The researcher decided on a two minute time allowance to complete each section. Participants were thanked for their contribution and time.

The questionnaires were collected, coded (the Likert type scale was assigned the following values: Extremely Unlikely = -2; Quite Unlikely = -1; Uncertain = 0; Quite Likely = +1; Extremely Likely = +2), and analysed for descriptives and response discrimination (one-way ANOVA) between the three fire scenarios (cues) presented.

Pilot 4

Participants.

Piloting involved 30 adult post-secondary students from two different Melbourne metropolitan campuses, recruited by convenience sampling.

Apparatus.

Pilot 4 used two questionnaires (Version 4a and Version 4b) comprising the three sections of previous versions. Each version comprised two fire scenarios (in contrast to three fire scenarios described in previous questionnaires), with each fire scenario containing the same 36 items (Appendices F1 and F2). The questionnaires were identical except that the order of the cues was reversed. Changes were introduced into the second section of the questionnaire to measure the effect of the order of cue presentation. The cues chosen were smelling smoke and the building alarm. In the written description the term used was building alarm - no distinction made between "alert" or "action" alarm.

Version 4a presented the smell of smoke as the first cue, followed by the sound of the building alarm (second cue). Version 4(b) reversed this order.

Procedure.

The researcher administered the questionnaire to both groups. Eight individuals in group one and seven individuals in group two were given one version of the questionnaire to complete. Eight individuals in group one and seven individuals in group two were given the second version of the questionnaire. The purpose of the questionnaire was explained and it was stressed that honesty and spontaneity in response was very important. Participants were assured that their answers would be confidential and anonymous. They were requested to mark their answers (the probability of each response for each stage of the scenario) on a five-point scale Likert type scale as in previous questionnaires (Extremely Unlikely to Extremely Likely). Participants were asked to mark each action the three fire scenarios. There was time pressure on participants to complete the questionnaire. They were allowed two minutes to complete each list of 36 items.

The questionnaires were collected, coded (as before) and analysed for descriptives and response discrimination (one-way ANOVA) between the three fire cues presented.

Chapter 6

Methodology (Main Study)

Participants

Two hundred and fifty four participants (148 males and 106 females) recruited by word of mouth and convenience sampling, took part in the study. The sample comprised two groups: office workers and post-secondary students. There were 95 office workers (64 males and 31 females, aged 20 to 60 years) from a number of government organisations and private companies, located in high rise buildings in the central business districts of Melbourne, Canberra and Sydney. Of the participants in this group, 17 experienced a fire in a building and 26 were trained as fire wardens. The 159 post-secondary students came from two institutes in Melbourne (Victoria University of Technology and Swinburne University of Technology). The group comprised 84 males and 75 females aged 18 to 45. Fifty four students were enrolled in a fire-related course, the rest were studying arts or business. Thirty one individuals in this group had experienced a building fire.

Apparatus

The instruments used were a questionnaire and a short film.

The Questionnaire. The questionnaire (Appendix G) comprised three sections. The face page contained instructions for completion, an explanation of how to scale responses, a request for honesty and spontaneity and reassurance to participants of the anonymity and confidentiality of the data.

The second section consisted of three separate pages (pertaining to each fire cue and corresponding to the order of cue presentation in the film) each containing the same 36 items accompanied by a five point Likert type scale (Extremely Unlikely, Quite Unlikely, Uncertain, Quite Likely, Extremely Likely). The 36 items represented seven constructs derived from existing models of behaviour in building fires (Bickman, Edelman & McDaniel, 1977; Bryan, 1983, 1985, 1986, 1988; Canter, 1980, 1985; Canter, Breaux, & Sime 1980; Levin, 1985; Sime 1984, 1988; Wood, 1972), case studies, incident reports and interviews with observers and survivors of office building fire emergencies (Brennan, 1995, 1996, 1997; Keating & Loftus, 1984, 1985; Latane & Darley, 1968). The constructs represented seven categories of action (continue normal activities, investigate/seek further information, alert/warn, protective procedures, wait for assistance, fight the fire and evacuate). The sources referenced also provided a number of the single items representative of each construct. The initial list of 42 items (six for each construct), typical of a high rise office building and relevant to the Australian context was refined during the piloting process. The criteria for selection was based on statistical analysis (ANOVA) such as identifying those items infrequently selected in response to cue presentation and items that failed to show discrimination between cues. Reliability estimates for each construct were also determined using Cronbach's alpha.

Examples of individual items for each construct Continue normal activities: "Continue with computer work; Continue with office paper work; Continue eating/drinking (tea/lunch break)". Investigate/seek further information: "Ask someone else nearby for more information about the situation; Look out of a door or window to investigate the situation." Alert/warn: "Contact the switchboard to report the situation; Activate the fire alarm (break the glass); Contact the floor warden to report the situation." Protective procedures: "Collect own or other's personal property or belongings; Turn off equipment." Wait for assistance: "Remain in the area until someone else arrives; Wait for a colleague's assistance to evacuate the area; Wait for the assistance of the emergency services (police, fire brigade or ambulance) to evacuate the area." Fight the fire: "Attempt to fight the fire with a fire extinguisher; Attempt to contain the fire by other means (e.g. smother, use a bucket of water, etc)." Evacuate: "Assist others to leave the area; Leave the area immediately by the emergency exit."

Reliability coefficients for the seven constructs for all participants for each cue presentation (computer breakdown, building alarm, smoke/flames) are: continue normal activities, $\alpha = .83$; $\alpha = .94$; $\alpha = .93$; investigate/seek further information, $\alpha = .78$; $\alpha = .81$; $\alpha = .83$; alert/warn, $\alpha = .88$; $\alpha = .87$; $\alpha = .71$; protective procedures, $\alpha = .82$; $\alpha = .74$; $\alpha = .66$; wait for assistance, $\alpha = .83$; $\alpha = .67$; $\alpha = .74$; fight the fire, $\alpha = .88$; $\alpha = .85$; $\alpha = .81$; and evacuate, $\alpha = .93$: $\alpha = .80$; $\alpha = .57$.

The final list of 36 items comprised those cognitively possible for occupants of office buildings. In other words the participants should have been routinely familiar with the items, they would represent everyday duties, actions and communications as well as those exploratory, warning, protective and fire fighting behaviours, compiled from previously mentioned studies of building fire emergencies. It was essential that the actions described by the items be uncomplicated, explicit and not give rise to ambiguity. This was necessary to avoid misinterpretation or confusion on the part of participants in the procedure. Not all construct categories contained the same number of actions.

The third section requested demographic information such as gender, age, qualifications and training (open ended - suggested responses were Year 12, TAFE, Diploma, Undergraduate, First Aid Certificate, etc), experience of a building fire and evacuation mobility.

The Film. The purpose of the film was to provide cues that are typical of a developing office fire emergency. These cues acted as stimuli for decision making choices on the accompanying questionnaire. Actors took the part of office staff involved in the development of the building fire scenario. The film paused when an actor experienced one of the cues to enable the participants in the procedure to complete the questionnaire. The point of view of each participant was controlled by the situation of the actor in the film.

The film (Appendix J) was set in a modern high rise office building in Melbourne. The floor on which the action took place had open plan work areas and single offices. To establish a credible fire scenario in a building equipped with modern detection, alarm and suppression systems (smoke detectors, EWIS system and sprinklers), the script (Appendix H) called for the temporary disconnection of the building's systems at the main fire panel, by workmen involved in cutting and welding on one of the floors. The fire was caused by an electrical fault in a photocopying room, whilst the detection system was disabled.

To establish content validity, the film scenario (developed by the researcher) was critiqued and changes suggested, by representatives of a number of fire-related professions, including fire fighters, fire safety engineers, building experts and office workers. The process of refinement was long and involved. The final story, incorporating advice and recommendations from a number of sources, was based on a number of real office fires in Melbourne and Sydney.

The original film contained a number of cues. It was edited into seven versions to measure the effects of various combinations of cues. Each version contained two to four cues, one was the initial control cue unrelated to a fire emergency. In all versions of the film the first cue was identical - a computer breakdown. Because the questionnaire was lengthy and repetitive and participants were under time pressure to complete each section, the version of the film chosen for the experiment (Version #2) contained only three cues. The results of this study are based on this version. It was selected after initially piloting questionnaires containing various combinations of cues (as written scenarios) and conducting preliminary analysis (descriptive statistics and ANOVAs) on the results. Version #2 was deemed to contain the three most differentiated fire cues and ANOVA analysis indicated that participants had discriminated significantly between the cues presented in the film.

Prior to administering the final version of the questionnaire with the film, to participants in this study, the film was reviewed by a number of volunteers. To anticipate the various viewing conditions that might have affected the visual presentation of the film (for example different sized groups or television monitors) viewings occurred in a number of settings ranging from individual viewings to group viewings. Feed back from volunteers indicated that the third cue (wisps of smoke coming from under the door of the photocopier room) was rather difficult to discern. In fact the comments indicated that it would probably be necessary for the study administrator to draw the viewer's attention to this cue in the film. It was the opinion of the author that intervening in the procedure to emphasise the cue in this way would not only affect the spontaneous reactions of the participants but also individual cognitive processing of the scene. It was decided to merge the third cue (wisps of smoke coming from under the door of the photocopier room) and the fourth cue (flames coming from the opened door of the photocopier room) into one cue hereafter referred to as cue three (smoke and flames).

It was possible to manually fast forward over the " break" (referred to in the script and present in the film) that follows the third cue, thus manually " merging" the two cues. Consistency in this procedure was maintained throughout the study as the author was the sole administrator of the film and questionnaire to all participants. Although neither the film nor the film script were amended to incorporate the merging of the cues, in practice and for the purposes of analysis, the participants were presented with only three cues.

The cues presented to participants were firstly a computer screen freezing (control cue present in all versions); secondly the sound of the building's alarm system; and finally, flames coming from a photocopying room.

Procedure

To maintain instruction and administration consistency, as well as time allowance for questionnaire completion, the researcher conducted the experiment with all groups. To reduce bias and influence on responses the participants were not informed of the exact purpose of the experiment. The title of the questionnaire alluded to decision making and participants were informed that the purpose of the questionnaire was to collect information on decision making behaviour in office buildings. No mention was made of fires or emergencies. Depending on participant availability (determined by each organisation) the questionnaire was administered to groups of between five and 70 individuals. Participants were asked to be honest and candid in their responses. They were requested to tick the box that best represented what they believed they would do rather than what they considered they should do. Participant were assured verbally and in writing (face page of the questionnaire) that the data would be anonymous and confidential and that participation was voluntary.

The participants were requested to tick a box for every item and to complete one list during each pause in the film. They were under time pressure to complete each section. They were allowed three minutes to indicate their answer to each of the 36 items after presentation of the first cue and 90 seconds for completing all items on subsequent cue presentations. The time intervals were selected after monitoring participants' performance and completion rates in the piloting studies.

The time intervals used when administering the study differed from those represented in the film. The film displayed a clock set at 90 seconds for participants to complete stage one of the questionnaire after presentation of the first cue (the computer screen freezing) and 60 seconds to complete each section for subsequent cues. *In practice* the author manually controlled the film and time set to complete each section of the questionnaire. It was found that the participants required three minutes to complete stage one of the questionnaire (presentation of the first cue) and 90 seconds for completion of the sections following the second and third cues. After finishing the last set of items, participants were asked to answer the demographic questions.

There were practical and theoretical reasons for the use of time pressure in the design of this study. The practical considerations included the limited time allowance that most organisations could afford to release employees to participate in the study. Another practical consideration involved the continuity of the film simulation. The film contained "natural" breaks (after the presentation of each cue) during which participants responded to the questionnaire. The breaks were quite short and were designed to correspond to the length of time spent in actual deliberative processes.

Time pressure was theoretically justified as the intention was to simulate a real fire emergency situation in which time to decide and act is limited. Methodologically it was anticipated that time pressure would stimulate more immediate response with less procrastination and hence a closer approximation to emergency decision making.

Participants were then immediately debriefed. The researcher explained the exact purpose and rationale of the study and participants were thanked for their voluntary co-operation.

The Likert type scale was assigned the following values: Extremely Unlikely = -2; Quite Unlikely = -1; Uncertain = 0; Quite Likely = +1; Extremely Likely = +2. The analysis comprised descriptive statistics (means and standard deviation of the 36 items for the three cues), one-way ANOVA for statistically significant discrimination between the three cues, construct reliability for each item, t tests, MANOVA, path analysis and structural equation modelling (Linear Structural Relations ie LISREL).

The rationale for selection of path analysis and structural equation modelling to model decision making was consistent with the theoretically driven choice and construction of each of the seven constructs (continue normal activities, alert/warn others, etc.). Each construct was an index comprising a combination of observable, accessible and cognitively possible indicator variables (individual items) derived in turn from prior empirical research, past experience and observations of actual behaviour in building fire emergencies/evacuations and other relevant theoretical positions. As structural equation modelling and path analysis hinge on theoretical justification of the specifics of the dependence relationships and components, and determine inclusion or omission of any causal relationships, it was deemed the appropriate statistical tool.

According to Hair, Anderson, Tatham & Black (1995, p. 627), the strength and conviction of assumed causation between two variables derives from the theoretical justification supporting the analysis and strong causal assertions may be made if the relationships between the variables are grounded in a theoretical rationale derived from past experience, observations of actual behaviour or other theoretical positions. After examination of the causal relationships, the researcher determined that it was conceptually sound to classify evacuate and wait for assistance as dependent variables and continue normal activities, alert/warn others, investigate, protective procedures and fight the fire as the predictor variables.

Chapter 7

Results (Pilot Studies)

Description of Data Handling

For all studies, raw data from the questionnaires was coded for each item (Extremely Unlikely = -2; Quite Unlikely = -1; Uncertain = 0; Quite Likely = +1; Extremely Likely = +2) and entered into SPSS for analysis. Means and standard deviations were calculated for individual items for each of the cues. Item means greater than 0.70 indicated likely behaviour for the item in response to the cue, whereas item means less than -0.70 indicated unlikely behaviour in response to the cue. One-way analyses of variance were used to test for differences between mean values for each item across each of the cues. The range of the item scores was -2.00 to 2.00.

Pilot 1

Descriptives and analysis.

Table 7.1

Pilot 1: Univariate and Descriptive Statistics for All Participants (N = 29)

Construct and Individual Items			Alert		Smoke Visible		Smoke Logging	
Continue Normal Activities	F	p	Mean	SD	Mean	SD	Mean	SD
1. Continue with computer work.	8.44	.00	-0.90	1.21	-1.59	0.82	-1.86	0.59
2. Continue with office paper work.	10.70	.00	-0.72	1.31	-1.55	0.83	-1.86	0.59
3. Continue meeting with others	15.21	.00	-0.59	1.18	-1.52	0.83	-1.86	0.59
4. Continue telephone conversation.	24.26	.00	-0.31	1.11	-1.52	0.87	-1.86	0.59
5. Continue eating/drinking (tea/lunch break)	13.36	.00	-0.62	1.29	-1.59	0.82	-1.86	0.59
6. Continue deliveries/errands	11.06	.00	-0.79	1.11	-1.52	0.83	-1.86	0.59
Investigate								
7. Ask someone else in the immediate vicinity for more information	1.07	.35	0.79	1.26	0.72	1.28	0.29	1.67
8. Search for a colleague for more information.	.40	.67	0.34	1.47	0.31	1.34	0.04	1.45
9. Telephone switchboard for more information.	.9136	.41	-0.69	1.39	-0.28	2.25	-0.25	1.51
10. Telephone floor warden for more information.	1.70	.19	-0.07	1.31	0.18	1.39	0.61	1.50
11. Search for the source of smell, noise, smoke, heat.	.76	.47	-0.17	1.23	0.24	1.38	-0.18	1.52

12. Look out of a door or window to investigate signs.	.09	.91	0.50	1.26	0.34	1.40	0.43	1.45
Alert/Warn								
13. Contact the switchboard to report the situation.	2.48	.09	-0.34	1.20	0.10	1.26	0.43	1.48
14. Telephone one of the emergency services (police, fire brigade or ambulance).	7.00	.00	-0.79	1.08	-0.10	1.23	0.39	1.29
15. Activate the fire alarm (break the glass).	10.58	.00	-0.57	1.14	0.28	1.28	0.89	1.17
16. Contact the floor warden to report the situation.	1.10	.34	0.97	2.02	1.34	0.90	1.25	1.11
17. Contact colleagues to report the situation.	.52	.60	0.83	0.93	1.07	1.07	1.07	1.12
18. Ask someone else to raise the alarm or report the situation.	2.74	.07	-0.31	2.00	0.34	1.20	0.32	1.29
Protective Procedures								
19. Collect own or other's personal property or belongings.	1.83	.17	-0.28	1.36	0.28	1.49	0.43	1.55
20. Secure computer files/disks or documents.	.12	.89	0.34	1.29	0.52	1.38	0.43	1.43
21. Turn off equipment.	.73	.49	0.24	1.27	0.55	1.35	0.64	1.34
22. Open doors or windows to ventilate the area.	.44	.65	-1.31	1.04	-1.31	1.00	-1.07	1.27
23. Remain in the area until someone else arrives.	8.59	.00	0.21	1.17	-0.41	0.98	-0.93	0.94
24. Check the presence of other people.	.20	.82	0.83	1.04	1.00	1.00	0.86	1.24
Wait for Assistance								
25. Wait for a colleague's assistance.	.39	.68	-0.21	1.08	-0.24	0.91	-0.43	1.03

26. Call a colleague for assistance.	.67	.51	-0.17	1.14	0.07	1.10	0.18	1.28
27. Telephone the switchboard for assistance.	1.49	.23	-0.69	1.04	-0.62	0.90	-0.25	1.14
28. Telephone the floor warden for assistance.	.58	.56	0.03	1.24	0.24	1.21	0.39	1.34
29. Wait for the assistance of one of the emergency services.	.87	.42	-0.36	1.22	-0.66	0.97	-0.71	1.05
30. Wait for the floor warden's assistance.	3.25	.04	0.93	0.96	0.79	1.08	0.25	1.14
Evacuation								
31. Prepare others for evacuation.	1.24	.29	0.17	2.36	0.69	0.97	0.79	0.99
32. Assist others to leave the area.	5.37	.01	0.10	1.23	0.79	0.90	0.89	0.79
33. Leave the area immediately by the emergency exit.	11.54	.00	-0.24	1.18	0.72	1.00	0.96	0.79
34. Leave the area immediately by the most familiar route.	.52	.60	-0.76	1.06	-0.48	1.24	-0.46	1.37
35. Advise or assist (comfort, first aid) others.	.24	.78	0.69	1.00	0.86	0.92	0.82	1.02
36. Move towards an exit.	7.33	.00	0.55	1.30	1.31	0.71	1.39	0.57
Fight the Fire								
37. Attempt to fight the fire with a fire extinguisher.	1.21	.30	0.55	1.09	0.29	1.27	0.04	1.34
38. Attempt to contain the fire by other means	1.24	.29	0.31	1.00	0.14	1.24	-0.18	1.31
39. Close doors or windows to prevent further fire and/or smoke spread.	.09	.91	0.79	1.05	0.68	1,22	0.68	1.19
40. Remain in the area until the fire brigade arrives.	.62	.54	-0.66	1.08	-0.89	0.92	-0.89	0.79

41. Ask others for assistance in fighting the fire.	.56	.57	0.10	1.32	-0.14	1.30	-0.25	1.27
42. Search for things to fight the fire with.	1.42	.25	0.07	1.36	-0.04	1.40	-0.50	1.29

One-way analysis of variance and Scheffe post hocs indicated that there were statistically significant differences between the mean responses of participants across the alert signal and both smoke visible on the floor and a smoke-logged corridor for items 1, 2, 3, 4, 5, 6, 15, 32, 33, and 36. For the alert signal and a smoke-logged corridor cues, there were significant differences between the mean responses of participants for items 14, and 23.

Pilot 2

Descriptives and analysis.

Table 7.2

Pilot 2 Univariate and Descriptive Statistics for All Participants (N = 24

Construct and Individual Items			Alert Signal		Evac Signal		Smoke	
Continue Normal Activities	F	p	Mean	SD	Mean	SD	Mean	SD
1. Continue with computer work.	8.14	.00	-0.79	1.38	-1.58	0.93	-1.91	0.29
2. Continue with office paper work.	9.53	.00	-0.75	1.36	-1.63	0.88	-1.91	0.29
3. Continue meeting with others	16.59	.00	-0.38	1.35	-1.50	0.88	-1.91	0.29
4. Continue telephone conversation.	16.59	.00	-0.38	1.35	-1.50	0.88	-1.91	0.29
5. Continue eating/drinking (tea/lunch break)	14.89	.00	-0.46	1.32	-1.54	0.93	-1.91	0.29
6. Continue deliveries/errand s	10.55	.00	-0.75	1.26	-1.63	0.88	-1.91	0.29
Investigate								
7. Ask someone else in the immediate vicinity for more information	3.74	.02	0.54	1.28	-0.17	1.66	-0.63	1.50
8. Search for a colleague for more information.	1.30	.28	-0.08	1.38	-0.38	1.44	-0.75	1.48
9. Telephone switchboard for more information.	.36	.70	-0.58	1.41	-0.78	1.44	0.92	1.25
10. Telephone floor warden for more information.	1.00	.37	-0.04	1.43	0.00	1.56	-0.54	1.44
11. Search for the source of smell, noise, smoke, heat.	3.15	.05	0.13	1.48	-0.83	1.24	-0.63	1.44

12. Look out of a door or window to investigate signs.	3.69	.03	0.38	1.35	-0.63	1.35	-0.50	1.47
Alert/Warn								
13. Contact the switchboard to report the situation.	.60	.55	-0.25	1.29	-0.67	1.40	-0.58	1.47
14. Telephone one of the emergency services (police, fire brigade or ambulance).	1.17	.32	-0.79	1.28	-0.88	1.26	-0.33	1.40
15. Activate the fire alarm (break the glass).	5.54	.01	-0.79	1.22	-0.50	1.35	0.46	1.50
16. Contact the floor warden to report the situation.	.11	.90	0.71	1.27	0.61	1.41	0.79	1.41
17. Contact colleagues to report the situation.	1.51	.23	0.46	1.22	0.29	1.40	0.92	1.25
18. Ask someone else to raise the alarm or report the situation.	3.04	.05	-0.21	1.18	-0.52	1.31	0.38	1.32
Protective Procedures								
19. Collect own or other's personal property or belongings.	.46	.63	0.33	1.34	0.71	1.52	0.38	1.58
20. Secure computer files/disks or documents.	1.60	.21	0.25	1.29	0.67	1.24	-0.04	1.57
21. Turn off equipment.	2.05	.14	0.33	1.37	0.96	1.16	0.21	1.56
22. Open doors or windows to ventilate the area.	.29	.75	-1.50	0.72	-1.30	1.11	-1.33	1.01
23. Remain in the area until someone else arrives.	3.32	.04	-0.38	1.35	-0.87	1.22	-1.25	0.94
24. Check the presence of other people.	.18	.83	0.38	1.10	0.48	1.27	0.58	1.21
Wait for Assistance								
25. Wait for a colleague's assistance to evacuate.	1.28	.28	-0.54	1.25	-0.38	1.28	-0.92	1.06

26. Call a colleague for assistance to evacuate.	.57	.57	-0.67	1.13	-0.29	1.33	-0.46	1.18
27. Telephone the switchboard for assistance to evacuate.	.72	.49	-1.04	0.86	-1.17	0.98	-0.83	1.09
28. Telephone the floor warden for assistance to evacuate.	.79	.46	-0.54	1.41	-0.48	1.53	-0.04	1.55
29. Wait for the assistance of one of the emergency services (police, fire brigade or ambulance) to evacuate.	.23	.79	-1.08	1.06	-1.08	1.02	-1.25	0.85
30. Wait for the floor warden's assistance to evacuate.	3.21	.05	0.29	1.46	1.04	1.02	0.13	1.42
Evacuate								
31. Prepare others for evacuation.	4.15	.02	-0.08	1.41	0.92	1.06	0.58	1.18
32. Assist others to leave the area.	4.98	.01	0.08	1.32	1.13	0.85	0.58	1.21
33. Leave the area immediately by the emergency exit.	8.32	.00	0.04	1.46	1.00	1.13	1.38	0.82
34. Leave the area immediately by the most familiar route.	2.01	.14	-1.13	1.03	-0.54	1.22	-0.50	1.35
35. Advise or assist (comfort, first aid) others.	.10	.90	0.79	2.50	1.00	0.83	0.92	0.93
36. Move towards an exit.	8.14	.00	0.29	1.46	1.21	1.02	1.50	0.59
Fight the Fire								
37. Attempt to fight the fire with a fire extinguisher.	.24	.79	0.08	1.21	-0.08	1.28	-0.17	1.31
38. Attempt to contain the fire by other means (e.g. smother, use a bucket of water, etc).	.28	.76	-0.21	1.18	-0.46	1.22	-0.42	1.35

39. Close doors or windows to prevent further fire and/or smoke spread.	.57	.57	0.67	1.17	0.25	1.42	0.50	1.47
40. Remain in the area until the fire brigade arrives.	1.14	.32	-1.04	0.95	-1.33	0.87	-1.42	0.88
41. Ask others for assistance in fighting the fire.	.98	.38	-0.08	1.25	-0.54	1.32	-0.54	1.35
42. Search for things to fight the fire with.	.67	.52	-0.38	1.21	-0.79	1.22	-0.58	1.32

One-way analysis of variance indicated that there were statistically significant differences between the mean responses of all participants across the cues the alert signal, and the evacuation signal and a smoke-logged corridor for items 1, 2, 3, 4, 5, 6, 33, and 36. For the cues alert signal and the evacuation signal, there were significant differences between the mean responses of participants for items 31, and 32. There were statistically significant differences between the mean responses of participants for the alert signal and a smoke-logged corridor, for items 7, 15, and 23.

Pilot 3

Descriptives and analysis.

Table 7.3

Pilot 3 Univariate and Descriptive Statistics, (N = 33)

Construct and Individual Items			Alert		Smoke Corridor		Smoke Evac Sign	
Continue Normal Activities	F	p	Mean	SD	Mean	SD	Mean	SD

1. Continue with computer work.	4.21	.02	-1.58	0.61	-1.55	0.79	-1.94	0.35
2. Continue with office paper work.	4.47	.01	-1.67	0.54	-1.48	1.00	-1.97	0.17
3. Continue meeting with others	7.77	.00	-1.36	0.86	-1.55	0.79	-2.00	0.00
4. Continue telephone conversation.	10.20	.00	-1.00	1.15	-1.21	0.99	-1.94	0.24
5. Continue eating/drinking (tea/lunch break)	11.47	.00	-1.15	1.00	-1.48	0.76	-2.00	0.00
6. Continue deliveries/errands	8.87	.00	-1.21	0.89	-1.42	0.94	-1.97	0.17
Investigate								
7. Ask someone else nearby for more information	8.97	.00	1.39	0.90	1.00	1.22	0.06	1.69
8. Search for a colleague for more information.	3.61	.03	0.91	1.16	0.70	1.33	0.03	1.63
9. Telephone floor warden for more information.	4.73	.01	0.33	1.19	0.85	1.03	-0.09	1.47
10. Search for the source of the unusual signs.	3.92	.02	0.24	1.25	0.79	1.24	-0.12	1.47
11. Look out of a door or window to investigate signs.	4.30	.02	1.15	0.87	1.42	0.56	0.73	1.33
Alert/Warn								
12. Contact the switchboard to report the situation.	2.17	.12	0.24	1.03	0.73	0.91	0.21	1.39
13. Telephone one of the emergency services (police, fire brigade or ambulance).	1.80	.17	-0.12	1.29	0.27	1.15	0.45	1.33
14. Activate the fire alarm (break the glass).	7.76	.00	-0.42	1.23	0.36	1.17	0.76	1.32
15. Contact the floor warden to report the situation.	.48	.62	0.42	1.06	0.70	0.95	0.52	1.39
16. Contact colleagues to report the situation.	.38	.69	0.67	0.99	0.88	0.96	0.70	1.24

Protective Procedures								
17. Collect own or other's personal property or belongings.	.27	.76	0.18	1.36	0.24	1.28	0.00	1.52
18. Secure computer files/disks or documents.	2.48	.09	-0.45	1.28	-0.30	1.24	-0.94	1.12
19. Turn off equipment.	1.05	.35	-0.15	1.33	-0.03	1.33	-0.52	1.56
20. Remain in the area until someone else arrives.	1.55	.22	-1.18	1.04	-0.94	1.12	-1.36	0.74
21. Check the area for the presence of other people.	.65	.53	0.79	1.11	1.06	1.06	1.06	1.20
Wait for Assistance								
22. Wait for a colleague's assistance to evacuate the area.	3.73	.03	-0.67	0.96	-0.64	0.99	-1.18	0.77
23. Call a colleague for assistance to evacuate the area.	.78	.46	0.21	1.08	0.24	1.09	-0.09	1.40
24. Telephone the floor warden for assistance to evacuate the area.	.80	.45	0.12	1.02	0.30	1.05	-0.06	1.39
25. Wait for the assistance of the emergency services.	1.87	.16	-0.88	1.22	-0.97	0.98	-1.33	0.78
26. Wait for the floor warden's assistance to evacuate the area.	.85	.43	-0.67	1.11	-0.85	1.00	-1.00	1.00
Evacuate								
27. Assist others to leave the area.	.27	.77	1.12	0.93	1.18	0.68	1.27	0.91
28. Leave the area immediately by the emergency exit.	4.26	.02	0.58	1.15	0.58	1.09	1.24	0.97
29. Leave the area immediately by the most familiar route.	.54	.58	0.36	1.25	0.09	1.26	0.39	1.39

30. Advise or assist (comfort, first aid) others.	.68	.51	1.21	0.70	1.15	0.67	1.36	0.90
31. Move towards an exit.	2.51	.09	1.18	0.81	1.15	0.76	1.52	0.62
Fight the Fire								
32. Attempt to fight the fire with a fire extinguisher.	.15	.86	0.88	1.10	0.81	1.23	0.70	1.55
33. Attempt to contain the fire by other means.	.79	.46	0.94	0.88	0.63	1.21	0.58	1.56
34. Close doors or windows to prevent further fire and/or smoke spread.	.17	.85	0.91	1.09	0.81	1.38	1.00	1.44
35. Remain in the area until the fire brigade arrives.	.23	.80	-0.91	1.15	-0.94	1.11	-1.09	1.28
36. Search for things to fight the fire with.	.56	.57	0.34	1.21	0.03	1.40	0.00	1.66

One-way analysis of variance indicated that there were statistically significant differences between the mean responses of all participants across cues (thick black smoke and the evacuation signal) for items 10, 12, 14, 26, and 34.

