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GORDON INSTITUTE
OF BUSINESS SCIENCE
University of Pretoria

Why South African engineers choose to leave companies: a replication in the developing world

Craig Brown

2446824

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Abstract

Despite extensive research spanning almost a century, no theory has yet been developed to adequately explain and predict voluntary turnover. This study replicated a relatively new approach to turnover theory, namely the unfolding model.

Responses from 123 South African engineers, who had voluntarily left an organisation, to an electronic survey were used to test the validity of the model and its component parts, or decision paths. The data was also applied to the impact of sudden events, as well as relationships between the work-relatedness and negativity of these events, and the work-relatedness of the event and the resultant decision to quit.

The model proved unsuccessful in describing the voluntary turnover of the respondents, and only one of the five component paths was successful in describing a proportional group of the respondents. Sudden events, when present, were found to play a significant role in the decision to quit, but no relationship was found between either of the work-relatedness and negativity of these events, or the work-relatedness of the events and the avoidability of the resultant decision to quit.

Improvements to the model were suggested, and some suggestions were made as to possible actions companies might take to mitigate voluntary turnover and its effects.

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Declaration

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

Craig Brown

11 November 2009

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1 Problem definition

1.1 Introduction

Despite a plethora of work having been done on the topic of employee turnover, a unified theory of the causes of turnover and the mitigating actions that companies should take to address turnover, remains elusive. The unfolding model of voluntary turnover takes a different approach to those models and theories that have preceded it. This model attempts to describe the decision process of the employee, rather than a series of factors and events.

During times of economic downturn (as are currently being experienced), or when an organisation chooses to downsize for other reasons, the organisation itself is in control, to some extent at least, of which employees leave and which remain. However, during times when economies are healthy and jobs are available, it is the employees themselves who choose whether to leave or not. Moreover, it is the best performing employees who are most marketable and are therefore more likely to leave the organisation, and at considerable cost.

In the South African context, a nation that is very much still growing out of a legacy of disproportionate development of sectors of its population, the retention of knowledge workers and the intellectual capital they possess is essential for sustained and competitive economic development. This research is intended provide insight into the voluntary turnover behaviour of a particular segment of the knowledge worker fraternity: the South African engineer.

1.2 Research problem

Can voluntary turnover among South African engineers be described by the unfolding model of employee turnover? Are there particular areas within the unfolding model's framework that describe a significant number of voluntary turnover cases?

Are there specific events that trigger voluntary turnover, and how much of a role do these events play in the voluntary turnover of South African engineers?

As these events become more work-related, do they become more negative, and can the resulting decisions to quit become more avoidable?

1.3 Research scope

The research will apply the unfolding model of employee turnover, first developed by Lee and Mitchell (1994), to South African engineers who have voluntarily left a company. The research will categorise these engineers according to the decision paths followed using data from the responses received to a structured electronic survey.

The research will then determine whether the unfolding model is effective in describing the voluntary turnover of South African engineers, and attempt to assess various aspects of voluntary turnover of this group according to the principles of the unfolding model.

Non-engineers, i.e. any person who has not achieved at least a Bachelor of Engineering degree or a Bachelor of Science degree in Engineering from an accredited tertiary institution (Engineering Council of South Africa, 2008), are excluded from the study, as is anyone who is not a South African citizen. Also, since the unfolding model is applicable only to voluntary turnover, only those who have left an organisation, and *voluntarily* at that, are eligible to participate in the study.

1.4 Research motivation

This research is a replication of a study conducted on employee turnover of nurses in the United States (Lee, Mitchell, Wise and Fireman, 1996), accountants in the United States (Lee, Mitchell, Holtom and McDaniel, 1999; Lee, Mitchell, Sablynski, Burton and Holtom, 2004), engineers in the United States (Lee and Maurer, 1997) and nurses in the United Kingdom (Morrell, Loan-Clarke and Wilkinson, 2004a; Morrell, Loan-Clarke and Wilkinson, 2004b; Morrell and Arnold, 2007; Morrell, Loan-Clarke, Arnold and Wilkinson, 2008). Each study made use of a relatively new tool for describing voluntary turnover, namely the unfolding model (Lee and Mitchell, 1994). These studies have two things in common, beyond their usage of the unfolding model:

1. they were conducted on so-called “knowledge workers;” and
2. they were conducted in developed nations (United Nations, 2009).

1.4.1 Where is the value in repeating a study?

"Replication is at the heart of any science" (Darley, 2000), and is an indispensable tool for testing the reliability of any study (La Sorte, 1972; Singh, Ang and Leong, 2003; Eden, 2002). A hypothesis can neither be accepted nor rejected until such time as the reliability of the research has been tested (Mack, 1951), which prompts the call for more extensive use of replication (La Sorte, 1972). As a matter of course, one should be wary of using the results of unreplicated studies (Evanschitzky, Baumgarth, Hubbard and Armstrong, 2007).

1.4.2 Engineers are worth keeping

Although the concept of a knowledge worker may be difficult to define (Spira, 2008), the concept of "people doing knowledge work" (Drucker, 1959) has been part of the management vocabulary for half a century. Since knowledge workers (including engineers) add value through what they know, rather than their labour or work histories, and their ability to work with abstracts, like symbols and ideas (Lee and Maurer, 1997), they are expected to be a key differentiator between successful and unsuccessful companies in the 21st century (Tushman and O'Reilly, 1997).

1.4.3 South Africa poses a special challenge

Although "no established convention for the designation of 'developed' and 'developing' countries" officially exists, South Africa (and indeed the rest of Africa) is considered to be part of the so-called "developing" regions (United Nations, 2009). More importantly, South Africa's unemployment rate is between 22% (Central Intelligence Agency, 2009) and 24% (Statistics South Africa, 2009), whereas the unemployment rates in the United States and United Kingdom are 7% (Central Intelligence Agency, 2009) and 6% (Central Intelligence Agency, 2009), respectively. The ranking of these nations relative to 200 surveyed nations is shown in Chart 1:

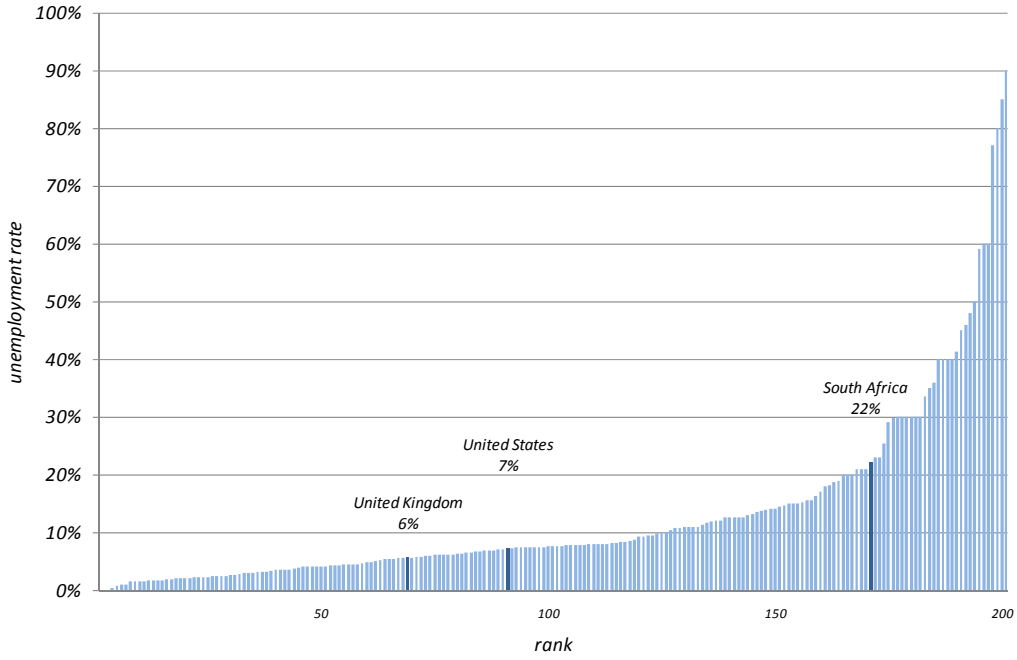

Chart 1 – Relative unemployment rates of 200 surveyed nations (source: Central Intelligence Agency, 2009)

The United Kingdom ranks 69th out of 200, the United States 91st, and South Africa 171st. As such, and since the unfolding model has previously been applied in developed nations, replication of the study in South Africa serves to test the robustness of the model by applying it to voluntary turnover in a developing nation with a relatively high unemployment rate.

Furthermore, the Accelerated and shared growth initiative for South Africa (AsgiSA) has identified six "binding constraints on growth" that need to be addressed, one of which is the shortage of skilled graduates (South African Government Information, 2007a). Engineering is classified as a "priority skill" (South African Government Information, 2007b), and the retention of engineers has been singled out as a key factor that must be addressed if the shortfall of thousands of engineers in the country is to be mitigated.

1.4.4 Surely we know enough about turnover

Despite almost a century of extensive research, the topic of voluntary turnover – its causes and how to manage it – remains a mystery. No single unifying theory exists that can account for all, even most instances of voluntary turnover, despite the significant financial, organisational and social costs of the phenomenon.

The unfolding model of voluntary turnover is a break from the traditional schools of turnover theory, and attempts to understand voluntary turnover as a *decision* process, rather than a human resources process. As such, the process may be understood as a natural outcome of a human being's interaction with his/her environment, rather than just part of the basket of an organisation's activities.

The model has been applied with mixed success to limited sectors of the labour market. Through further applications, it is hoped that the model may be refined to the point that it becomes a useful tool in describing voluntary turnover, and thereby provide the necessary understanding that will enable better human resource management systems to be developed.

1.5 Aim of the research

The aim of the research is to provide insight into the nature of voluntary turnover among South African engineers, to determine its underlying causes, and to suggest a strategy for either reducing the extent of the phenomenon or minimising the impact it has on companies. If applied correctly, the learning from this research may ultimately aid the building of the South African nation through improved retention of valuable national resources, which are critical to the competitiveness of the country.

2 Literature and theory review

Over the past century, an anthology of literature and theory on the subject of employee turnover has been accumulated. However, despite a wealth of information, there seems to be no consistent, accepted, unifying view of the causes of employee turnover, the actions that can be taken to mitigate its effect, or even how to measure it. One area where consensus appears to exist is that its effect is considerable. It seems obvious that new developments in the field are still required.

2.1 Employee turnover

Employee turnover has been a topic of discussion for almost a century (Fish, 1917). Turnover is significant (Morrell, Loan-Clarke and Wilkinson, 2001), complex (Lee and Mitchell, 1994), of great interest to most organisations (Jenkins, 1993), and can be costly (Morrell *et al.*, 2001), although the cost may not be immediately apparent (Clark-Raynor and Harcourt, 2000). When an employee leaves, it can have either positive or negative effects on the employee, the organisation and society, and can be either functional or dysfunctional (Morrell *et al.*, 2001). Key themes of labour turnover are meaning, measurement and prediction (Morrell *et al.*, 2001). An understanding of labour turnover allows the organisation and the employee to influence these effects (Morrell *et al.*, 2001).

2.1.1 The yardstick of turnover

Effective turnover management is an organisation's goal (Morrell *et al.*, 2001), but turnover measurement is an area that requires significant improvement. An accurate measure of turnover is a measure of the effectiveness of an organisation and is essential for resource planning, prediction and control (Morrell *et al.*, 2001). Despite this, organisations often use crude measures of employee turnover (Morrell *et al.*, 2001; Morrell *et al*. 2004a), like Marchington and Wilkinson's (1996) equation:

$$\frac{number\ of\ leavers\ in\ a\ year}{average\ number\ of\ staff\ in\ post\ during\ year} \times 100[\%]$$

Equation 1 – Standard equation for measuring turnover (Marchington and Wilkinson, 1996)

High turnover rates are harmful (Glebbeek and Bax, 2004), but rather than simply reducing turnover rates, it is preferable to prevent dysfunctional turnover by retaining

the best, or most valuable staff while simultaneously encouraging functional turnover in order to replace ineffective employees (Morrell *et al*., 2001). However, there must be some basic stability or consistency in turnover before applying a targeted turnover and retention strategy (Morrell *et al*., 2001).

2.1.2 When employees choose to leave

Involuntary turnover occurs within the organisation's control of the company (Morrell *et al*. 2004a) during, for instance, downsizing, cost-cutting, restructuring or as a result of dismissal on the grounds of poor performance (Morrell *et al*., 2001). In such an instance, the better performing employees are generally retained (Morrell *et al*. 2004a). Voluntary turnover, however, occurs within the *employee's* control, and may occur through a variety of mechanisms (Lee, Gerhart, Weller and Trevor, 2008).

