OPTIMISING HEALTH AND SAFETY MANAGEMENT BY JOB TASK TO RISK BEHAVIOUR PROFILE MATCHING

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1 Introduction

Organisations in the electrical engineering environment do not always acknowledge risk factors related to specific employees predisposition for high risk-taking behaviour that could have a negative impact on their activities. Rather, organisations concentrate on structuring their engineering environment and activities to comply with health and safety (H&S) legislation in the belief that such compliance could afford a guarantee against incidents. The unfortunate reality is that the individual has the capacity, intentionally or unintentionally, to cause the greatest impact on H&S statistics.

The approach in managing probabilities in equipment and reticulation failures are to optimise design criteria with a higher factor of safety in managing fault conditions in order to render such equipment safe. The maintenance and installation of electrical engineering activities have always had a close relationship with H&S, more so than for other engineering activities, due to the high impact failures that such systems have on plant and equipment and the greater possibility for human fatalities. However, the input from management has always been to provide policy and procedures that need to be followed exactly. Unfortunately in the electrical engineering environment, due to a mostly continuous altering work environment, fixed procedures do not hold as too much reliance is placed on the individual's competence and insight for correct evaluation and decision making.

According to Navare (2003), focus on human behaviour rather than on procedures is not a new feature of risk management. In 1959, Heinrich introduced two views of risk management and control; the engineering view and the human-relations view. The former related to the physical causes of accidents while the latter required human action to be taken into consideration as most of the accidents were recorded as being related to human failure.

The need for a different approach to managing H&S in an electrical engineering environment and the acknowledgement of the impact that incorrect decisions made by an employee, due to differences in individual's perception of risks, is indicative of the impact of electrical incidents. The need is further emphasised by the unique environment of electrical engineering and the differences in competency requirements for risk identification, in relation to human sensory and heuristic knowledge gained by experience. The influence of a diverse cultural society of South Africa, and the impact such cultural paradigms have on influencing individual decision making, further require a different approach to managing H&S.

Undesirable human behaviour is a major contributing factor in accident causation. Such Undesirable risk-taking behaviour should be managed and taken into account by H&S management systems, but the unfortunate reality is that in most instances provision is made only for the management and control of environmental factors, and not the impact of human behaviour.

Although human error cannot be completely eliminated, it should be identified and correctly managed according to each individual's risk-taking profile. The reason people decide to take certain risks under certain conditions and the effect it has on H&S management systems is a key component to managing organisational risk exposure.

A model that includes methods to identify specific risk-taking behaviour profiles of individuals and to manage such characteristics in order to limit the negative impact, with improvement in incident statistics, is required. A model of risk behaviour profile matching to high risk task is presented.

2 Literature Overview

2.2 Human risk-taking behaviour

Human behaviour relates to factors affecting psychology, sociology, and the anthropology of humans. Individual human factors that affect decision-making in taking or rejecting risks relates to both the external socio-environment as well as the individual's beliefs. Mahadevan (2009) indicated that human behaviour patterns are the chains that still bind us from achieving our goals. Mahadevan (2009) states, "More than a hundred years ago it was said that we have nothing to lose but our chains. Now the chains are, of course, not of our hands but the chains of our brains."

According to Stranks (1994), human behaviour patterns affecting H&S are defined as a wide range of issues which include, but are not limited to:

- The perceptual, physical and mental capabilities of individuals;
- The influence of equipment and system design on such person's performance, and
- The organisational characteristics that influence such individual behaviour.

Human risk behaviour is dependent on various parameters, for instance, the differences in the behaviour of genders and the view of risk to oneself and to others. Women have been found to show a greater difference between personal and general risk than men, reducing the often quite large gender difference in ratings of general risk (Sjöberg, 2002). People are usually more concerned about the risks to others than to themselves (Sjöberg, 2002).

To determine what motivates an individual to either intentionally or unintentionally behave in a certain risk-taking manner there is a need to understand human motivational analysis. According to Domingo and Santiago (2008), the optimum amount of risk a person is prepared to take depends not only on uncertainty, but also on the person's risk preferences.

When in threatening situations people behave to protect themselves psychologically by denying unpleasant situations. Psychological denial is very common during the first moments of a fire when people find reassuring and benign explanations for the cues they see, smell, and hear. Avoidance explains why a person delays recognising the threat and spends long minutes ignoring the situation (Mitchell, 1999).