With an alpha level of .05, two-tailed independent samples t-test indicated that there was a statistically significant difference between the mean responses of the two groups in their response to cue 3 for item 14, $t(31) = 5.73$, $p = .00$. Those who were presented with "thick black smoke" were more likely "To activate the fire alarm (break the glass)" ($M = 1.61$. $SD = 0.61$) compared with to those who had the "evacuation signal" as cue 3 ($M = -.27$. $SD = 1.22$).

Pilot 4

Descriptives and analysis.

Table 7.4

Pilot 4 Univariate and Descriptive Statistics for Version 1 (N = 15)

Construct and Individual items			Smell Smoke		Alarm	
Normal Activities	F	p	Mean	SD	Mean	SD
1. Continue with computer work.	1.08	.31	-0.60	1.12	-1.07	1.33
2. Continue with office paper work.	1.82	.19	-0.53	1.19	-1.13	1.25
3. Continue meeting with others	7.44	.01	-0.13	1.13	-1.20	1.01
4. Continue telephone conversation.	11.48	.00	0.20	1.26	-1.27	1.10
5. Continue eating/drinking (tea/lunch break)	1.77	.19	-0.80	1.15	-1.33	1.05
6. Continue deliveries/errands	1.87	.18	-0.73	1.10	-1.27	1.03
Investigate						
7. Ask someone else nearby for more information	2.86	.10	1.33	0.49	0.67	1.45
8. Search for a colleague for more information.	.33	.57	0.67	1.05	0.40	1.45
9. Telephone floor warden for more information.	.03	.87	0.33	1.11	0.40	1.18
10. Search for the source of the unusual signs.	.22	.65	0.33	1.05	0.13	1.30
11. Look out of a door or window to investigate signs.	.16	.69	1.00	0.65	0.87	1.13
Alert/Warn						
12. Contact the switchboard to report the situation.	.00	1.00	0.07	1.33	0.07	2.44
13. Telephone one of the emergency services (police, fire brigade or ambulance).	.12	.73	0.07	1.44	0.27	1.67
14. Activate the fire alarm (break the glass).	.59	.45	-0.33	1.35	0.07	1.49
15. Contact the floor warden to report the situation.	.38	.54	0.33	1.05	0.60	1.30
16. Contact colleagues to report the situation.	.13	.72	0.67	0.98	0.80	1.01
Protective Procedures						
17. Collect own or other's personal property or belongings.	3.31	.08	-0.20	1.15	0.53	1.06
18. Secure computer files/disks or documents.	4.20	.05	-0.20	1.15	0.60	0.99
19. Turn off equipment.	.03	.87	0.13	0.92	0.20	1.32
20. Remain in the area until someone else arrives.	2.14	.15	-0.40	0.91	-0.87	0.83
21. Check the area for the presence of other people.	2.47	.13	0.60	0.91	1.07	0.70

Wait for Assistance						
22. Wait for a colleague's assistance to evacuate the area.	.26	.61	-0.07	1.03	-0.27	1.10
23. Call a colleague for assistance to evacuate the area.	.03	.86	0.13	0.83	0.20	1.21
24. Telephone the floor warden for assistance to evacuate the area.	.40	.53	0.20	0.86	-0.07	1.39
25. Wait for the assistance of the emergency services (police, fire brigade or ambulance).	.00	1.00	-0.53	1.19	-0.53	1.25
26. Wait for the floor warden's assistance to evacuate the area.	.00	1.00	-0.33	1.18	-0.33	1.11
Evacuation						
27. Assist others to leave the area.	1.04	.32	0.33	1.11	0.73	1.03
28. Leave the area immediately by the emergency exit.	.02	.89	0.80	1.21	0.87	1.30
29. Leave the area immediately by the most familiar route.	.34	.56	-0.07	1.16	0.20	1.32
30. Advise or assist (comfort, first aid) others.	.88	.36	0.33	0.90	0.67	1.05
31. Move towards an exit.	.48	.50	0.80	0.94	1.07	1.16
Fight the Fire						
32. Attempt to fight the fire with a fire extinguisher.	.21	.65	0.20	1.15	0.00	1.25
33. Attempt to contain the fire by other means (e.g. smother, use a bucket of water, etc).	.10	.75	0.00	1.13	-0.13	1.13
34. Close doors or windows to prevent further fire and/or smoke spread.	.26	.62	0.47	1.25	0.20	1.61
35. Remain in the area until the fire brigade arrives.	.00	1.00	-1.13	0.83	-1.13	0.99
36. Search for things to fight the fire with.	.00	1.00	-0.13	0.99	-0.13	1.13

For the group presented with smelling smoke before the building alarm, one-way analysis of variance indicated that there was a statistically significant difference between the mean responses for smelling smoke compared to the building alarm for items 3, 4, and 18.

The participants were less likely to "Continue meeting with others" in response to the building alarm (M = -1.20, SD = 1.01), compared to smelling smoke (M = -.13, SD = 1.13). They were less likely to "Continue telephone conversation" in response to the building alarm ($\underline{M}$ = -1.27, $\underline{SD}$ = 1.10), compared to smelling smoke ($\underline{M}$ = .20, $\underline{SD}$ = 1.26), and they were more likely to "Secure computer files/disks or documents" in response to the building alarm ($\underline{M}$ = .60, $\underline{SD}$ = .99), compared to smelling smoke ($\underline{M}$ = -.20, $\underline{SD}$ = 1.15).

Table 7.5

Pilot 4 Univariate and Descriptive Statistics for Version 2 (N =15)

Construct and Individual Items			Alarm		Smell Smok	
Continue Normal Activities	F	p	Mean	SD	Mean	SD
1. Continue with computer work.	.04	.85	-0.80	1.15	-0.87	0.74
2. Continue with office paper work.	.46	.50	-1.00	0.85	-0.80	0.77
3. Continue meeting with others	.32	.57	-0.80	0.94	-0.60	0.99
4. Continue telephone conversation.	.52	.48	-0.40	1.12	-0.67	0.90
5. Continue eating/drinking (tea/lunch break)	.04	.84	-0.87	1.06	-0.93	0.70
6. Continue deliveries/errands	.35	.56	-0.60	0.99	-0.80	0.86
Investigate						
7. Ask someone else nearby for more information	.17	.68	1.20	1.08	1.33	0.62
8. Search for a colleague for more information.	.78	.38	0.73	1.03	1.07	1.03
9. Telephone floor warden for more information.	4.2	.05	-0.36	1.22	0.53	1.13
10. Search for the source of the unusual signs.	10.03	.00	0.13	0.92	1.00	0.53
11. Look out of a door or window to investigate signs.	3.40	.08	0.47	1.19	1.13	0.74
Alert/Warn						
12. Contact the switchboard to report the situation.	2.76	.11	0.07	1.28	0.73	0.88
13. Telephone one of the emergency services (police, fire brigade or ambulance).	3.04	.09	-0.33	1.18	0.33	0.90
14. Activate the fire alarm (break the glass).	2.53	.12	-0.73	1.28	-0.07	0.92
15. Contact the floor warden to report the situation.	2.39	.13	0.00	1.20	0.60	0.91
16. Contact colleagues to report the situation.	.71	.41	0.73	0.70	0.93	0.59
Protective Procedures						
17. Collect own or other's personal property or belongings.	.05	.82	0.20	0.77	0.27	0.80
18. Secure computer files/disks or documents.	.10	.76	0.27	1.22	0.13	1.13
19. Turn off equipment.	.29	.59	-0.47	1.13	-0.27	0.88
20. Remain in the area until someone else arrives.	.04	.85	-0.47	1.13	-0.40	0.74
21. Check the area for the presence of other people.	.06	.81	0.73	0.59	0.80	0.86
Wait for Assistance						

22. Wait for a colleague's assistance to evacuate the area.	.90	.35	0.07	0.96	-0.27	0.96
23. Call a colleague for assistance to evacuate the area.	1.60	.22	0.40	0.91	-0.07	1.10
24. Telephone the floor warden for assistance to evacuate the area.	.68	.42	-0.20	1.32	0.13	0.83
25. Wait for the assistance of the emergency services (police, fire brigade or ambulance).	.77	.39	-0.87	0.83	-0.60	0.83
26. Wait for the floor warden's assistance to evacuate the area.	2.02	.17	-0.93	0.59	-0.53	0.92
Protective Procedures						
27. Assist others to leave the area.	.29	.59	0.87	0.74	0.73	0.59
28. Leave the area immediately by the emergency exit.	23.6 2	.00	1.33	0.62	0.07	0.80
29. Leave the area immediately by the most familiar route.	.61	.44	0.07	1.10	-0.21	0.80
30. Advise or assist (comfort, first aid) others.	.10	.75	0.60	0.63	0.53	0.52
31. Move towards an exit.	2.15	.15	1.00	0.65	0.60	0.83
Fight the Fire						
32. Attempt to fight the fire with a fire extinguisher.	.61	.44	0.36	0.63	0.60	0.99
33. Attempt to contain the fire by other means (e.g. smother, use a bucket of water, etc).	.02	.89	0.29	0.61	0.33	1.11
34. Close doors or windows to prevent further fire and/or smoke spread.	.43	.52	0.36	1.01	0.60	0.99
35. Remain in the area until the fire brigade arrives.	1.75	.20	-1.07	0.92	-0.67	0.72
36. Search for things to fight the fire with.	.55	.47	-0.43	1.16	-0.13	0.99

For the group presented with the building alarm before smelling smoke, one-way analysis of variance indicated that there were statistically significant differences between the mean responses of the participants across cues (smelling smoke compared to the building alarm) for items 9, 10, and 28.

Two-tailed independent samples t-test indicated that there was no statistically significant difference between the mean responses of the two groups in their response to the first cue. There was a statistically significant difference between the mean responses of the two groups in their response to the second cue for item 10, $t(28) = -2.38$, $p = .02$. Those who were presented with the building alarm before smelling smoke ($M = 1.00$, $SD = 0.53$) were more likely to "Search for the source of the unusual signs", compared with to those who were presented with smelling smoke before the building alarm, ($M = .13$, $SD = 1.30$).

There was a statistically significant difference between the mean responses of the two groups in their response to the second cue for item 28, $t(28) = 2.03$, $p = .05$. Those who were presented with smelling smoke before the building alarm, were more likely to "Leave the area immediately by the emergency exit", ($M = .87$, $SD = 1.30$) compared with to those who were presented with the building alarm before smelling smoke, ($M = .07$, $SD = .80$).

Chapter 8

Results (Main Study)

Description of Data Handling

The raw data from the questionnaires was coded for each item (Extremely Unlikely = -2; Quite Unlikely = -1; Uncertain = 0; Quite Likely = +1; Extremely Likely = +2). Item means greater than 0.60 indicated likely behaviour for the item in response to the cue, whereas item means less than -0.60 indicated unlikely behaviour in response to the cue. Means and standard deviations were calculated for individual items for each of the three cues. One-way analyses of variance were used to test for differences between mean values for each item across each of the cues. T tests for independent samples were used to compare mean responses for each item, by cue, for the two groups (students and office workers). T tests for independent samples were also used to compare mean responses for each construct, by cue, for the two groups. The internal reliability of each construct was assessed using Cronbach's alpha. Items with low reliability estimates were removed. Finally, Multiple Analysis of Variance (MANOVA) was used to determine differences between mean values for each construct across each of the three cues.

Each construct comprised selected theoretically justified individual items. For example the construct Alert/warn others consisted of the items: Contact the switchboard to report the situation; Telephone one of the emergency services (police, fire brigade or ambulance) to report the situation; Activate the fire alarm (break the glass); Contact the floor warden to report the situation; Contact other colleagues to report the situation. Path analysis, using LISREL, estimated coefficients of the structural equations describing the relationship between the independent and dependent variables of the model.

Descriptives Statistics (All Participants)

Table 8.1

Univariate and Descriptive Statistics for All Participants (N=254)

Construct and Individual Items			Computer		Alarm		Smoke Flame	
NORMAL ACTIVITIES	F	p	Mean	SD	Mean	SD	Mean	SD
1. Continue with computer work.	268.78	.000	0.22	1.22	-1.16	1.03	-1.86	0.59
2. Continue with office paper work.	467.72	.000	0.63	1.09	-1.17	1.02	-1.86	0.60
3. Continue meeting with others.	378.83	.000	0.65	1.08	-1.05	1.11	-1.78	0.77
4. Continue a telephone conversation.	354.47	.000	0.56	1.14	-1.03	1.13	-1.81	0.65
5. Continue eating/drinking (tea/lunch break).	389.19	.000	0.67	1.28	-1.10	1.07	-1.86	0.54
6. Continue deliveries/errands.	417.22	.000	0.65	1.19	-1.08	1.05	-1.85	0.53
INVESTIGATE								
7. Ask someone else nearby for more information.	119.46	.000	0.63	1.19	0.73	1.25	-0.90	1.52
8. Search for a colleague for more information.	90.40	.000	0.45	1.24	0.49	1.26	-0.91	1.48
9. Telephone the floor warden for more information.	8.30	.000	0.00	1.46	0.24	1.37	-0.31	1.68

10. Search for the source of the unusual signs.	5.49	.004	0.07	1.28	0.28	1.31	-0.29	1.63
11. Look out of a door or window to investigate.	36.87	.000	0.06	1.32	0.60	1.27	-0.51	1.58
23. Answer a ringing telephone.	79.33	.000	0.71	1.31	0.10	1.38	-0.86	1.40
ALERT								
12. Contact the switchboard to report the situation.	34.49	.000	0.00	1.43	0.09	1.32	0.98	1.34
13. Telephone the fire brigade to report the situation.	123.79	.000	-0.91	1.28	-0.31	1.34	1.09	1.34
14. Activate the fire alarm (break the glass).	346.48	.000	-1.10	1.24	-0.37	1.32	1.63	0.83
15. Contact the floor warden to report the situation.	115.78	.000	-0.35	1.45	0.23	1.37	1.41	0.95
16. Contact other colleagues to report the situation.	83.16	.000	0.00	1.35	0.55	1.24	1.43	0.98
PROTECT								
17. Collect own or other's personal property.	29.49	.000	-0.94	1.21	-0.09	1.21	0.08	1.59
18. Secure computer files, disks or documents.	6.63	.001	-0.03	1.51	0.12	1.34	-0.34	1.52
19. Turn off equipment.	2.81	.061	-0.26	1.38	0.06	1.30	-0.13	1.54
20. Remain in the area until someone else arrives.	31.90	.000	-0.03	1.25	-0.45	1.19	-0.92	1.17
21. Check the area for the presence of other people.	58.04	.000	-0.02	1.38	0.62	1.09	1.24	0.97
30. Assist (comfort, first aid) others.	58.45	.000	-0.32	1.47	0.41	1.26	1.02	0.97

34. Close doors or windows.	43.88	.000	-0.74	1.32	-0.34	1.33	0.45	1.43
WAIT FOR ASSISTANCE								
22. Wait for a colleague's assistance to evacuate the area.	3.53	.030	-0.64	1.30	-0.28	1.19	-0.47	1.26
24. Telephone the floor warden for assistance to evacuate the area.	54.78	.000	-0.65	1.33	-0.12	1.22	0.67	1.38
25. Wait for the assistance of the fire brigade to evacuate the area.	.37	.691	-0.88	1.25	-0.75	1.08	-0.87	1.21
26. Wait for the floor warden's assistance to evacuate the area.	8.71	.000	-0.69	1.35	-0.17	1.28	-0.31	1.37
EVACUATE								
27. Assist others to leave the area.	89.94	.000	-0.42	1.48	0.47	1.28	1.21	0.98
28. Leave the area immediately by the emergency exit.	59.20	.000	-0.64	1.42	0.17	1.35	0.76	1.22
29. Leave the area immediately by the most familiar route.	13.30	.000	-0.64	1.38	-0.05	1.33	0.05	1.33
31. Move towards an exit.	100.39	.000	-0.45	1.41	0.67	1.20	1.15	0.94
FIGHT THE FIRE								
32. Attempt to fight the fire with a fire extinguisher.	51.41	.000	-0.93	1.20	-0.42	1.24	0.29	1.35
33. Attempt to put out the fire by smothering, using a bucket of water, etc.	9.82	.000	-1.02	1.14	-0.66	1.15	-0.51	1.32

35. Remain in the area until the fire brigade arrives.	.70	.495	-0.81	1.27	-0.84	1.17	-0.91	1.20
36. Search for things to fight the fire with.	354.47	.000	-0.92	1.26	-0.65	1.20	-0.19	1.44

Analysis of Variance (All Participants)

One-way analysis of variance indicated that there were statistically significant differences between the mean responses of all participants across cues (computer breakdown, building alarm signal and smoke/flames) for items 1, 2, 3, 4, 5, 6, 11, 13, 14, 15, 16, 20, 21, 23, 24, 27, 28, 30, 31, 32, 34.

To guard against alpha inflation, each item was considered to be a 'separate' question.

For the cues computer breakdown and building alarm signal and smoke/flames, there were significant differences between the mean responses of participants for items 17, 26, 29, 33. The means for item 22 were significantly different for the computer breakdown and the building alarm signal only.

There were statistically significant differences between the mean responses of participants for computer breakdown and building alarm signal and smoke/flames, for items 7, 8, 9, 12, 36. Items 10, 18 showed statistically significant differences between the mean responses of all participants, for the cues building alarm signal and smoke/flames. There were no statistically significant differences between the mean responses for each cue, for items 19, 25, 35.

Descriptive Statistics (Student Participants)

Table 8.2

Univariate and Descriptive Statistics for Student Participants (N=159)

Construct and Individual Items			Computer		Alarm		Smoke Flame	
	F	p	Mean	SD	Mean	SD	Mean	SD
NORMAL ACTIVITIES								
1. Continue with computer work.	175.40	.000	0.14	1.21	-1.18	0.98	-1.86	0.61
2. Continue with office paper work.	350.78	.000	0.66	1.04	-1.17	0.96	-1.87	0.55
3. Continue meeting with others.	257.94	.000	0.69	1.00	-1.05	1.07	-1.73	0.85
4. Continue a telephone conversation.	233.27	.000	0.48	1.15	-1.12	1.02	-1.80	0.66
5. Continue eating/drinking (tea/lunch break).	296.51	.000	0.73	1.25	-1.13	1.00	-1.85	0.53
6. Continue deliveries/errands.	266.90	.000	0.61	1.23	-1.10	1.00	-1.83	0.54
INVESTIGATE								
7. Ask someone else nearby for more information.	94.07	.000	0.59	1.21	0.82	1.19	-1.00	1.46
8. Search for a colleague for more information.	61.37	.000	0.50	1.24	0.60	1.18	-0.87	1.53
9. Telephone the floor warden for more information.	16.32	.000	0.24	1.44	0.41	1.28	-0.48	1.66
10. Search for the source of the unusual signs.	7.25	.001	0.23	1.24	0.42	1.25	-0.17	1.63
11. Look out of a door or window to investigate.	28.33	.000	0.24	1.29	0.77	1.17	-0.37	1.58

23. Answer a ringing telephone.	37.96	.000	0.58	1.36	0.04	1.37	-0.78	1.43
ALERT								
12. Contact the switchboard to report the situation.	21.45	.000	0.29	1.41	0.36	1.20	1.13	1.16
13. Telephone the fire brigade to report the situation.	94.96	.000	-0.66	1.39	0.00	1.32	1.31	1.16
14. Activate the fire alarm (break the glass).	189.26	.000	-0.91	1.33	-0.03	1.30	1.63	0.85
15. Contact the floor warden to report the situation.	48.22	.000	-0.05	1.44	0.37	1.28	1.31	1.03
16. Contact other colleagues to report the situation.	41.43	.000	0.17	1.33	0.76	1.07	1.36	1.04
PROTECT								
17. Collect own or other's personal property.	14.10	.000	-0.70	1.27	-0.05	1.18	0.04	1.57
18. Secure computer files, disks or documents.	10.31	.000	0.29	1.44	0.25	1.27	-0.35	1.47
19. Turn off equipment.	2.93	.054	-0.02	1.37	0.21	1.25	-0.16	1.51
20. Remain in the area until someone else arrives.	19.74	.000	-0.08	1.18	-0.62	1.08	-0.88	1.17
21. Check the area for the presence of other people.	36.21	.000	0.18	1.36	0.78	0.97	1.25	0.96
30. Assist (comfort, first aid) others.	28.84	.000	-0.08	1.53	0.59	1.23	1.03	1.00
34. Close doors or windows.	22.75	.000	-0.59	1.37	-0.16	1.36	0.49	1.45
WAIT FOR ASSISTANCE								

22. Wait for a colleague's assistance to evacuate the area.	1.40	.249	-0.36	1.34	-0.23	1.15	-0.47	1.26
24. Telephone the floor warden for assistance to evacuate the area.	25.43	.000	-0.39	1.31	0.03	1.19	0.64	1.33
25. Wait for the assistance of the fire brigade to evacuate the area.	.18	.833	-0.64	1.29	-0.69	1.03	-0.61	1.28
26. Wait for the floor warden's assistance to evacuate the area.	.73	.482	-0.60	1.33	-0.45	1.13	-0.44	1.28
EVACUATE								
27. Assist others to leave the area.	43.20	.000	-0.16	1.52	0.66	1.22	1.19	1.04
28. Leave the area immediately by the emergency exit.	37.82	.000	-0.40	1.48	0.48	1.24	0.87	1.13
29. Leave the area immediately by the most familiar route.	11.98	.000	-0.35	1.39	0.22	1.25	0.33	1.23
31. Move towards an exit.	48.88	.000	-0.19	1.44	0.85	1.10	1.10	0.98
FIGHT THE FIRE								
32. Attempt to fight the fire with a fire extinguisher.	42.78	.000	-0.80	1.26	-0.26	1.24	0.56	1.32
33. Attempt to put out the fire by smothering, using a bucket of water, etc.	7.28	.000	-0.80	1.24	-0.47	1.14	-0.26	1.33
35. Remain in the area until the fire brigade arrives.	.51	.602	-0.70	1.24	-0.84	1.14	-0.73	1.23

36. Search for things to fight the fire with.	10.91	.000	-0.68	1.34	-0.44	1.21	0.03	1.44

Analysis of Variance (Student Participants)

One-way analysis of variance indicated that there were statistically significant differences between the mean responses of student participants across cues (computer breakdown, building alarm signal and smoke/flames) for items 1, 2, 3, 4, 5, 6, 11, 13, 14, 15, 16, 21, 23, 24, 27, 28, 30, 32, 34.

For the computer breakdown and building alarm signal and smoke/flames cues, there were statistically significant differences between the mean responses for items 17, 20, 29, 31. The means for item 33 were significantly different for the computer breakdown and smoke/flames only.

There were statistically significant differences between the mean responses of student participants for the computer breakdown and building alarm signal, and smoke/flames, for items 7, 8, 9, 10, 12, 18, 36. Items 19, 22, 25, 26 and 35 did not discriminate between any cues.

Descriptive Statistics (Office Worker Participants)

Table 8.3

Univariate and Descriptive Statistics for Office Participants (N=95)

Construct and Individual Items			Computer		Alarm		Smoke Flame	
	F	p	Mean	SD	Mean	SD	Mean	SD
NORMAL ACTIVITIES								
1. Continue with computer work.	116.66	.000	0.34	1.24	-1.14	1.12	-1.87	0.55

2. Continue with office paper work.	144.70	.000	0.58	1.16	-1.17	1.13	-1.84	0.67
3. Continue meeting with others.	138.08	.000	0.59	1.20	-1.05	1.19	-1.86	0.61
4. Continue a telephone conversation.	139.22	.000	0.67	1.11	-0.88	1.29	-1.83	0.63
5. Continue eating/drinking (tea/lunch break).	126.93	.000	0.56	1.31	-1.06	1.19	-1.87	0.55
6. Continue deliveries/errands.	180.15	.000	0.73	1.13	-1.03	1.12	-1.88	0.50
INVESTIGATE								
7. Ask someone else nearby for more information.	30.50	.000	0.68	1.16	0.57	1.34	-0.73	1.61
8. Search for a colleague for more information.	30.29	.000	0.37	1.23	0.31	1.37	-0.97	1.40
9. Telephone the floor warden for more information.	1.81	.166	-0.40	1.41	-0.05	1.47	-0.02	1.68
10. Search for the source of the unusual signs.	3.75	.025	-0.20	1.31	0.06	1.39	-0.51	1.61
11. Look out of a door or window to investigate.	12.56	.000	-0.23	1.32	0.31	1.38	-0.73	1.57
23. Answer a ringing telephone.	49.65	.000	0.90	1.22	0.18	1.38	-0.99	1.35
ALERT								
12. Contact the switchboard to report the situation.	20.37	.000	-0.48	1.32	-0.36	1.40	0.71	1.52
13. Telephone the fire brigade to report the situation.	67.41	.000	-1.31	0.98	-0.82	1.21	0.74	1.55
14. Activate the fire alarm (break the glass).	253.89	.000	-1.41	1.01	-0.94	1.17	1.63	0.80

15. Contact the floor warden to report the situation.	95.42	.000	-0.85	1.33	-0.01	1.48	1.58	0.77
16. Contact other colleagues to report the situation.	54.99	.000	-0.28	1.36	0.19	1.42	1.54	0.86
PROTECT								
17. Collect own or other's personal property.	33.60	.000	-1.34	0.99	-0.16	1.25	0.15	1.64
18. Secure computer files, disks or documents.	2.13	.121	-0.55	1.49	-0.09	1.43	-0.32	1.61
19. Turn off equipment.	3.98	.020	-0.64	1.30	-0.20	1.33	-0.09	1.60
20. Remain in the area until someone else arrives.	17.29	.000	0.04	1.35	-0.17	1.33	-1.00	1.19
21. Check the area for the presence of other people.	39.72	.000	-0.34	1.31	0.35	1.23	1.21	0.98
30. Assist (comfort, first aid) others.	49.62	.000	-0.70	1.30	0.09	1.27	1.01	0.94
34. Close doors or windows.	28.07	.000	-0.99	1.19	-0.65	1.24	0.38	1.40
WAIT FOR ASSISTANCE								
22. Wait for a colleague's assistance to evacuate the area.	9.72	.000	-1.10	1.09	-0.37	1.26	-0.48	1.28
24. Telephone the floor warden for assistance to evacuate the area.	41.80	.000	-1.05	1.27	-0.37	1.24	0.71	1.47
25. Wait for the assistance of the fire brigade to evacuate the area.	4.88	.008	-1.26	1.09	-0.85	1.14	-1.28	0.95

26. Wait for the floor warden's assistance to evacuate the area.	15.80	.000	-0.85	1.36	0.31	1.39	-0.11	1.50
EVACUATE								
27. Assist others to leave the area.	71.90	.000	-0.83	1.32	0.15	1.32	1.25	0.89
28. Leave the area immediately by the emergency exit.	34.10	.000	-1.00	1.23	-0.36	1.36	0.57	1.33
29. Leave the area immediately by the most familiar route.	6.89	.001	-1.08	1.24	-0.53	1.34	-0.40	1.36
31. Move towards an exit.	76.76	.000	-0.87	1.25	0.36	1.30	1.22	0.88
FIGHT THE FIRE								
32. Attempt to fight the fire with a fire extinguisher.	16.27	.000	-1.14	1.07	-0.69	1.21	-0.15	1.28
33. Attempt to put out the fire by smothering, using a bucket of water, etc.	4.64	.011	-1.38	0.86	-0.99	1.10	-0.93	1.20
35. Remain in the area until the fire brigade arrives.	2.21	.111	-0.98	1.30	-0.84	1.24	-1.21	1.09
36. Search for things to fight the fire with.	8.97	.000	-1.29	1.01	-0.99	1.09	-0.56	1.36

Analysis of Variance (Office Worker Participants)

One-way analysis of variance indicated that there were statistically significant differences between the mean responses of office participants, for all cues (computer breakdown, building alarm signal and smoke/flames) for items

1, 2, 3, 4, 5, 6, 13, 14, 15, 16, 21, 23, 24, 27, 28, 30, 31, 32.

There were statistically significant differences between the mean responses of office participants for computer breakdown and the building alarm signal and smoke/flames for items 17, 26, 22, and 29. The means for items 19, 33, 36 were significantly different for the computer breakdown and the smoke/flames only. The mean responses of office participants were significantly different for the computer breakdown and building alarm signal, and smoke/flames, for items 7, 8, 12, 20, 34.

There were statistically significant differences between the mean responses of office participants, for the cues building alarm signal and smoke/flames, for item 10. The mean responses of office participants, were statistically significantly different for the cue building alarm signal and both computer breakdown and smoke/flames, for items 11, 25. There were no statistically significant differences between the mean responses for any cue, for items 9, 18, 35.