Voluntary turnover is the "voluntary cessation of membership of an organisation by an employee of that organisation" (Morrell *et al*., 2001). The word "voluntary" implies choice, which in turn implies a decision process (Morrell *et al*., 2001). It is therefore a social phenomenon (Morrell *et al*., 2001), and as such is complex in nature (Morrell and Arnold, 2007). It is little wonder, therefore, that a century's research has failed to produce a satisfactory solution to the problem. Voluntary turnover occurs as a result of the employee's *ability* to leave (Morrell *et al*. 2004a), and it is therefore often the better performing, and thus more sought after employees who leave during times of economic upturn (Morrell *et al*. 2004a). It is generally agreed that voluntary turnover is expensive (Morrell *et al*. 2004a; Holtom and Inderrieden, 2006; Holtom, Mitchell, Lee and Inderrieden, 2005; Burnes, 2006), although this cost may be overstated (Dalton, Krackhardt and Porter, 1981; Dalton, Todor and Krackhardt, 1982).

In order for the establishment of meaningful relationships with factors (e.g. commitment) or psychological state it must first be possible to classify turnover as voluntary or involuntary (Morrell *et al*., 2001). Inclusion of involuntary turnover in turnover analysis dilutes research (Morrell *et al*., 2001). Moreover, volition may not be reported accurately during an exit interview by either party (Morrell *et al*., 2001). "Voluntariness" may need a unique definition in each organisation (Morrell *et al*., 2001).

2.1.3 Can turnover be avoided?

Turnover can be avoidable (Morrell *et al*., 2001), and to know the extent to which it is avoidable is to be able to better structure a human resources (HR) strategy (Morrell *et al*., 2001). However, there can be a mismatch between the assessment and the true nature of the turnover (Morrell *et al*., 2001). Such a misunderstanding of the degree to which turnover is avoidable can lead the organisation to pursue an ineffective HR strategy (Morrell *et al*., 2001), as shown in Figure 1:

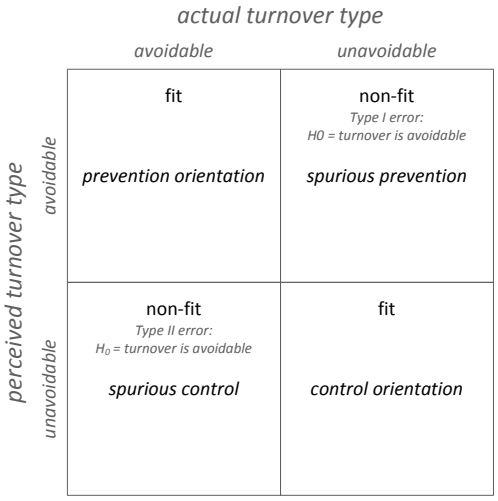

Figure 1 – Avoidability matrix (Morrell et al., 2001)

If most turnover is unavoidable, turnover can be managed "post-hoc" through streamlining the recruitment process (a "control" model), whereas if the majority of turnover is avoidable focus can be placed on preventative measures, such as like salary adjustments (Morrell *et al*. 2004a).

Managerial intervention can deter quitting (Griffeth, Hom and Gaertner, 2000), and job satisfaction, organisational commitment, job tension and withdrawal cognitions differ between avoidable leavers and stayers more than in unavoidable leavers and stayers (Abelson, 1987). However, the distinction must be made that although turnover may be *avoidable*, it may still be *desirable* since the action to retain an employee may be cost ineffective, or seen as unfair by other employees (Morrell *et al*. 2004a).

2.2 The mixed success of turnover modelling, prediction and control

Research has connected turnover to multiple variables (Cotton and Tuttle, 1986), but the extent of these relationships, and the consistency with which they apply, are highly debatable. For instance, logic would dictate that job satisfaction would have a significant correlation with turnover, and indeed it has been show to have an effect (Iverson, 1999; Lum, Kervin, Clark, Reid and Sirola, 1998; Jenkins, 1993; Kammeyer-Mueller, Wanberg, Glomb and Ahlburg, 2005; Trevor, 2001; Muchinsky and Tuttle, 1979), but this relationship can also be weak (Mobley, 1977), dependent on external factors (Carsten and Spector, 1987) or time (Dickter, Roznowski and Harrison, 1996), or even non-existent (Williams, 1999; Tang, Kim and Tang, 2000). The importance of job satisfaction depends on the group being studied (Lee *et al*., 2008).

Similarly, job performance may affect turnover (Lee, 1988; Shaw, Gupta and Delery, 2005; Siebert and Zubanov, 2009), but this relationship may vary depending on other factors (Jackofsky, Ferris and Breckinridge, 1986; Trevor, Gerhart and Boudreau, 1997; McEvoy and Cascio, 1987; Allen and Griffeth, 2001). Even the search for alternate employment may (Kammeyer-Mueller *et al*., 2005; Laker, 1991) or may not (Kirschenbaum and Weisberg, 1994) be related to turnover.

Organisational commitment has been demonstrated to have an effect on turnover (Iverson, 1999; Blau and Boal, 1987; DeCottis and Summers, 1987; Kammeyer-Mueller *et al*., 2005; Lum *et al*., 1998; Lee, 1988; Sheridan and Abelson, 1983; Spreitzer and Mishra, 2002), as has job commitment (Blau and Boal, 1987; Rusbult and Farrell, 1983; Porter, Steers, Mowday and Boulian, 1974), although commitment may also have a varying effect (Jenkins, 1993). Intent to leave, the opposite of commitment, may affect turnover (Iverson, 1999; Bedeian, Kemery and Pizzolatto, 1991), but again this relationship may also be weak (Vandenberg and Nelson, 1999; Kirschenbaum and Weisberg, 1994).

Job embeddedness, defined by as Mitchell, Holtom and Lee (2001) as “perks, routines, or projects to which [employees] have grown accustomed” affects turnover (Mitchell *et al*., 2001), although off-the-job embeddedness is sometimes more predictive (Lee *et al*., 2004). Indeed, non-work factors, i.e. factors that are beyond the control of the organisation, can have a great effect on turnover (Lee and Maurer, 1999; Mitchell *et al*.,

2001; Mobley, Griffeth, Hand and Meglino, 1979; Price and Mueller, 1981), and may even have a greater impact than work-related factors (Cohen, 1999). External factors like economic activity (Terborg and Lee, 1984; Trevor, 2001) and labour market conditions (Hom and Kinicki, 2001; Gerhart, 1990; Morrell *et al*., 2001) have been shown to affect turnover. However, the use of these factors implies that employees are homogeneous, and therefore equally subject to the variables. They are, therefore, not a useful tool in managing turnover (Morrell *et al*. 2004b).

Other factors that may impact turnover include job tenure (Terborg and Lee, 1984; Taylor, Audia and Gupta, 1996), emotional exhaustion (Wright and Cropanzano, 1998), age (Terborg and Lee, 1984), time in present position (Terborg and Lee, 1984), employee attitudes (Porter *et al*., 1974), initial commitment (Lee, Ashford, Walsh and Mowday, 1992), education (Terborg and Lee, 1984), career commitment (Blau, 1998), job tension (Sheridan, 1985), group cohesion (Sheridan, 1985), organisational citizenship behaviour (OCB) (Chen, Hui and Sego, 1998), full-time or part-time employment (Peters, Jackofsky and Salter, 1981), career type, career stage and career development (Krau, 1981), perceived costs of turnover (Kammeyer-Mueller *et al*., 2005), remuneration (Lum *et al*., 1998), salary growth and promotions (Trevor *et al*., 1997), willingness to relocate (Brett and Reilly, 1988), and behavioural intentions (Steel and Ovalle, 1984). The list is long, and brings us no closer to an effective descriptor, let alone predictor, of turnover.

Obviously, turnover is a complex issue, and one that is not easy to solve. A single framework does not exist to fully explain employee turnover (Morrell *et al*., 2004a), nor is there a single way of conducting turnover research (Morrell and Arnold, 2007). “The inability for any current model to ‘fit’ empirical data on turnover perfectly implies that no such (comprehensive) account has yet been found” (Morrell *et al*., 2001). Traditional models of turnover are too simplistic (Lee and Mitchell, 1994), and their effectiveness in describing and predicting turnover varies (Griffeth and Hom, 1988; Hom, Caranikas-Walker, Prussia and Griffeth, 1992; Lee *et al*., 2008). Tests of models have shown that many, but not all variables are related to turnover (Lee and Mowday, 1987), indicating that existing models are perhaps *too* comprehensive. Much of today’s research into turnover is focussed on relatively well-established relationships (Morrell *et al*., 2001), and is still derived from March and Simon’s (1958) work on the ease and desirability of movement, even though the importance of ease of movement depends on the group

being studied (Lee *et al*., 2008). Complex problems tend to defy simple solutions (Moerdyk, 2009).

Current studies and models of employee turnover focus on prediction rather than understanding (Morrell and Arnold, 2007), and do not address the complexity of the *decision* to quit (Morrell and Arnold, 2007; Lee *et al*., 1999). "Although many of the current dominant models of turnover do not rely exclusively on a bivariate correlation, they nonetheless aim to predict turnover via clarification and ordering of the role of antecedent factors, factors which are seen as determined solely by interactions between the employee and their work environment, rather than other external, unexpected or random events or non-work domain variables. These theories fail to describe a large proportion of voluntary turnover decisions, and thus have low ecological validity" (Morrell *et al*., 2001).

Only through understanding *how* the process of turnover evolves can we understand *why* people choose to leave organisations (Lee and Mitchell, 1994). New research designs and directions are needed (Lee *et al*., 1999), and the unfolding model is a break from that paradigm (Morrell *et al*., 2001).

2.3 How is the unfolding model different?

The unfolding model of employee turnover (Lee and Mitchell, 1994; Lee *et al*., 1999) focuses on the *act* of quitting, and therefore classifies turnover as a *decision* process. This model has been refined (Morrell *et al*., 2004a; Morrell *et al*., 2004b, Morrell *et al*., 2008), and applies to multiple generations (Burnes, 2006). It has been successfully replicated in studies of accountants (Donnelly and Quirin, 2006) and engineers (Lee and Maurer, 1997), but was unsuccessful when applied to IT professionals (Niederman, Sumner and Maertz, 2007). The model is shown in Figure 2:

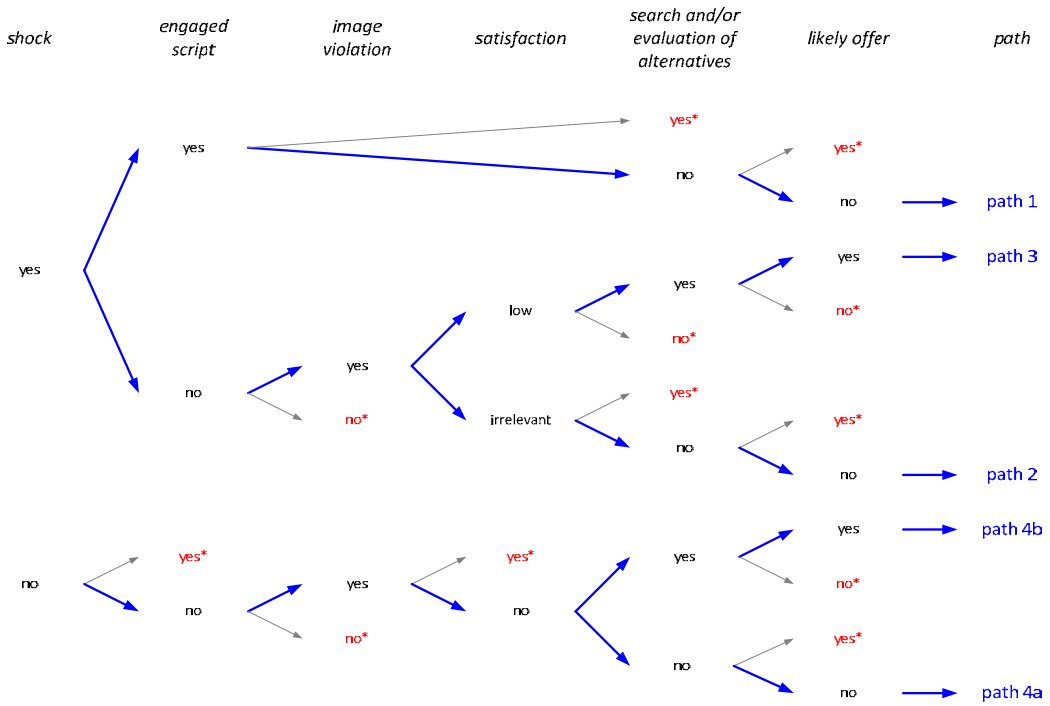

Figure 2 – The unfolding model of voluntary employee turnover (Lee et al., 1999)

The unfolding model postulates that voluntary turnover follows a generic process (Lee and Mitchell, 1994) of:

1. an event occurs (a shock to the system) that causes the individual to think about that event's meaning or implication in relation to the individual's job;

2. this may or may not lead to the individual considering the idea of leaving his/her current job as an alternative (there may or may not be other job alternatives under consideration).