The role of unintentional actions in incidents, or as Sigmund Freud names it 'unconscious intent', is a factor contributing to incidents that is not always taken into account. According to McClelland (1985) Freud's early work showed that peoples' motives for what they do in everyday life are often unconscious. Human risk behaviour thus involves more than mere action or impulses.

The application of human behavioural factors requires an understanding of human capabilities and fallibilities so as to recognize the relationship between work demands and human capacities when considering human and system performance. The aim is to eliminate or reduce the chance of adverse behavioural outcomes which can lead to harm through accidents or chronic exposure to conditions adverse to health (Bellamy, Geyer & Wilkinson, 2008).

No person intentionally behaves in a manner that would cause him injury but rather takes a risk based on a personal estimation or calculation that no harm will befall him. Individual risk-taking behaviour is influenced by a person's psychological and physiological make up, as well as environmental influences. The behaviour of a group of people, taking risks, is influenced by the way individuals in the group transfer their beliefs to the group as a whole.

Individual risk-taking behaviour is affected to the extent that the individual's abilities allow him certain actions. Navare (2003) indicated that behavioural aspects transcend all boundaries, in that we seek to manage the initiative and ability of those involved or affected by incidents, irrespective of boundaries.

Human H&S behaviour standards, incorporated in various legislation, have the aim of creating procedures that will limit or prevent any unhealthy or unsafe acts. Smallwood (2000) states that underwater diving accidents occurred because divers were so well trained in procedures that obvious, simple, and immediate solutions were forgotten or ignored. Professionalism, when superseded by a system, clouds an individual's initiative and judgment. The effect of standards in contributing to incidents by creating confusion and limiting 'common sense' is not always taken into account in legislation. The initial approach to H&S management was that sound controls and management of the physical environment could override human incompetence.

If risk management is one of behavioural management then it is the behaviour which is the risk that needs to be managed (Navare, 2003).

2.2 Perception of risk

Sjöberg (2002) indicates that risk perception is not a question of emotion. The judgement of the size of a risk is an intellectual one, having only a weak relationship to an emotional dimension such as worry. With non-professionals the nature of risk perception is greatly affected by the level of their self-esteem, (i.e. how competent they consider themselves and how they estimate their own skills). Those who are uncertain and do not feel competent generally overestimate risk (Verez, 2009).

Behaviour is linked to perception of risk. Gstraunthaler and Day (2008) found that the greater the individual's perception of risk the higher the likelihood of action to reduce that risk. They proposed that the state of mind and emotional condition affected the individual's risk-taking behaviour.

This is supported by the evidence that happier decision makers tend to be less risk seeking in situations where a meaningful loss may diminish their positive emotional state (Gstraunthaler, 2005).

How we evaluate, classify and value risk affects our decisions to ignore, take action or avoid the circumstance a risk environment poses (Aucote and Dahlhaus 2010).Sjöberg (2002) found that high-risk takers were mostly found among those who had the lowest level of education. In the context of lowly educated construction workers it is assumed that risk-taking behaviour will predominate. This correlation between competence and risk-taking behaviour indicates lack of knowledge rather than intent on risk taking.

3 The Cause of Accidents due to Human Error

3.1 Factors contributing to incidents

The impact of individual risk-taking behaviour, intentionally or due to negligence, is one of the main contributing factors of incidents. If we analyse the impact and cause of human errors, socio-technical failures are inherent to the core of human performance failures and indirectly the cause of accidents. (Bjerkan, 2010) indicates that the traditional view of industrial accidents reflects that accidents are produced by technological as well as individual human failures. Accidents are caused by a dynamic interaction of factors in the social and physical environments, that is, characteristics of the individual and the organisation as well as technical forces that have an influence in such environments.

3.2 Managerial approach to incorrect behaviour

Training is perhaps the most effective aspect that can influence and alter risk-taking behaviour and would be the most valuable tool that organisations can use to influence incident statistics. Challenges in training occur because even when large amounts of money are allocated towards H&S training, managers often do not consider whether or not training procedures and programmes are appropriate for the people being trained. The Ideal opportunity for management intervention, as indicated in figure 1, would be to be pro-active before the individual acts on incorrect on high risk decisions made.