<u>Construct Descriptives as a Function of the Fire Cue Presented</u>

Table 8.4

Means and Standard Deviations for the Seven Constructs by Cue (Student Group)

	Computer	Breakdown	Building	Alarm	Smoke	Flames
Construct	Mean	SD	Mean	SD	Mean	SD
Normal	3.27	5.10	-6.95	5.10	-10.89	3.31
Invest	1.86	4.84	3.26	4.36	-2.69	6.23
Alert	-1.15	5.82	1.64	4.99	6.82	3.93
Protect	-1.07	6.00	1.78	4.89	2.32	4.89
Wait	-1.67	3.41	-1.36	2.69	-1.48	3.25
Evacuate	-0.79	4.14	1.99	3.05	3.23	2.28
Fight	-2.37	3.44	-1.10	3.16	0.28	3.45

Table 8.5

Means and Standard Deviations for the Seven Constructs by Cue (Office Workers)

	Computer	Breakdown	Building	Alarm	Smoke	Flames
Construct	Mean	SD	Mean	SD	Mean	SD
Normal	3.50	5.82	-6.29	6.38	-11.39	2.76
Invest	0.13	4.56	1.27	5.42	-3.17	5.91
Alert	-4.58	4.72	-2.35	5.35	6.39	3.29
Protect	-4.94	5.12	-0.81	5.20	2.34	5.25
Wait	-3.37	2.91	-0.90	3.02	-1.92	2.92
Evacuate	-2.85	2.92	0.08	3.37	3.04	2.34
Fight	-3.88	2.88	-2.80	2.88	-1.70	3.32

The possible range of scores for each construct is as follows:

Continue Normal Activities: -12.00 to 12.00

Investigate: -10.00 to 10.00

Alert/Warn: -10.00 to 10.00

Protective procedures: -12.00 to 12.00

Wait: -6.00 to 6.00

Evacuate: -6.00 to 6.00

Fight the Fire: -6.00 to 6.00

Extreme negative scores indicate an "extremely unlikely" response and extreme positive scores indicate an "extremely likely" response.

T- Tests

Two-tailed t tests for independent samples indicated significant differences between the mean responses of the student group compared with office workers on the following constructs for the computer breakdown cue. Students were more likely to investigate (M = 1.77, SD = 4.80; M = 0.22, SD = 4.48), t (251) = 2.55, p = .011. Office workers were less likely to alert/warn others (M = -1.14, SD = 5.71; M = -4.34, SD = 4.78), t(245) = 4.73, p = .000; institute protective procedures (M = -1.11, SD = 6.03; M = -4.88, SD = 5.08), t(227) = 4.88, p = .000; wait for assistance (M = -1.60, SD = 3.42; M = -3.20, SD = 3.02), t(237) = 3.68, p = .000; evacuate (M = -0.78, SD = 4.15; M = -2.67, SD = 3.62), t(232) = 3.67, p = .000; and fight the fire (M = -2.30, SD = 3.43; M = -3.85, SD = 2.62), t(226) = 3.85, p = .000.

Two-tailed t tests for independent samples indicated significant differences between mean responses of the student group compared with office workers on the following constructs for the building alarm cue. The student group were more likely to investigate (M = 3.02, SD = 4.46; M = 1.19, SD = 5.17), t(252) = 2.94, p = .004; alert/warn others (M = 1.47, SD = 4.94; M = -1.94, SD = 5.37), t(251) = 5.15, p = .000;

institute protective procedures (M = 1.71, SD = 4.69; M = -0.72, SD = 5.14), $t(232) = 3.71$, $p = .000$; evacuate (M = 2.01, SD = 3.01; M = 0.15, SD = 3.35), $t(235) = 4.40$, $p = .000$; and fight the fire (M = -1.16, SD = 3.17; M = -2.68, SD = 2.90), $t(232) = 3.67$, $p = .000$.

Two-tailed t tests for independent samples indicated significant differences between the mean responses of the two groups with the student group more likely to fight the fire for the smoke/flames cue, (M = 0.33, SD = 3.45) compared with office workers (M = -1.62, SD = 3.27), $t(248) = 4.43$, $p = .000$.

Reliability Analysis

Table 8.6

Initial Reliability Analysis (Cronbach α Values) Within Constructs for All Items

Construct	Group	All Cues	Computer Breakdown	Building Alarm	Smoke and Flames
Continue Normal Activities 1, 2, 3, 4, 5, 6	Office	0.97	0.84	0.96	0.95
	Students	0.96	0.80	0.94	0.93
	Total	0.96	0.83	0.95	0.93
Investigate 7, 8, 9, 10, 11, 23	Office	0.77	0.61	0.78	0.80
	Students	0.80	0.65	0.76	0.81
	Total	0.79	0.64	0.77	0.80
Alert 12, 13, 14, 15, 16	Office	0.84	0.82	0.86	0.50
	Students	0.89	0.88	0.86	0.80
	Total	0.89	0.87	0.87	0.71
Protect 17, 18, 19, 20, 21, 30, 34	Office	0.68	0.74	0.71	0.56
	Students	0.69	0.79	0.65	0.63
	Total	0.69	0.70	0.67	0.60
Wait for Assistance 22, 24, 25, 26	Office	0.78	0.86	0.74	0.73
	Students	0.76	0.85	0.72	0.72
	Total	0.76	0.86	0.71	0.71
Evacuate 27, 28, 29, 31	Office	0.83	0.93	0.76	0.58
	Students	0.85	0.93	0.76	0.62
	Total	0.85	0.93	0.78	0.59
Fight the Fire 32, 33, 35, 36	Office	0.69	0.73	0.75	0.58
	Students	0.81	0.87	0.81	0.73
	Total	0.79	0.84	0.80	0.71

Underlying the scaling is the premise that people will respond in a consistent fashion. That is, when people respond to the cues and select probabilities for individual actions, these probabilities will be consistent within the category. If the probabilities are not consistent within the categories, then it can be assumed that the construct used to label the category is not reliable. The initial within category effects were found to yield low correlations. It was considered prudent to take an exploratory approach to establish a well-fitting model. In other words, a model that is statistically well-fitting and substantively meaningful. The following five items, exhibiting low reliability were discarded (see Table 10.) with the view of improving the fit. Each construct retained a minimum of three items.

20. Remain in the area until someone else arrives.
23. Answer a ringing telephone.
24. Telephone the floor warden for assistance to evacuate the area..
29. Leave the area immediately by the most familiar route.
35. Remain in the area until the fire brigade arrives.

Table 8.7

Reliability Analysis (Cronbach α Values) where Low Reliability Items have been Removed

Construct	Group	All Cues	Computer Breakdown	Alarm	Smoke and Flames
Continue Normal Activities 1, 2, 3, 4, 5, 6	Office Workers	0.97	0.88	0.95	0.95
	Students	0.96	0.80	0.94	0.93
	Total	0.96	0.83	0.94	0.93
Investigate 7, 8, 9, 10, 11,	Office	0.79	0.73	0.80	0.80
	Students	0.80	0.80	0.81	0.85
	Total	0.83	0.78	0.81	0.83
Alert 12, 13, 14, 15, 16	Office	0.89	0.85	0.86	0.51
	Students	0.89	0.89	0.86	0.80
	Total	0.90	0.89	0.87	0.71
Protect 17, 18, 19, 21, 30, 34	Office	0.78	0.75	0.74	0.68
	Students	0.74	0.82	0.71	0.65
	Total	0.76	0.82	0.74	0.66
Wait for Assistance 22, 25, 26	Office	0.73	0.81	0.65	0.67
	Students	0.79	0.83	0.73	0.80
	Total	0.76	0.83	0.67	0.74
Evacuate 27, 28, 31	Office	0.88	0.94	0.78	0.57
	Students	0.86	0.93	0.80	0.58
	Total	0.87	0.93	0.80	0.57
Fight the Fire 32, 33, 36	Office	0.83	0.87	0.81	0.80
	Students	0.85	0.88	0.86	0.80
	Total	0.85	0.88	0.85	0.81

Following removal of low alpha items, the reliabilities associated with certain constructs for the smoke and flames cue were still relatively low. However given the nature of the constructs and the face validity of the relevant items, it was decided to maintain these constructs within the model. Low alpha values were accepted for the construct alert (office group in response to the cue smoke and flames, $\alpha = 0.51$), for the construct evacuate (both groups for the cue smoke and flames, office group $\alpha = 0.57$; students $\alpha = 0.58$); for the construct protect in response to the cue smoke and flames (office group $\alpha = 0.68$ and students $\alpha = 0.65$); and for the construct wait for assistance for the cues building alarm and smoke and flames (office group $\alpha = 0.65$ and $\alpha = 0.67$ respectively).

In determining the α threshold for reliability, recourse to literature (for example Hair et al., 1995) indicated that the accepted value is $\alpha \geq 0.70$.

> " A commonly used threshold value for acceptable reliability is .70, although this is not an absolute standard, and values below .70 have been deemed acceptable if the research is exploratory in nature."
>
> (Hair et al. 1995, p. 641)

However Hughes, Price & Marrs, (1986) accepted indicator items with reliability coefficients as low as 0.50 for inclusion as indices for constructs.

Results of Multivariate Tests of Significance (MANOVA)

Table 8.8

MANOVA Tests of Significance for the Seven Constructs: Main and Interaction Effects

Test	Variable	F	df	p
Multivariate	.071	3.58	14, 683	.000
Univariate	Evacuation	5.96	2, 683	.003
Interaction	Fight the fire	0.29	2, 683	.747
Effect	Investigate	1.29	2, 683	.277
	Normal	0.82	2, 683	.442
CUE by GROUP	Protective	8.06	2, 683	.000
	Alert/Warn	8.81	2, 683	.000
	Wait	6.57	2, 683	.001
Multivariate	.956	88.69	14, 683	.000
Univariate	Evacuation	133.24	2, 683	.000
Main	Fight the fire	30.79	2, 683	.000
Effect	Investigate	58.05	2, 683	.000
	Normal	510.35	2, 683	.000
CUE	Protective	58.99	2, 683	.000
	Alert/Warn	231.75	2, 683	.000
	Wait	10.94	2, 683	.000
Multivariate	.109	11.88	7, 677	.000
Univariate	Evacuation	30.79		.000
Main	Fight the fire	46.95	1, 683	.000
Effect	Investigate	11.35	1, 683	..001
	Normal	0.12	1, 683	.729
GROUP	Protective	27.75	1, 683	.000
	Alert/Warn	48.41	1, 683	.000
	Wait	5.47	1, 683	.020

The repeated measures multivariate tests of significance indicated that there were significant interaction effects ($F(14, 1356) = 3.58$), for cue and group. An examination of the univariate F-tests indicated significant interaction effects for the constructs evacuation ($\underline{F}(2, 683) = 5.96$); protective procedures ($\underline{F}(2, 683) = 8.06$); alert/warn ($\underline{F}(2, 683) = 8.81$) and wait for assistance ($\underline{F}(2, 683) = 6.57$).

Multivariate tests of significance indicated that there was a significant main effect ($\underline{F}(7, 677) = 11.88$), for group. An examination of the univariate F-tests indicated at an alpha level of .05, there were significant differences (for the three cues) between the student and office groups for all constructs except continue normal activities. The multivariate tests confirm the differences between the two groups identified previously by t tests.

The multivariate tests of significance indicated that there was a significant main effect ($\underline{F}(14, 1356) = 88.69$), for cue. An examination of the univariate F-tests indicated at an alpha level of .05, there were significant differences (for both the student and office groups) between the three cues (Computer Breakdown, Building Alarm, Smoke/Flames) for all constructs.

<u>Path Analysis</u>

Figures 8.1 to 8.6 illustrate the causal relationships between the seven behavioural constructs for the three cues. Because of identified significant differences in response between the student group and office workers, separate diagrams have been constructed for each group. Appendix K contains the covariance matrices and LISREL estimates, the structural equations are found in Appendix L.

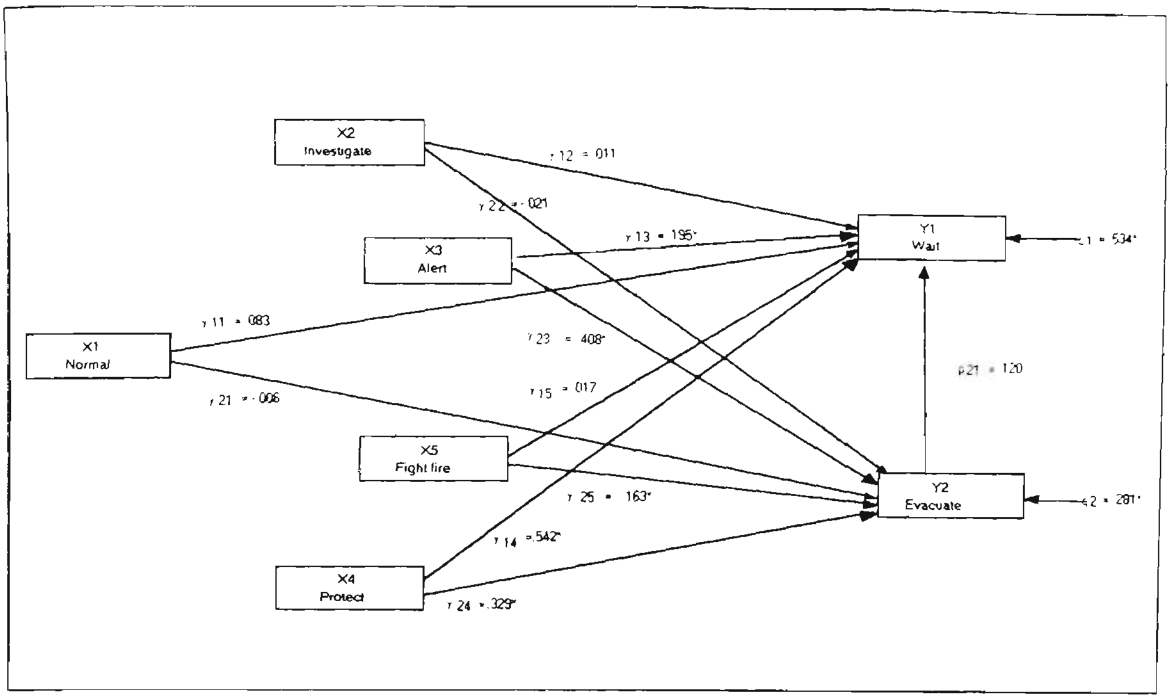


Figure 8.1 Path analytic model for the computer breakdown cue (student group): influence of the constructs continue normal activities, investigate, alert/warn others, protective procedures and fight the fire on the constructs wait for assistance and evacuate.

At $\alpha < .05$, the t-values for the solution reveal that the constructs alert/warn (γ_{13}), and protective procedures (γ_{14}), were significant determinants of wait for assistance and the constructs alert/warn (γ_{23}), protective procedures ($\gamma 24$) and fight the fire (γ_{25}) were significant determinants of evacuation, for the cue computer breakdown

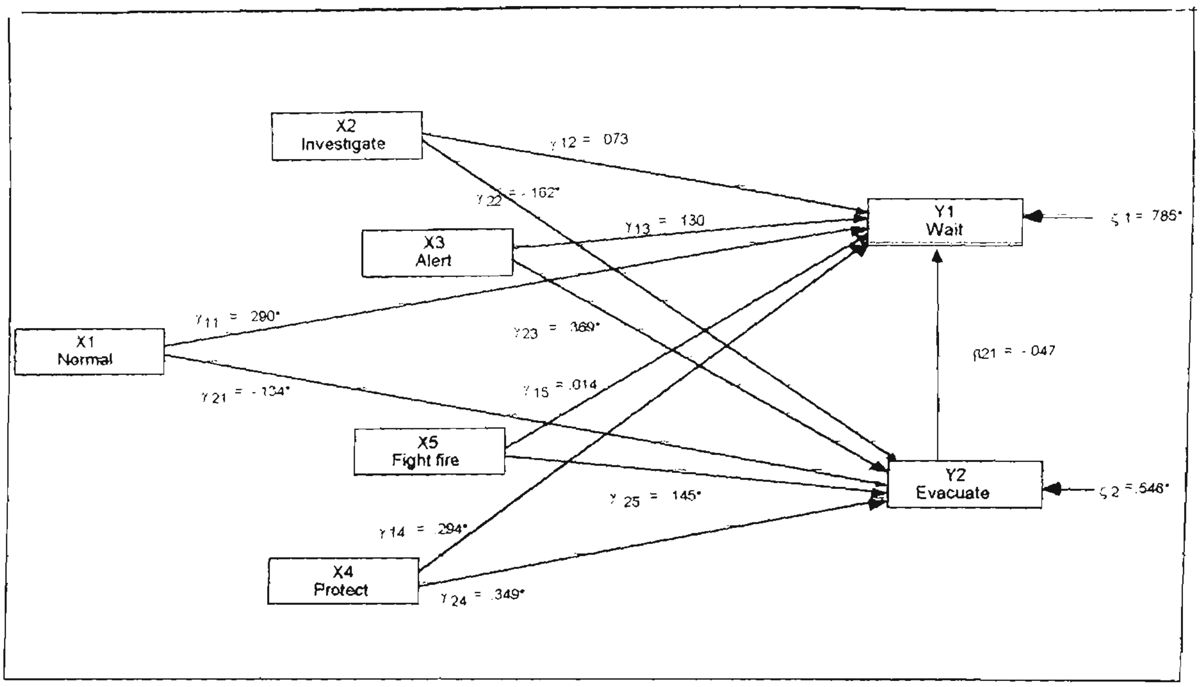
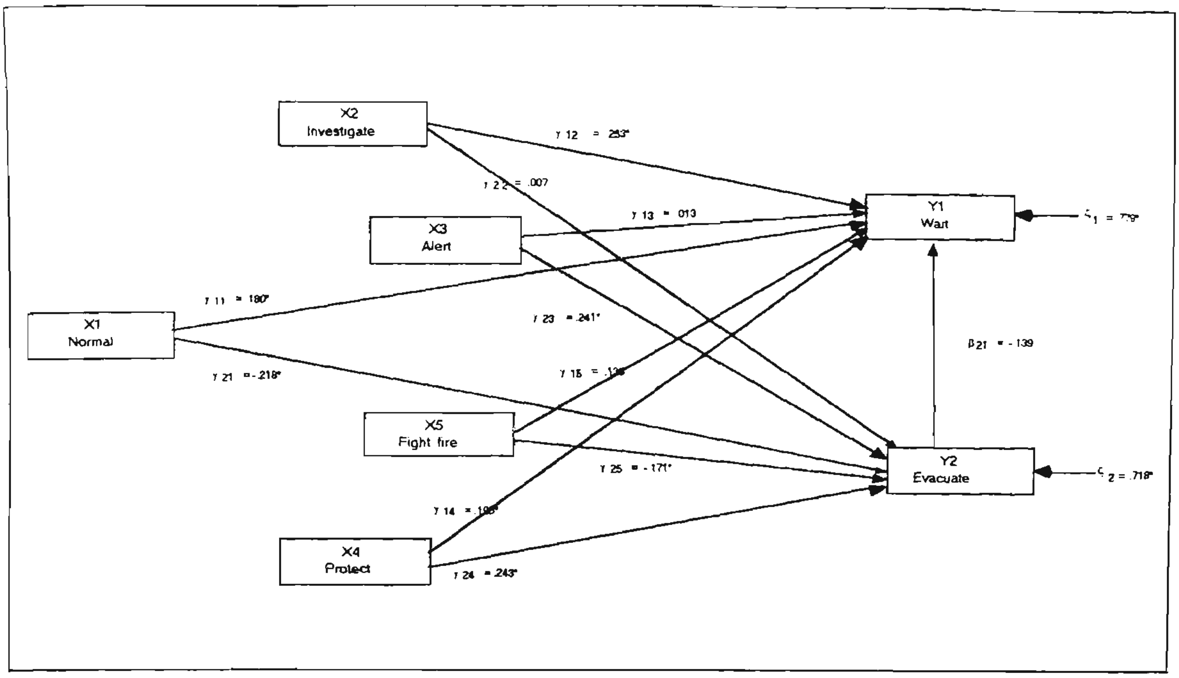


Figure 8.2 Path analytic model for the building alarm cue (student group): influence of the constructs continue normal activities, investigate, alert/warn others, protective procedures and fight the fire on the constructs wait for assistance and evacuate.

The t-values for the solution reveal that the constructs continue normal activities ($\gamma 11$), and protective procedures ($\gamma 14$) were significant determinants of wait for assistance. The constructs alert/warn ($\gamma 23$), protective procedures ($\gamma 24$), and fight the fire ($\gamma 25$) were significant determinants of evacuation, for the building alarm cue. T-values for the constructs continue normal activities ($\gamma 21$) and investigate ($\gamma 22$) were significantly negative determinants for evacuation.



<u>Figure 8.3</u> Path analytic model for the smoke and flames cue (student group): influence of the constructs continue normal activities, investigate, alert/warn others, protective procedures and fight the fire on the constructs wait for assistance and evacuate.

The t-values for the solution reveal that the constructs continue normal activities (γ_{11}), investigate (γ_{12}) and protective procedures (γ_{14}), were significant determinants of wait for assistance. the constructs alert/warn (γ_{23}) and protective procedures (γ_{24}) were significant determinants of evacuation. Continue normal activities ($\gamma 21$) and fight the fire ($\gamma 21$) were significantly negative determinants for evacuation

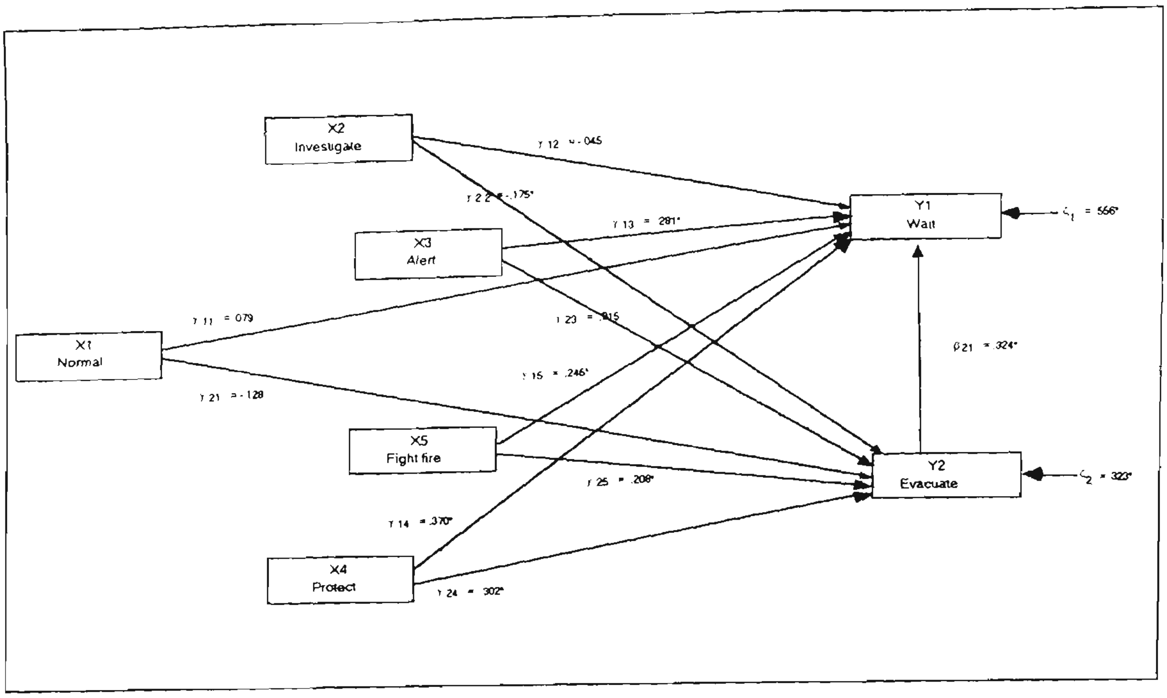


Figure 8.4 Path analytic model for the computer breakdown cue (office group): influence of the constructs continue normal activities, investigate, alert/warn others, protective procedures and fight the fire on the constructs wait for assistance and evacuate.

The constructs continue normal activities (γ_{11}) alert/warn (γ_{13}), and protective procedures (γ_{14}) were significant determinants of wait for assistance, for the computer breakdown. For evacuation the significant determinants were continue normal activities (γ_{21}) and fight the fire (γ_{25}). Investigate (γ_{22}) reported a significant negative t-value for evacuation.

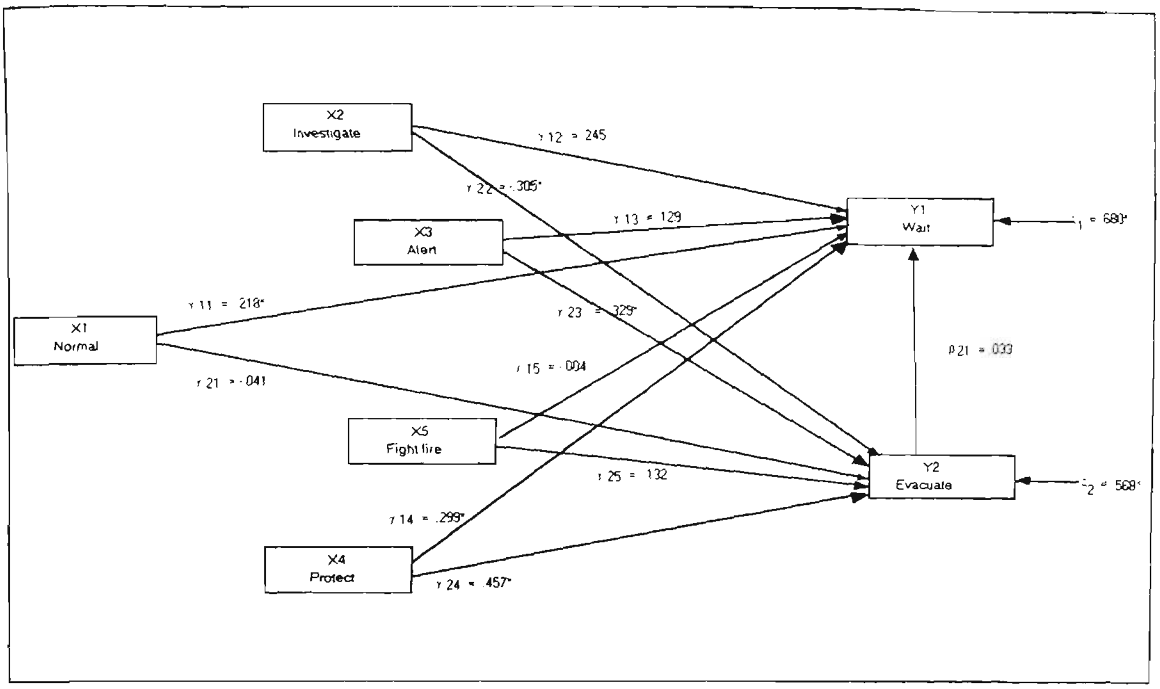


Figure 8.5 Path analytic model for the building alarm cue (office group): influence of the constructs continue normal activities, investigate, alert/warn others, protective procedures and fight the fire on the constructs wait for assistance and evacuate.

For the building alarm, the constructs continue normal activities (γ_{11}) and protective procedures (γ_{14}) were significant determinants of wait for assistance, whereas alert/warn (γ_{23}) and protective procedures (γ_{24}) were significant determinants for evacuation. Continue normal activities (γ_{21}) returned a significantly negative t-value for evacuation.

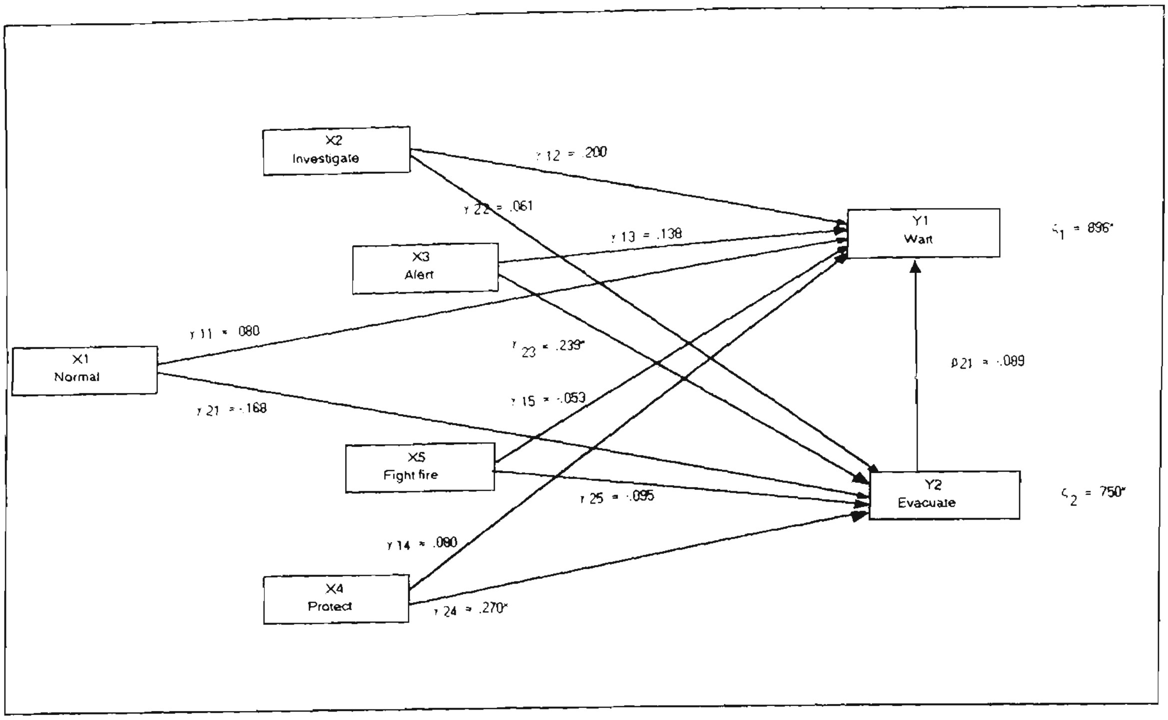


Figure 8.6 Path analytic model for the smoke and flames cue (office group): influence of the constructs continue normal activities, investigate, alert/warn others, protective procedures and fight the fire on the constructs wait for assistance and evacuate.