Over time, this cognitive process leads to 4 distinct ways of leaving the job, as described below (Lee and Mitchell, 1994). Different human resource management strategies can be followed depending on which path is most prevalent (Lee and Maurer, 1997).

2.3.1 Decision path 1 – script-driven decision

On this path, a shock to the system causes a memory probe. The purpose of the memory probe is to enable the individual to interpret the shock, or construct a decision frame for the shock in the context of the circumstances. A search for prior decisions, rules, learned responses and circumstances is initiated, as is a search for whether the previous behaviour was appropriate. If a virtually identical situation is found, and the decision to quit was appropriate, this yields a match. The decision to quit is "almost automatically enacted" with "very little mental deliberation."

It does not involve so-called "images" (described below), evaluation of job alternatives or any consideration of job satisfaction. Such decisions to quit are characteristic of the secondary labour market (temporary, short-term and part-time employees).

2.3.2 Decision path 2 – push decision

On this path, the shock does not result in a match, and additional mental deliberations are initiated. The individual uses images to reassess his/her attachment to the current organisation. No specific job alternative is considered, and it is essentially a binary choice: either stay, which requires the image to be changed, or leave.

The shocks that set off this path are essentially the same as those involved in decision path 1, except there is no prepared response. Since scripts are the result of past experiences, and images are associated with current values, future goals, and current to future strategies for at attaining those goals, it could be inferred that path 2 is the forward-looking equivalent of path 1.

2.3.3 Decision path 3 – pull decision

On this path, the shock again does not result in a match, but there is a specific job alternative to be considered. Images are now used to determine whether a potential commitment could be formed with the prospective organisation.

Two additional judgements are invoked:

1. the deletion or survival of alternatives, i.e. whether the new company can fit the individual's values; and then
2. the assessment of the utility of each surviving option, which may include the individual's current job.

2.3.4 Decision path 4 – affect initiated

On this path there is no shock, but rather the individual evaluates his/her job on an ongoing basis. Since both the job and the employee evolve over time, a lack of fit may develop, either consciously or unconsciously. Dissatisfaction leads to reduced commitment, which in turn leads to more searches being carried out for alternative employment, leading to easier movement, then a greater intent to quit, and ultimately a higher turnover probability.

This decision path may manifest in two ways:

1. the more traditional method, which involves job search, evaluation of alternatives, the increased intent to quit, etc., all of which result from dissatisfaction with the current job (4b); or
2. as a direct result of the dissatisfaction, the employee simply leaves (4a).

2.4 Image theory – the foundation of the unfolding model

Image theory was first introduced by Beach and Mitchell (1987) and is the theoretical base for the unfolding model (Lee and Mitchell, 1994). It proposes that decision-making involves screening of options rather than a rational choice (Beach, 1993, in Lee and Mitchell, 1994), and uses some assumptions that are contrary to traditional decision theory. In a real decision process (Beach, 1993, in Lee and Mitchell, 1994), evaluation is seldom extensive, choice occurs relatively seldom, behaviour is to a large extent pre-programmed, and decision-makers have various strategies for making choices, many of which do not aim to maximise utility.

Image theory instead proposes that a process of "screening" rather than "choosing" among options is the most important mechanism for understanding the decision-making process (Beach, 1993, in Lee and Mitchell, 1994). Screening is a rapid and crude

process and is used to determine whether new information can easily be incorporated into a set of three images (Beach, 1993, in Lee and Mitchell, 1994):

1. value image – the general values, standards and principles that define a person
2. trajectory image – a set of goals that energise the person and direct his/her behaviour
3. strategic image – the behavioural tactics and strategies that the individual believes are effective in attaining his/her goals.

Since most of the information with which people are bombarded is filtered, they are rarely forced to make decisions (Beach, 1993, in Lee and Mitchell, 1994). The screening process may be affected by how the decision-maker perceives the scenario (Pesta, Kass and Dunegan, 2005). Those (relatively few) options that survive are compared with the status quo and, usually, the status quo prevails (Beach, 1993, in Lee and Mitchell, 1994), but on the very rare occasions where multiple options survive, a profitability test may be used (Beach, 1993, in Lee and Mitchell, 1994).

Image violation occurs when an "individual's values, goals and strategies for goal attainment do not fit with those of the employing organisation or those implied by the shock" (Lee *et al.*, 1999). Rather than being probabilistic, people tend to be habitual, impulsive and intuitive, so image violation is a strong motivator for action (Morrell *et al*., 2004b), but individuals may instead change their image rather than accept or reject an option or information (Beach, 1993, in Lee and Mitchell, 1994).

Image theory has been shown to apply to job selection (Beach and Strom, 1989), retirement decisions (Brougham and Walsh, 2007) and consumer decision-making (Nelson, 2004). Use of image theory in turnover analysis allows focus to be placed on the decision process rather than the entire quitting process (Morrell *et al*., 2004b).

2.5 Shock – the trigger

Decision makers frequently choose to continue the present course of action (Silver and Mitchell, 1990). Often a shock is required to overcome that inertia or lethargy, and prompt the thought of quitting (Morrell *et al.*, 2004b). A shock is a "very distinguishable event that jars employees toward deliberate judgements about their jobs and, perhaps, to voluntarily quit their job" (Lee and Mitchell, 1994).

The unfolding model suggests that the decision to leave an organisation is often initiated by some form of shock, one that may even be anticipated (Lee and Mitchell, 1994). They may be positive, negative or neutral, and may or may not be work-related (Lee and Mitchell, 1994). They may be internal or external to the individual (Lee *et al*., 1999), but they nonetheless challenge the status quo or disturb the steady state (Lee and Mitchell, 1994).

Shocks must be "sufficiently jarring that they cannot be ignored" (Lee and Mitchell, 1994), and are the link between organisation change and employee turnover (Morrell *et al*. 2004a). Such critical events have a strong effect on turnover (Mitchell *et al*., 2001; Kammeyer-Mueller *et al*., 2005), more so even than job dissatisfaction (Holtom *et al*., 2005), and understanding shocks allows for better understanding of how change affects employees (Morrell *et al*. 2004a).

2.6 Script – the dress rehearsal

A script is a "pre-existing plan of action" (Lee *et al*., 1999) based on past experiences, observation of others, reading or social expectations (Lee *et al*., 1999). There may even be an element of predetermination involved (Lee and Mitchell, 1994), such as the decision to leave the organisation should a certain event (e.g. being passed over for promotion) occur. Alternatively, employees can leave without significant deliberation (Lee and Mitchell, 1994).

Although scripts may exist in paths 2, 3 and 4 of the unfolding model, they must not be engaged (Lee *et al*., 1999).

2.7 Job satisfaction

Job satisfaction is diminished when the job can no longer provide the desired intellectual, emotional or financial benefits (Lee *et al*., 1999). Job satisfaction is a key factor in many turnover models, and the unfolding model is no exception. However, since 40% of quits result from shocks, job satisfaction may have little effect on employee turnover (Lee *et al*., 2008).

2.8 Job search and alternative selection

Job search refers to "activities involved with looking for alternatives to a current job and the evaluation of those alternatives" (Lee *et al*., 1999). Job alternatives need not be certain in order to affect the individual's cognitive processes or prompt action, just likely (Lee *et al*., 1999), and can include non-work functions, like furthering one's studies or buying a business (Lee *et al*., 1999). On the other hand, employees can leave without considering alternatives (Lee and Mitchell, 1994). The decision to quit may be based on a fit (or lack of fit) with the current organisation rather than a comparison with another organisation (Lee and Mitchell, 1994).

3 Research questions and hypotheses

The research will attempt to replicate previous studies (Lee *et al*. 1996; Lee *et al*., 1999; Morrell *et al*. 2004a; Morrell *et al*., 2004b; Morrell *et al*., 2008) on accountants and nurses in the United States and on nurses in the United Kingdom, sampling instead South African engineers. Some of the hypotheses that will be tested are based, wholly or in part, on the work from those studies. The choice of measurement instrument is important to any study (Tolsma, 2004), and given the set of questions used to determine whether the unfolding model is in play, and which path, it is possible to test several relationships, especially those related to shocks.

3.1 Applicability of the model

Different occupational groups have different ways of leaving jobs (Lee *et al*., 1999). This study will determine whether the voluntary turnover of South African engineers can be adequately described by the unfolding model.

Hypothesis 1: *(H_1)*	*The unfolding model will account for the voluntary turnover of at least 50% of South African engineers.*
Hypothesis 1_0: *(H_{10})*	*The unfolding model will account for the voluntary turnover of less than 50% of South African engineers.*

H_1 can be proved or disproved by dividing the total number of decisions to quit that are described by one of the five decision paths of the unfolding model by the total number of eligible respondents to the survey. For a large enough sample, the binomial distribution, *B*(model match, model mismatch), approximates a normal distribution (Butler, 2009). Given a 95% confidence level (α = 0.05), z = 1.96 (see Table 15, Appendix D) for a one-tailed test. If we seek at least 50% model match, then p = 0.5, and the upper and lower bounds of the model match, S, are given by Equation 2:

$$\frac{X}{n} - z\sqrt{\frac{p(1-p)}{n}} \leq S \leq \frac{X}{n} + z\sqrt{\frac{p(1-p)}{n}}$$

Equation 2 – Upper and lower bounds of the model match, given a 95% confidence interval

X is the number of model matches observed by the research, and n is the total number of eligible respondents.

To enable an organisation to control turnover it must first determine the importance of the different turnover paths (Lee *et al.*, 2008). It is therefore necessary to determine which path, or paths, account for a significant portion of responses. Given that, according to the criteria set out in Hypothesis 1, the model shall be deemed applicable if it accounts for 50% (or more) of the eligible responses, and that there are five potential paths, a path that describes at least one fifth of that 50%, or 10% of the total number of eligible responses, shall be deemed a significant descriptor of voluntary turnover among the survey group.

Hypothesis 2a: *(H_{2a})*	*Path 1 will account for the voluntary turnover of at least 10% of South African engineers.*
Hypothesis 2a_0: *(H_{2a0})*	*Path 1 will not account for the voluntary turnover of less than 10% of South African engineers.*
Hypothesis 2b: *(H_{2b})*	*Path 2 will account for the voluntary turnover of at least 10% of South African engineers.*
Hypothesis 2b_0: *(H_{2b0})*	*Path 2 will not account for the voluntary turnover of less than 10% of South African engineers.*
Hypothesis 2c: *(H_{2c})*	*Path 3 will account for the voluntary turnover of at least 10% of South African engineers.*
Hypothesis 2c_0: *(H_{2c0})*	*Path 3 will not account for the voluntary turnover of less than 10% of South African engineers.*

Hypothesis 2d: (H_{2d})	*Path 4a will account for the voluntary turnover of at least 10% of South African engineers.*
Hypothesis 2d$_0$: (H_{2d0})	*Path 4a will not account for the voluntary turnover of less than 10% of South African engineers.*
Hypothesis 2e: (H_{2e})	*Path 4b will account for the voluntary turnover of at least 10% of South African engineers.*
Hypothesis 2e$_0$: (H_{2e0})	*Path 4b will not account for the voluntary turnover of less than 10% of South African engineers.*

H_{2a}, H_{2b}, H_{2c}, H_{2d} and H_{2e} can be proved or disproved by dividing the total number of decisions to quit that are described by each of the five decision paths of the unfolding model by the total number of eligible respondents to the survey. Again, Equation 2 is used, but with $p = 0.1$, since we require a 10% match rate for each path.