3.3 An alternative approach to managing high risk behaviour

Alternative interventions to training in addressing risk behaviour would be to match and optimise individuals to correct tasks by using effective HR expertise assistance and technical job risk requirement knowledge. The probability for risk-taking behaviour would be limited in that high risk behaviour individual decisions to act correctly are not always a clear choice, especially when the individual is exposed to unknown scenarios or where immediate decisions should be made by correct selection of individuals with capacity. Due to their competence to make appropriate decisions when exposed to high risk tasks incidents would be limited.

The optimum scenario is to have the right tools for the right task or in other words the right person for a specific task. Such matching should have the competence of the person and the quantitative value of the task in mind.

3.4 Addressing risk behaviour

Stages of H&S management intervention required due to risk behaviour

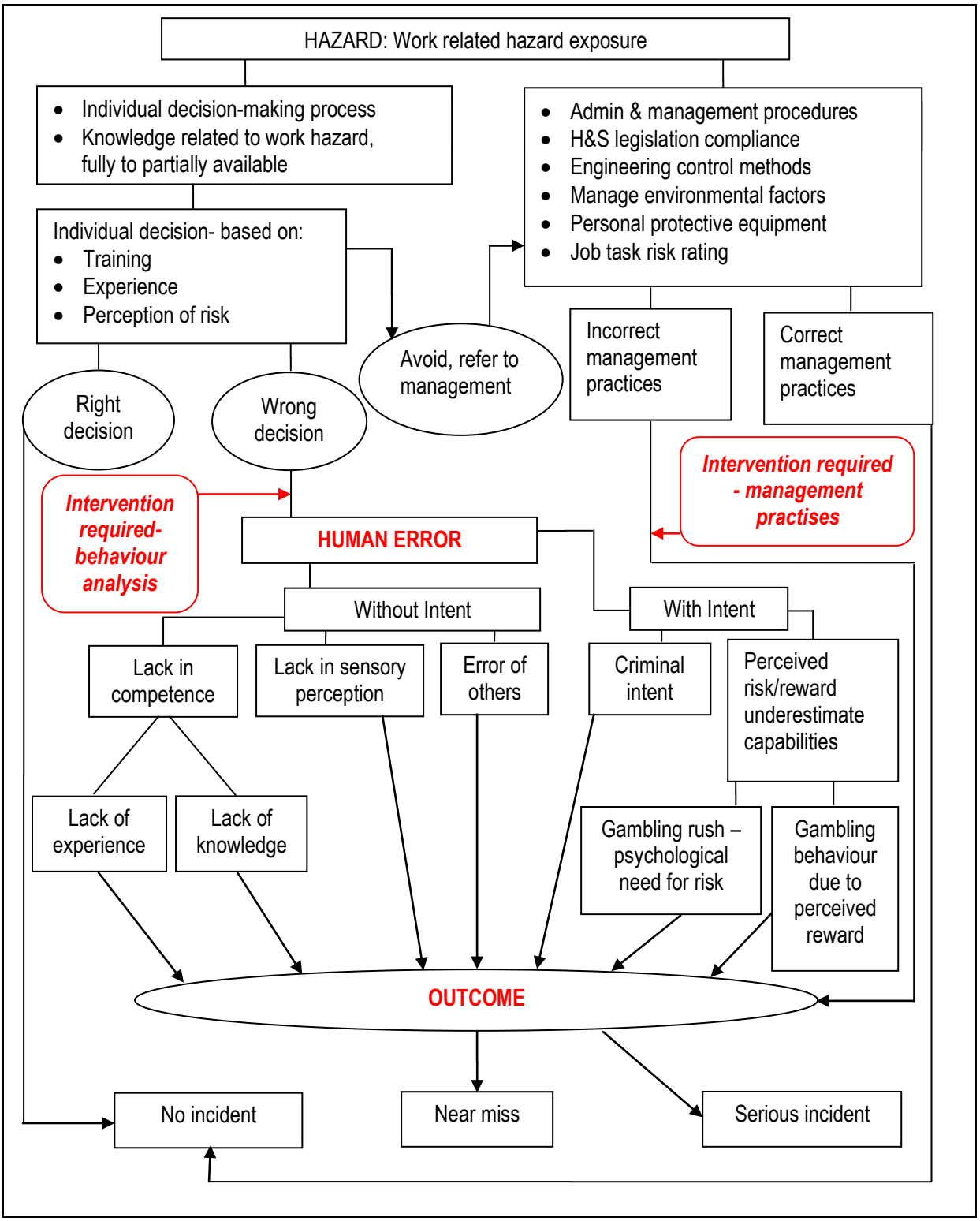

Figure 1 Basis for a model that will address risk behaviour
(Flow diagram designed by author)

The aim of a risk rating for a job task match to an individual profile is to obtain a mathematical index that will reflect the risk factor associated with each job task and the individual's risk profile that will afford the capacity for matching such profiles as per the proposed model in Figure 1.