For smoke and flames, the t-values for the solution reveal that alert/warn (γ_{23}) and protective procedures (γ_{24}) were significant determinants of evacuation.

Most Likely and Least Likely Actions in Response to Each Fire Cue

Tables 8.9 to 8.14 detail the most likely or preferred actions (Mean $\geq$ 0.60) and least likely or non-preferred actions (Mean $\leq$ 0.60) in response to each cue.

Table 8.9

Student Group Response to Computer Breakdown

Preferred or Likely Actions in Response to the Cue	Mean
Continue with office paper work.	0.66
Continue meeting with others.	0.69
Continue eating/drinking (tea/lunch break).	0.73
Continue deliveries/errands.	0.61
Ask someone else nearby for more information.	0.59
Answer a ringing telephone	0.58

Non-Preferred or Unlikely Actions in Response to the Cue	Mean
Telephone the fire brigade to report the situation.	-0.66
Activate the fire alarm (break the glass)	-0.91
Collect own or other's personal property.	-0.70
Close doors or windows	-0.59
Remain in the area until the fire brigade arrives	-0.70
Wait for the assistance of the fire brigade to evacuate the area.	-0.64
Wait for the floor warden's assistance to evacuate the area.	-0.60
Attempt to fight the fire with a fire extinguisher.	-0.80
Attempt to put out the fire by smothering, using a bucket of water, etc.	-0.80
Search for things to fight the fire with.	-0.68

Table 8.10

Student Group Response to Building Alarm

Preferred or Likely Actions in Response to the Cue	Mean
Ask someone else nearby for more information.	0.82
Search for a colleague for more information.	0.60
Look out of a door or window to investigate.	0.77
Contact other colleagues to report the situation.	0.76
Check the area for the presence of other people.	0.78
Assist (comfort, first aid) others.	0.59
Assist others to leave the area.	0.66
Move towards an exit.	0.85

Non-Preferred or Uniquely Actions in Response to the Cue	Mean
Continue with computer work.	-1.18
Continue with office paper work.	-1.17
Continue meeting with others.	-1.05
Continue a telephone conversation.	-1.12
Continue eating/drinking (tea/lunch break).	-1.13
Continue deliveries/errands.	-1.10
Wait for the assistance of the fire brigade to evacuate the area.	-0.69
Remain in the area until the fire brigade arrives	-0.84
Remain in the area until someone else arrives	-0.62

Table 8.11

Student Group Response to Smoke and Flames

Preferred or Likely Actions in Response to the Cue	Mean
Contact the switchboard to report the situation.	1.13
Telephone the fire brigade to report the situation.	1.31
Activate the fire alarm (break the glass).	1.63
Contact the floor warden to report the situation.	1.31
Contact other colleagues to report the situation.	1.36
Check the area for the presence of other people.	1.25
Assist (comfort, first aid) others.	1.03
Telephone the floor warden for assistance to evacuate the area	0.64
Assist others to leave the area.	1.19
Leave the area immediately by the emergency exit.	0.87
Move towards an exit.	1.10
Attempt to fight the fire with a fire extinguisher.	0.56

Non-Preferred or Unlikely Actions in Response to the Cue	Mean
Continue with computer work.	-1.86
Continue with office paper work.	-1.87
Continue meeting with others.	-1.73
Continue a telephone conversation.	-1.80
Continue eating/drinking (tea/lunch break).	-1.85
Continue deliveries/errands.	-1.83
Answer a ringing telephone	-0.78
Ask someone else nearby for more information.	-1.00
Search for a colleague for more information.	-0.87
Wait for the assistance of the fire brigade to evacuate the area.	-0.61
Remain in the area until the fire brigade arrives	-0.73
Remain in the area until someone else arrives	-0.88

Table 8.12

Office Group Response to Computer Breakdown

Preferred or Likely Actions in Response to the Cue	Mean
Continue with office paper work.	0.58
Continue meeting with others.	0.59
Continue a telephone conversation.	0.67
Continue eating/drinking (tea/lunch break).	0.56
Continue deliveries/errands.	0.73
Ask someone else nearby for more information.	0.68
Answer a ringing telephone.	0.90

Non-Preferred or Unlikely Actions in Response to the Cue	Mean
Telephone the fire brigade to report the situation.	-1.31
Activate the fire alarm (break the glass).	-1.41
Contact the floor warden to report the situation.	-0.85
Collect own or other's personal property.	-1.34
Secure computer files, disks or documents.	-0.55
Turn off equipment.	-0.64
Assist (comfort, first aid) others.	-0.70
Close doors or windows.	-0.99
Wait for a colleague's assistance to evacuate the area.	-1.10
Wait for the assistance of the fire brigade to evacuate the area.	-1.26
Wait for the floor warden's assistance to evacuate the area.	-0.85
Assist others to leave the area.	-0.83
Leave the area immediately by the most familiar route.	-1.08
Leave the area immediately by the emergency exit.	-1.00
Move towards an exit.	-0.87
Attempt to fight the fire with a fire extinguisher.	-1.14
Remain in the area until the fire brigade arrives.	-0.98
Attempt to put out the fire by smothering, using a bucket of water, etc.	-1.38
Search for things to fight the fire with.	-1.29

Table 8.13

Office Group Response to Building Alarm

Preferred or Likely Actions in Response to the Cue	Mean
Ask someone else nearby for more information.	0.57

Non-Preferred or Unlikely Actions in Response to the Cue	Mean
Continue with computer work.	-1.14
Continue with office paper work.	-1.17
Continue meeting with others.	-1.05
Continue a telephone conversation.	-0.88
Continue eating/drinking (tea/lunch break).	-1.06
Continue deliveries/errands.	-1.03
Telephone the fire brigade to report the situation.	-0.82
Activate the fire alarm (break the glass).	-0.94
Close doors or windows.	-0.65
Wait for the assistance of the fire brigade to evacuate the area.	-0.85
Leave the area immediately by the most familiar route.	-0.53
Remain in the area until the fire brigade arrives	-0.84
Attempt to fight the fire with a fire extinguisher.	-0.69
Attempt to put out the fire by smothering, using a bucket of water, etc.	-0.99
Search for things to fight the fire with.	-0.99

Table 8.14

Office Group Response to Smoke and Flames

Preferred or Likely Actions in Response to the Cue	Mean
Contact the switchboard to report the situation.	0.71
Telephone the fire brigade to report the situation.	0.74
Activate the fire alarm (break the glass).	1.63
Contact the floor warden to report the situation.	1.58
Contact other colleagues to report the situation.	1.54
Check the area for the presence of other people.	1.21
Assist (comfort, first aid) others.	1.01
Telephone the floor warden for assistance to evacuate the area	0.71
Assist others to leave the area.	1.25
Leave the area immediately by the emergency exit.	0.57
Move towards an exit.	1.22

Non-Preferred or Unlikely Actions in Response to the Cue	Mean
Continue with computer work.	-1.87
Continue with office paper work.	-1.84
Continue meeting with others.	-1.86
Continue a telephone conversation.	-1.83
Continue eating/drinking (tea/lunch break).	-1.87
Continue deliveries/errands.	-1.88
Ask someone else nearby for more information.	-0.73
Search for a colleague for more information.	-0.97
Look out of a door or window to investigate.	-0.73
Answer a ringing telephone	-0.99
Remain in the area until someone else arrives	-1.00
Wait for the assistance of the fire brigade to evacuate the area.	-1.28
Remain in the area until the fire brigade arrives	-1.21
Attempt to put out the fire by smothering, using a bucket of water, etc.	-0.93
Search for things to fight the fire with.	-0.56

Summary

1. For both the students and office workers, one-way analyses of variance indicated significant differences between mean values for most items across each of the cues ($\alpha < 0.50$).

2. T tests for independent samples revealed some significant differences between the students and office workers for most of the constructs in response to the computer breakdown and building alarm cues. There were no significant differences between the two groups for the constructs " continue normal activities" and " wait for assistance" for any of the cues.

3. In response to smoke and flames, the two groups only differed statistically in the construct " fight the fire" .

4. Most constructs demonstrated high ($\alpha \geq 0.80$). internal reliability. Items with low reliability estimates were removed before conducting path analysis.

5. Multivariate tests of significance indicated that there was a significant main for group confirming the differences between the students and office workers identified previously by t tests. The multivariate tests also exhibited a significant main effect for cue for both the student and office groups (response to the three cues differed statistically) for all constructs.

6. Path analysis and structural equations determined that for both the student and office groups, alert/warn others and protective procedures were the only significant predictors of evacuation in this study.

7. Inspection of the means of individual items showed that for both groups "continue normal activities"was the general

response to the computer breakdown cue, " investigation" and " protective procedures" to the building alarm and " alert/warn others, " protective procedures" and " evacuation" in answer to smoke and flames.

Chapter 9

Discussion

Discussion of the Aims

The overall aim of this research was to develop and test a model of decision making in office building evacuations. As part of this process were four aims:

1. To identify the preferred behaviours of occupants in response to particular cues in office building fire emergencies.
2. To describe decision making in office building fire emergencies in terms of seven behavioural constructs (continue normal activities, investigate, alert/warn others, protective procedures, wait for assistance, fight the fire, evacuate).
3. To offer explanations of behaviour in terms of decision making theories such as the conflict model of decision making (Janis & Mann, 1977), task-induced cognitive processing (Hammond et al. 1997) and impact of negative emotions on choice processing (Luce et al. 1997).
4. To predict behavioural responses in terms of decision making theories such as the conflict model of decision making (Janis & Mann, 1977), task-induced cognitive processing (Hammond et al. 1997) and impact of negative emotions on choice processing (Luce et al. 1997).

Figures 9.1 and 9.2 identify preferred behaviours and describe decision making sequences for the two occupational groups (159 tertiary students and 95 office workers) studied. The preferred (or most probable) behaviour was derived from the mean responses of participants on an evaluative scale with mean range of -2.0 to +2.0. Preferred actions were those whose mean was greater than +0.6. This corresponds to the choice of "quite likely". In contrast non-preferred actions were those whose mean was less than -0.6 corresponding to the perception of "quite unlikely" choices in the circumstances.

The sequences of behaviour in response to evolving cues were constructed from path analyses for each cue. The model selected the constructs "wait for assistance" and "evacuate" to be functions of the remaining five constructs in response to each cue. Path analyses then determined which of the five behavioural constructs (continue normal activities, investigate/seek further information, alert/warn, protect and fight the fire) loaded significantly onto "wait for assistance" or "evacuate". Significant loadings between constructs are shown as arrows in Figures 9.1 and 9.2. The arrows indicate the direct causal contribution of each construct onto either wait for assistance or evacuate. The preferred or most probable ("quite likely") actions are also shown.

For both occupational groups (students and office workers) the preferred constructs in response to the computer breakdown were to continue normal activities and investigate. Preferred actions were identical for both groups with the exception of "Continue a telephone conversation" (office workers only). The actions selected by both groups were: "Continue with office paper work"; "Continue meeting with others"; "Continue eating/drinking (tea/lunch break)"; "Continue deliveries/errands"; "Ask someone else nearby for more information" and "Answer a ringing telephone".
There were differences evident between the two groups in their responses to the building alarm. Students selected as "quite likely" actions from a greater range of behaviours - investigating, alerting/warning others, protective procedures and evacuation, whereas office workers chose alerting/warning others as most probable behaviour. The groups selected only one action in common. "Ask someone else nearby for more information" was judged by office workers to be the only appropriate response to this cue. Actions selected by students were "Ask someone else nearby for more information"; "Search for a colleague for more information"; "Look out of a door or window to investigate"; "Contact other colleagues to report the situation"; "Assist (comfort, first aid) others";

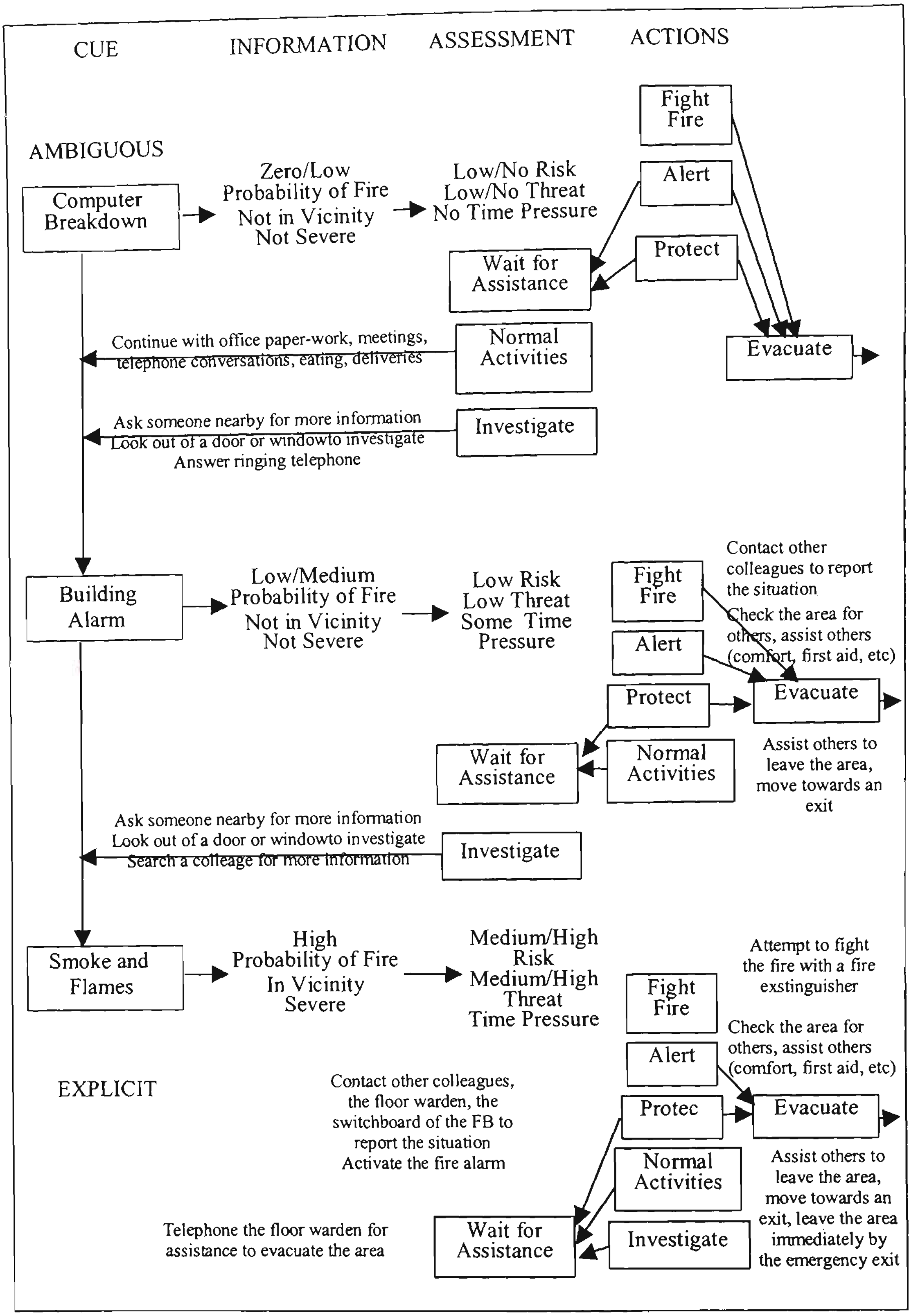


Figure 9.1

Decision making in office building fire emergencies most probable actions in response to selected cues (students)

"Check the area for the presence of others"; "Assist others to leave the area"; and "Move towards an exit".

In response to smoke and flames there was close agreement in preferred behaviours. Both groups judged appropriate behaviour to be alerting/warning others, protective procedures and evacuation. Students chose one fire fighting action "Attempt to fight the fire with a fire extinguisher" whereas office workers showed preference for "telephoning the floor warden for assistance to evacuate the area". Single actions described as highly likely for the groups are shown on respective diagrams (Figures 9.1 and 9.2).

Wait for assistance and evacuation were judged non-preferred or quite unlikely behaviours by both groups in response to the computer breakdown. In fact wait for assistance was not a preferred construct for any of the cues and office workers only selected evacuation in response to explicit signs of fire (smoke and flames).

For both students and office workers in response to the computer breakdown, alert/warn others and protective procedures were significant predictors of wait for assistance. This is consistent with the non-preferred status of this construct. In a similar fashion and for both groups, continue normal activities and protective procedures significantly

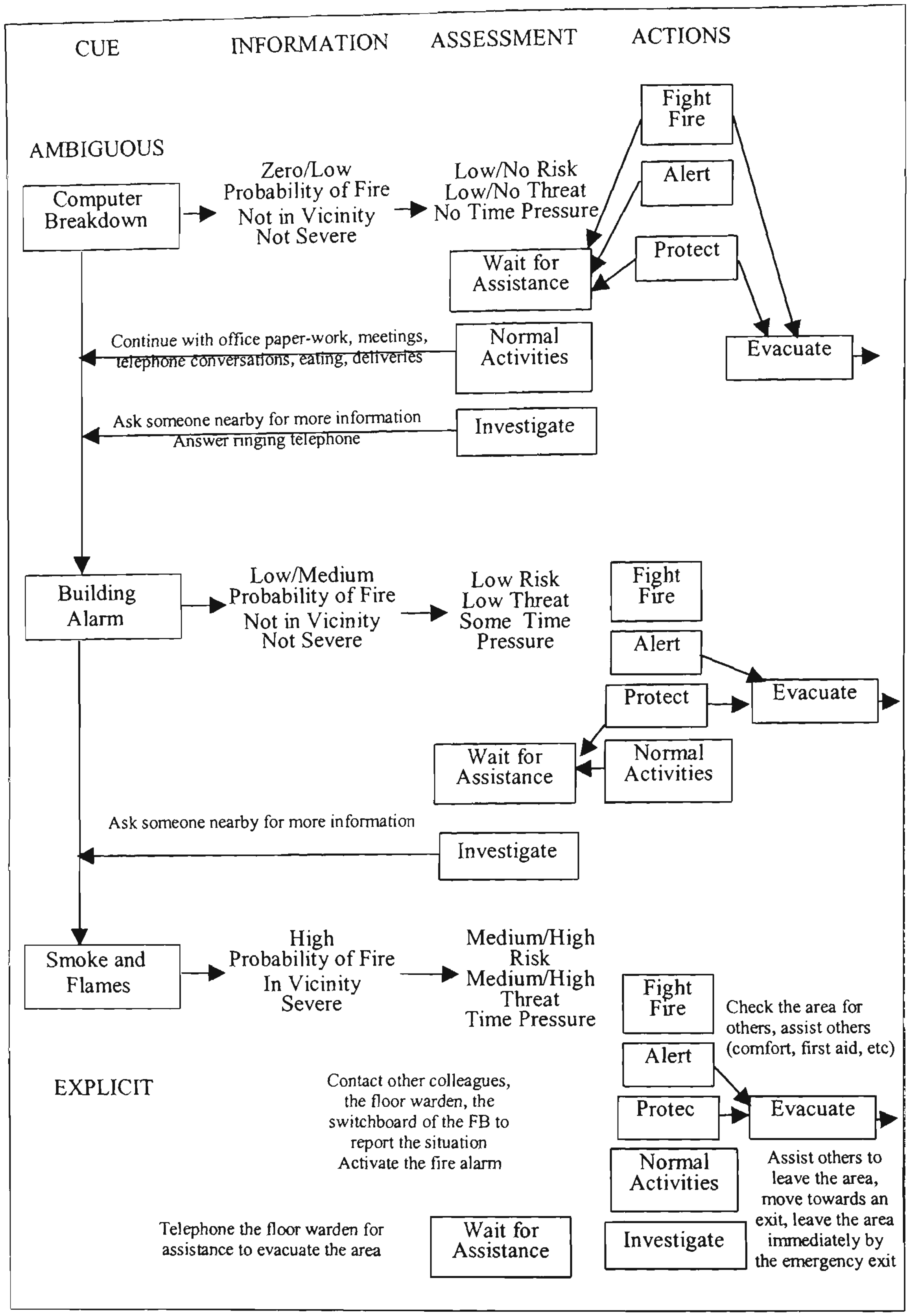


Figure 9.2

Decision making in office building fire emergencies most probable actions in response to selected cues (office workers) predicted wait for assistance in response to the building alarm. All were deemed unlikely behaviours by the participants in response to the cue.

Explanations and predictions of behaviour in terms of decision making theories such as the conflict model of decision making (Janis & Mann, 1977), task-induced cognitive processing (Hammond et al. 1997) and impact of negative emotions on choice processing (Luce et al. 1997) will be discussed in detail in a later section.

Summary of the Hypotheses

Hypothesis 1. There will be measurable behavioural discrimination between different categories of cues in office building fire emergencies.

Hypothesis 2. Behaviour in response to cues defined as ambiguous (such as disturbances to building systems and equipment and non-informative building alarms) will exhibit a greater range of actions than behaviour in response to explicit fire cues.

Hypothesis 3. Behaviour in response to explicit fire cues (such as smoke and flames) will exhibit a smaller range of actions than behaviour in response to ambiguous fire cues.

Hypothesis 4. Social decision making (people oriented actions) will dominate responses.

Hypothesis 5. There will be occupational differences in response to the cues in office building fire emergencies.

Hypothesis 6. Behaviour in response to cues defined as ambiguous (such as disturbances to building systems and equipment and non-informative building alarms) will consist predominately of ignoring the interruption, attempting to continue with tasks at hand, seeking further information and advice.

Hypothesis 7. Behaviour in response to explicit fire cues (such as smoke and flames) will consist predominately of protective procedures, preparing to evacuate and evacuation.

There was strong support for Hypotheses 1, and 5 and qualified support for hypotheses 4, 6, and 7. Hypotheses 2 and 3 were not supported.

Discussion of Hypotheses

Hypothesis 1. For both students and office workers one way analyses of variance suggested that the majority of 36 single actions showed measurable differences in response to the cues presented (Tables 8.1 and 8.2). For students five of the actions ("Turn off equipment."; "Wait for a colleague's assistance to evacuate the area."; "Wait for the assistance of the fire brigade to evacuate the area."; "Wait for the floor warden's assistance to evacuate the area." and "Remain in the area until the fire brigade arrives.") failed to show measurable differences in response to any of the cues and for the office workers three actions ("Telephone the floor warden for more information"; "Secure computer files, etc." and "Remain in the area until the fire brigade arrives.") showed no significant differences in mean response. Multivariate analyses of variance showed significant differences in response to cues for all seven constructs for both office workers and students.

The findings concur with most research in this area. Recognition of a fire emergency discourages continuing with the task at hand and there is unanimous endorsement across most types of building fires of the notion that people do not immediately head for the nearest exit and evacuate. In a review of more than 20 papers on well-documented office fires, Boyce, Fraser-Mitchell and Shields (1998, p. 691) proposed that occupants, unless directly exposed to fire, would delay evacuation to seek further information and confirm the presence of fire:

> "Over 80% of 'ordinary' staff collected personal belongings before evacuating the building. Approximately 37% of staff completed work, e.g. logged/switched off computers, ended a telephone conversation, or finished typing a letter before exiting. Most staff who were not in their own offices

at the time of the alarm returned to their offices before evacuating, although they were few in number (5.8% of all staff). It is also interesting to note that approximately 2.5% of staff, although they did not have designated responsibilities in the event of an emergency, reported checking that other staff had left the building before exiting themselves."

(Boyce, Fraser-Mitchell & Shields, 1998, p. 696)

Hypothesis 2. Behaviour in response to cues defined as ambiguous (such as disturbances to building systems and equipment and non-informative building alarms) *did not* exhibit a greater range of actions than behaviour in response to explicit fire cues. However there is evidence that there were *greater differences* in behavioural preferences between students and office workers in response to the non-explicit fire cues. These differences may be a function of individual differences such as experience (with building fires) familiarity with the building and emergency procedures and training and emergency drills.

Tables 8.9 to 8.14 illustrate, for both groups that with the exception of continue normal office activities, and some actions from the investigate construct, there was a stronger non-preference for alert, protect, fight the fire, wait and evacuate, in response to the computer breakdown than to the building alarm. The mean values for actions in response to the building alarm were in the range -0.5 to +0.5 with many tending to zero. In contrast, the constructs alert, wait, evacuate and fight the fire in response to the computer breakdown exhibited quite strong negative values and smaller standard deviations - indicating greater homogeneity of response. Mean values tending to zero can be explained as follows: "Uncertain" was assigned a zero value on the scale used by participants. Scrutiny of the raw data revealed that about 20% of respondents ticked the "Uncertain" option in response to the computer breakdown. Remaining participants were almost equally split between the choices "quite likely" (+1 scale value) and "quite unlikely" (-1 scale value) for most actions. Homogeneity of response to the computer breakdown is perhaps due to participants interpreting the computer breakdown as an explicit cue associated with the operation of the computer and not related to an office fire. The heterogeneity of decisional choice manifested by the larger standard deviations of actions in response to the building alarm provides some support for the hypothesis that decision making is more uncertain (albeit not apparent as a greater range of actions) in response to ambiguous situational cues. It may be speculated that the building alarm was perceived to be a more ambiguous cue in this situation and participants appeared to show greater uncertainty in what to do, but less uncertainty in what not to do.

Hypothesis 3. There was non significant support for the prediction that behaviour in response to explicit fire cues (such as smoke and flames) would exhibit a smaller range of actions than behaviour in response to non-explicit fire cues. As illustrated by the means (Tables 8.1 and 8.2) and path analyses, the number of preferred behavioural constructs actually increased indicating greater complexity of behavioural choice. Responses also strengthened and exhibited greater polarisation (smaller standard deviations and mean values tending towards the extreme scale values of -2.0 and +2.0) evidence of strong commitment to preferred actions in response to the explicit fire cues of smoke and flames. Scrutiny of the raw data showed a great reduction in choice of the "uncertain" option for the constructs alert, protect and evacuate. The only statistical difference in choice of behaviour between the two groups was that students selected one action from the construct fighting the fire. In other words the differences between the groups in terms of preferred behavioural constructs diminished. Past studies such as Canter's (1985) overview of studies of human behaviour in fires based on British and North American research postulate an increase in variety of actions as the fire event develops.

Hypothesis 4. Of the thirty six actions provided to participants, 18 (50%) were classified as involving other people (including the fire brigade). Of the preferred actions (those with means $\geq +0.6$) 50% in response to the computer breakdown selected by students and 57% by office workers were "social actions". For the building alarm there was an increase in selection of actions involving other people (75% for the students and 100% for office workers). For smoke and flames, the proportions decreased for both groups (67% students and 73% office workers).

Although the study did not directly set out to investigate social decision making, observations in the field (Brennan, 1995; 1997; Bryan, 1985; Latane & Darley, 1968) have identified the importance of social influences on emergency decision making. The participants in this study were part of a group when viewing the film but responded to the questionnaire individually and did not have the opportunity to interact with each other nor discuss their responses. Nevertheless the majority of actions selected by the participants as preferred behaviours related to other people. There appear to be a number of explanations for this phenomena. In terms of social decision making the predominance of actions involving other people conforms to a common-sense heuristic that groups are likely to make better decisions than individuals (McKnight & Sutton, 1994). However a competing explanation for the choice of social actions resides in drive theories (Maslow, 1971) which suggest that affiliation or the need to belong is a more powerful need than being liked.

Confirmation of the importance of the presence of others and the formation of groups in building fire emergencies is found in many studies. Reasons proposed for these phenomena include mechanisms for dealing with threatening situations prior to or during flight or fight situations and for information seeking (Canter, 1985, Bryan, 1988), affiliation (Sime, 1984), formation of new norms in a situation where traditional norms (expected modes of behaviour) are disrupted (Perry, 1979), social evaluation, social comparison" (Cialdini 1988; Festinger, 1954; Schacter, 1959) and to reduce confusion and assist interpretation of unfamiliar circumstances (Brennan, 1995). This interpretation is corroborated to some extent in the later discussion concerning the use of heuristics invoked by ambiguous cues or situations that induce intuitive or emotion-focused coping strategies. Processing peripheral social information and taking cues from others rather than analysing complex information relating to the threat itself, reduces effort and simplifies decision making.

In their discussion of bystander intervention (Latane & Darley, 1970) proposed that as the number of people involved increases, individual responsibility declines and assistance becomes less likely. Consistency in the phenomena of diffusion of responsibility suffered by the group as a whole was substantiated by Latane and Nida (1981) in a later review of 56 other studies of emergencies. The mere presence of others led to a diffusion of responsibility that was debilitating. Only 22% of those in groups assisted whilst more than half of the sole bystanders intervened. Comforting (first aid, etc) and assisting others to evacuate the area were chosen as strongly preferred behaviours in response to the building alarm and the sight of smoke and flames, by the majority of participants (>60%) in the study. In a sense the individual participants were responding in a similar fashion to the simulated office fire as the sole bystanders in the studies by Latane and Nida.

Hypothesis 5. There were significant differences between the two occupational groups (students and office workers) in response to particular fire cues in office building fire emergencies. The differences were evident in results of t-tests and multivariate analysis of variance (a significant main effect for "group" was apparent) conducted on the groups. For the computer breakdown two-tailed t tests for independent samples indicated that students were more likely to seek further information about the situation, than office workers. Office workers were less likely to alert/warn others, institute protective procedures, wait for assistance, evacuate or fight the fire. In response to the building alarm the student group were more likely to investigate, alert/warn others, institute protective procedures evacuate and fight the fire. However the only significant behavioural difference between the two groups for the smoke and flames cue was that the student group indicated that they were more likely to fight the fire than the office workers.