3.2 The influence of shocks

Shocks play an important role in some people's decisions to leave voluntarily (Lee *et al*., 1999). Moreover, shocks may not only prompt initial thoughts of quitting, but could also influence the final decision to quit (Morrell *et al*. 2004a). Decisions to quit resulting from a single event would have been avoided altogether had that event not taken place (Morrell *et al*. 2004a). Shocks may also improve the accuracy of reflective responses since, when the decision to quit is considered, a particular event (Wheeler *et al*., 1997) may be invoked which will result in a more detailed recollection (Symons and Johnson, 1997). Morrell *et al*. (2004a) found evidence to support their hypothesis that "shocks will be highly influential in terms of the final decision to quit" by using the visual interrogation of a histogram of the 5-point Likert scale responses to the question: "*How much did the event* (the shock) *influence your final decision to leave?*" However, the hypothesis should be reworded to be more accurately testable (Tolsma, 2009).

Hypothesis 3: *(H_3)*	*Of those leavers who cite the presence of a shock, at least 50% will acknowledge this shock as the main influence or as having an overwhelming influence on the final decision to quit.*
Hypothesis 3_0: *(H_{30})*	*Of those leavers who cite the presence of a shock, fewer than 50% will acknowledge this shock as the main influence or as having an overwhelming influence on the final decision to quit.*

H_3 can be proved or disproved by dividing the number of leavers who cite the presence of a shock, and acknowledge that the shock was either the main influence or had an overwhelming influence on their decision to leave, by the total number of leavers who cite the presence of a shock. We again use Equation 2 to determine the upper and lower bounds, but with the total number of eligible respondents who experienced a shock as n, and those who acknowledge the shock as being the main influence or as having an overwhelming influence as X.

3.3 Work-related shocks

If personal events, such as family responsibilities, are at the root of a decision to quit, that decision is likely to be unavoidable (Cohen, 1999; Lee and Maurer, 1999; Mitchell *et al*., 2001; Mobley *et al*., 1979; Price and Mueller, 1981). Such a personal event need not be negative, nor unexpected, such as the birth of a child (Morrell *et al*., 2004b). Since personal events occur *outside* the influence of an organisation, there is little the organisation can do to prevent turnover driven by personal factors.

However, a substantial amount of research links work factors such as commitment (Iverson, 1999; Blau and Boal, 1987; DeCottis and Summers, 1987; Kammeyer-Mueller *et al*., 2005; Lum *et al*., 1998; Lee, 1988; Sheridan and Abelson, 1983; Spreitzer and Mishra, 2002; Rusbult and Farrell, 1983; Porter *et al*., 1974), satisfaction (Iverson, 1999; Jenkins, 1993; Trevor, 2001; Muchinsky and Tuttle, 1979) and other variables, such as company mergers and corporate restructuring, to turnover. Morrell *et al*. (2004b) found that there was sufficient evidence to support the theory that negative shocks tend to be work-related. It stands to reason then that the more work-related a shock is that leads to a decision to quit, the more negative that shock is expected to be.

Hypothesis 4: *(H_4)*	*As shocks that initiate decisions to leave become more work-related, they become more negative.*
Hypothesis 4_0: *(H_{40})*	*As shocks that initiate decisions to leave become more work-related, they do not become more negative.*

Morrell *et al*. (2004b) used Pearson's product-moment correlation to determine the relationship between the work-relatedness and negativity of shocks that initiate the decision to quit. However, since the data is ordinal rather than numerical, Spearman's rank correlation coefficient is a more appropriate method of analysis (Tolsma, 2009.) Accordingly, H_4 shall be tested using Spearman's method. In order to establish the significance of the correlation, the value of Spearman's correlation coefficient (ρ) shall be compared with the standard critical values table (see Table 16, Appendix E.)

Morrell *et al*. (2004b) found evidence to support the hypothesis that as shocks that result in decisions to quit become more work-related, those decisions become more avoidable. Certainly an organisation would benefit from such a relationship, as it implies that even the *voluntary* turnover of its employees is within its control.

Hypothesis 5: *(H_5)*	*As shocks that result in decisions to quit become more work-related, those decisions to quit become more avoidable.*
Hypothesis 5_0: *(H_{50})*	*As shocks that result in decisions to quit become more work-related, those decisions to quit do not become more avoidable.*

Again, Morrell *et al*. (2004b) used Pearson's criteria to establish the relationship. For the purposes of this study, Spearman's method shall be used to test H_5, and in order to establish the significance of the correlation, the value of Spearman's correlation coefficient (ρ) shall again be compared with the standard critical values table (see Appendix E.)

4 Research methodology

4.1 Research design

The research will attempt to quantify the extent to which the unfolding model of employee turnover applies to South African engineers by replicating precious studies using the model (Lee *et al*. 1996; Lee *et al*., 1999; Lee *et al*., 2004; Morrell *et al*. 2004a; Morrell *et al*., 2004b; Morrell and Arnold, 2007; Morrell *et al*., 2008). The research will then attempt to quantify which paths of the unfolding model are most prevalent among South African engineers.

An attempt will also be made to confirm relationships between variables associated with voluntary turnover. Although no causal inferences are intended to be made, it is hoped that these relationships between the work-relatedness and negativity of shocks, as well as the degree to which the resultant decisions to quit are avoidable, will assist in the formulation of human resource strategies to mitigate the effect of voluntary turnover among South African engineers.

A structured questionnaire with some open-ended items is used as the collection mechanism. The questionnaire is based on that used by Morrell *et al*. (2008). This questionnaire will be developed online, and a link sent to a set of respondents via a personalised e-mail, which is intended to increase the likelihood of a response. Anonymity of the respondents is assured through the agglomeration of responses prior to output from the online survey.

4.2 Population and sampling

The sample will consist of South African engineers who have left a company voluntarily, the choice of which is, to a certain extent, one of convenience. However, the need to retain knowledge workers (Tushman and O'Reilly, 1997), among them engineers, and particularly in the South African context (South African Government Information, 2007a; South African Government Information, 2007b), has been established.

4.2.1 What is a South African engineer?

For the purposes of this study, a South African engineer will be considered as a person meeting all the following criteria:

- In possession of a valid South African identification document; and
- Having earned at least a Bachelor of Engineering (BEng) or Bachelor of Science in Engineering (BSc(Eng)) degree from an accredited South African tertiary institution, according to the Engineering Council of South Africa (2008).

Respondents who do not have a valid South African identity document, or do not have a valid Bachelor of Engineering or Bachelor of Science in Engineering degree from an accredited South African tertiary institution, will be excluded from the study.

4.2.2 Unit of analysis

The unit of analysis will be the act of quitting, or the "voluntary cessation of membership of an organisation by an employee of that organisation" (Morrell *et al*., 2001). Those respondents who have not left an organisation, or have been forced to leave (downsized, retrenched, mandatory retirement, dismissal, etc.) will be excluded from the study.

4.2.3 Data collection

An electronic survey will be conducted in the format described by Morrell *et al*. (2008). The questionnaire will make us of a combination of open-ended questions, dichotomous questions and 5-point Likert-type scales. The questionnaire is given in Appendix A, together with a description of the range of the response and its interpretation.

The consistency matrix is given in Appendix B. It refers to the applicable questions in the questionnaire which will be used to address each research question.

4.2.4 Data analysis

Since the unfolding model deals with dichotomous decision nodes in order to select the appropriate decision path, a dichotomous set of responses will need to be extracted from the Likert-type scales. This will be achieve as described in Appendix A, in accordance with the method described by Morrell *et al*. (2008). The answers to the open-ended

questions will be subjectively analysed in order to determine how they apply to the unfolding model.

The hypotheses will be tested according to the methods described in Section 3.

4.2.5 Data validity

Although the research requires the respondents to describe events that may have taken place many years before, the responses are expected to be valid. Memory biases, including forgetting and rationalising, are possible (Lee *et al*., 1996).

However, since the memory of leaving a company can be categorised as episodic memory (Lee *et al*., 1999), and episodic memory is accurately kept (Wheeler, Stuss and Tulving, 1997), forgetting should not be a concern. Retrospective self-reporting is a good source of data since deals with actual accounts rather than inferred events (Morrell and Arnold, 2007), and self-based memory actually improves over time (Symons and Johnson, 1997). Retrospective research is valid, but should not be used indiscriminately (Miller Cardinal and Glick, 1997). Therefore the responses received are expected to be valid for the purposes of the study.

Non-response bias may affect the results of the research, since the circumstances surrounding the leaving of a job may be of a sensitive nature. Volunteer bias may also affect the results, as those who have had particularly bad experiences with their previous employers may be inclined to use the survey as a cathartic tool.

However, the primary threat to the validity of the research is an overall lack of response. Organisations will most likely not keep current contact details of their former employees, and alumni associations may be disinclined to acquiesce to a request for the contact details of graduates for (obvious) reasons of privacy. The best course of action to mitigate this problem would be to employ a snowball methodology (Tolsma, 2009), which may skew the results of the research by incorporating a disproportionate number of respondents from a particular cluster or the engineering community.

4.3 Research timeline

task	*duration*	*due date*
Submit research proposal	-	4 May 2009
Gather names and contact details of potential participants	4 weeks	1 June 2009
1st meeting with supervisor	-	1 June 2009
Complete literature review and refine methodology	2 weeks	14 June 2009
Send our surveys to participants	-	14 June 2009
Draft chapters 1 to 4 (introduction, literature review, research hypotheses, and research methodology)	3 weeks	5 July 2009
Submit chapters 1 to 4 to supervisor	-	5 July 2009
2nd meeting with supervisor	-	20 July 2009
Data collection	4 weeks	9 August 2009
Data processing	1 week	16 August 2009
Data analysis	3 weeks	6 September 2009
Draft chapters 5 to 7 (results, discussion of results, and conclusion)	2 weeks	20 September 2009

Submit chapters 5 to 7 to supervisor	-	20 September 2009
3rd meeting with supervisor	-	5 October 2009
Proof read	2 weeks	25 October 2009
Print and submit final draft	1 week	11 November 2009

Table 1 – Proposed research timeline

5 Results

5.1 Response rate

A total of 547 personalised requests were sent via e-mail to potential candidates. The survey was posted on social networking sites, and an unknown number of e-mails were forwarded to a secondary audience of candidates. A total of 216 responses were received, which represents a 39% response rate (based on the number of candidates contacted directly via e-mail.)

Of the 216 responses received, 93 were deemed ineligible for one or a combination of the following reasons:

- the respondent did not possess an engineering degree;
- the respondent did not attend an accredited tertiary institution;
- the respondent did not leave voluntarily;
- the respondent was not South African;
- the respondent did not confirm the legitimacy of his/her responses and consent to the use of his/her response as part of the survey;
- the response was in some way spoiled; and/or
- the eligibility of the respondent could not be confirmed.

Ultimately, 123 respondents remained for analysis.

5.2 Descriptive statistics

5.2.1 Age

The youngest respondent was 23 years of age, the oldest 63, with the average age of the respondents 33 years. This is a fairly young average age, and may be the result of the use of the snowball effect with most of the invitations to complete the survey sent to engineers of approximately this age. The distribution of the ages of the respondents is given in Chart 2.

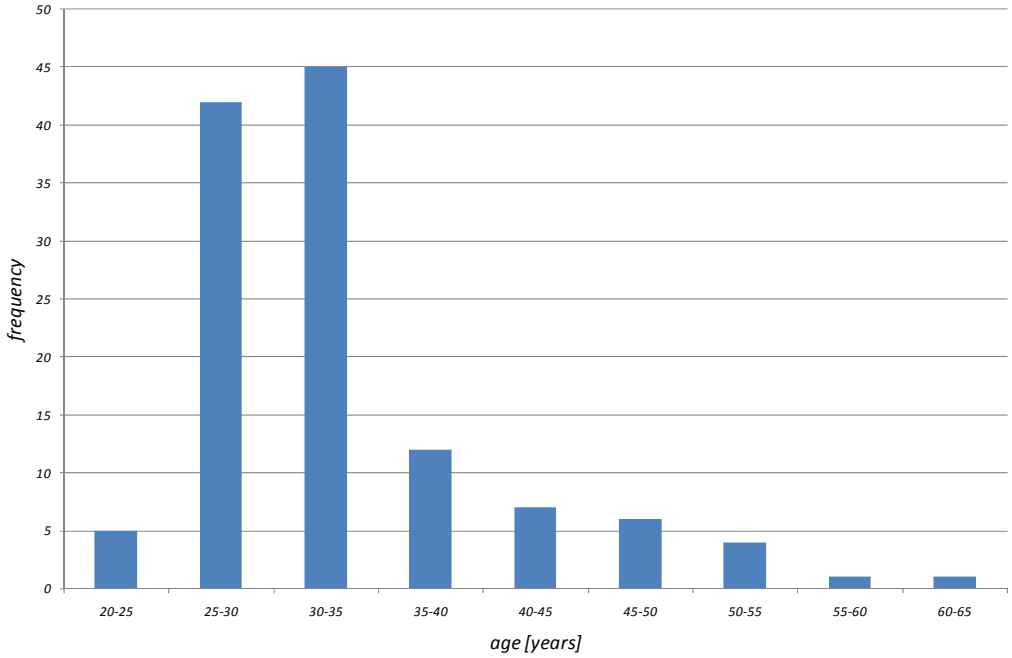

Chart 2 – Distribution of ages of respondents

5.2.2 Gender

Of the 123 eligible respondents, 88 respondents (72%) were male and 34 (28%) were female, potentially skewing the responses in favour of male engineers.