4 Job Task to Individual Profile Matching

The rating index aims to quantify the values related to job tasks and individual profiles where such mathematical index will give better matching of the different profiles as presented in figure 2.

Application of job task to individual profile matching		Acceptability
Individual risk behaviour profile	Job task risk profile	
Low	High	Optimum
	Average	Optimum
	Low	Optimum
Average	High	Acceptable
	Average	Optimum
	Low	Optimum
High	High	Unacceptable
	Average	Unacceptable
	Low	Acceptable

Figure 2 Acceptability levels of job task to individual profile matching
(Figure designed by author)

The job task to individual profile matching as shown in Figure 2 shows that optimum job to individual profile matching occurs with an index of low individual risk-taking behaviour to a high risk job task profile matching. The unacceptable matching which would pose high risk in profile matching of high individual risk-taking behaviour to a high or average risk job task.

4.1 Job task matching

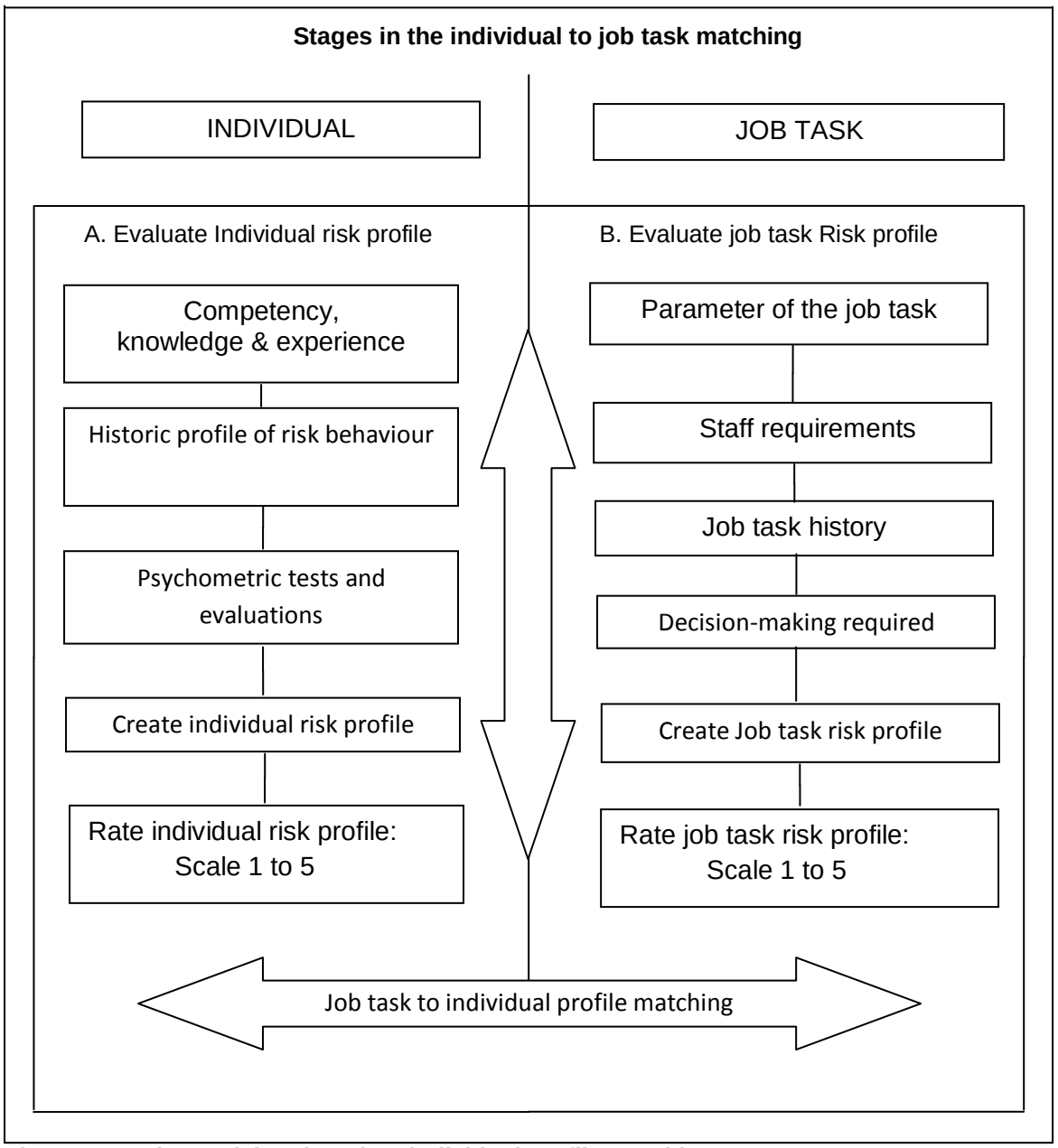

Figure 3 The Model: Job task to individual profile matching

(Figure designed by author)

The model proposed in Figure 3 that of job risk task to behaviour profile matching, if implemented, provides an ideal opportunity for organisations to lower incident statistics.

4.2 Rating index for job task

The rating index for job tasks, indicated in figure 4, concentrates on four aspects according to parameters and training required; staff requirements and physical capability, the history of job task performance and the experience required for decision-making.

The higher the risk involved in the task the more stringent the requirements must be. The process of recruitment begins when new jobs are created in the organisation or when an existing designation becomes vacant due to transfer or retirement. The rating index can be obtained by the following formula:

$$RIj = (Pj * w) + (Sj * w) + (Ej * w) + (Hj * w)$$

Formula 1 Rating index for job task

Formula 1 provides a rating index for job tasks according to specific risk attributes of the job task where the value of the indexes will indicate the risk involved in performing a specific job task.

Description of symbols used in Formula 1.

RIj - Rating Index for job task

Pj - Parameters and training required for job task

Sj - Staff requirements and physical capability for job task

Ej - Experience required for decision-making for job task

Hj - History of job task performance

w - Weight allocation

Variable	Environment	Weight allocation
P-Parameters and training required	High competency demand	High
	Average competency demand	Medium
	High competency demand	Low
H - History of job task performance	High competency demand	High