Although prior experience with a disaster has been shown to play an important role in the way that people define the situation (Perry et al. 1981; Saunders, 1998; Weinstein, 1989; White & Haas, 1977; Whittow, 1980), only 19% of the participants in this study had experienced a building fire. To some extent the differences in response of the two groups to a simulated office building fire reflects the importance of role in an organisation and familiarity with particular buildings, their daily routines and emergency procedures. Brennan (1996) contended that decision making in emergencies reflects the way that an organisation operates, the inherent roles, social groups, what communications occur, and who makes the decisions that affect others. In the current study, occupational role for the office workers (manager, non-managerial staff, emergency responder, visitor, etc) possibly determined the degree of knowledge of, familiarity with, and command of emergency procedures. Most office workers would have a script to follow in an emergency situation. This script would incorporate the building's emergency cues, warning systems, lines of communication, chains of command, actions and responsibilities to others. Naive respondents (for example the majority of students) without training in the building's emergency procedures and lacking an appropriate script would perhaps be expected to exhibit more diverse responses to signs such as building alarms. In reality this group are generally strongly influenced by the behaviour and instructions of those perceived to have information or expertise in the situation and take their decision making cues from significant others.

In a similar vein, and based on accounts of behaviour of staff and shoppers in retail fires, as reported in international literature, detailed statistical information on retail building fires in the United States and Australian, structured interviews with shopping centre management, anecdotal accounts from staff and shoppers of retail fire incidents and observations of evacuation exercises in shopping centres (Bennetts, Poh , Thomas, Lee, Beever, 1996, Boyce, Fraser-Mitchell & Shields, 1998; Saunders, 1998) those who are not familiar with the public alarm systems, evacuation procedures or emergency exits in shopping centres rely heavily on the instructions of staff and/or emergency services in a fire emergency.

Hypothesis 6. Behaviour in response to cues defined as ambiguous (such as disturbances to building systems and equipment and non-informative building alarms) consisted predominately of ignoring the interruption, attempting to continue with tasks at hand, seeking further information and advice. For both the students and office workers the preferred behavioural constructs in response to the computer breakdown were to continue with normal activities (continue with office paper work, meeting with others, eating, drinking, deliveries, errands) and investigate/seek further information (ask someone nearby for more information; answer a ringing telephone). For the building alarm, student participants elected to investigate/seek further information (ask someone nearby for more information, search for a colleague for more information, look out of a door or window to investigate) and protect (check the area for the presence of others, comfort others) with some alerting (contact other colleagues to report the situation) and preliminary evacuation actions (assist others to leave the area, move towards an exit). However for office workers the only preferred action (from the construct investigate/seek further information) was to ask someone nearby for more information.

In fact this study showed that in response to the computer breakdown most people indicated that they preferred to continue with what they were doing (with the obvious exception of computer work) or investigate the situation manifested by non-fire related information seeking. Between 65% and 72% of respondents indicated that they were quite or extremely likely to continue normal office activities or investigative activities. These findings accord with other accounts of behaviour in response to ambiguous cues (such as interruptions to electrical supply, communication or mechanical breakdowns). Researchers (Canter, 1980; Keating & Loftus, 1984; Levin, 1985, 1989; Lo, 1996; Proulx & Passini; 1991) identified the most common early behaviours in the fires as misinterpretation (the first cue is often associated with crime as people have a greater awareness of crime than fire, Townsend, 1998, p. 176) or ignoring ambiguous cues, investigation or searching for additional information to establish a clearer picture of the situation, fetching things to fight the fire and searching for or checking on other people.

In response to the building alarm, information seeking was the predominant response with 75% of participants saying that it was likely they would ask someone nearby for more information, 66% that they would search for a colleague for more information and 68% that they would look out of a door or window to investigate. Other responses chosen by between 60% and 70% of the participants were to contact other colleagues to report the situation, check the area for the presence of others, assist (comfort) others and pre-evacuation behaviour such as assist others to leave the area and move towards an exit. These results show close agreement with other findings (Bellamy & Geyer, 1990; Bennetts et al. 1996; Bickman, Edelman & McDaniel, 1977; Boyce, Fraser-Mitchell & Shields, 1998; Breen, 1985; Fahy & Sapochetti, 1999; Gardner, 1996; Horasan & Johnson, 1995; Kahn, 1984; Keating & Loftus, 1977; Moore, 1988; Proulx, 1997, 1998; Proulx & Syme, 1991; Proulx, Larouche, & Latour, 1995; Ramachandran, 1990; Saunders, 1998) of behaviour in response to building alarms. Research reports that people sought further information or advice, waited for some form of instruction or assistance and initiated pre-evacuation responses such as gathering together personal possessions, closing doors or windows, etc. many people will ignore the alarm. The studies indicate that the majority of occupants searched for more information to assist their interpretation of events, or to confirm the need to prepare to evacuate.

Proulx, Pineau, Latour & Stewart (1995, p. 23) reported in their investigation of human behaviour in a fatal multi-storey residential fire that "No one reported actions falling in other categories such as *Preparation to Evacuate, Evacuation, Assisting or Seeking Refuge* as their initial action."

> "Once occupants have recognised the need to respond to the emergency, they cease their normal activities and begin a range of other activities. These activities do not immediately include heading for the nearest exit."...In the clothing store ... and probably also in the football stadium, the first activities of people near the fire were to warn others by attracting the attention of the staff. In the clothing store the response of staff was to fight the fire. ...In the restaurant the first actions were to seek information then gather family members. Only when these important activities were completed did occupants begin to move towards the exits. Other activities people engage in are stopping machinery or securing money or other risks, investigative behaviour to find the source of the fire

when an alarm is triggered and finding the appropriate exit route."

(Purser, 1998, p. 500)

Hypothesis 7. Behaviour in response to explicit fire cues (such as smoke and flames) consisted predominately of alerting, protective procedures, preparing to evacuate and evacuation. The preferred constructs for both students and office workers were to alert/warn others (contact the floor warden; contact other colleagues; contact the switchboard; telephone the fire brigade; activate the fire alarm). In fact 87% of participants indicated that they were extremely likely to contact the floor warden and contact other colleagues. More than three quarters of the participants demonstrated high level of support for the other actions forming this construct and more than 79% chose protective procedures (check the area for the presence of others, comfort others) whilst 82% indicated that they would evacuate (move towards an exit, assist others to leave the area, leave the area immediately by the emergency exit). Consensus for evacuation actions in response to the explicit signs of smoke and flames was evident in the narrow range of mean responses (small standard deviations). The exception was "leave the area immediately by the most familiar exit." The results concur with past fire and emergency research (Boyce, Fraser-Mitchell & Shields, 1998; Canter, 1980; Levin, 1985; Perry, Lindell & Green, 1981; Purser, 1998;) where evacuation as a preferred behaviour generally increased with the increase in perception of threat as real (explicit fire cues).

This study determined that continuing normal activities and investigating/seeking further information were definitely non-preferred (quite unlikely) behaviours in response to smoke and flames. Support for these observations include Levin (1985) whose investigation of survivors of residential fires found that no respondent who had seen the flames sought information and alerting behaviour was confined to those who believed it was *likely* there was a fire or were sure and had seen smoke or flames and fighting the fire was restricted to those who had seen the flames.

Explanations and predictions of behaviour in terms of decision making theories

The results of this study provide some support for the conflict model of decision making (Janis & Mann, 1977), task-induced cognitive processing (Hammond et al. 1997) and impact of negative emotions on choice processing (Luce et al. 1997). There is evidence that problem-focused coping strategies govern cognitive processing in response to cues that are perceived to be not indicative of a fire and/or are cues low threat and that emotion-focused coping strategies will dominate cognitive processing of explicit and/or high threat fire cues.

If uncertainty in response is an indication of cognitive difficulty in decision making, then the high number of "uncertain" responses to particular cues may act as a measure of cognitive uncertainty in the present study. Approximately 15% of all responses for the computer breakdown and building alarm cues were recorded as "uncertain" on the evaluative scale. For the explicit fire cues of smoke and flames this reduced to 9% across all actions. This could be explained by the fact that participants in the study encountered smoke and flames as the third cue and perhaps they had become familiar with the composition of the questionnaire. However there were fewer individual actions registering large percentages for uncertainty (>20%) for the computer breakdown and smoke and flames, compared with the building alarm. For the computer breakdown, actions displaying high uncertainty were "remaining in the area until someone arrives", "closing doors and windows", "attempting to put out the fire by means other than a fire extinguisher" and "remaining in the area until the fire brigade arrives". In response to smoke and flames, actions demonstrating high uncertainty were "waiting for a colleague's assistance to evacuate", "leaving the area immediately by the emergency exit" and "attempting to put out the fire" (using a fire extinguisher or other means). In contrast many more actions demonstrated a high percentage of uncertainty in response to the building alarm. "Telephoning the fire brigade", "activating the fire alarm", "collecting personal property", "turning off equipment" and "waiting for assistance to evacuate the area". By far the highest (between 25% and 30% of respondents indicated uncertainty) with respect to leaving the area immediately by the emergency exit and *all* fire fighting activities.

It was postulated in this study that explicit fire cues such as smoke and flames would most probably invoke emotion-focused coping strategies manifested as selective, non-compensatory, attribute-based decision strategies. These strategies embrace conservative behavioural options and familiar heuristics (follow the crowd, safety in numbers, etc) and discourage comprehensive processing of all alternatives or trying new and probably untested options.

Use of risk averse heuristics has been observed in studies of retail fire emergencies (Bennetts et al. 1996). In response to prolonged alarms or multiple cues (smelling/seeing smoke, fire sirens, unusual activities on the part of staff, etc), the most common shopper reaction is to seek information by approaching a staff member (retail assistant or security personnel), or conferring with other shoppers. The behaviour of retail and security staff and emergency services personnel appears to be a decisive factor in shopper assessment of the situation. As well as following directives from these sources, shoppers reported being affected by the demeanour of staff, in the situation. If retail staff, security and fire brigade personnel appear calm and unconcerned (in the case of false alarms or small incidents), shoppers will, on the whole, take little notice of their presence and assume that the situation is under control and not serious. The behaviour of other shoppers is a significant determinant of direction of movement of shoppers. People tend to follow the crowd when evacuation is required and move in the same direction as other people. In summary then the choice of selective, non-compensatory, attribute-based decision strategies is an attempt to "restore a sense of familiarity or rationality by either 1) investigating the source of unrecognised information to obtain additional information consistent (individual) experience or 2) retreating or relocating to a familiar or more comfortable context." (Chubb et al. 1998, p. 208)

What actions would be defined as conservative, risk-averse strategies (emotion-focused coping)? Proulx, Pineau, Latour and Stewart speculated in their 1995 study of a fatal high rise apartment fire, that the resident's interpretation of the gravity of the situation was reflected in their choice of behaviour. Although the observations derive from residential fires there is a degree of congruence in coping strategies as a function of the strength of emotion.

> "People who thought the situation was *Not at all Serious* were much more likely to *Wait*, people who thought the situation was *Only Slightly Serious* or *Moderately Serious* decided in a greater proportion to *Investigate* and people who believed the situation to be *Extremely Serious* were more likely to *Alert*."
>
> (Proulx et al. 1995, p. 24)

It is predicted that although smoke and flames are explicit fire cues, they will induce in most respondents intuitive cognitive processing.

> "People are not in buildings with fire uppermost in their minds, but for other purposes for which they have a considerable commitment. In order to attend to some other demand they have to recognise its importance and cease their normal activities. The early cues to a developing fire emergency are often ambiguous, so that some time may elapse before occupants become fully aware and convinced of the need to change their behaviour"
>
> (Purser, 1998, p. 500)

According to Hammond et al (1997) uncertainty is a catalyst for inducing intuitive cognition. However in this sense uncertainty is not the same as ambiguity, but instead, equated with unfamiliarity. People who are unfamiliar with building fires and/or have no training in recognition and fire emergency response will be required to make decisions in an environment whose characteristics are almost certainly difficult and most probably unfamiliar and uncertain. Both groups of participants displayed a shift towards intuitive cognition invoked by the task characteristics and appeared to rely more on individual solutions (such as guessing or approximation strategies) with observed increased diversity of behaviours.

Do the results from this study reflect task-induced cognitive processing? In the case of the computer breakdown the small number of preferred behaviours (continue normal activities for all participants) could be evidence that this cue was interpreted as an explicit sign relating to the functioning of the computer rather than an ambiguous building fire cue. The groups reacted to this cue by selecting all individual actions comprising continue normal office activities construct with the exception of continue with computer work. The building alarm cue however produced a range of responses across the groups. When the groups are combined all constructs are weakly represented with the exception of fight the fire. Office workers showed preference for one action only (within the construct - investigate). The explicit fire cues of smoke and flames produced responses strongly representative of two constructs (alert and evacuate) and moderately suggestive of the construct protect. Fighting the fire as a construct was almost unanimously not preferred.

Most occupants of office buildings have no previous experience with building fires. Fires in office buildings are relatively rare and are characterised by fairly brief development phases with multiple and simultaneously presented cues that are perceptually measured. Lack of experience or preparation in the situation limits access to a suitable cognitive organising principle. After perception of and reaction to the initial ambiguous cues, a process of gathering and conferring with others occurs as people attempt to define the situation. If warden or emergency response structures are activated occupants will acquiesce to instruction from trained responders or other authority figures such as managerial staff. Occupant decision making is then essentially controlled and the organising cognitive principle becomes reliance on and expectation that, wardens or management will provide advice and guidance in the situation.

In conclusion, in terms of task-induced cognitive processes fire emergencies in office buildings may be characterised as "tasks" whose properties induce in occupants, other than trained emergency responders (wardens, security staff, safety officers, etc), or people who are prepared and have access to expert support or advice, a tendency towards intuitive decision making. In contrast selective measurement (enhanced by training, experience or preparation) of the same task characteristics, will induce in trained responders a quasi-rational form of cognitive processing. Office buildings are complex physical and social, task oriented, hierarchically organised environments with an emphasis on security and supervision of occupants. People in office buildings, whether employees or visitors are generally involved in purposive activities. The computer breakdown occurs at the beginning of the film. The scenario is that of people engaged in various office activities. The problem that occurs is specifically to do with the computer. In terms of analysis or intuition-inducing task conditions, it is a fairly straightforward problem. The audience (participants in the experiment) can objectively measure the cues, there is low redundancy between cues (they only portray various office activities) there would be a reasonably high certainty of task decomposition and certainty in what could be still achieved (other normal office activities not related to computer work) and individuals would have access to a task specific organising principle - continue with the tasks at hand if possible.

Figure 9.1 (Chubb et al. 1998) derives from a review of earlier studies of human behaviour in fire summarises the relationships between the characteristics of a fire (degree of ambiguity, intensity of cues) and predicted actions. There is substantial agreement between behavioural outcomes in past research and the reported (intended) actions of the current study. In terms of inferred cognitive processing, Chubb et al. identify the salience of the level of ambiguity in primarily recognising a situation as typical and then being capable of identifying and implementing an appropriate strategy.

" High levels of ambiguity unaccompanied by intense cues seem likely to encourage the decision maker to wait for more information. Slightly more information suggesting danger will very likely produce a response aimed at dispelling or confirming the notion of danger. On the other hand, extremely vigorous threats will probably overwhelm the decision maker. At the other extreme, situations which seem ordinary, including those involving little ambiguous information and eliciting no stress, will probably produce no overt response. Situations involving little ambiguity may still be accompanied by stress though. In intense but familiar situations, the altruistic tendency to share insight into the nature of the threat is likely when the danger to the decision maker does not necessitate an immediate withdrawal to a place of safety. The most difficult situation outcomes to predict involve relatively moderate degrees of ambiguity. Here it will be important to appreciate the source of ambiguity. If the decision maker is adequately equipped with prior knowledge of how to deal with a fire or experience operating fire fighting equipment and has tools available with which to respond, an effort to fight the fire could be expected. On the other hand, the absence of fire fighting equipment or lack of fire fighting experience should encourage efforts to warn others and evacuate, the tendency towards the latter increasing as the danger becomes more imminent."

(Chubb, Groner & Shephard, 1998, pp. 208-209)

Table 9.1

Predicted Relationships Between *Actions and Situation Attributes (from Chubb, Groner & Shephard, 1998, p. 209)

Action	Ambiguity	Intensity
No action (ignore)	<	<
Withdraw	<	>
Instruct	<	~
Warn	~	~
Evacuate	~	>
Fight	~	<
Investigate/explore	>	~
Wait	>	<
Unable to respond	>	>

Key: < low; ~ moderate; > high

*summarised from Canter (1990), and Bryan, (1976)

Methodological Critique

Theoretical Validity

The model depends for its theoretical validity on substantiation of the following concepts:

1. That the library of actions contained in the questionnaire and the film are a representative sample of

those cognitively possible in the circumstances (content domain of behaviours).

Assessing the content validity involved making judgements about the adequacy with which the questionnaire sampled the content domain of possible actions in an office fire. The procedures used to select cues and the library of cognitively possible actions for inclusion in the questionnaire and film have been described the methodology. The literature review of pertinent research in the area provided a list of actions, this was refined initially during the pre validation and face validation phases and after piloting the questionnaire with various groups. Fire cues were derived from empirical research and expert opinion.

The film script was given to a number of experts in the field of building fire emergencies (fire safety managers and operational fire fighters) for criticism and suggestions and to ensure credibility (that it was representative of office fires). The narrative was based on a number of real office building fire incidents in Australian cities. The process of refinement to ensure a credible fire scenario involved many rewrites of the script and careful editing.

The final film and questionnaire provided a plausible fire scenario with stimuli (fire cues) typical of the situation and giving participants the choice of a representative sample of the domain of possible responses. The time taken to view the film and complete the questionnaire - about 15 minutes - equates closely to the real time development of the type of fire depicted.

2. That the constructs to be measured were identified and the relationship between individual actions and the constructs were detailed.

Establishing construct validity was a multi-stage process. The first stage provided a detailed description of the relationship between specific behaviours (individual actions) and the abstract constructs. The thirty six actions represented those cognitively possible for occupants of an office building during a fire emergency. They cover seven categories of behaviour (constructs) described by earlier researchers in human behaviour in building fires. Other constructs were identified and decision made as to whether they were related or unrelated.

The next stage involved demonstrating that the relationship between the results and other observable measures were similar to the relationships that would be expected between the construct itself and other observable measures. The determination that the results and subsequent model provide a good measure of specific constructs relied on the relation between constructs and empirical (laboratory studies, field experiments, archival data, case studies, review of existing research) and theoretical evidence from related studies.

3. Did the film simulate the dangers associated with a developing office fire? How engaged were the participants in the experimental realism" ? Of paramount concern were the ethical considerations of exposing people to stressful and anxiety provoking circumstances. There may be questions concerning response validity in the simulated and artificial circumstances.

4. Were the participants trying to please and furnishing socially desirable answers in the questionnaire? Were they responding as they felt they *should* rather than how they *would* behave in the circumstances? To address this concern participants were assured (both in writing and verbally during administration of the questionnaire) that confidentiality and anonymity would be preserved. Validity however will always depend on the candour and willingness of respondents to co-operate and give spontaneous and honest answers.

5. The determination of independent and dependent variables was theoretically driven and the choice justified according to past research and observations. The conceptual validity of the results are contingent upon the correctness of

selecting evacuate and wait for assistance as dependent variables and continue normal activities, alert/warn others, investigate, protective procedures and fight the fire as the independent variables.

Design issues

1. The usual problems associated with employing questionnaires for data collection were addressed as strenuously as possible through careful face validation, pre-validation, recourse to expert opinion, piloting and subsequent inclusion of suggested amendments. An ongoing process of refinement was used to redress unclear, confusing, ambiguous or complicated wording and expression.

2. All actions were worded positively and the number of items in the final questionnaire, and the number of cues in the film were kept to a manageable length with respect to the time and patience of the participants. This imposed constraints on the level and complexity of the fire scenario and must be taken into consideration when evaluating the results.

3. Item analysis and rejection of low reliability items were used in conjunction with conceptual and empirical methods to ensure the unidimensionality of the individual items. Although no construct had an α value less than 0.50, there may be concerns regarding the reliability and validity of

individual items with low reliability as measures of a particular construct.

4. In this study it was not possible to formally investigate decision making in a social context. The participants responded from an individual perspective and in their selection of strategies did not have recourse to the gathering and information exchange processes of most workplaces.

Chapter 10

Conclusions and Recommendations

Overall findings

1. All participants in this study demonstrated significant differences in response between the three fire scenarios presented.

2. There were however significant differences between the two occupational groups (students and office workers) in response to particular fire cues. These differences were more pronounced in response to ambiguous cues than to explicit fire cues.

3. For both the students and office workers the preferred behavioural constructs in response to the computer breakdown were to 'continue normal activities' and to 'investigate/seek further information'.

4. There were differences evident between the two groups in their responses to the building alarm. Students indicated that they were most likely to investigate, alert/warn others, protect and evacuate whereas office workers chose alerting/warning others as most probable behaviour.

5. With respect to smoke and flames both groups judged appropriate behaviour to be alerting/warning others, protective procedures and evacuation

6. Wait for assistance and evacuation were judged non-preferred or quite unlikely behaviours in response to the computer breakdown. In fact wait for assistance was not a

preferred behavioural construct for any of the cues and office workers selected only one construct - evacuation in response to explicit signs of fire (smoke and flames).

7. Participants chose a greater range of constructs when presented with explicit fire cues (smoke and flames) than in response to non-explicit fire cues (computer breakdown and building alarm). Responses also displayed stronger commitment to preferred actions.

8. 'Social actions', particularly in response to the ambiguous cues, appeared to dominate decision making for both groups.

9. Evacuation as a preferred behaviour increased markedly for explicit fire cues.

10. The results of this study provide some support for the conflict model of decision making (Janis & Mann, 1977), task-induced cognitive processing (Hammond et al. 1997) and the impact of negative emotions on choice processing (Luce et al. 1997). There is evidence that problem-focused coping strategies governed cognitive processing in response to ambiguous fire cues and that emotion-focused coping strategies dominated cognitive processing of explicit and/or high threat fire cues.

11. As a means for collecting large amounts of reliable and valid data on decision making in building fires, the use of film and structured questionnaires appears to be a feasible and cost effective method.

Implications

The results of this study will contribute to theory building within the area of decision making in building fires and the wider field of response to emergencies. The results confirm the need to provide more information and direction where possible to assist people's interpretation of ambiguous or non-explicit fire cues (such as non-informative building alarms, etc) and to expedite effective behaviour in response to explicit fire cues. As building design is cost-driven and changes are often the result of response to catastrophic incidents this study contributes to the understanding of decision making processes of building occupants and thus has implications for the design of safety systems and emergency procedures.

Recommendations

1. Most investigations of human behaviour in building fires are conducted in an ad-hoc fashion. Where controlled studies are used to collect data there is a need for a co-ordinated approach and review of methodological design issues such as balanced sampling to investigate the effects of factors such as age, gender, cultural differences, etc. on decision making.
2. It is recommended that a thoroughly conducted review or meta analysis of the findings of human behaviour in building fires be done. This should be performed with careful attention to the classification of the results of various studies.

3. Future studies could employ triangulation techniques to enhance and validate data derived from the same phenomena. This methodology would involve two different approaches to data collection. For example information recorded from interviews could be checked against observational data (e.g. closed circuit television records) or responses to open questionnaires could be compared with those from closed questionnaires.

4. Judicious use of closed circuit television (CCTV) monitoring to review behaviour and movement during building evacuations (drills, false alarms and real emergencies). As with aircraft flight recorders, the objective and dispassionate eye of the fixed surveillance video camera is not influenced by the subjective point of view of the human operator.

5. Particularly in emergency situations, there is a need for research that concentrates on perceptions and meanings of actions in a social context. It is recommended that techniques be developed that focus on interactions between people to capture the complexities and influence of social decision making in these circumstances.

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APPENDIX A PRE-VALIDATION

Questionnaire Critique

Decision Making Behaviour in an Office Fire Emergency.

<u>Purpose:</u>

A questionnaire is being constructed to collect data on the decision making behaviour of people in an office building fire situation. The questionnaire will be administered to a sample of office workers.

A fire scenario will be created for the subjects by presenting a film of a real office fire. The film will contain pauses at certain stages. During these short pauses (20-30 seconds) the subjects will be requested to complete the relevant stage of the questionnaire.

Given the time pressure, the responses of the subjects will reflect *immediate reactions* (decision making) in the situation presented.

In order to produce valid and reliable results it would be appreciated if you would evaluate the following questionnaire with respect to the points listed below.

You have not been presented with the fire scenario (film of a real office fire) and you have only been given Stage I to evaluate. Although the stages represented in the film differ, the questions relating to each stage are identical.

<u>Evaluation:</u>

1. Clarity of instructions. Are there ambiguities, inconsistencies, unclear instructions?
   (You may write your comments on the questionnaire if you prefer).

   ____

2. Do the questions make sense? Are they easy to understand?
   (You may write your comments on the questionnaire if you prefer).

   ____

3. The activities listed:
   a) Would they represent the activities undertaken in a typical office in normal circumstances as well as a fire emergency?
   (You may write your comments on the questionnaire if you prefer).

   ____

   b) Are there other activities which you consider important in this situation which have not been listed? Please write these on the questionnaire in the space marked "Other".

4. Do you have any other suggestions for the questionnaire?
   (You may write your comments on the questionnaire if you prefer).

   ____

Thank you for your time.

Wendy Saunders

QUESTIONNAIRE

Decision Making Behaviour in an Office Building Fire

The purpose of this questionnaire is to collect data on the decision making behaviour of people in an office building fire situation. It is not necessary for you to have experienced a building fire to answer the questionnaire as a fire scenario will be presented to you.

The fire scenario will be a film of a real office building fire. The film contains pauses at certain stages. During these short pauses (20-30 seconds) you will be requested to complete the relevant stage of the questionnaire.

To ensure that reliable data is collected, it is important that your responses reflect your *immediate reactions* to the situation. It would be appreciated if you could give honest and spontaneous answers.

The questionnaire is anonymous and voluntary and all results will be treated confidentially.

Stage 1.

Please complete the following information for *this stage* of the film.

1. Cues (description)

a)____

b)____

c)____

d)____

2. Liklihood of Fire

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

3. Severity of Fire

Extremely Non-Threatening	Quite Non-Threatening	Neither	Quite Threatening	Extremely Threatening

4. Proximity of Fire

Extremely Remote	Quite Remote	Neither	Quite Close	Extremely Close

5. Would you feel yourself in danger?

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

Stage 1.

To describe your *immediate reaction* mark how likely on the scale it would be for you to take the following actions and the expected time you would spend on the activity *at this stage* of the fire.

1. Continue typing/wordprocessing. Expected Time___________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

2. Continue filing/photocopying. Expected Time___________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

3. Continue meeting/discussion/client interaction. Expected Time___________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

4. Continue telephone conversation. Expected Time___________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

5. Continue eating/drinking (tea/lunch break). Expected Time___________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

6. Continue deliveries/errands. Expected Time___________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

7. Ask someone else nearby for more information. Expected Time___________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

8. Search for colleague/supervisor/manager for more information.
Expected Time___________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

9. Telephone switchboard for more information. Expected Time__________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

10. Telephone floor warden/safety officer for more information. Expected Time__________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

15. Activate the fire alarm (break the glass). Expected Time__________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

16. Contact the floor warden/safety officer to report the situation. Expected Time__________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

17. Contact colleagues/supervisor/manager to report the situation. Expected Time__________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

18. Ask someone else to raise the alarm/report the situation. Expected Time__________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

19. Collect own or other's personal property/belongings. Expected Time__________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

20. Secure computer files/disks or documents. Expected Time__________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

21. Turn off equipment. Expected Time__________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

22. Open doors/windows to ventilate the area. Expected Time__________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

23. Remain in the area until someone else arrives. Expected Time__________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

24. Check presence of other people. Expected Time__________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

25. Wait for colleague/supervisor/manager's assistance/instruction.
Expected Time__________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

26. Call colleague/supervisor/manager for assistance/instruction.
Expected Time__________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

27. Telephone switchboard for assistance/instruction. Expected Time__________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

28. Telephone floor warden/safety officer for assistance/instruction.
Expected Time__________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

29. Wait for fire brigade assistance/instruction. Expected Time__________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

30. Wait for floor warden/safety officer's assistance/instruction.
Expected Time__________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

31. Prepare others for evacuation. Expected Time__________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

32. Assist others to leave the area. Expected Time___________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

33. Leave the area immediately by the emergency exit . Expected Time___________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

34. Leave the area immediately by the most familiar route. Expected Time___________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

35. Advise/assist (comfort, first aid) others. Expected Time___________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

36. Move towards an exit. Expected Time___________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

37. Attempt to fight the fire with a fire extinguisher. Expected Time___________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

38. Attempt to contain the fire by other means (eg smother, use a bucket of water, etc).
Expected Time___________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

39. Close doors/windows to prevent further fire and/or smoke spread.
Expected Time___________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

40. Remain in the area until the fire brigade arrives. Expected Time____________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

41. Ask others for assistance in fighting the fire. Expected Time____________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

42. Search for things to fight the fire with. Expected Time____________

Extremely Unlikely	Quite Unlikely	Neither	Quite Likely	Extremely Likely

43. Other activities representing normal office activities or a building fire emergency situation. (if possible with expected times to complete these activities)

____

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____

____

Would you please fill in the following information:

1. Gender

Male	Female

2. Age

Less than 19	20 to 29	30 to 39	40 to 49	50 or above

3. Qualifications/Training

____

____

____

4. Normal Duties

Please fill in (where applicable) the approximate number of hours which you would spend on the following activities in an *average* week.

Activity	Number of Hours per Week
Typing	
Wordprocessing	
Filing	
Photocopying	
Meetings	
Client Interaction	
Deliveries	
Lunch and Teabreaks	
Other	

APPENDIX B

Face Validation Questionnaire

Stage 1.

Initial ambiguous stage, smoke detector or alarm (alert signal) has activated on your floor. No obvious reasons for the alarm. There are about 40 people on your floor, some occupying single offices others working in open plan (partitioned) areas.

To describe your *immediate reaction* mark how likely on the scale it would be for you to take the following actions and the expected time you would spend on the activity *at this stage* .