5.2.3 Tenure

The minimum tenure was 1 month, while the longest tenure was 22 years, with the average 3.6 years. The distribution of tenure of the respondents is given in Chart 3. One respondent did not state the length of his/her tenure.

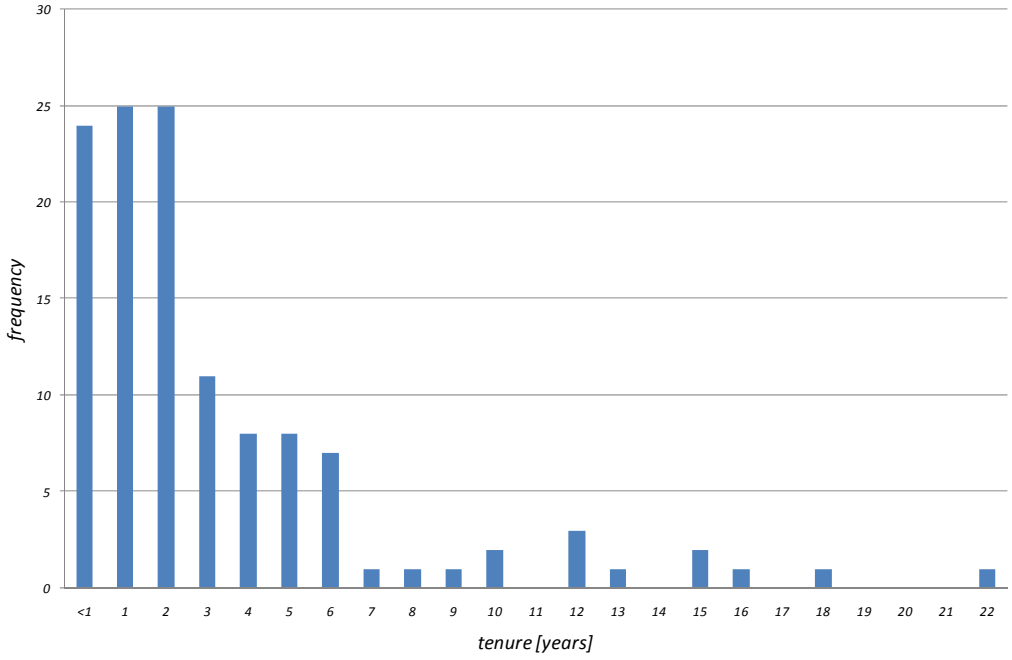

Chart 3 – Distribution of tenure or respondents

5.2.4 Degree to which quits were avoidable

The distribution of responses regarding the degree to which decisions to quit were avoidable is shown in Chart 4:

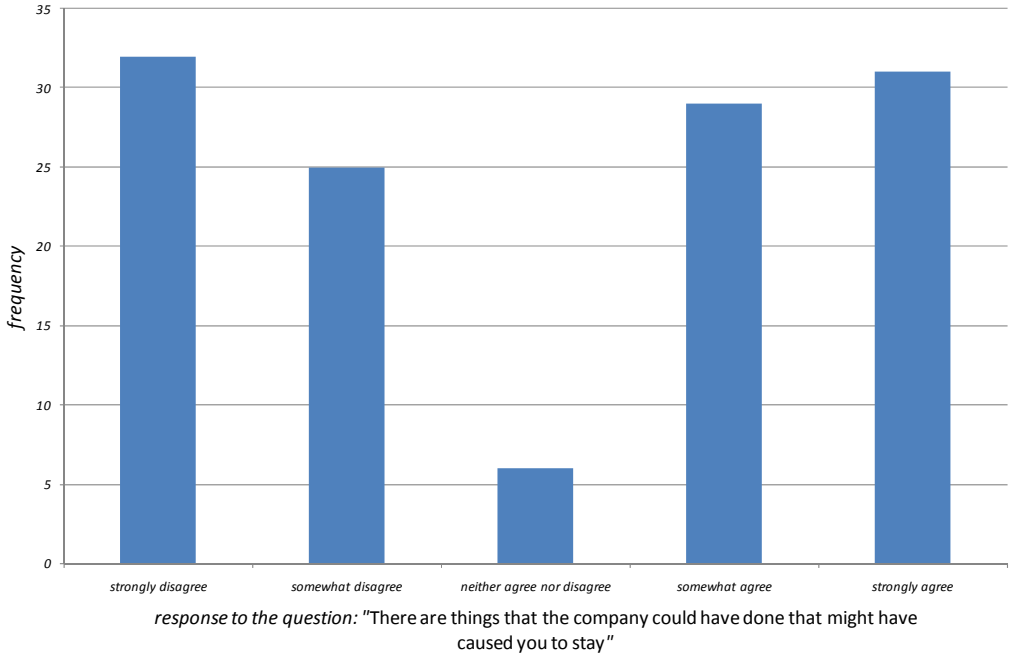

Chart 4 – Degree to which decisions to quit were avoidable

5.2.5 Consideration of return

Of the 123 eligible respondents, 72 respondents (59%, with lower and upper confidence bounds of 50% and 68%, respectively) stated that they would consider working for the firm they left, while 51 (41%, with lower and upper confidence bounds of 33% and 50%, respectively) stated that they would not consider working for that firm again.

5.2.6 Shock

Of the 123 eligible respondents, 49 respondents (40%, with lower and upper 95% confidence bounds of 31% and 49%, respectively) claimed that a particular event caused them to think about leaving the organisation.

5.2.6.1 Negativity of shocks

The distribution of responses regarding the negativity of shocks is given in Chart 5.

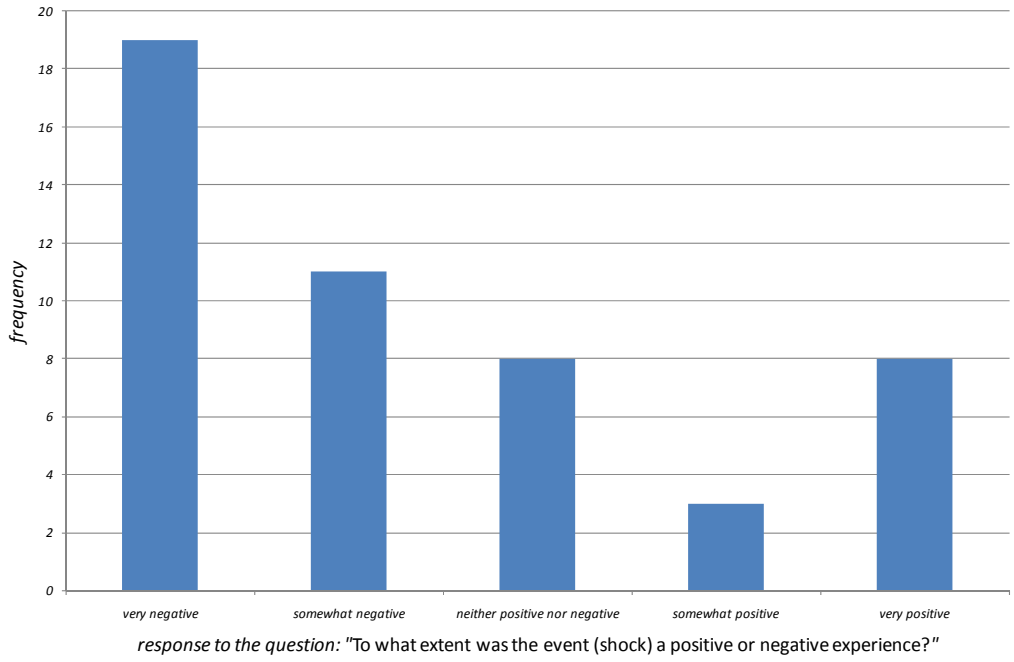

Chart 5 – Negativity of shocks

5.2.6.2 Work-relatedness of shocks

The distribution of responses regarding the work-relatedness of shocks is shown in Chart 6.

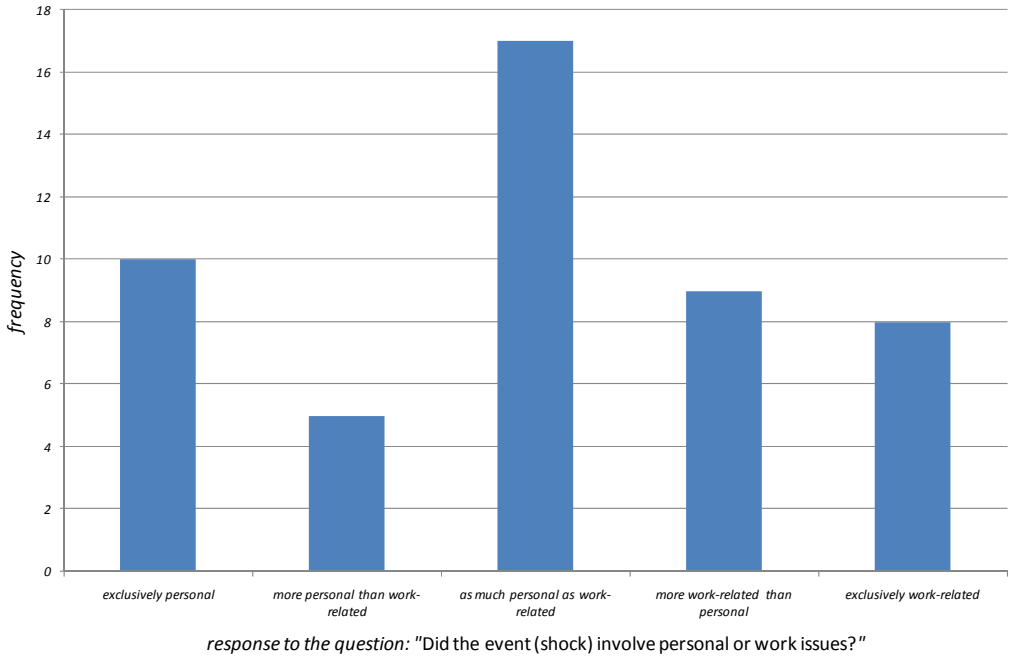

Chart 6 – Work-relatedness of shocks

5.2.6.3 Influence of shocks

The distribution regarding the influence shocks had on the final decision to quit is shown in Chart 7.