	Average competency demand	Medium
	High competency demand	Low
S- Staff requirements and physical capability	High competency demand	High
	Average competency demand	Medium
	High competency demand	Low
E- Experience required for Decision making	High competency demand	High
	Average competency demand	Medium
	High competency demand	Low

Figure 4 Weight allocations for variables related to specific job tasks

4.3 Rating index for individual risk behaviour profiling (RIi)

The rating of the individual risk behaviour profile is the sum of competency of the individual plus the history of risk-taking behaviour including task performance plus the outcome of specific psychometric tests.

$$RIi = (Hi * w) + (Pi* w) + (Ci * w)$$

Formula 2 Rating index for individual risk behaviour profiling (RIi)

Formula 2 provides a rating index for individual risk-taking behaviour profiling.

Description of symbols used in formula 2.

RIi - Rating Index for individual risk behaviour profile.

Hi - History of individual incidents related to job task.

Pi - Psychometric testing of individual.

Ci - Competency of individual.

w - Weight allocation.

Variable	Environment	Weight allocation
Hi - History of incidents related to Job task	High competency demand	High
	Average competency demand	Medium
	High competency demand	Low
Pi - Psychometric testing of individual	High competency demand	Allocation determined by psychometric test developer
	Average competency demand	
	High competency demand	
Ci – Competency of individual	High competency demand	High
	Average competency demand	Medium
	Low competency demand	Low

Figure 5 Weight allocation for variables of risk behaviour profiling

The weight allocated to each variable, as indicated in Figure 5 depends on the importance afforded due to the specific work environment.

5 Conclusion

The variability in risk that human behaviour poses to organisations should be taken into account and managed in ways that can quantify the risk profiles of individuals. H&S management can no longer be seen as the management of environmental factors only, but must also take into account the critical component of individual behaviour. Such components relate to the capacity of influencing incident statistics, due to personal decisions made according to beliefs and psychological profiles. Organisations need to employ ongoing assessment processes in working towards and achieving set goals and targets. Such targets can only be achieved from lessons learned by previous incident experiences (Al-Qudah and Al-Momani, 2011).

The model proposed in figure 3, that of job risk task to behaviour profile matching, if implemented, provides an ideal opportunity for organisations to lower incident statistics.

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