1. Continue typing/wordprocessing. Expected Time__________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

2. Continue filing/photocopying. Expected Time__________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

3. Continue meeting/discussion/client interaction. Expected Time__________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

4. Continue telephone conversation. Expected Time__________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

5. Continue eating/drinking (tea/lunch break). Expected Time__________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

6. Continue deliveries/errands. Expected Time__________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

7. Ask someone else nearby for more information. Expected Time__________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

8. Search for colleague/supervisor/manager for more information. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

9. Telephone switchboard for more information. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

10. Telephone floor warden/safety officer for more information. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

11. Search for the source of the unusual signs. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

12. Look out of door or window to investigate the signs. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

13. Contact the switchboard to report the situation. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

14. Telephone the fire brigade, police, ambulance. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

15. Activate the fire alarm (break the glass). Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

16. Contact the floor warden/safety officer to report the situation. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

17. Contact colleagues/supervisor/manager to report the situation.

Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

18. Ask someone else to raise the alarm/report the situation.

Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

19. Collect own or other's personal property/belongings. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

20. Secure computer files/disks or documents. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

21. Turn off equipment. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

22. Open doors/windows to ventilate the area. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

23. Remain in the area until someone else arrives. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

24. Check presence of other people. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

25. Wait for colleague/supervisor/manager's assistance/instruction.

Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

26. Call colleague/supervisor/manager for assistance/instruction.

Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

27. Telephone switchboard for assistance/instruction. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

28. Telephone floor warden/safety officer for assistance/instruction.

Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

29. Wait for fire brigade, police, ambulance assistance/instruction.

Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

30. Wait for floor warden/safety officer's assistance/instruction.

Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

31. Prepare others for evacuation. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

32. Assist others to leave the area. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

33. Leave the area immediately by the emergency exit. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

34. Leave the area immediately by the most familiar route. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

35. Advise/assist (comfort, first aid) others. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

36. Move towards an exit. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

Questions 37 to 42 only refer to the event being a fire in the building.

37. Attempt to fight the fire with a fire extinguisher. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

38. Attempt to contain the fire by other means (eg smother, use a bucket of water, etc).
Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

39. Close doors/windows to prevent further fire and/or smoke spread.
Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

40. Remain in the area until the fire brigade arrives. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

41. Ask others for assistance in fighting the fire. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

42. Search for things to fight the fire with. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

43. Other activities representing normal office activities or a building fire emergency situation.
(if possible with expected times to complete these activities)

____
____
____
____

Stage 2

You see smoke coming from under the door of a room (on your floor) used for photocopying.

To describe your *immediate reaction* mark how likely on the scale it would be for you to take the following actions and the expected time you would spend on the activity *at this stage* .

1. Continue typing/wordprocessing. Expected Time__________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

2. Continue filing/photocopying. Expected Time__________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

3. Continue meeting/discussion/client interaction. Expected Time__________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

4. Continue telephone conversation. Expected Time__________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

5. Continue eating/drinking (tea/lunch break). Expected Time__________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

6. Continue deliveries/errands. Expected Time__________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

7. Ask someone else nearby for more information. Expected Time__________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

8. Search for colleague/supervisor/manager for more information.

Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

9. Telephone switchboard for more information. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

10. Telephone floor warden/safety officer for more information.

Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

11. Search for the source of the unusual signs. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

12. Look out of door or window to investigate the signs. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

13. Contact the switchboard to report the situation. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

14. Telephone the fire brigade, police, ambulance. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

15. Activate the fire alarm (break the glass). Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

16. Contact the floor warden/safety officer to report the situation.

Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

17. Contact colleagues/supervisor/manager to report the situation.

Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

18. Ask someone else to raise the alarm/report the situation.

Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

19. Collect own or other's personal property/belongings. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

20. Secure computer files/disks or documents. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

21. Turn off equipment. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

22. Open doors/windows to ventilate the area. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

23. Remain in the area until someone else arrives. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

24. Check presence of other people. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

25. Wait for colleague/supervisor/manager's assistance/instruction.

Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

26. Call colleague/supervisor/manager for assistance/instruction.

Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

27. Telephone switchboard for assistance/instruction. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

28. Telephone floor warden/safety officer for assistance/instruction.

Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

29. Wait for fire brigade, police, ambulance assistance/instruction.

Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

30. Wait for floor warden/safety officer's assistance/instruction.

Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

31. Prepare others for evacuation. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

32. Assist others to leave the area. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

33. Leave the area immediately by the emergency exit . Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

34. Leave the area immediately by the most familiar route. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

35. Advise/assist (comfort, first aid) others. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

36. Move towards an exit. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

Questions 37 to 42 only refer to the event being a fire in the building.

37. Attempt to fight the fire with a fire extinguisher. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

38. Attempt to contain the fire by other means (eg smother, use a bucket of water, etc). Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

39. Close doors/windows to prevent further fire and/or smoke spread. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

40. Remain in the area until the fire brigade arrives. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

41. Ask others for assistance in fighting the fire. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

42. Search for things to fight the fire with. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

43. Other activities representing normal office activities or a building fire emergency situation. (if possible with expected times to complete these activities)

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Stage 3

You open the door of your office to find that the corridor is filling with smoke.
To describe your *immediate reaction* mark how likely on the scale it would be for you to take the following actions and the expected time you would spend on the activity *at this stage* .

1. Continue typing/wordprocessing. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

2. Continue filing/photocopying. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

3. Continue meeting/discussion/client interaction. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

4. Continue telephone conversation. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

5. Continue eating/drinking (tea/lunch break). Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

6. Continue deliveries/errands. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

7. Ask someone else nearby for more information. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

8. Search for colleague/supervisor/manager for more information. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

9. Telephone switchboard for more information. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

10. Telephone floor warden/safety officer for more information. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

11. Search for the source of the unusual signs. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

12. Look out of door or window to investigate the signs. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

13. Contact the switchboard to report the situation. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

14. Telephone the fire brigade, police, ambulance. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

15. Activate the fire alarm (break the glass). Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

16. Contact the floor warden/safety officer to report the situation. Expected Time___________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

17. Contact colleagues/supervisor/manager to report the situation.

Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

18. Ask someone else to raise the alarm/report the situation.

Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

19. Collect own or other's personal property/belongings. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

20. Secure computer files/disks or documents. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

21. Turn off equipment. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

22. Open doors/windows to ventilate the area. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

23. Remain in the area until someone else arrives. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

24. Check presence of other people. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

25. Wait for colleague/supervisor/manager's assistance/instruction.

Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

26. Call colleague/supervisor/manager for assistance/instruction. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

27. Telephone switchboard for assistance/instruction. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

28. Telephone floor warden/safety officer for assistance/instruction. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

29. Wait for fire brigade, police, ambulance assistance/instruction. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

30. Wait for floor warden/safety officer's assistance/instruction. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

31. Prepare others for evacuation. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

32. Assist others to leave the area. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

33. Leave the area immediately by the emergency exit . Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

34. Leave the area immediately by the most familiar route. Expected Time____________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

35. Advise/assist (comfort, first aid) others. Expected Time__________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

36. Move towards an exit. Expected Time__________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

Questions 37 to 42 only refer to the event being a fire in the building.

37. Attempt to fight the fire with a fire extinguisher. Expected Time__________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

38. Attempt to contain the fire by other means (eg smother, use a bucket of water, etc). Expected Time__________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

39. Close doors/windows to prevent further fire and/or smoke spread. Expected Time__________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

40. Remain in the area until the fire brigade arrives. Expected Time__________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

41. Ask others for assistance in fighting the fire. Expected Time__________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

42. Search for things to fight the fire with. Expected Time__________

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

43. Other activities representing normal office activities or a building fire emergency situation. (if possible with expected times to complete these activities)

____

____

____

____

Statistical Information

Would you please fill in the following information (anonymous and confidential):

1. Gender

Male	Female

2. Age

Less than 19	20 to 29	30 to 39	40 to 49	50 or above

3. Qualifications and Training

____

____

____

4. Normal Duties

Please fill in (where applicable) the approximate number of hours which you would spend on the following activities in an *average* week.

Activity	Number of Hours per Week
Typing	
Wordprocessing	
Filing	
Photocopying	
Meetings	
Client/Public Interaction	
Deliveries	
Reading/Writing Reports	
Correspondence	
Cleaning/Maintenance	
Book keeping/Accountancy Duties	
Lunch and Teabreaks	
Other	

5. Office Floor (1st, 34th, etc)

____

6. <u>Building Fire Experience</u>

Have you ever been in any building during a large or potentially serious fire?

Yes	No

7. Building Type (describe the building)

____

____

8. Do you have any of the following disabilities?

Sight Loss ________________

Hearing Loss ________________

Respiratory Difficulties ________________

Impaired Movement
(eg due to arthritis, rheumatism, back trouble, etc) ________________

None ________________

Other disabilities which could affect your ability to evacuate the building (please specify)

____

APPENDIX C Pilot 1

Decision Making in Office Building Fire Emergencies

Postgraduate Research Thesis
Victoria University of Technology
(Department of Psychology and Centre for Environmental Safety and Risk Engineering)
and BHP Research Melbourne Laboratories

Questionnaire Validation

The purpose of this survey is to ensure the validity of this questionnaire when it is administered (in conjunction with a film) to a large sample of office workers. The questionnaire will be used to measure the types and probabilities of behavioural responses (decisions) in office building emergencies. This information will be used to develop a model of human behaviour in this situation for my post graduate research degree at Victoria University of Technology.

• It would be appreciated if you could go through *each stage* of the questionnaire and tick the relevant box for *each* question.

• There is also provision for you to list any other actions or responses which you feel should be included. These activities should be representative of responses which take place in a typical office in normal circumstances as well as in an emergency.

• There are three stages in the questionnaire, each representing a particular stage in the development of the situation. You have not been presented with the film of the emergency scenario (which will accompany the final version), but you have been given a brief written description of the relevant stage of the emergency.

• Please complete the last section - Statistical Information. This is anonymous and will remain confidential.

The survey is anonymous and results will be treated confidentially. If you have any queries regarding this questionnaire, please contact **Wendy Saunders on (03) 560-7066.**

Address: BHP Research
Melbourne Laboratories
P.O. Box 264
Rosebank M.D.C.
Clayton, 3169 Victoria

APPENDIX C

Questionnaire Validation

Stage 1.

Initial ambiguous stage: A smoke detector or alarm (the alert signal) has activated on your floor. There are no obvious reasons for the alarm. There are about 40 people on your floor, some occupying single offices others working in open plan (partitioned) areas.

To describe your *immediate reaction* tick the box showing how likely it would be for you to take the following actions *at this stage*. Please tick *one* box only for *every* action listed.

1. Continue with computer work.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

2. Continue with office paper work.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

3. Continue meeting with others.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

4. Continue telephone conversation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

5. Continue eating/drinking (tea/lunch break).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

6. Continue deliveries/errands.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

7. Ask someone else nearby for more information.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

8. Search for a colleague for more information.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

9. Telephone the switchboard for more information.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

10. Telephone the floor warden for more information.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

11. Search for the source of the unusual signs.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

12. Look out of a door or window to investigate the signs.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

13. Contact the switchboard to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

14. Telephone one of the emergency services (police, fire brigade or ambulance).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

15. Activate the fire alarm (break the glass).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

16. Contact the floor warden to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

17. Contact colleagues to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

18. Ask someone else to raise the alarm or report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

19. Collect own or other's personal property or belongings.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

20. Secure computer files, disks or documents.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

21. Turn off equipment.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

22. Open doors or windows to ventilate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

23. Remain in the area until someone else arrives.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

24. Check for the presence of other people.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

25. Wait for a colleague's assistance to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

26. Call a colleague for assistance to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

27. Telephone the switchboard for assistance to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

28. Telephone the floor warden for assistance to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

29. Wait for the assistance of the emergency services (police, fire brigade or ambulance) to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

30. Wait for the floor warden's assistance to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

31. Prepare others for evacuation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

32. Assist others to leave the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

33. Leave the area immediately by the emergency exit.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

34. Leave the area immediately by the most familiar route.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

35. Advise or assist (comfort, first aid) others.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

36. Move towards an exit.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

Questions 37 to 42 only refer to the event being a fire in the building.

37. Attempt to fight the fire with a fire extinguisher.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

38. Attempt to contain the fire by other means (eg smother, use a bucket of water, etc).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

39. Close doors or windows to prevent further fire and/or smoke spread.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

40. Remain in the area until the fire brigade arrives.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

41. Ask others for assistance in fighting the fire.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

42. Search for things to fight the fire with.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

43. Other activities representing normal office activities or a building fire emergency situation.

____
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Stage 2.

The alarm signal changes to the evacuation tone.

To describe your *immediate reaction* tick the box showing how likely it would be for you to take the following actions *at this stage* . Please tick *one* box only for *every* action listed.

1. Continue with computer work.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

2. Continue with office paperwork.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

3. Continue meeting with others.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

4. Continue telephone conversation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

5. Continue eating/drinking (tea/lunch break).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

6. Continue deliveries/errands.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

7. Ask someone else nearby for more information.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

8. Search for a colleague for more information.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

9. Telephone the switchboard for more information.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

10. Telephone the floor warden for more information.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

11. Search for the source of the unusual signs.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

12. Look out of a door or window to investigate the signs.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

13. Contact the switchboard to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

14. Telephone one of the emergency services (police, fire brigade or ambulance).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

15. Activate the fire alarm (break the glass).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

16. Contact the floor warden to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

17. Contact colleagues to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

18. Ask someone else to raise the alarm or report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

19. Collect own or other's personal property or belongings.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

20. Secure computer files, disks or documents.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

21. Turn off equipment.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

22. Open doors or windows to ventilate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

23. Remain in the area until someone else arrives.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

24. Check for the presence of other people.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

25. Wait for a colleague's assistance to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

26. Call a colleague for assistance to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

27. Telephone the switchboard for assistance to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

28. Telephone the floor warden for assistance to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

29. Wait for the assistance of the emergency services (police, fire brigade or ambulance) to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

30. Wait for the floor warden's assistance to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

31. Prepare others for evacuation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

32. Assist others to leave the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

33. Leave the area immediately by the emergency exit.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

34. Leave the area immediately by the most familiar route.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

35. Advise or assist (comfort, first aid) others.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

36. Move towards an exit.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

Questions 37 to 42 only refer to the event being a fire in the building.

37. Attempt to fight the fire with a fire extinguisher.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

38. Attempt to contain the fire by other means (eg smother, use a bucket of water, etc).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

39. Close doors or windows to prevent further fire and/or smoke spread.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

40. Remain in the area until the fire brigade arrives.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

41. Ask others for assistance in fighting the fire.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

42. Search for things to fight the fire with.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

43. Other activities representing normal office activities or a building fire emergency situation.

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Stage 3.

You open the door of your office to find that the corridor is filling with smoke.

To describe your *immediate reaction* tick the box showing how likely it would be for you to take the following actions *at this stage* . Please tick *one* box only for *every* action listed.

1. Continue with computer work.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

2. Continue with office paperwork.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

3. Continue meeting with others.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

4. Continue a telephone conversation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

5. Continue eating or drinking (tea/lunch break).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

6. Continue deliveries or errands.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

7. Ask someone else nearby for more information.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

8. Search for a colleague for more information.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

9. Telephone the switchboard for more information.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

10. Telephone the floor warden for more information.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

11. Search for the source of the unusual signs.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

12. Look out of a door or window to investigate the signs.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

13. Contact the switchboard to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

14. Telephone one of the emergency services (police, fire brigade or ambulance).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

15. Activate the fire alarm (break the glass).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

16. Contact the floor warden to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

17. Contact colleagues to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

18. Ask someone else to raise the alarm or report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

19. Collect own or other's personal property or belongings.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

20. Secure computer files, disks or documents.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

21. Turn off equipment.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

22. Open doors or windows to ventilate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

23. Remain in the area until someone else arrives.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

24. Check for the presence of other people.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

25. Wait for a colleague's assistance to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

26. Call a colleague for assistance to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

27. Telephone the switchboard for assistance to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

28. Telephone the floor warden for assistance to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

29. Wait for the assistance of the emergency services (police, fire brigade or ambulance) to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

30. Wait for the floor warden's assistance to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

31. Prepare others for evacuation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

32. Assist others to leave the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

33. Leave the area immediately by the emergency exit.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

34. Leave the area immediately by the most familiar route.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

35. Advise or assist (comfort, first aid) others.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

36. Move towards an exit.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

Questions 37 to 42 only refer to the event being a fire in the building.

37. Attempt to fight the fire with a fire extinguisher.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

38. Attempt to contain the fire by other means (eg smother, use a bucket of water, etc).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

39. Close doors or windows to prevent further fire and/or smoke spread.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

40. Remain in the area until the fire brigade arrives.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

41. Ask others for assistance in fighting the fire.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

42. Search for things to fight the fire with.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

43. Other activities representing normal office activities or a building fire emergency situation.

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Statistical Information

Would you please fill in the following information (it is anonymous and will remain confidential):

1. Gender

Male	Female

2. Age

Less than 19	20 to 29	30 to 39	40 to 49	50 or above

3. Qualifications and Training

____
____
____

4. Office Floor (1st, 34th, etc)

____

5. Building Fire Experience

Have you ever been in any building during a large or potentially serious fire?

Yes	No

6. Type of Building in which the Fire Occurred (describe the building)

____

____

7. Normal Duties

Please fill in (where applicable) the approximate number of hours which you would spend on the following activities in an *average* week.

Activity	Number of Hours per Week
Typing	
Word processing	
Filing	
Photocopying	
Meetings	
Client/Public Interaction	
Deliveries	
Reading/Writing Reports	
Correspondence	
Cleaning/Maintenance	
Book keeping/Accountancy Duties	
Lunch and Teabreaks	
Other	

8. Evacuation Mobility

Do you have any of the following disabilities?

Sight Loss ________________

Hearing Loss ________________

Respiratory Difficulties ________________

Impaired Movement ________________
(eg due to arthritis, rheumatism, back trouble, etc)

None ________________

Other disabilities which could affect your ability to evacuate the building (please specify)

____

Thank you for the time that you have taken to complete this questionnaire.

Wendy Saunders
Postgraduate Student (Department of Psychology) Victoria University of Technology.

APPENDIX D PILOT 2

Decision Making in Office Building Fire Emergencies

Postgraduate Research Thesis
Victoria University of Technology
(Department of Psychology and Centre for Environmental Safety and Risk Engineering)
and BHP Research Melbourne Laboratories

Questionnaire Validation

The purpose of this survey is to ensure the validity of this questionnaire when it is administered (in conjunction with a film) to a large sample of office workers. The questionnaire will be used to measure the types and probabilities of behavioural responses (decisions) in office building emergencies. This information will be used to develop a model of human behaviour in this situation for my post graduate research degree at Victoria University of Technology.

• It would be appreciated if you could go through *each stage* of the questionnaire and tick the relevant box for *each* question.

• There is also provision for you to list any other actions or responses which you feel should be included. These activities should be representative of responses which take place in a typical office in normal circumstances as well as in an emergency.

• There are three stages in the questionnaire, each representing a particular stage in the development of the situation. You have not been presented with the film of the emergency scenario (which will accompany the final version), but you have been given a brief written description of the relevant stage of the emergency.

• Please complete the last section - Statistical Information. This is anonymous and will remain confidential.

The survey is anonymous and results will be treated confidentially. If you have any queries regarding this questionnaire, please contact **Wendy Saunders on (03) 560-7066.**

Address: BHP Research
Melbourne Laboratories
P.O. Box 264
Rosebank M.D.C.
Clayton, 3169 Victoria

APPENDIX D Pilot 2

2

Questionnaire Validation

Stage 1.

Initial ambiguous stage: A smoke detector or alarm (the alert signal) has activated on your floor. There are no obvious reasons for the alarm. There are about 40 people on your floor, some occupying single offices others working in open plan (partitioned) areas.

To describe your *immediate reaction* tick the box showing how likely it would be for you to take the following actions *at this stage*. Please tick *one* box only for *every* action listed.

1. Continue with computer work.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

2. Continue with office paper work.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

3. Continue meeting with others.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

4. Continue telephone conversation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

5. Continue eating/drinking (tea/lunch break).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

6. Continue deliveries/errands.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

7. Ask someone else nearby for more information.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

8. Search for a colleague for more information.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

9. Telephone the switchboard for more information.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

10. Telephone the floor warden for more information.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

11. Search for the source of the unusual signs.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

12. Look out of a door or window to investigate the signs.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

13. Contact the switchboard to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

14. Telephone one of the emergency services (police, fire brigade or ambulance).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

15. Activate the fire alarm (break the glass).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

16. Contact the floor warden to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

17. Contact colleagues to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

18. Ask someone else to raise the alarm or report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

19. Collect own or other's personal property or belongings.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

20. Secure computer files, disks or documents.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

21. Turn off equipment.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

22. Open doors or windows to ventilate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

23. Remain in the area until someone else arrives.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

24. Check for the presence of other people.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

25. Wait for a colleague's assistance to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

26. Call a colleague for assistance to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

27. Telephone the switchboard for assistance to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

28. Telephone the floor warden for assistance to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

29. Wait for the assistance of the emergency services (police, fire brigade or ambulance) to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

30. Wait for the floor warden's assistance to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

31. Prepare others for evacuation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

32. Assist others to leave the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

33. Leave the area immediately by the emergency exit.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

34. Leave the area immediately by the most familiar route.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

35. Advise or assist (comfort, first aid) others.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

36. Move towards an exit.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

Questions 37 to 42 only refer to the event being a fire in the building.

37. Attempt to fight the fire with a fire extinguisher.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

38. Attempt to contain the fire by other means (eg smother, use a bucket of water, etc).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

39. Close doors or windows to prevent further fire and/or smoke spread.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

40. Remain in the area until the fire brigade arrives.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

41. Ask others for assistance in fighting the fire.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

42. Search for things to fight the fire with.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

43. Other activities representing normal office activities or a building fire emergency situation.

Stage 2.

The alarm signal changes to the evacuation tone.

To describe your *immediate reaction* tick the box showing how likely it would be for you to take the following actions *at this stage* . Please tick *one* box only for *every* action listed.

1. Continue with computer work.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

2. Continue with office paperwork.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

3. Continue meeting with others.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

4. Continue telephone conversation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

5. Continue eating/drinking (tea/lunch break).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

6. Continue deliveries/errands.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

7. Ask someone else nearby for more information.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

8. Search for a colleague for more information.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

9. Telephone the switchboard for more information.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

10. Telephone the floor warden for more information.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

11. Search for the source of the unusual signs.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

12. Look out of a door or window to investigate the signs.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

13. Contact the switchboard to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

14. Telephone one of the emergency services (police, fire brigade or ambulance).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

15. Activate the fire alarm (break the glass).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

16. Contact the floor warden to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

17. Contact colleagues to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

18. Ask someone else to raise the alarm or report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

19. Collect own or other's personal property or belongings.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

20. Secure computer files, disks or documents.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

21. Turn off equipment.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

22. Open doors or windows to ventilate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

23. Remain in the area until someone else arrives.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

24. Check for the presence of other people.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

25. Wait for a colleague's assistance to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

26. Call a colleague for assistance to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

27. Telephone the switchboard for assistance to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

28. Telephone the floor warden for assistance to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

29. Wait for the assistance of the emergency services (police, fire brigade or ambulance) to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

30. Wait for the floor warden's assistance to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

31. Prepare others for evacuation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

32. Assist others to leave the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

33. Leave the area immediately by the emergency exit.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

34. Leave the area immediately by the most familiar route.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

35. Advise or assist (comfort, first aid) others.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

36. Move towards an exit.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

Questions 37 to 42 only refer to the event being a fire in the building.

37. Attempt to fight the fire with a fire extinguisher.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

38. Attempt to contain the fire by other means (eg smother, use a bucket of water, etc).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

39. Close doors or windows to prevent further fire and/or smoke spread.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

40. Remain in the area until the fire brigade arrives.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

41. Ask others for assistance in fighting the fire.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

42. Search for things to fight the fire with.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

43. Other activities representing normal office activities or a building fire emergency situation.

____
____
____
____

Stage 3.

You open the door of your office to find that the corridor is filling with smoke.

To describe your *immediate reaction* tick the box showing how likely it would be for you to take the following actions *at this stage*. Please tick *one* box only for *every* action listed.

1. Continue with computer work.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

2. Continue with office paperwork.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

3. Continue meeting with others.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

4. Continue a telephone conversation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

5. Continue eating or drinking (tea/lunch break).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

6. Continue deliveries or errands.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

7. Ask someone else nearby for more information.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

8. Search for a colleague for more information.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

9. Telephone the switchboard for more information.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

10. Telephone the floor warden for more information.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

11. Search for the source of the unusual signs.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

12. Look out of a door or window to investigate the signs.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

13. Contact the switchboard to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

14. Telephone one of the emergency services (police, fire brigade or ambulance).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

15. Activate the fire alarm (break the glass).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

16. Contact the floor warden to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

17. Contact colleagues to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

18. Ask someone else to raise the alarm or report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

19. Collect own or other's personal property or belongings.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

20. Secure computer files, disks or documents.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

21. Turn off equipment.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

22. Open doors or windows to ventilate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

23. Remain in the area until someone else arrives.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

24. Check for the presence of other people.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

25. Wait for a colleague's assistance to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

26. Call a colleague for assistance to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

27. Telephone the switchboard for assistance to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

28. Telephone the floor warden for assistance to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

29. Wait for the assistance of the emergency services (police, fire brigade or ambulance) to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

30. Wait for the floor warden's assistance to evacuate.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

31. Prepare others for evacuation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

32. Assist others to leave the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

33. Leave the area immediately by the emergency exit.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

34. Leave the area immediately by the most familiar route.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

35. Advise or assist (comfort, first aid) others.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

36. Move towards an exit.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

Questions 37 to 42 only refer to the event being a fire in the building.

37. Attempt to fight the fire with a fire extinguisher.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

38. Attempt to contain the fire by other means (eg smother, use a bucket of water, etc).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

39. Close doors or windows to prevent further fire and/or smoke spread.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

40. Remain in the area until the fire brigade arrives.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

41. Ask others for assistance in fighting the fire.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

42. Search for things to fight the fire with.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

43. Other activities representing normal office activities or a building fire emergency situation.

____
____
____
____

Statistical Information

Would you please fill in the following information (it is anonymous and will remain confidential):

1. <u>Gender</u>

Male	Female

2. <u>Age</u>

Less than 19	20 to 29	30 to 39	40 to 49	50 or above

3. <u>Qualifications and Training</u>

____
____
____

4. <u>Office Floor</u> (1st, 34th, etc)

____

5. <u>Building Fire Experience</u>

Have you ever been in any building during a large or potentially serious fire?

Yes	No

6. Type of Building in which the Fire Occurred (describe the building)

____

____

7. Normal Duties

Please fill in (where applicable) the approximate number of hours which you would spend on the following activities in an *average* week.

Activity	Number of Hours per Week
Typing	
Word processing	
Filing	
Photocopying	
Meetings	
Client/Public Interaction	
Deliveries	
Reading/Writing Reports	
Correspondence	
Cleaning/Maintenance	
Book keeping/Accountancy Duties	
Lunch and Teabreaks	
Other	

8. Evacuation Mobility

Do you have any of the following disabilities?

Sight Loss __________

Hearing Loss __________

Respiratory Difficulties __________

Impaired Movement
(eg due to arthritis, rheumatism, back trouble, etc) __________

None __________

Other disabilities which could affect your ability to evacuate the building (please specify)

____

Thank you for the time that you have taken to complete this questionnaire.

Wendy Saunders
Postgraduate Student (Department of Psychology) Victoria University of Technology.

APPENDIX E PILOT 39

Decision Making in Office Buildings

Postgraduate Research Thesis
Victoria University of Technology
(Department of Psychology and Centre for Environmental Safety and Risk Engineering)
and BHP Research Melbourne Laboratories

Questionnaire Validation

Version 3a

The purpose of this survey is to ensure the validity of this questionnaire when it is administered in conjunction with a film to a large sample of office workers. The questionnaire will be used to measure the types and probabilities of various behavioural responses (decisions) of office building occupants. This information will be used to develop a model of human behaviour in this situation for my post graduate research degree at Victoria University of Technology.

• It would be appreciated if you could go through *each stage* of the questionnaire and tick the relevant box for *each* question.

• There are three stages in the questionnaire, each representing a particular stage in the development of the situation. You have not been presented with the film of the scenario (which will accompany the final version), but you have been given a brief written description of the relevant stage of the situation.

The survey is anonymous and results will be treated confidentially. If you have any queries regarding this questionnaire, please contact:

Wendy Saunders

C/o : BHP Research
Melbourne Laboratories
P.O. Box 264
Rosebank M.D.C.
Clayton, 3169 Victoria

Decision Making Questionnaire

Stage 1.

There are about 40 people occupying the same floor of a modern office building in which you work. Some have single offices and others work in open plan (partitioned) areas. You are alone in your office when you hear the building alarm (alert signal) go off.

To describe your *immediate reaction* tick the box showing how likely it would be for you to take the following actions *at this stage*. Please tick *one* box only for *every* action listed.

1. Continue with computer work.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

2. Continue with office paper work.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

3. Continue meeting with others.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

4. Continue a telephone conversation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

5. Continue eating/drinking (tea/lunch break).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

6. Continue deliveries/errands.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

7. Ask someone else nearby for more information about the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

8. Search for a colleague for more information about the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

9. Telephone the floor warden for more information about the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

10. Search for the source of the unusual signs.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

11. Look out of a door or window to investigate the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

12. Contact the switchboard to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

13. Telephone one of the emergency services (police, fire brigade or ambulance) to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

14. Activate the fire alarm (break the glass).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

15. Contact the floor warden to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

16. Contact other colleagues to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

17. Collect own or other's personal property or belongings.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

18. Secure computer files, disks or documents.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

19. Turn off equipment.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

20. Remain in the area until someone else arrives.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

21. Check the area for the presence of other people.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

22. Wait for a colleague's assistance to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

23. Call a colleague for assistance to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

24. Telephone the floor warden for assistance to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

25. Wait for the assistance of the emergency services (police, fire brigade or ambulance) to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

26. Wait for the floor warden's assistance to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

27. Assist others to leave the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

28. Leave the area immediately by the emergency exit.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

29. Leave the area immediately by the most familiar route.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

30. Assist (comfort, first aid) others.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

31. Move towards an exit.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

Questions 32 to 36 only apply if you think that there could be a fire in the building.