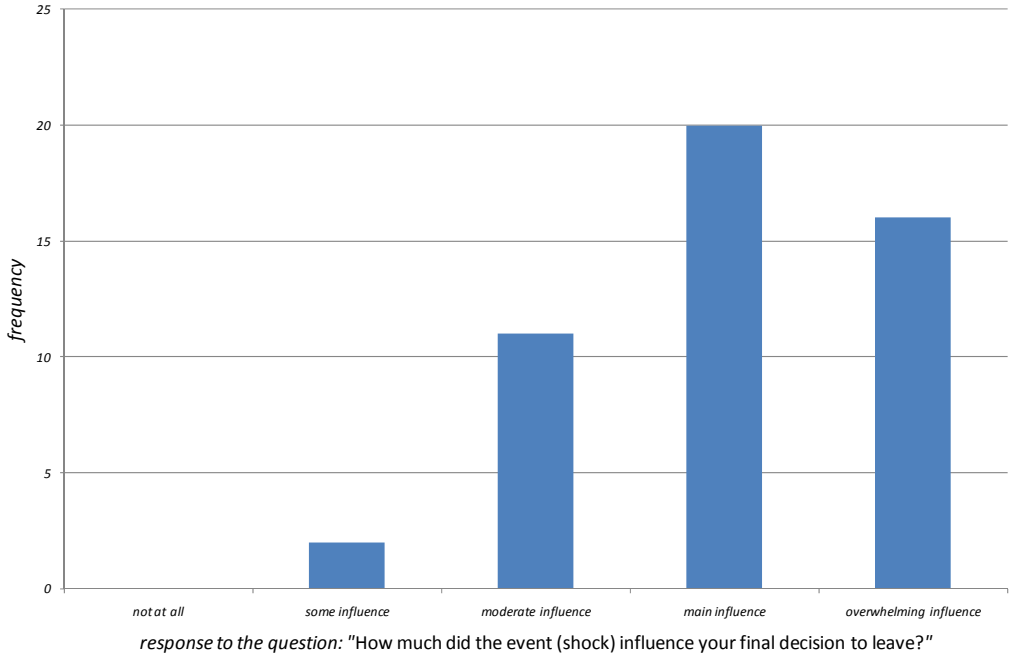

Chart 7 – Influence of shocks on the final decision to quit

5.2.6.4 Degree to which shock-related quits were avoidable

The distribution of responses regarding whether shock-related quits were avoidable is given in Chart 8:

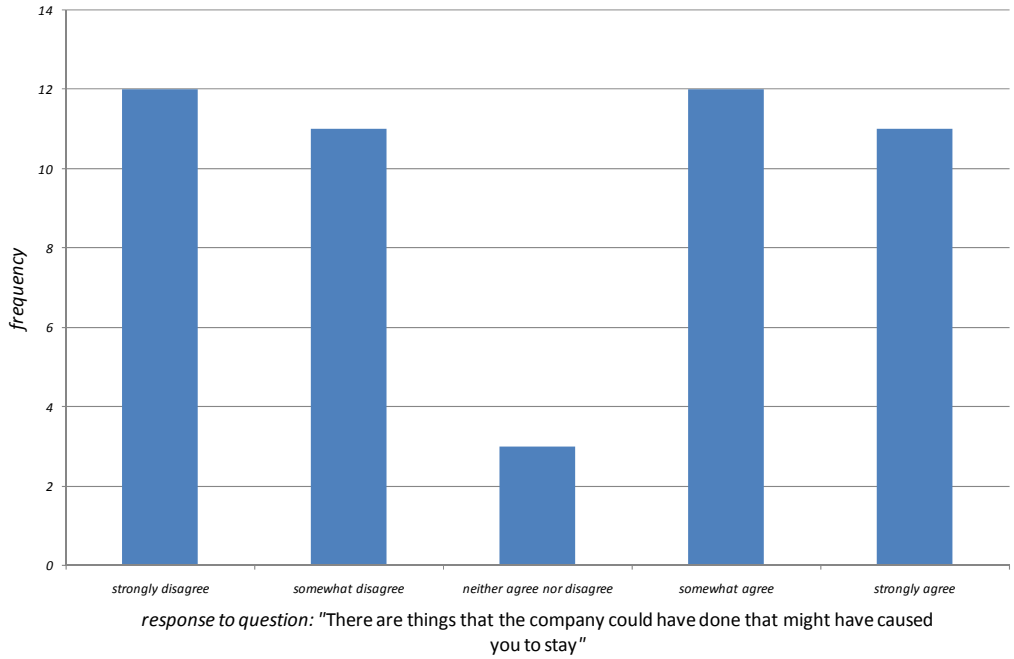

Chart 8 – Degree to which shock-related quits were avoidable

5.2.7 Script

Of the 123 eligible respondents, 66 (54%, with a lower confidence bound of 45% and an upper confidence bound of 62%) admitted to having a prepared response to a particular event or set of circumstances at work.

5.2.8 Image violation

Of the 123 eligible respondents, 110 (89%, with a lower confidence bound of 81% and an upper confidence bound of 98%) experienced some form of image violation in their previous jobs.

The frequency with which each type of potential image violation was cited is shown in Table 2.

	frequency	*%*
personal goal achievement	84	68% ±9%
career goal achievement	71	58% ±9%
personal goal compatibility	67	54% ±9%
personal goal progress	66	54% ±9%
professional goal compatibility	65	53% ±9%
career progress	65	53% ±9%
professional values/ethics compatability	34	28% ±9%
personal values/ethics compatability	32	26% ±9%

Table 2 – Frequency with which types of image violation were cited

5.2.9 Job satisfaction

Of the 123 eligible respondents, 11 (9%, with a lower confidence bound of 0% and an upper confidence bound of 18%) were satisfied with all aspects of the jobs they left.

The frequency with which each area of job dissatisfaction was cited is shown in Table 3.

	frequency	*%*
career opportunities	69	56% ±9%
remuneration	56	46% ±9%
supervisor	51	41% ±9%
nature of work	49	40% ±9%
new business generation	43	35% ±9%
fringe benefits	38	31% ±9%
time flexibility	38	31% ±9%
work pressure	37	30% ±9%
firm	35	28% ±9%
competitive pressures	34	28% ±9%
recreational activities	33	27% ±9%
autonomy	31	25% ±9%
co-workers	13	11% ±9%

Table 3 – Frequency with which areas of job dissatisfaction were cited

5.2.10 Job search and alternative evaluation

Of the 123 eligible respondents, 85 (69%, with a lower confidence bound of 60% and an upper confidence bound of 78%) searched for a job and/or evaluated alternatives before leaving their current job.

5.2.11 Likely offer

Of the 123 eligible respondents, 117 (95%, with a lower confidence bound of 86% and an upper confidence bound of 100%) waited until they had a firm offer of alternate employment before leaving their current position.

5.3 Hypotheses

5.3.1 Hypothesis 1

The correlation of responses with the various paths of the unfolding model is shown in Chart 9:

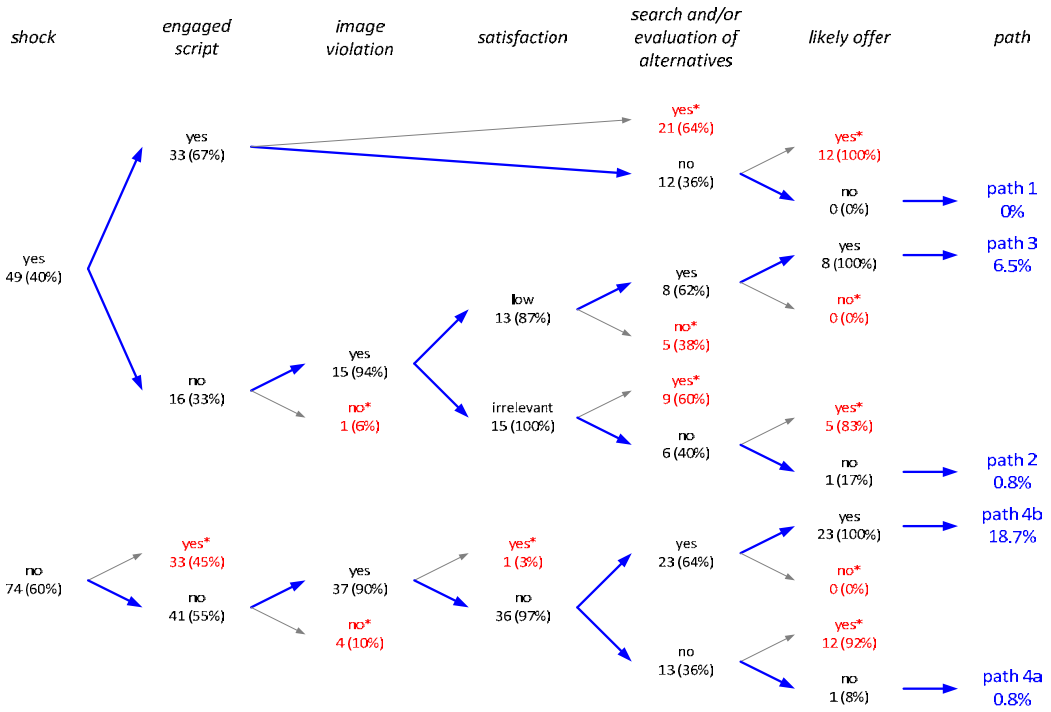

Chart 9 – Correlation between responses and the unfolding model

The retention rate of respondents as their responses were processed through the model is given in Table 4:

phase	*retention*
shock	100%
script	73%
image violation	69%
job satisfaction	68%
search and/or evaluation of alternatives	50%
likely offer	27%

Table 4 – Retention of responses within model by phase

The expected number of observations is given by the product of the probabilities of each phase of the model (that is the total number of respondents who respondent in that way to that particular phase, divided by the total number of eligible respondents), multiplied by the total number of eligible respondents. The observations of the various possible routes through the model are shown in Table 5:

route	*expected*	*observed*	*path*
shock, script, image violation, job satisfaction, search and/or evaluation of alternatives, likely offer	1	-	
shock, script, image violation, job satisfaction, search and/or evaluation of alternatives, no likely offer	0	-	
shock, script, image violation, job satisfaction, no search and/or evaluation of alternatives, likely offer	1	-	
shock, script, image violation, job satisfaction, no search and/or evaluation of alternatives, no likely offer	0	-	path 1
shock, script, image violation, no job satisfaction, search and/or evaluation of alternatives, likely offer	14	15	
shock, script, image violation, no job satisfaction, search and/or evaluation of alternatives, no likely offer	1	2	
shock, script, image violation, no job satisfaction, no search and/or evaluation of alternatives, likely offer	6	11	
shock, script, image violation, no job satisfaction, no search and/or evaluation of alternatives, no likely offer	0	-	path 1

shock, script, no image violation, job satisfaction, search and/or evaluation of alternatives, likely offer	0	2	
shock, script, no image violation, job satisfaction, search and/or evaluation of alternatives, no likely offer	0	1	
shock, script, no image violation, job satisfaction, no search and/or evaluation of alternatives, likely offer	0	-	
shock, script, no image violation, job satisfaction, no search and/or evaluation of alternatives, no likely offer	0	-	path 1
shock, script, no image violation, no job satisfaction, search and/or evaluation of alternatives, likely offer	2	1	
shock, script, no image violation, no job satisfaction, search and/or evaluation of alternatives, no likely offer	0	-	
shock, script, no image violation, no job satisfaction, no search and/or evaluation of alternatives, likely offer	1	1	
shock, script, no image violation, no job satisfaction, no search and/or evaluation of alternatives, no likely offer	0	-	path 1
shock, no script, image violation, job satisfaction, search and/or evaluation of alternatives, likely offer	1	1	

shock, no script, image violation, job satisfaction, search and/or evaluation of alternatives, no likely offer	0	-	
shock, no script, image violation, job satisfaction, no search and/or evaluation of alternatives, likely offer	1	1	
shock, no script, image violation, job satisfaction, no search and/or evaluation of alternatives, no likely offer	0	-	path 2
shock, no script, image violation, no job satisfaction, search and/or evaluation of alternatives, likely offer	12	8	path 3
shock, no script, image violation, no job satisfaction, search and/or evaluation of alternatives, no likely offer	1	-	
shock, no script, image violation, no job satisfaction, no search and/or evaluation of alternatives, likely offer	5	4	
shock, no script, image violation, no job satisfaction, no search and/or evaluation of alternatives, no likely offer	0	1	path 2
shock, no script, no image violation, job satisfaction, search and/or evaluation of alternatives, likely offer	0	-	
shock, no script, no image violation, job satisfaction, search and/or evaluation of alternatives, no likely offer	0	-	

shock, no script, no image violation, job satisfaction, no search and/or evaluation of alternatives, likely offer	0	-
shock, no script, no image violation, job satisfaction, no search and/or evaluation of alternatives, no likely offer	0	-
shock, no script, no image violation, no job satisfaction, search and/or evaluation of alternatives, likely offer	1	1
shock, no script, no image violation, no job satisfaction, search and/or evaluation of alternatives, no likely offer	0	-
shock, no script, no image violation, no job satisfaction, no search and/or evaluation of alternatives, likely offer	1	-
shock, no script, no image violation, no job satisfaction, no search and/or evaluation of alternatives, no likely offer	0	-
no shock, script, image violation, job satisfaction, search and/or evaluation of alternatives, likely offer	2	1
no shock, script, image violation, job satisfaction, search and/or evaluation of alternatives, no likely offer	0	-
no shock, script, image violation, job satisfaction, no search and/or evaluation of alternatives, likely offer	1	1