32. Attempt to fight the fire with a fire extinguisher.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

33. Attempt to contain the fire by other means (eg smother, use a bucket of water, etc).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

34. Close doors or windows to prevent further fire and/or smoke spread.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

35. Remain in the area until the fire brigade arrives.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

36. Search for things to fight the fire with.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

Stage 2.

You think that you can smell smoke but you are not too sure where it is coming from.

To describe your *immediate reaction* tick the box showing how likely it would be for you to take the following actions *at this stage* . Please tick *one* box only for *every* action listed.

1. Continue with computer work.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

2. Continue with office paper work.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

3. Continue meeting with others.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

4. Continue a telephone conversation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

5. Continue eating/drinking (tea/lunch break).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

6. Continue deliveries/errands.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

7. Ask someone else nearby for more information about the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

8. Search for a colleague for more information about the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

9. Telephone the floor warden for more information about the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

10. Search for the source of the unusual signs.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

11. Look out of a door or window to investigate the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

12. Contact the switchboard to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

13. Telephone one of the emergency services (police, fire brigade or ambulance) to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

14. Activate the fire alarm (break the glass).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

15. Contact the floor warden to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

16. Contact other colleagues to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

17. Collect own or other's personal property or belongings.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

18. Secure computer files, disks or documents.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

19. Turn off equipment.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

20. Remain in the area until someone else arrives.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

21. Check the area for the presence of other people.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

22. Wait for a colleague's assistance to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

23. Call a colleague for assistance to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

24. Telephone the floor warden for assistance to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

25. Wait for the assistance of the emergency services (police, fire brigade or ambulance) to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

26. Wait for the floor warden's assistance to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

27. Assist others to leave the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

28. Leave the area immediately by the emergency exit.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

29. Leave the area immediately by the most familiar route.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

30. Assist (comfort, first aid) others.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

31. Move towards an exit.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

Questions 32 to 36 only apply if you think that there could be a fire in the building.

32. Attempt to fight the fire with a fire extinguisher.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

33. Attempt to contain the fire by other means (eg smother, use a bucket of water, etc).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

34. Close doors or windows to prevent further fire and/or smoke spread.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

35. Remain in the area until the fire brigade arrives.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

36. Search for things to fight the fire with.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

Stage 3.

You open the office door to find thick black smoke in the corridor.

To describe your *immediate reaction* tick the box showing how likely it would be for you to take the following actions *at this stage* . Please tick *one* box only for *every* action listed.

1. Continue with computer work.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

2. Continue with office paper work.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

3. Continue meeting with others.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

4. Continue a telephone conversation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

5. Continue eating/drinking (tea/lunch break).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

6. Continue deliveries/errands.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

7. Ask someone else nearby for more information about the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

8. Search for a colleague for more information about the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

9. Telephone the floor warden for more information about the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

10. Search for the source of the unusual signs.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

11. Look out of a door or window to investigate the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

12. Contact the switchboard to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

13. Telephone one of the emergency services (police, fire brigade or ambulance) to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

14. Activate the fire alarm (break the glass).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

15. Contact the floor warden to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

16. Contact other colleagues to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

17. Collect own or other's personal property or belongings.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

18. Secure computer files, disks or documents.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

19. Turn off equipment.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

20. Remain in the area until someone else arrives.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

21. Check the area for the presence of other people.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

22. Wait for a colleague's assistance to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

23. Call a colleague for assistance to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

24. Telephone the floor warden for assistance to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

25. Wait for the assistance of the emergency services (police, fire brigade or ambulance) to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

26. Wait for the floor warden's assistance to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

27. Assist others to leave the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

28. Leave the area immediately by the emergency exit.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

29. Leave the area immediately by the most familiar route.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

30. Assist (comfort, first aid) others.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

31. Move towards an exit.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

Questions 32 to 36 only apply if you think that there could be a fire in the building.

32. Attempt to fight the fire with a fire extinguisher.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

33. Attempt to contain the fire by other means (eg smother, use a bucket of water, etc).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

34. Close doors or windows to prevent further fire and/or smoke spread.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

35. Remain in the area until the fire brigade arrives.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

36. Search for things to fight the fire with.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

Thank you for the time that you have taken to complete this questionnaire.

Wendy Saunders
Postgraduate Student (Department of Psychology) Victoria University of Technology.

APPENDIX E PILOT 3b

Decision Making in Office Buildings

Postgraduate Research Thesis
Victoria University of Technology
(Department of Psychology and Centre for Environmental Safety and Risk Engineering)
and BHP Research Melbourne Laboratories

Questionnaire Validation

Version 3b

The purpose of this survey is to ensure the validity of this questionnaire when it is administered in conjunction with a film to a large sample of office workers. The questionnaire will be used to measure the types and probabilities of various behavioural responses (decisions) of office building occupants. This information will be used to develop a model of human behaviour in this situation for my post graduate research degree at Victoria University of Technology.

• It would be appreciated if you could go through *each stage* of the questionnaire and tick the relevant box for *each* question.

• There are three stages in the questionnaire, each representing a particular stage in the development of the situation. You have not been presented with the film of the scenario (which will accompany the final version), but you have been given a brief written description of the relevant stage of the situation.

The survey is anonymous and results will be treated confidentially. If you have any queries regarding this questionnaire, please contact:

Wendy Saunders

C/o : BHP Research
Melbourne Laboratories
P.O. Box 264
Rosebank M.D.C.
Clayton, 3169 Victoria

Decision Making Questionnaire

Stage 1.

There are about 40 people occupying the same floor of an office building in which you work. Some have single offices and others work in open plan (partitioned) areas. You are alone in your office when you hear the building alarm (alert signal) go off.

To describe your *immediate reaction* tick the box showing how likely it would be for you to take the following actions *at this stage* . Please tick *one* box only for *every* action listed.

1. Continue with computer work.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

2. Continue with office paper work.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

3. Continue meeting with others.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

4. Continue a telephone conversation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

5. Continue eating/drinking (tea/lunch break).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

6. Continue deliveries/errands.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

7. Ask someone else nearby for more information about the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

8. Search for a colleague for more information about the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

9. Telephone the floor warden for more information about the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

10. Search for the source of the unusual signs.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

11. Look out of a door or window to investigate the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

12. Contact the switchboard to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

13. Telephone one of the emergency services (police, fire brigade or ambulance) to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

14. Activate the fire alarm (break the glass).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

15. Contact the floor warden to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

16. Contact other colleagues to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

17. Collect own or other's personal property or belongings.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

18. Secure computer files, disks or documents.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

19. Turn off equipment.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

20. Remain in the area until someone else arrives.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

21. Check the area for the presence of other people.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

22. Wait for a colleague's assistance to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

23. Call a colleague for assistance to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

24. Telephone the floor warden for assistance to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

25. Wait for the assistance of the emergency services (police, fire brigade or ambulance) to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

26. Wait for the floor warden's assistance to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

27. Assist others to leave the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

28. Leave the area immediately by the emergency exit.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

29. Leave the area immediately by the most familiar route.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

30. Assist (comfort, first aid) others.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

31. Move towards an exit.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

Questions 32 to 36 only apply if you think that there could be a fire in the building.

32. Attempt to fight the fire with a fire extinguisher.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

33. Attempt to contain the fire by other means (eg smother, use a bucket of water, etc).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

34. Close doors or windows to prevent further fire and/or smoke spread.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

35. Remain in the area until the fire brigade arrives.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

36. Search for things to fight the fire with.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

Stage 2.

You hear the building alarm going off.

To describe your *immediate reaction* tick the box showing how likely it would be for you to take the following actions *at this stage*. Please tick *one* box only for *every* action listed.

1. Continue with computer work.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

2. Continue with office paper work.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

3. Continue meeting with others.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

4. Continue a telephone conversation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

5. Continue eating/drinking (tea/lunch break).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

6. Continue deliveries/errands.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

7. Ask someone else nearby for more information about the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

8. Search for a colleague for more information about the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

9. Telephone the floor warden for more information about the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

10. Search for the source of the unusual signs.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

11. Look out of a door or window to investigate the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

12. Contact the switchboard to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

13. Telephone one of the emergency services (police, fire brigade or ambulance) to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

14. Activate the fire alarm (break the glass).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

15. Contact the floor warden to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

16. Contact other colleagues to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

17. Collect own or other's personal property or belongings.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

18. Secure computer files, disks or documents.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

19. Turn off equipment.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

20. Remain in the area until someone else arrives.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

21. Check the area for the presence of other people.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

22. Wait for a colleague's assistance to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

23. Call a colleague for assistance to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

24. Telephone the floor warden for assistance to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

25. Wait for the assistance of the emergency services (police, fire brigade or ambulance) to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

26. Wait for the floor warden's assistance to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

27. Assist others to leave the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

28. Leave the area immediately by the emergency exit.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

29. Leave the area immediately by the most familiar route.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

30. Assist (comfort, first aid) others.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

31. Move towards an exit.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

Questions 32 to 36 only apply if you think that there could be a fire in the building.

32. Attempt to fight the fire with a fire extinguisher.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

33. Attempt to contain the fire by other means (eg smother, use a bucket of water, etc).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

34. Close doors or windows to prevent further fire and/or smoke spread.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

35. Remain in the area until the fire brigade arrives.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

36. Search for things to fight the fire with.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

Thank you for the time that you have taken to complete this questionnaire.

Wendy Saunders
Postgraduate Student (Department of Psychology) Victoria University of Technology.

APPENDIX G PILOT 4b

Decision Making in Office Buildings

Postgraduate Research Thesis
Victoria University of Technology
(Department of Psychology and Centre for Environmental Safety and Risk Engineering)
and BHP Research Melbourne Laboratories

Questionnaire Validation

Version 4b

The purpose of this survey is to ensure the validity of this questionnaire when it is administered in conjunction with a film to a large sample of office workers. The questionnaire will be used to measure the types and probabilities of various behavioural responses (decisions) of office building occupants. This information will be used to develop a model of human behaviour in this situation for my post graduate research degree at Victoria University of Technology.

• It would be appreciated if you could go through *each stage* of the questionnaire and tick the relevant box for *each* question.

• There are three stages in the questionnaire, each representing a particular stage in the development of the situation. You have not been presented with the film of the scenario (which will accompany the final version), but you have been given a brief written description of the relevant stage of the situation.

The survey is anonymous and results will be treated confidentially. If you have any queries regarding this questionnaire, please contact:

Wendy Saunders

C/o : BHP Research
Melbourne Laboratories
P.O. Box 264
Rosebank M.D.C.
Clayton, 3169 Victoria

Decision Making Questionnaire

Stage 1.

There are about 40 people occupying the same floor of a modern office building in which you work. Some have single offices and others work in open plan (partitioned) areas. You are in your office when you hear the building alarm go off.

To describe your *immediate reaction* tick the box showing how likely it would be for you to take the following actions *at this stage* . Please tick *one* box only for *every* action listed.

1. Continue with computer work.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

2. Continue with office paper work.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

3. Continue meeting with others.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

4. Continue a telephone conversation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

5. Continue eating/drinking (tea/lunch break).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

6. Continue deliveries/errands.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

7. Ask someone else nearby for more information about the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

8. Search for a colleague for more information about the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

9. Telephone the floor warden for more information about the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

10. Search for the source of the unusual signs.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

11. Look out of a door or window to investigate the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

12. Contact the switchboard to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

13. Telephone one of the emergency services (police, fire brigade or ambulance) to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

14. Activate the fire alarm (break the glass).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

15. Contact the floor warden to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

16. Contact other colleagues to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

17. Collect own or other's personal property or belongings.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

18. Secure computer files, disks or documents.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

19. Turn off equipment.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

20. Remain in the area until someone else arrives.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

21. Check the area for the presence of other people.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

22. Wait for a colleague's assistance to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

23. Call a colleague for assistance to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

24. Telephone the floor warden for assistance to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

25. Wait for the assistance of the emergency services (police, fire brigade or ambulance) to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

26. Wait for the floor warden's assistance to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

27. Assist others to leave the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

28. Leave the area immediately by the emergency exit.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

29. Leave the area immediately by the most familiar route.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

30. Assist (comfort, first aid) others.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

31. Move towards an exit.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

Questions 32 to 36 only apply if you think that there could be a fire in the building.

32. Attempt to fight the fire with a fire extinguisher.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

33. Attempt to contain the fire by other means (eg smother, use a bucket of water, etc).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

34. Close doors or windows to prevent further fire and/or smoke spread.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

35. Remain in the area until the fire brigade arrives.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

36. Search for things to fight the fire with.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

Stage 2.

You think that you can smell smoke but you are not too sure where it is coming from.

To describe your *immediate reaction* tick the box showing how likely it would be for you to take the following actions *at this stage* . Please tick *one* box only for *every* action listed.

1. Continue with computer work.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

2. Continue with office paper work.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

3. Continue meeting with others.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

4. Continue a telephone conversation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

5. Continue eating/drinking (tea/lunch break).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

6. Continue deliveries/errands.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

7. Ask someone else nearby for more information about the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

8. Search for a colleague for more information about the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

9. Telephone the floor warden for more information about the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

10. Search for the source of the unusual signs.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

11. Look out of a door or window to investigate the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

12. Contact the switchboard to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

13. Telephone one of the emergency services (police, fire brigade or ambulance) to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

14. Activate the fire alarm (break the glass).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

15. Contact the floor warden to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

16. Contact other colleagues to report the situation.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

17. Collect own or other's personal property or belongings.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

18. Secure computer files, disks or documents.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

19. Turn off equipment.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

20. Remain in the area until someone else arrives.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

21. Check the area for the presence of other people.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

22. Wait for a colleague's assistance to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

23. Call a colleague for assistance to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

24. Telephone the floor warden for assistance to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

25. Wait for the assistance of the emergency services (police, fire brigade or ambulance) to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

26. Wait for the floor warden's assistance to evacuate the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

27. Assist others to leave the area.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

28. Leave the area immediately by the emergency exit.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

29. Leave the area immediately by the most familiar route.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

30. Assist (comfort, first aid) others.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

31. Move towards an exit.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

Questions 32 to 36 only apply if you think that there could be a fire in the building.

32. Attempt to fight the fire with a fire extinguisher.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

33. Attempt to contain the fire by other means (eg smother, use a bucket of water, etc).

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

34. Close doors or windows to prevent further fire and/or smoke spread.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

35. Remain in the area until the fire brigade arrives.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

36. Search for things to fight the fire with.

Extremely Unlikely	Quite Unlikely	Uncertain	Quite Likely	Extremely Likely

Thank you for the time that you have taken to complete this questionnaire.

Wendy Saunders
Postgraduate Student (Department of Psychology) Victoria University of Technology.

APPENDIX H

Decision Making Film and Questionnaire

Postgraduate Research Thesis
Victoria University of Technology
(Department of Psychology)

- Please do not open this questionnaire until instructed.
- The questionnaire comprises **three identical** pages.
- Each page corresponds to **a pause** in the film.
- Each page contains the **same** thirty six (36) actions.
- Beneath each action is a set of boxes (See below) describing the probability that you would choose the action in the circumstances.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

- Upon instruction from the film, please tick **one** box for **every** action listed on that page.
- This process will be repeated **for each pause** in the film.
- It is important that you respond honestly and spontaneously
- Please complete the last section - Statistical Information at the end of the film. This is anonymous and will remain confidential.
- Thank you for your time.

This questionnaire is anonymous and the results will be treated confidentially.

1. Continue with computer work.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

2. Continue with office paper work.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

3. Continue meeting with others.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

4. Continue a telephone conversation.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

5. Continue eating/drinking (tea/lunch break).

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

6. Continue deliveries/errands.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

7. Ask someone else nearby for more information.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

8. Search for a colleague for more information.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

9. Telephone the floor warden for more information.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

10. Search for the source of the unusual signs.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

11. Look out of a door or window to investigate.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

12. Contact the switchboard to report the situation.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

13. Telephone the fire brigade to report the situation.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

14. Activate the fire alarm (break the glass).

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

15. Contact the floor warden to report the situation.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

16. Contact other colleagues to report the situation.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

17. Collect own or other's personal property.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

18. Secure computer files, disks or documents.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

19. Turn off equipment.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

20. Remain in the area until someone else arrives.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

21. Check the area for the presence of other people.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

22. Wait for a colleague's assistance to evacuate the area.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

23. Answer a ringing telephone.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

24. Telephone the floor warden for assistance to evacuate the area.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

25. Wait for the assistance of the fire brigade to evacuate the area.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

26. Wait for the floor warden's assistance to evacuate the area.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

27. Assist others to leave the area.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

28. Leave the area immediately by the emergency exit.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

29. Leave the area immediately by the most familiar route.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

30. Assist (comfort, first aid) others.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

31. Move towards an exit.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

32. Attempt to fight the fire with a fire extinguisher.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

33. Attempt to put out the fire by smothering, using a bucket of water, etc.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

34. Close doors or windows.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

35. Remain in the area until the fire brigade arrives.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

36. Search for things to fight the fire with.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

1. Continue with computer work.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

2. Continue with office paper work.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

3. Continue meeting with others.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

4. Continue a telephone conversation.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

5. Continue eating/drinking (tea/lunch break).

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

6. Continue deliveries/errands.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

7. Ask someone else nearby for more information.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

8. Search for a colleague for more information.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

9. Telephone the floor warden for more information.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

10. Search for the source of the unusual signs.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

11. Look out of a door or window to investigate.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

12. Contact the switchboard to report the situation.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

13. Telephone the fire brigade to report the situation.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

14. Activate the fire alarm (break the glass).

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

15. Contact the floor warden to report the situation.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

16. Contact other colleagues to report the situation.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

17. Collect own or other's personal property.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

18. Secure computer files, disks or documents.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

19. Turn off equipment.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

20. Remain in the area until someone else arrives.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

21. Check the area for the presence of other people.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

22. Wait for a colleague's assistance to evacuate the area.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

23. Answer a ringing telephone.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

24. Telephone the floor warden for assistance to evacuate the area.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

25. Wait for the assistance of the fire brigade to evacuate the area.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

26. Wait for the floor warden's assistance to evacuate the area.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

27. Assist others to leave the area.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

28. Leave the area immediately by the emergency exit.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

29. Leave the area immediately by the most familiar route.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

30. Assist (comfort, first aid) others.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

31. Move towards an exit.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

32. Attempt to fight the fire with a fire extinguisher.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

33. Attempt to put out the fire by smothering, using a bucket of water, etc.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

34. Close doors or windows.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

35. Remain in the area until the fire brigade arrives.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

36. Search for things to fight the fire with.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

1. Continue with computer work.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

2. Continue with office paper work.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

3. Continue meeting with others.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

4. Continue a telephone conversation.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

5. Continue eating/drinking (tea/lunch break).

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

6. Continue deliveries/errands.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

7. Ask someone else nearby for more information.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

8. Search for a colleague for more information.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

9. Telephone the floor warden for more information.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

10. Search for the source of the unusual signs.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

11. Look out of a door or window to investigate.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

12. Contact the switchboard to report the situation.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

13. Telephone the fire brigade to report the situation.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

14. Activate the fire alarm (break the glass).

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

15. Contact the floor warden to report the situation.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

16. Contact other colleagues to report the situation.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

17. Collect own or other's personal property.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

18. Secure computer files, disks or documents.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

19. Turn off equipment.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

20. Remain in the area until someone else arrives.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

21. Check the area for the presence of other people.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

22. Wait for a colleague's assistance to evacuate the area.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

23. Answer a ringing telephone.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

24. Telephone the floor warden for assistance to evacuate the area.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

25. Wait for the assistance of the fire brigade to evacuate the area.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

26. Wait for the floor warden's assistance to evacuate the area.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

27. Assist others to leave the area.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

28. Leave the area immediately by the emergency exit.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

29. Leave the area immediately by the most familiar route.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

30. Assist (comfort, first aid) others.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

31. Move towards an exit.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

32. Attempt to fight the fire with a fire extinguisher.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

33. Attempt to put out the fire by smothering, using a bucket of water, etc.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

34. Close doors or windows.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

35. Remain in the area until the fire brigade arrives.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

36. Search for things to fight the fire with.

UNLIKELY			LIKELY	
Extremely	Quite	Uncertain	Quite	Extremely

STATISTICAL INFORMATION

Would you please fill in the following information (it is anonymous and will remain confidential):

1. Gender

Male	Female

2. Age

Less than 19	20 to 29	30 to 39	40 to 49	50 or above

3. Qualifications and Training

____

____

____

4. Building Fire Experience

Have you ever been in a building during a large or potentially serious fire?

Yes	No

5. Type of Building (describe the building)

____

____

6. Evacuation Mobility

Please tick if you have the following:

Sight Loss ____________

Hearing Loss ____________

Respiratory Difficulties ____________

Impaired Movement
(eg due to arthritis, rheumatism, back trouble, etc) ____________

None ____________

Other factors that could affect your ability to evacuate a building in an emergency (please specify).

____

APPENDIX 1

DECISION MAKING IN OFFICE BUILDING FIRE EMERGENCIES.

 Version 1.8

Although this film consists of eight versions there are basically three different scenarios, these are:

VERSION #1 Individual alone in an office;

Version 1a; Evacuation signal sounds
Version 1b; Smells smoke
Version 1c; Opens door to smoke filled corridor

VERSION #2. Individual also alone in office who discovers fire

VERSION #3. Individual who is part of the group of office workers

Version 3a; Alarm signal sounds
Version 3b; Smells smoke
Version 3c; Smoke flows from Air conditioning duct.
Version 3d; Evacuation alarms sounds

CHARACTER PROFILES

Character #1 , **Bill**
Manager, male, 40 - 50
Sociable but under some pressure

Character #2, **Sue**
Secretary, female , 30 - 40
Well organised.

Character #3, **Tim**
Male, 20 - 30
Health conscious, not technically minded.

Other characters; Receptionist; **Jane / Wendy**
another office worker
2 x Workmen, (1 X **Actor speaking part.**)

VISION	ACTION
Scene 1	
8.50 am , Monday morning City Buildings	Tim making this way to work, enters high rise building.
Scene 2	
Office foyer	Tim comes through door, meets Bill and Sue who are talking.
	TIM ; *MORNING BILL , SUE*
	BILL ; *MORNING TIM*
Office foyer	Tim goes for the stairs
	TIM; *SEE YOU UP THERE, GOTTA KEEP FIT YOU KNOW!*
	BILL ; *BUSY WEEK COMING UP ?*
	SUE ; *YEAH, DON'T FORGET THE MONTHLY REPORT MEETING'S NOW AT 10.00 THIS MORNING.*
	BILL ; *THAT'S RIGHT, DID ANYONE TELL TIM?*
	SUE; *NOT SURE*
Scene 3	
Lift	Bill & Sue reach the lift, 2 workmen arrive with tools and welding gear, head towards the Fire control room
	BILL ; *WHAT ARE YOU BLOKES UP TO?*
	WORKMAN ; *WE NEED TO TURN THE FIRE ALARM OFF FOR A WHILE. WE HAVE SOME WELDING TO DO ON THE 7TH FLOOR,*
	BILL; *THAT'S OUR TERRITORY*
	WORKMAN; *DON'T WORRY IT'S ALL AUTHORISED,......SHOULD BE BACK ON IN NO TIME AT ALL*
Scene 4	
Outside lift	Bill & Sue take the lift, (pan past) "Do not use the lift in case of fire" sign, and they are going to the seventh floor
Scene 5	
Open Plan office	Bill & Sue arrive at reception, Bill greets the receptionist,
	BILL ; *GOOD MORNING JANE,*
	SUE; *WOULD YOU LIKE A COFFEE BILL?*
	BILL; *THANKS SUE*
	Sue exits.
	Tim arrives at reception
	TIM; *MORNING EVERYONE, YOU'LL NEVER GUESS WHAT HAPPENED ON THE WEEKEND, I WENT SURFING AND THE WAVES WERE THE BEST I'VE EVER SEEN.*
Scene 6	
Corridor & Kitchen	Sue heads to kitchen area, (pan past) fire extinguishers and hose reels

Scene 7
Open plan office

A workman arrives and makes this way past reception carring welding gear

BILL ; *I MUST HAVE THOSE COPIES OF THE REPORT ON MY DESK BY 10 .00.*
TIM ; *NOT ALL 200*
Bill nods. Tim looks in disbelief.
Then resigns himself to the task
TIM; *RIGHT THEN. IF ANYONE WANTS ME JANE I'LL BE WRESTLING WITH THE PHOTOCOPIER*

Sue returns with coffee
Bill goes off to his little office.

Scene 8
Photocopier Room

Tim is having some difficulties making the photocopier work properly. He is reading the manual and fiddling with its internal mechanisms the paper is constantly jaming, he pulls out the paper and throws in on the floor. He gets frustrated when he sees time ticking away and the report not yet started. He slams the machine shut, which has the effect of making it work. He does not know what he has done to correct the fault, nor does he have time to care about it. We indirectly see that the machine is very close to a large recycle paper bin which is full to overflowing with crumpled paper. Tim sets the machine in action we see him set the control to 200 copies, the machine starts, Tim programs his watch to remind him when the copies are ready. He leaves the room and shuts the door behind him. The sign on the door reads
"KEEP THIS DOOR CLOSED AT ALL TIMES".

Scene 9
Open plan office

Sue is on the phone,
SUE ; *..... WELL BILL'S OFFICE IS AT THE OTHER END OF THE BUILDING,.........LOOK, I HAVE A COPY SO I'LL GET IT TO HIM AND MAKE SURE HE SIGNS IT........... YEAH, BYE.*

Sue exits her office
We hear in the background the noise of workman
Sue reacts to the interruption

Scene 10
Bill's office

There is a knock at Bills door, Sue enters with a pile of urgent correspondence to be dealt with, Bill turns away from his computer,"Saving the File" is displayed on the screen

SUE ; *HAROLD TYERS JUST PHONED AND ASKED IF YOU HAD SIGNED THAT CONTRACT FOR HIM.?*

During her conversation we hear in the background the noise of workman - HAMMERING. Sue reacts to the interrupution

BILL ; *YEAH, OK. ......THOSE WORKMAN ARE NOISY I HOPE THEY'RE FINISHED BEFORE THE MEETING*

SUE ; YEAH, ...HERE'S YOUR MAIL

He takes the letters from Sue, and begins to read his correspondence and looks up as lights black out and his computer screen flickers off.

FREEZE ACTION, BREAK

Scene 11
Bill's office

Bill is reading his mail. Almost simultaneously his phone rings and the first stage of the evacuation signal goes off.
On his desk we see the important contract.

FREEZE ACTION; BREAK; END OF VERSION #1a

Scene 12
Bill's office

Evacuation alarm is ringing, then stops, Bill resumes reading his mail..... time passes he looks around his office indicating that he can smell smoke, but he is not sure where it is coming from. He stands up to look around.

FREEZE ACTION

BREAK; END OF VERSION #1b

Scene 13
Bill's office

Bill is standing, he notices the smell of smoke becoming stronger. He notices wisps of smoke coming under the door. When he opens the door he finds that the corridor is filling with thick white smoke.

FREEZE ACTION

BREAK; END OF VERSION #1c

VISION	ACTION
Scene 14	
8.50 am , Monday morning City Buildings	Tim making this way to work, enters high rise building.
Scene 15	
Office foyer Photo #1	Tim comes through door, meets Bill and Sue who are talking.
	TIM ; MORNING BILL , SUE *BILL ; MORNING TIM*
Office foyer Photo #2	Tim goes for the stairs TIM; *SEE YOU UP THERE, GOTTA KEEP FIT YOU KNOW!*
	BILL ; BUSY WEEK COMING UP ? *SUE ; DON'T FORGET THE MONTHLY REPORT MEETING'S NOW AT 10.00 THIS MORNING.*
	BILL ; THAT'S RIGHT, DID ANYONE TELL TIM?
	SUE; NOT SURE
Scene 16	
Lift Photo #3 Photo #4	Bill & Sue reach the lift, 2 workmen arrive with tools and welding gear, head towards the Fire control room *BILL ; WHAT ARE YOU BLOKES UP TO?* *WORKMAN ; WE NEED TO TURN THE FIRE ALARM OFF FOR A WHILE. WE HAVE SOME WELDING TO DO ON THE 7TH FLOOR,*
	BILL; THAT'S OUR TERRITORY *WORKMAN; DON'T WORRY IT'S ALL AUTHORISED,......SHOULD BE BACK ON ON IN NO TIME AT ALL*
Inside lift	Bill & Sue take the lift, (pan past) "Do not use the lift in case of fire" sign, and they are going to the seventh floor
Scene 17	
Open Plan office Photo #6	Bill & Sue arrive at reception, Bill greets the receptionist,
	BILL ; GOOD MORNING JANE, *SUE; WOULD YOU LIKE A COFFEE BILL?* *BILL; THANKS SUE* Sue exits.
Scene 18	Tim arrives at reception *TIM; MORNING EVERYONE, YOU'LL NEVER GUESS WHAT HAPPENED ON THE WEEKEND, I WENT SURFING AND THE WAVES WERE THE BEST I'VE EVER SEEN..*
Scene 19	
Corridor & Kitchen	Sue heads to kitchen area, (pan past) fire extinguishers and hose reels

Scene 20
Open plan office

A workman arrives and makes this way past reception carring welding gear

BILL ; *I MUST HAVE THOSE COPIES OF THE REPORT ON MY DESK BY 10 O'CLOCK,*

TIM ; *NOT ALL 200*

Bill nods. Tim looks in disbelief.
Then resigns himself to the task

TIM; *RIGHT THEN. IF ANYONE WANTS ME JANE I'LL BE WRESTLING WITH THE PHOTOCOPIER*

Sue returns with coffee
Bill goes to his little office.