no shock, script, image violation, job satisfaction, no search and/or evaluation of alternatives, no likely offer	0	-
no shock, script, image violation, no job satisfaction, search and/or evaluation of alternatives, likely offer	21	24
no shock, script, image violation, no job satisfaction, search and/or evaluation of alternatives, no likely offer	1	-
no shock, script, image violation, no job satisfaction, no search and/or evaluation of alternatives, likely offer	10	3
no shock, script, image violation, no job satisfaction, no search and/or evaluation of alternatives, no likely offer	0	1
no shock, script, no image violation, job satisfaction, search and/or evaluation of alternatives, likely offer	0	-
no shock, script, no image violation, job satisfaction, search and/or evaluation of alternatives, no likely offer	0	-
no shock, script, no image violation, job satisfaction, no search and/or evaluation of alternatives, likely offer	0	1
no shock, script, no image violation, job satisfaction, no search and/or evaluation of alternatives, no likely offer	0	-

no shock, script, no image violation, no job satisfaction, search and/or evaluation of alternatives, likely offer	3	2	
no shock, script, no image violation, no job satisfaction, search and/or evaluation of alternatives, no likely offer	0	-	
no shock, script, no image violation, no job satisfaction, no search and/or evaluation of alternatives, likely offer	1	-	
no shock, script, no image violation, no job satisfaction, no search and/or evaluation of alternatives, no likely offer	0	-	
no shock, no script, image violation, job satisfaction, search and/or evaluation of alternatives, likely offer	2	1	
no shock, no script, image violation, job satisfaction, search and/or evaluation of alternatives, no likely offer	0	-	
no shock, no script, image violation, job satisfaction, no search and/or evaluation of alternatives, likely offer	1	-	
no shock, no script, image violation, job satisfaction, no search and/or evaluation of alternatives, no likely offer	0	-	
no shock, no script, image violation, no job satisfaction, search and/or evaluation of alternatives, likely offer	18	23	path 4b

no shock, no script, image violation, no job satisfaction, search and/or evaluation of alternatives, no likely offer	1	-	
no shock, no script, image violation, no job satisfaction, no search and/or evaluation of alternatives, likely offer	8	12	
no shock, no script, image violation, no job satisfaction, no search and/or evaluation of alternatives, no likely offer	0	1	path 4a
no shock, no script, no image violation, job satisfaction, search and/or evaluation of alternatives, likely offer	0	1	
no shock, no script, no image violation, job satisfaction, search and/or evaluation of alternatives, no likely offer	0	-	
no shock, no script, no image violation, job satisfaction, no search and/or evaluation of alternatives, likely offer	0	1	
no shock, no script, no image violation, job satisfaction, no search and/or evaluation of alternatives, no likely offer	0	-	
no shock, no script, no image violation, no job satisfaction, search and/or evaluation of alternatives, likely offer	2	2	
no shock, no script, no image violation, no job satisfaction, search and/or evaluation of alternatives, no likely offer	0	-	

no shock, no script, no image violation, no job satisfaction, no search and/or evaluation of alternatives, likely offer	1	-
no shock, no script, no image violation, no job satisfaction, no search and/or evaluation of alternatives, no likely offer	0	-

Table 5 – Matching of possible paths with responses to the survey

A Chi-squared analysis was performed on the data using Equation 3, where *e* is the number of actual observations for each route, *o* is the number of actual observations for each route, and *n* is the total number of observations:

$$\chi^2 = \sum_{i=1}^{n} \frac{(e_i - o_i)^2}{e_i}$$

Equation 3 – Chi-squared formula

For the data set, χ^2 = 187.40, which is greater than 91.99, the critical value for 63 degrees of freedom (*df* = *n*-1, interpolated linearly between 88.38 for *df* = 60 and 100.43 for *df* = 70, see Table 14 in Appendix C), and we can therefore be 99% certain (*P* = 0.01) that the deviation from the expected number of observations is *not* random.

Of the 123 eligible respondents, 33 (27%) could be described by the unfolding model. Given the 95% confidence interval, the lower and upper bounds (according to Equation 2) are 18% and 36%, respectively. We can therefore be 95% confident that the unfolding model does *not* describe the turnover of 50% of South African engineers, and we therefore cannot reject the null hypothesis (H_{10}).

5.3.2 Hypothesis 2

The percentage of the total respondents who matched the prescribed unfolding model paths (including their overall rankings) are shown in Table 6, with lower and upper bounds calculated according to Equation 2.

rank	*path*	*match*	*upper bound*	*lower bound*
2	path 4b	19%	24%	13%
6	path 3	7%	12%	1%
13	path 2	1%	6%	0% *(-4%, truncated)*
13	path 4a	1%	6%	0% *(-4%, truncated)*
28	path 1	0%	5%	0% *(-5%, truncated)*

Table 6 – Unfolding model path match as percentage of total respondents

Therefore, we can be 95% certain that path 4b accounts for at least 10% of respondents. We can therefore reject the null hypothesis, H_{2e0}, and confirm the alternate hypothesis, H_{2e}. Path 3 may account for 10% of respondents, since the upper bound is 12%, but we cannot be 95% confident. We therefore cannot reject the null hypothesis, H_{2c0}. None of the other paths' upper bounds are greater than or equal to 10%, and we therefore cannot (with 95% confidence) reject the null hypotheses, H_{2a0}, H_{2b0} and H_{2d0}.

5.3.3 Hypothesis 3

Of the 123 eligible respondents to the survey, 49 (40%) acknowledged that a single, jarring event played a role in the decision to quit. Of those, 20 (41%) acknowledged the event as being the main influence on their decision to quit, while 16 acknowledged the event as having an overwhelming influence on the decision to quit.

Thus, of those leavers who cited shocks, 73% (36 of 49) acknowledged that shock as the main influence or as having an overwhelming influence on the final decision to quit. The lower and upper 95% confidence bounds (according to Equation 2) of this result are 59% and 87%, respectively, and we can therefore reject the null hypothesis (H_{30}) and confirm that, when present, shocks play a significant role (at least 50% prevalence) in the decision to quit (H_3).

5.3.4 Hypothesis 4

The correlation of the work-relatedness of shocks with the negativity of the shock is shown in Table 7.

response to the question: "To what extent was the event (shock) a positive or negative experience?"	response to the question: "Did the event (shock) involve personal or work issues?" exclusively personal	more personal than work-related	as much personal as work-related	more work-related than personal	exclusively work-related	
very negative	3	2	7	2	5	**19**
somewhat negative	2	2	1	5	1	**11**
neither positive nor negative	4	0	3	0	1	**8**
somewhat positive	0	1	1	1	0	**3**
very positive	1	0	5	1	1	**8**
	10	**5**	**17**	**9**	**8**	**49**

Table 7 – Work-relatedness of shocks vs negativity of shocks

Given the distribution to the answers to each question, there exists and expected distribution of responses for each cell in the five by five matrix shown in Table 7. Dividing the actual number of responses per cell by the expected number of responses yields a matrix indicating the cell that have a disproportionate response rate. The result is shown in Table 8, where the number is the actual number of responses corresponding to a particular combination of answers to the questions regarding work-relatedness and negativity of shocks, divided by the expected number. Ratios greater than 2 (indicating more than double the expected response rate) are highlighted in green, whereas ratios less than 0.5 (indicating less than half the expected response rate) are highlighted in red.

The χ^2 for this array of responses (as calculated from Equation 3) is 21.48, which is less than the critical value of 36.35 for 95% confidence (according to Table 14 for *df* = 24, interpolated linearly between 31.41 for *df* = 20 and 43.77 for *df* = 30,) and we therefore cannot be 95% certain that the deviations are not random.

response to the question: "To what extent was the event (shock) a positive or negative experience?"	exclusively personal	more personal than work-related	as much personal as work-related	more work-related than personal	exclusively work-related	
	response to the question: "Did the event (shock) involve personal or work issues?"					
very negative	0.8	1.0	1.1	0.6	1.6	**19**
somewhat negative	0.9	1.8	0.3	2.5	0.6	**11**
neither positive nor negative	2.5	0.0	1.1	0.0	0.8	**8**
somewhat positive	0.0	3.3	1.0	1.8	0.0	**3**
very positive	0.6	0.0	1.8	0.7	0.8	**8**
	10	**5**	**17**	**9**	**8**	**49**

Table 8 – Disproportionate response correlations for work-relatedness of shocks and negativity of shocks

Since tied ranks exist (i.e. several responses are identical) the Spearman's rank correlation coefficient, ρ, is given by Equation 4:

$$\rho = \frac{n(\sum x_i y_i) - (\sum x_i)(\sum y_i)}{\sqrt{n(\sum x_i^2) - (\sum x_i)^2}\sqrt{n(\sum y_i^2) - (\sum y_i)^2}}$$

Equation 4 – Spearman's rank correlation coefficient

Where n is the number of values in the data set (49), x_i is the rank (adjusted for ties) of the answers to the question, "*Did the event (shock) involve personal or work issues?*" and y_i is the rank (adjusted for ties) of the answers to the question, "*To what extent was the event (shock) a positive or negative experience?*" The values of x_i and y_i are given in Table 9 and Table 10, respectively.

"Did the event (shock) involve personal or work issues?"

Response	*count*	x_i
exclusively personal	10	5.5
more personal than work-related	5	13
as much personal as work-related	17	24
more work-related than personal	9	37
exclusively work-related	8	45.5

Table 9 – Rankings of responses to the question, "Did the event (shock) involve personal or work issues?"

"To what extent was the event (shock) a positive or negative experience?"

response	*count*	y_i
very negative	19	10
somewhat negative	11	25
neither positive nor negative	8	34.5
somewhat positive	3	40
very positive	8	45.5

Table 10 – Rankings of responses to the question, "To what extent was the event (shock) a positive or negative experience?"

For this relationship, the Spearman's rank correlation coefficient (ρ) was -0.108, indicating there is a very weak negative relationship (i.e. as shocks become more work-related they become more negative) between the work-relatedness of a shock and the

negativity of that shock. Given a sample space of 49 respondents who experienced shock, there are 47 (n-2) degrees of freedom. For a 90% confidence level, the critical coefficient value is ±0.238 (interpolated linearly between 0.243 for 45 degrees of freedom, and 0.231 for 50 degrees of freedom.) Although this is directionally aligned with H_4, the relationship is too weak, and we therefore cannot reject the null hypothesis, H_{40}.

5.3.5 Hypothesis 5

The correlation of the work-relatedness of shocks with the negativity of the shock is shown in Table 11.

response to the question: "There are things that the company could have done that might have caused you to stay"	*response to the question: "Did the event (shock) involve personal or work issues?"*					
	exclusively personal	*more personal than work-related*	*as much personal as work-related*	*more work-related than personal*	*exclusively work-related*	
strongly disagree	1	2	2	3	4	**12**
somewhat disagree	3	2	5	1	0	**11**
neither agree nor disagree	1	0	2	0	0	**3**
somewhat agree	4	0	3	3	2	**12**
strongly agree	1	1	5	2	2	**11**
	10	**5**	**17**	**9**	**8**	**49**

Table 11 – Work-relatedness of shocks vs degree to which resultant decisions to quit were avoidable

As with Table 7, there exists an expected distribution of responses for each cell in the five by five matrix shown in Table 11. Dividing the actual number of responses per cell by the expected number of responses yields a matrix indicating the cell that have a disproportionate response rate. The result is shown in Table 12, where the number is the actual number of responses corresponding to a particular combination of answers to the questions regarding work-relatedness and negativity of shocks, divided by the expected number. Ratios greater than 2 (indicating more than double the expected response rate) are highlighted in green, whereas ratios less than 0.5 (indicating less than half the

expected response rate) are highlighted in red. The χ^2 for this array of responses (as calculated from Equation 3) is 14.90, which is less than the critical value of 36.35 for 95% confidence (according to Table 14 for df = 24, interpolated linearly between 31.41 for df = 20 and 43.77 for df = 30,) and we therefore cannot be 95% certain that the deviations are not random.

response to the question: "There are things that the company could have done that might have caused you to stay"	response to the question: "Did the event (shock) involve personal or work issues?" exclusively personal	more personal than work-related	as much personal as work-related	more work-related than personal	exclusively work-related	
strongly disagree	0.4	1.6	0.5	1.4	2.0	**12**
somewhat disagree	1.3	1.8	1.3	0.5	0.0	**11**
neither agree nor disagree	1.6	0.0	1.9	0.0	0.0	**3**
somewhat agree	1.6	0.0	0.7	1.4	1.0	**12**
strongly agree	0.4	0.9	1.3	1.0	1.1	**11**
	10	**5**	**17**	**9**	**8**	**49**

Table 12 – Disproportionate response correlations for work-relatedness of shocks and avoidability of resultant quits

Since tied ranks exist (i.e. several responses are identical) the Spearman's rank correlation coefficient, ρ, is given by Equation 4, where n is again the number of values in the data set (49), x_i is the rank (adjusted for ties) of the answers to the question, "*Did the event (shock) involve personal or work issues?*" and y_i is the rank (adjusted for ties) of the responses to the statement, "*There are things that the company could have done that might have caused you to stay*" The values of x_i and y_i are given in Table 9 and Table 13, respectively.