Scene 21
Photocopier Room

Tim is having some difficulties making the photocopier wor properly. He is reading the manual and fiddling with its intern mechanisms the paper is constantly jaming, he pulls out th paper and throws in on the floor. He gets frustrated when h sees time ticking away and the report not yet started. He slam the machine shut, which has the effect of making it work. H does not know what he has done to correct the fault, nor doe he have time to care about it. We indirectly see that the machine is very close to a large recycle paper bin which is fu to overflowing with crumpled paper. Tim sets the machine i action we see him set the control to 200 copies, the machin starts, Tim programs his watch to remind him when the copie are ready. He leaves the room and shuts the door behind hir
The sign on the door reads
"KEEP THIS DOOR CLOSED AT ALL TIMES".

Scene 22
Open plan office

Sue is on the phone,

SUE ; *..... WELL BILL'S OFFICE IS AT THE OTHER END OF THE BUILDING,.........LOOK, I HAVE A COPY SO I'LL GET IT T(HIM AND MAKE SURE HE SIGNS IT.......... YEAH, BYE.*

Sue exits her office
We hear in the background the noise of workman
Sue reacts to the interruption

Scene 23
Bill's office

There is a knock at Bills door, Sue enters with a pile of urgen correspondence to be dealt with, Bill turns away from his computer,"Saving the File" is displayed on the screen

SUE ; *HAROLD TYERS JUST PHONED AND ASKED IF YOU HAD SIGNED THAT CONTRACT FOR HIM.?*

During her conversation we hear in the background the noise of workman - HAMMERING. Sue reacts to the interruption

BILL ; *YEAH, OK. ITHOSE WORKMAN ARE NOISY I HOPE THEY'RE FINISHED BEFORE THE MEETING*

SUE ; YEAH, ...HERE'S THE CONTRACT AND YOUR YOUR MAIL

He takes the letters from Sue, and begins to read his correspondence and looks up as lights black out and his computer screen flickers off.

FREEZE ACTION.........CONTROL BREAK

Scene 24
Tim's office

Tim at his desk reading a fax, coffee in hand, phone rings,

TIM; HI SUE.................YEAH, THE COPIES WILL BE READY BY 10, NO WORRIES, BYE.

He looks at the clock on the wall it is 9.53 am. Returns to his fax, the first stage of the building alarm goes off.

FREEZE ACTION

BREAK

Scene 25
Tim's office

The alarm is sounding then stops. Tim at desk, resumes his reading, ... watch alerts him that the copies are ready.

Scene 26
Corridor

Tim walking down corridor, he is aware of the smell of smoke and as he nears the photocopier room he notices wisps of smoke coming out from under the door

FREEZE ACTION

BREAK;

Scene 27
Photocopier room

Tim opens the door to the copier room, Smoke pours out from the photocopier

TIM; *#?* THE REPORT!!!

FREEZE ACTION

BREAK; END OF VERSION #2

Scene 37
Open plan office

Sue is talking on the phone.
Bill is still working or his computer
Tim returns and talks to receptionist.

TIM; *WHAT A WEEKEND YOU SHOULD HAVE SEEN THE SURF, TOTALLY AWE SOME...... 2 METRE WAVES A SURFERS DREAM*

First stage of the building alarm sounds.

FREEZE ACTION

BREAK, END OF VERSION #3A

Scene 38
Open plan office

The alarm is still sounding, then stops,Sue is at her desk Tim is also there,

TIM; WHAT WAS THAT?

SUE; THAT'S THE BUILDING ALARM, ITS STOPPED NOW

The office activities continue........time passes......

Tim mentions to Sue that he thinks he can smell smoke.

TIM*(TO SUE)*; *DO YOU SMELL ANYTHING ODD?*

We hear in the background the noise of workman

BILL; *ITS PROBABLY THOSE WORKMAN, THEY'RE USING WELDING GEAR*

A phone rings at Bill's desks.

FREEZE ACTION / BREAK;
END OF VERSION #3B

Scene 39
Open plan office

Sue is talking to the receptionist, while operating the fax machine.

SUE; THIS IS THE BIGGEST ORDER THE COMPANY 'S SCORED ALL YEAR , AND I GOT IT

Tim is walking around looking for the smell, in the background we see thick black smoke pouring from an air conditioning duct.

FREEZE ACTION
BREAK; END OF VERSION #3C

Scene 40
Open plan office

The building evacuation alarm goes off
Tim is on the phone, Sue is at her desk.

TIM; YES......YES......YES THAT'S RIGHT.......

Sue is at the fax machine, very excited
Bill stares intently at his screen. The sortware has loaded
FREEZE ACTION
BREAK; END OF VERSION #3D

Appendix J
Ethics Proposal

1. **Title of Project:**

Decision Making Model of Behaviour in Office Building Fire Evacuations.

2. **Principal Investigator:**

Dr Wally Karnilowicz

3. **Department:**

Department of Psychology, Victoria University of Technology, St Albans Campus.

4. **Associate Investigator:**

Wendy Saunders (Postgraduate Student - Australian Postgraduate Research Award, VUT).

5. **Source of External Funds:**

BHP Melbourne Laboratories - industry partner in the Australian Postgraduate Research Award (Industry).

6. **Aim of Project:**

To develop a mathematical model to predict the occurrence and duration of various categories of human behaviour in an office building fire prior to evacuation.

The model will concentrate on numerically describing:

A. occupant assessed level of seriousness of the fire (perception and interpretation of fire cues);

B. decision making processes in response to the fire cues; and

C. behavioural responses of the building occupants.

7. **Plain Language Statement of Project:**

The decision making model of behaviour in office building fire evacuations will form part of the occupant response sub model being developed to provide results for inclusion in a total fire safety system model for *assessment of risk to life due to fires* in office buildings. It will complement and interact with work already done by Victoria University of Technology on modelling evacuation, fire development, fire spread, smoke spread and fire brigade response.

Methodology

In order to collect data for the model a questionnaire technique will be used. In the initial validation process the questionnaire will use a *written* description of a developing office building fire emergency. The developing fire scenario will be broken down into a small number of discrete stages. The questionnaire will be administered to office building occupant volunteers and adult tertiary students. The data collected will be in the form of intended responses of the subjects given the situation described in the questionnaire.

When the questionnaire has been satisfactorily validated and refined, a final version will be administered to groups of voluntary subjects in conjunction with a film simulating a developing office building fire emergency. The variables to be simulated in the film or by the reactions of actors are:

• the physical properties of the fire itself (smoke, smell, flames, heat and noise);

• the alarms and emergency warnings (sirens, electronic tones, public address system announcements, oscillating lights, recorded messages, etc);

• the activities and communications of others in the same situation (these include personal alerts, telephone messages and other forms of social information exchange).

To enable prediction of occupant location as a function of time the following data from the subjects' responses to the questionnaire will be collected:

• the probabilities of single actions (as a function of the fire cues as presented in the film);

• the perceived severity, etc of the emergency (as a function of the proximity and nature of the fire cues as presented in the film).

Potential risk to the subjects is extremely minimal. The first stage of the project involves subjects voluntarily responding to a questionnaire which employs a written description of the scenario. The second stage of the project involves subjects voluntarily responding to a questionnaire whilst viewing a film. Subjects will complete both stages in safe and/or familiar environments. There will be some time pressure on the subjects (ie a short time in which to complete responses at each stage of the film) in order to emulate decision making processes and capture spontaneous responses.

8. Date of Commencement of Project:

October 1994.

9. Duration of Project:

1/10 94 to 1/10/96

10. Number of Subjects:

Approximately 200.

Type of Subjects:

Office building occupants (government and private company employees).
Adult tertiary students.

Age Range of Subjects:

Adult subjects only (18 to 60 years of age).

11. Source of Subjects:

Government institutions and organisations;
Private companies;
Victoria University of Technology.

Recruitment Means:

Participating voluntary government and private organisations will be contacted through groups such as BOMA (Building Owners and Managers Association) and organisations concerned with building fire safety measures **(see Attachments 1 and 2).**

Students will be recruited by advertisements on campus **(see Attachment 3).**

12. Payment of Subjects:
No payment.

13. **Premises on which Project is to be Conducted:**

Various office buildings;
Victoria University of Technology, St Albans campus.

14. **Nature of Research:**

Procedures to be used with human subjects:

A. Initial Process (Validation of the Questionnaire)

Subjects will be asked to complete a questionnaire in which they will be asked to scale the probability of a number of single actions from a list given to them. The questionnaire will contain a written description of three stages of a developing office fire emergency and the subject's answers will be in response to the changing cues presented. The cues *described* will include an alert signal, an evacuation signal, thick black smoke in the building and smelling smoke in the building.

B. Final Process (Administration of the Questionnaire in Conjunction with the Film)

Subjects will be asked to complete a questionnaire, scaling the probabilities of the single actions as described above. The questionnaire will accompany a film of a simulated office building fire. The film will contain short pauses after the presentation of each cue and subjects will be asked to complete the relevant section of the questionnaire. As well as scaling action probabilities, subjects will be requested to scale the perceived proximity and severity of the fire in response to the cues presented in the film. There will be some time pressure on the subjects during these pauses in order to emulate decision making in this situation.

15. **Potential Risks:**

No potential physical, social or legal risks are associated with any of the procedures listed above. Minimal psychological risk would involve the potential for bringing to the surface old material in those subjects who may have experienced a building fire or lost family or friends in such a situation. All subjects will be advised that they are free to withdraw at any time. In the event of any distress subjects will be referred to appropriate counselling facilities. Co-operating organisations and individual subjects will be assured that all questionnaires are anonymous, confidential and voluntary. Individual questionnaires will be identified only as a number. Once the data has been entered from the questionnaires they will be kept in a locked filing cabinet in the Department of Psychology, VUT. The names of participating organisations will be kept confidential and not included in any publications or reports. Participating students will not be identified.

16. **Potential Benefits and Contribution to Knowledge:**

The research to be undertaken will make a significant contribution to the provision of new information and methodology in the field of human behaviour in building fires. It will

- develop a more complete understanding (qualitative) of the response of building occupants to office fires;

- develop a more precise understanding (quantitative) of the time-dependent parameters, probabilities of action choices and action hierarchies chosen by occupants in response to an office fire which can be integrated into a systems model;

- extend the methodology to other types of building and provide a scientific basis for human response models in this situation and a framework for the dynamic simulation generating predictions concerning human response for a range of emergencies and environments;

- Complement and integrate with models being developed at VUT to describe fire growth and spread and the response of an office building to fire.

- contribute to building fire-safety systems research by developing a model which can be used to assess the *life safety performance* of a building's fire safety systems;

- develop Australian expertise in the area of modelling human behaviour in this way by combining the methodology and theory of disciplines such as Engineering with Psychology;

- improve current fire-safety awareness in education and training programs;

- have the capacity to apply the research methodology to other areas, for example occupational health and safety.

17. Ethical Issues:

Low risk of distress to those subjects who may have experienced a building fire or lost friends or family in such an incident.

18. Informed Consent:

A. Informed consent of the participating organisations and subjects will be obtained via an introductory letter to organisations and individual subject consent forms see Attachment 3).

B. See Attachment 3.

19. Confidentiality:

19.1 Procedures:

To ensure confidentiality the data (questionnaires and backup computer disks) will be kept in a locked filing cabinet in the Department of Psychology, VUT. Information stored on computer hard disk will be accessed only through security passwords. All sources of data will be coded to protect confidentiality. This access will be granted only to the Principal and Associate Investigators.

19.2

A. Security:

Dr Wally Karnilowicz.

B. Period of Time for which Data will be Held:

Five years.

C. Access to Data:

The following people will have access to the raw data (questionnaires):
Dr Wally Karnilowicz.
Wendy Saunders.
The following groups will have access to the results of analysis of the data and reports (the data will not identify participating groups to maintain anonymity and confidentiality):
Human Behaviour and Building Fire Safety Systems Group (Centre for Environmental Safety and Risk Engineering, VUT).
Structures Group, BHP Research, Melbourne Laboratories.
Individual participating companies and government organisations.
Metropolitan Fire Brigade and Country Fire Authority.

Attachments:

Attachment 1: Recruitment Means (Letter to Participating Organisation).

Dear Sir,

I am writing to explain more fully the research project. The area of research is decision making behaviour in office building fire emergencies. The model will be used to complement and integrate with models being developed at VUT to describe fire growth and spread and the response of an office building to fire (assessment of the life safety performance of a building's fire safety systems). The aim of the research is to develop a model to predict behaviour in this situation.

To measure the types and probabilities of the behavioural responses (decisions) it is necessary to validate and refine a questionnaire which is enclosed with this letter. I am therefore asking whether it would be possible, as part of the evaluation and validation processes, to administer the decision making questionnaire to a group of about 30 occupants of your building. The questionnaire is voluntary and anonymous and details of the organisation and sample will be kept confidential. The responses will be coded and statistically analysed for significance. The participants will be provided with stamped return address envelopes in which to place their completed questionnaires.

The final version of the questionnaire will accompany a film in which an office fire emergency scenario has been created. The film will include pauses at certain stages in the development and the respondents will be given a limited amount of time to mark their response.

Thank you for your attention to this matter. I look forward to hearing from you.

Yours sincerely

Attachment 4: 18B Informed Consent of Subjects.

Certification by Subject:

I..
of..

certify that I have the legal ability to give valid consent and that I am voluntarily giving my consent to participate in an experiment entitled:

Decision Making in Office Buildings.

being conducted at Victoria University of Technology by:

Dr Wally Karnilowicz.

I certify that the objectives of the experiment, together with any risks to me associated with the procedures listed hereunder to be carried out in the experiment have been fully explained to me and that I freely consent to participation involving the use on me of:

- responding to a questionnaire about decision making in an office building whilst viewing a film.
- providing voluntary, anonymous and confidential statistical information.

Explanation of the aims of the project to subjects who volunteer to participate:

The purpose of this survey is to measure the types and probabilities of behavioural responses (decisions) in an office building environment. This information will be used to develop a model of human behaviour in this situation. You will be presented with various scenarios after which there will be a short pause in the film. During this time you will be asked to tick the relevant box for *each* question.

- Your participation is voluntary and you are free to withdraw at any time without penalty.
- The survey is voluntary, anonymous and all results will be treated confidentially.

I certify that I have had the opportunity to have my questions answered and that I understand that I can withdraw from this experiment at any time and that this withdrawal will not jeopardise in any way.

I have been informed that the confidentiality of the information I provide will be safeguarded.

Signed:...)
)
Witness other than the experimenter:) Date:...............................
)
....)

VICTORIA UNIVERSITY OF TECHNOLOGY

HUMAN RESEARCH ETHICS COMMITTEE

APPLICATION FOR APPROVAL OF PROJECT INVOLVING HUMAN SUBJECTS IN VICTORIA UNIVERSITY OF TECHNOLOGY

Note: This application form is included in the Human Research Register. If your project includes any information of a commercial or patentable nature this information should be sent separately and marked confidential.

Applications to be typewritten

To: Executive Director - Research
Office for Research

I attach a proposal for a project involving human subjects for the purposes specified on the attached sheets during the period 1/8/ to 1/3/ .

(Note: The Human Research Ethics Committee normally grants approval for periods of up to two years, subject to annual review. Consideration will be given to granting approval for a longer period in certain circumstances).

PROJECT TITLE:

PRINCIPAL INVESTIGATOR/S:

DEPARTMENT/S:

Office Use Only

Received by Secretary, Human Research Ethics Committee - Date:....................................

REGISTER NUMBER:

Project provisionally approved by the Chair, acting on behalf of the Human Research Ethics Committee.

Period of approval: // to // .

COMMENTS:

Date: .... **Chair:** ....

Endorsed by the Human Research Ethics Committee, Meeting No. / ,
held on / / .

Principal Investigator notified: / / .

1. **Title of Project:**

Main:

Subtitle:

2. **Principal Investigator/s:**
(Projects employing post-graduate students should list the Supervisor as the principal investigator.)

3. **Department/s:**

4. **Associate Investigator/s:**

5. **Source of External Funds (where applicable):**

6. **Aim of Project:**

7. **Plain language statement of project:**
Please state briefly, in language which may readily be understood by members of the general public, the aims, methodology and the nature of any potential risks associated with this project. (It is recognised that in some areas of research, this statement may be the same as that appearing under questions 6, 14, 15 and 16 of the application form.) Attach additional pages if necessary.

8. **Date of commencement of project:** 7

9. **Indicate duration of project:**

10. **Number, type and age range of subjects:**

11. **Source of subjects, and means by which subjects are to be recruited:**

12. **Is there any payment of subjects proposed? If so, how much?** ?

13. **Premises on which project is to be conducted:**

14. **Nature of research, including a list of all procedures to be used on human subjects, with a description of those you consider beyond already established and accepted techniques:**
(if, in the course your research, procedures are significantly varied from those stated here, the Human Research Ethics Committee must be informed.)

15. **State any potential risks** - physical, psychological, social, legal, or other connected with the proposed procedures and state means (including confidentiality safeguards) of protecting against or minimizing potential risks and an assessment of their likely effectiveness.

16. **If you consider the subject to be "at risk", in what respect do the potential benefits to the subject or contributions to the general body of knowledge outweigh the risks?**

17. **Please detail any other ethical issues which are particularly associated with this project.**

18. **Informed Consent:**

A. State how you will obtain documentation of informed consent. (Answer even if you consider subjects not at risk. Do not use "Inapplicable".)

B. If you consider subjects to be "at risk" (see question 15), <u>or</u> if the subject is in a dependent relationship with you (eg. patient or student), state exactly what you tell him or her in lay language to obtain informed consent to each procedure wherein he or she is "at risk". This must be a form that is given to the subject particularly for this purpose.
PLEASE ATTACH COPY OF FORM.

19. **Confidentiality:**

19.1 Describe the procedures you will adopt to ensure confidentiality.

19.2 The following details are also required:

A. The name of the person who will be responsible for the security of confidential data, including consent forms, collected in the course of the research.

B. The period for which the data will be held.

C. The names of any other people who will be granted access to the data.

20. Any other relevant comments:

VICTORIA UNIVERSITY OF TECHNOLOGY

STANDARD CONSENT FORM FOR SUBJECTS
INVOLVED IN EXPERIMENTS

CERTIFICATION BY SUBJECT

I, ...

of ....

certify that I have the legal ability to give valid consent and that I am voluntarily giving my consent to participate in the experiment entitled:

"Performance and dream report upon awakening". ....
....
....

being conducted at Victoria University of Technology by:

Dr Dorothy Bruck ....

I certify that the objectives of the experiment, together with any risks to me associated with the procedures listed hereunder to be carried out in the experiment, have been fully explained to me by:

Dr Dorothy Bruck ....

and that I freely consent to participation involving the use on me of these procedures.

Procedures:

- Attachment of electrodes for sleep pattern recording.
- Responding to a structured interview about dream content upon being awoken; with opportunity to edit interview record to delete any material of a personal or confidential nature.
- Completion of computer-based performance tasks.

I certify that I have had the opportunity to have my questions answered and that I understand that I can withdraw from this experiment at any time and that this withdrawal will not jeopardise me in any way.

I have been informed that the confidentiality of the information I provide will be safeguarded.

Signed: ....)
)
Witness other than the experimenter:) Date: ....
)
....)

Appendix K
Covariance Matrices and LISREL Estimates

Table K1
Covariance matrix for the computer breakdown (student group)

	WAIT	EVAC	FIGHT	NORMAL	INVEST	ALERT	PROTECT
WAIT	1.000						
EVAC	.620	1.000					
FIGHT	.455	.605	1.000				
NORMAL	-.113	-.247	-.091	1.000			
INVEST	.434	.536	.409	-.147	1.000		
ALERT	.528	.744	.441	-.338	.613	1.000	
PROTECT	.664	.767	.655	-.236	.570	.641	1.000

LISREL estimates (Maximum Likelihoods) for the computer breakdown (student group)

Table K2
BETA

	WAIT	EVACUATE
WAIT	.000	.000
EVACUATE	.120	.000

Table K3
GAMMA

	FIGHT	NORMAL	INVEST	ALERT	PROTECT
WAIT	.017	.083	.011	.195	.542
EVACUATE	.163	-.006	-.021	.408	.329

Table K4
PSI

WAIT	EVACUATE
.534	.281

T values for the computer breakdown (student group)

Table K5
BETA

	WAIT	EVACUATE
WAIT	.000	.000
EVACUATE	1.872	.000

Table K6
GAMMA

	FIGHT	NORMAL	INVEST	ALERT	PROTECT
WAIT	.193	1.200	.130	2.045	5.229
EVACUATE	2.594	-.120	-.338	5.807	3.972

Table K7
PSI

WAIT	EVACUATE
7.969	7.969

Table K8
Covariance matrix for the building alarm (student group)

	WAIT	EVAC	FIGHT	NORMAL	INVEST	ALERT	PROTECT
WAIT	1.000						
EVAC	.136	1.000					
FIGHT	.209	.428	1.000				
NORMAL	.193	-.295	-.075	1.000			
INVEST	.259	.228	.222	-.071	1.000		
ALERT	.277	.538	.374	-.206	.555	1.000	
PROTECT	.342	.565	.516	-.218	.446	.545	1.000

LISREL estimates (Maximum Likelihoods) for the building alarm (student group)

Table K9
BETA

	WAIT	EVACUATE
WAIT	.000	.000
EVACUATE	-.047	.000

Table K10
GAMMA

	FIGHT	NORMAL	INVEST	ALERT	PROTECT
WAIT	.014	.290	.073	.130	.294
EVACUATE	.145	-.134	-.162	.369	.349

Table K11
PSI

WAIT	EVACUATE
.785	.546

T values for the building alarm (student group)

Table K12
BETA

	WAIT	EVACUATE
WAIT	.000	.000
EVACUATE	-.841	.000

Table K13
GAMMA

	FIGHT	NORMAL	INVEST	ALERT	PROTECT
WAIT	.195	4.700	.995	1.633	3.652
EVACUATE	2.472	-2.484	-2.637	5.514	5.043

Table K14
PSI

WAIT	EVACUATE
10.512	10.512

Table K15
Covariance matrix for flames and smoke (student group)

	WAIT	EVAC	FIGHT	NORMAL	INVEST	ALERT	PROTECT
WAIT	1.000						
EVAC	-.159	1.000					
FIGHT	.223	-.134	1.000				
NORMAL	.253	-.365	.035	1.000			
INVEST	.365	-.087	.070	.377	1.000		
ALERT	.026	.394	-.008	-.334	.034	1.000	
PROTEC	.266	.260	.315	-.115	.175	.339	1.000

LISREL estimates (Maximum Likelihoods) for flames and smoke (student group)

Table K16
BETA

	WAIT	EVACUATE
WAIT	0.000	0.000
EVACUATE	-0.139	0.000

Table K17
GAMMA

	FIGHT	NORMAL	INVEST	ALERT	PROTECT
WAIT	0.138	0.180	0.253	0.013	0.195
EVACUATE	-0.171	-0.218	0.007	0.241	0.243

Table K18
PSI

WAIT	EVACUATE
0.779	0.718

T values for flames and smoke (student group)

Table K19
BETA

	WAIT	EVACUATE
WAIT	0.000	0.000
EVACUATE	-1.756	0.000

Table K20
GAMMA

	FIGHT	NORMAL	INVEST	ALERT	PROTECT
WAIT	1.782	2.113	3.104	0.155	2.331
EVACUATE	-2.276	-2.625	0.091	3.043	2.971

Table K21
PSI

WAIT	EVACUATE
8.573	8.573

Table K22

Covariance matrix for the computer breakdown (office group)

	WAIT	EVAC	FIGHT	NORMAL	INVEST	ALERT	PROTECT
WAIT	1.000						
EVAC	.690	1.000					
FIGHT	.422	.506	1.000				
NORMAL	-.289	-.454	-.264	1.000			
INVEST	.344	.336	.221	-.458	1.000		
ALERT	.552	.632	.273	-.526	.633	1.000	
PROTEC	.604	.701	.354	-.476	.520	.741	1.000

LISREL estimates (Maximum Likelihoods) for the computer breakdown (office group)

Table K23
BETA

	WAIT	EVACUATE
WAIT	.000	.000
EVACUATE	.324	.000

Table K24
GAMMA

	FIGHT	NORMAL	INVEST	ALERT	PROTECT
WAIT	.245	.079	-.045	.281	.370
EVACUATE	.208	-.128	-.174	.215	.302

Table K25
PSI

WAIT	EVACUATE
.556	.323

T values for the computer breakdown (office group)

Table K26
BETA

	WAIT	EVACUATE
WAIT	.000	.000
EVACUATE	3.794	.000

Table K27
GAMMA

	FIGHT	NORMAL	INVEST	ALERT	PROTECT
WAIT	2.729	.778	-.408	2.002	2.874
EVACUATE	2.911	-1.649	-2.067	1.959	2.928

Table K28
PSI

WAIT	EVACUATE
6.325	6.325

Table K29
Covariance matrix for the building alarm (office group)

	WAIT	EVAC	FIGHT	NORMAL	INVEST	ALERT	PROTECT
WAIT	1.000						
EVAC	.265	1.000					
FIGHT	.253	.440	1.000				
NORMAL	.082	-.212	-.123	1.000			
INVEST	.469	.222	.295	-.109	1.000		
ALERT	.433	.483	.465	-.163	.664	1.000	
PROTEC	.442	.582	.508	-.300	.545	.599	1.000

LISREL estimates (Maximum Likelihoods) for the building alarm (office group)

Table K30
BETA

	WAIT	EVACUATE
WAIT	.000	.000
EVACUATE	.033	.000

Table K31
GAMMA

	FIGHT	NORMAL	INVEST	ALERT	PROTECT
WAIT	-.004	.218	.245	.129	.299
EVACUATE	.132	-.041	-.304	.329	.457

Table K32
PSI

WAIT	EVACUATE
.680	.568

T values for the building alarm (office group)

Table K33
BETA

	WAIT	EVACUATE
WAIT	.000	.000
EVACUATE	.317	.000

Table K34
GAMMA

	FIGHT	NORMAL	INVEST	ALERT	PROTECT
WAIT	-.037	2.224	1.884	.927	2.257
EVACUATE	1.284	-.445	-2.504	2.566	3.655

Table K35
PSI

WAIT	EVACUATE
6.245	6.245

Table K36
Covariance matrix for smoke and flames (office group)

	WAIT	EVAC	FIGHT	NORMAL	INVEST	ALERT	PROTECT
WAIT	1.000						
EVAC	.023	1.000					
FIGHT	-.019	-.129	1.000				
NORMAL	.075	-.215	.142	1.000			
INVEST	.259	.140	.160	.138	1.000		
ALERT	.204	.396	-.038	-.217	.226	1.000	
PROTEC	.213	.372	-.047	.063	.319	.450	1.000

LISREL estimates (Maximum Likelihoods) for smoke and flames (office group)

Table K37
BETA

	WAIT	EVACUATE
WAIT	.000	.000
EVACUATE	-.089	.000

Table K38
GAMMA

	FIGHT	NORMAL	INVEST	ALERT	PROTECT
WAIT	-.053	.080	.200	.138	.080
EVACUATE	-.095	-.168	.061	.239	.270

Table K39
PSI

WAIT	EVACUATE
.896	.750

T values for smoke and flames (office group)

Table K40
BETA

	WAIT	EVACUATE
WAIT	.000	.000
EVACUATE	-.889	.000

Table K41
GAMMA

	FIGHT	NORMAL	INVEST	ALERT	PROTECT
WAIT	-.502	.726	1.781	1.137	.657
EVACUATE	-.982	-1.671	.581	2.136	2.431

Table K42
PSI

WAIT	EVACUATE
6.481	6.481

Appendix L
Structural Equations

Equations L1a & L1b
Computer breakdown (student group)

$$Y_1 = .083X_1 + .011X_2 + .195X_3 + .542X_4 + .017X_5 + .534$$

$$Y_2 = .120Y_1 + -.006X_1 + -.021X_2 + .408X_3 + .329X_4 + .163X_5 + .281$$

Equations L2a & L2b
Building alarm (student group)

$$Y_1 = .290X_1 + .073X_2 + .130X_3 + .294X_4 + .014X_5 + .785$$

$$Y_2 = -.047Y_1 + -.134X_1 + -.162X_2 + .369X_3 + .349X_4 + .145X_5 + .546$$

Equations L3a & L3b
Smoke and flames (student group)

$$Y_1 = .180X_1 + .253X_2 + .013X_3 + .195X_4 + .135X_5 + .779$$

$$Y_2 = -.139Y_1 + -.218X_1 + .007X_2 + .241X_3 + .243X_4 + -.171X_5 + .718$$

Equations L4a & L4b
Computer breakdown (office group)

$$Y_1 = .079X_1 + -.045X_2 + .281X_3 + .370X_4 + .245X_5 + .556$$

$$Y_2 = .324Y_1 + -.128X_1 + -.175X_2 + .215X_3 + .302X_4 + .208X_5 + .323$$

Equations L5a & L5b
Building alarm (office group)

$$Y_1 = .218X_1 + .245X_2 + .129X_3 + .299X_4 + -.004X_5 + .680$$

$$Y_2 = .033Y_1 + -.041X_1 + -.305X_2 + .329X_3 + .457X_4 + .132X_5 + .568$$

Equations L6a & L6b
Smoke and flames (office group)

$$Y_1 = .080X_1 + .200X_2 + .138X_3 + .080X_4 + -.053X_5 + .896$$

$$Y_2 = -.089Y_1 + -.168X_1 + .061X_2 + .239X_3 + .270X_4 + -.095X_5 + .750$$

Where:
Y_1 = Wait for Assistance
Y_2 = Evacuate
X_1 = Continue Normal Office Activities
X_2 = Investigate
X_3 = Alert/Warn Others
X_4 = Protective Procedures
X_5 = Fight the Fire