"There are things that the company could have done that might have caused you to stay"

response	*count*	y_i
strongly disagree	12	6.5
somewhat disagree	11	18
neither agree nor disagree	3	25
somewhat agree	12	32.5
strongly agree	11	44

Table 13 – Rankings of responses to the statement, "There are things that the company could have done that might have caused you to stay"

For this relationship, the Spearman's rank correlation coefficient (ρ) was -0.033, indicating there is an extremely weak negative relationship (i.e. as shocks become more work-related they become more avoidable, or conversely, as shocks become more personal they become more unavoidable) between the work-relatedness of a shock and the negativity of that shock. Again, given a sample space of 49 respondents who experienced shock, there are 47 (n-2) degrees of freedom, and for a 90% confidence level, the critical coefficient value is ±0.238. Once again, although the relationship is directionally aligned with H_5, the relationship is too weak, and we therefore cannot reject the null hypothesis, H_{50}.

6 Discussion of results

As expected, the snowball method produced a response distribution that is skewed toward youth, with 92 respondents (75% of the total) younger than 35 years of age. However, since new engineers are not likely to join the profession later in life, and since it is more likely that engineers would leave the profession, either altogether or to take up a role in management, the distribution may actually be a useful reflection of the pool of South African engineers.

There is also a strong bias towards the male engineering population, who outnumber females by almost three to one. Determining whether this is representative of the South African engineering profession, or indeed the voluntary turnover tendencies of South African engineers, is outside the scope of this survey. However, it should be noted that no sampling effects were in place that might artificially generate such a bias, and it is therefore assumed that the sample is representative, at least in terms of gender.

The distribution is in line with the age distribution of respondents, with most of the respondents being young, therefore in the early stages in their careers, and having not worked long at a firm. It should be noted that if the tenure distribution is representative of all South African engineers, then over a career of, say, forty years, the average South African engineer can be expected to change jobs approximately eleven times! Certainly this implies that the voluntary turnover of South African engineers is highly prevalent, and a matter of some importance to firms.

6.1 The unfolding model fails to classify voluntary turnover

The unfolding model of employee turnover proved unsuccessful in classifying the voluntary turnover of South African engineers who participated in this study. The only path that achieved some success in classifying the turnover of this group was path 4b, which, as mentioned above, accounted for more respondents that the rest of the paths combined. The success, or lack thereof, of each path in describing the turnover of the segment is discussed below.

6.1.1 Decision path 1 – script-driven decision

According to the model, leavers who experience a shock and engage a script can only be classified by path 1. Along this path, they quit without searching for a new job, and without evaluating alternatives. Of the 33 respondents who experienced a shock and engaged a script, which account for 27% of the total number of respondents, zero were classified by path 1. The decision of those respondents to search for a new job, evaluate alternatives, and/or wait for a likely job offer before leaving their place of employment resulted in a 100% attrition rate.

Of the 33 potential matches, 21 (64%) respondents searched for a new job or evaluated alternatives before quitting, 30 (91%) waited for a firm offer before quitting, and 18 (55%) did both.

It would seem that although the decision to quit may be "almost automatically enacted" with "very little mental deliberation," the decision of *when* to quit may be governed by factors that are not accommodated by the model. Such factors may be of a macroeconomic nature; for instance, South Africa's relatively high unemployment rate may lead a South African engineer to believe that it is necessary to have a new job confirmed before tendering his or her resignation at the current firm.

Path 1 is often associated with the secondary labour market, in which the employee is unlikely to be the primary earner within his or her household. The consequences of unemployment would be greater for the primary earner, and as such, he or she may be less likely to quit immediately and directly as a result of a particular event.

Whatever the reason for the employee conducting a search, evaluating alternatives, and/or confirming a new job before leaving an old one, there appears to be a shortcoming in the unfolding model in that it does not accommodate these options. It may be prudent to suggest a new path, a "tempered" or "moderated" version of path 1, or at the very least allow for two "flavours" of path 1:

- Path 1a – script-driven decision (traditional)
- Path 1b – script-driven decision (tempered)

It is suggested that the key differentiating variable of the tempered script-driven decision may be the confirmation of a new job before leaving the old job, since this

seems to be the most common characteristic of the shock-initiated, script-engaging set that path 1 attempts to describe. The classification of this path would therefore be that represented in Figure 3:

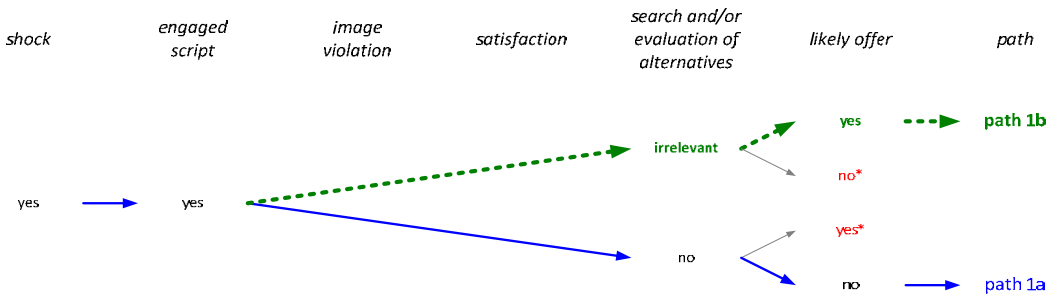

Figure 3 – Path 1b – script-driven decision (tempered)

Path 1b is therefore initiated by a shock, which invokes a memory probe, resulting in a match, where the decision to quit is appropriate. Image violation and job satisfaction are not determinants of the decision to quit in a script-driven scenario. The search for a new job and the evaluation of alternatives is irrelevant, but the leaver does not terminate his or her employment with the firm until a new position is confirmed, or at least likely. If such a path was applied to the survey of South African engineers, it would account for 30 (24%) of the total number of eligible respondents.

6.1.2 Decision path 2 – push decision

According to the unfolding model, leavers who experience a shock that causes a memory probe which does not result in a match can be classified by either path 2 or path 3. Both paths are characterised by image violation, where the leaver compares his or her values, goals and strategies with those associated with the current position and determines that those values, goals and strategies are best served by quitting. Those leavers who match path 2 essentially follow the same decision process as those who follow path 1, with the exception that the decision to quit results from a consideration of more future or present-oriented criteria (i.e. values, goals and strategies) rather than a past experience. Job satisfaction is irrelevant to path 2, and no job search is performed, no alternatives are evaluated, and the leaver quits before an offer of alternative employment is confirmed or likely.

Of the 16 respondents whose decision to quit was initiated by a shock that did not yield a match, 15 (94%) experienced an image violation. Of those 15, only 1 (7%) was

classified by path 2. Of the 15 potential matches, 14 (93%) waited for a firm or likely offer of alternative employment before leaving, and 9 (60%), all of whom waited for a likely offer, searched for a job or evaluated alternatives.

Again, there appears to be a shortcoming in the unfolding model in that it does not accommodate those who make a decision to quit based on image violation, but do not actually leave the firm until an alternative offer has been confirmed. The suggestion is therefore to include a new path (or flavour of path 2, as with path 1b) where the act of quitting is tempered by consideration of the impact of the act of quitting. The key factor differentiating this alternate path from the original would be the availability of alternate employment. We would therefore have two flavours of path 2, namely:

- Path 2a – push decision (traditional)
- Path 2b′ – push decision (tempered preliminary)

The classification of this path is as shown in Figure 4:

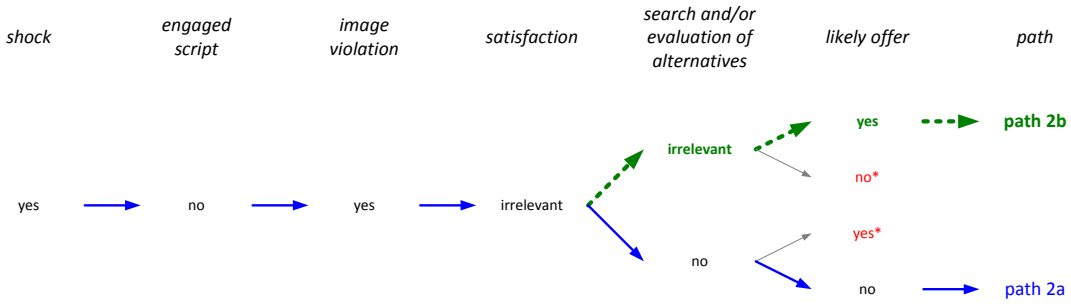

Figure 4 – Path 2b′ – push decision (tempered – preliminary)

Path 2b′ is initiated by a shock, which triggers a memory probe, but does not result in a match. Additional mental deliberations are initiated in which images are used to evaluate the individual's attachment to his or her organisation. The search for a new job and the evaluation of alternatives is irrelevant, but the leaver does not terminate his or her employment with the firm until a new position is confirmed, or at least likely. If such a path was applied to the survey of South African engineers, it would account for 14 (11%) of the total number of eligible respondents.

6.1.3 Decision path 3 – pull decision

Leavers who experience a shock that does not result in a match may experience an image violation that results in further cognitive processes. At least one specific job alternative may be considered against the current job, and alternatives are eliminated based on their fit with the individual's values, and the surviving options evaluated according to their utility. The unfolding model specifies that the individual experiences dissatisfaction with the current job, whether as a result of the image violation, or as a result of comparison with alternatives.

Of the 13 respondents who experienced a shock, did not engage a script, but did experience an image violation and were dissatisfied with their current jobs, 8 (62%) were classified by path 3. Of the 5 respondents who experienced shock, did not engage a script, experienced image violation and were dissatisfied with their jobs, 1 (8%) neither searched for a job, evaluated alternatives or waited for a firm offer (a subset of path 2), while 4 (31%) did not search for a job or evaluate alternatives, but did wait for a firm offer (a subset of path 2b′).

It is therefore suggested that, in order to accommodate the unique route described by path 3, that path 2b′ be modified to exclude those who evaluate alternatives (but not necessarily those who search for alternatives) such that there is no overlap with path 3. The resultant paths are shown in Figure 5.

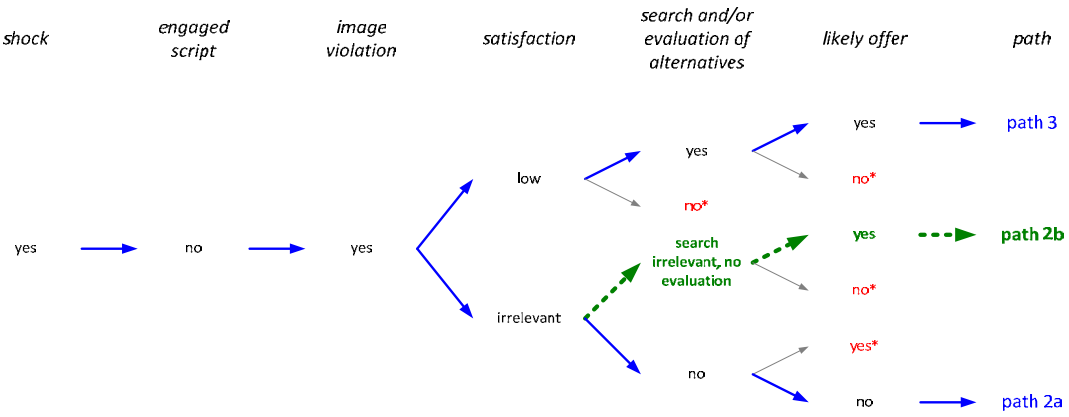

Figure 5 – Path 2b – push decision (tempered), with paths 2a and 3

Therefore, if an employee experiences a shock, which results in a memory probe that is unsuccessful, but leads to an image violation, and that employee leaves without search for or evaluating alternatives, or waiting for an alternative, then that employee is

classified by path 2a. If that employee does not evaluate alternatives, but does wait for a likely offer, then that employee is classified by path 2b. And if that employee does evaluate alternatives *and* waits for a firm offer, then he or she is classified by path 3. Had these options been available, 8 respondents (7% of the total) would have been classified by path 3, 1 respondent (1% of the total) would have been classified by path 2a, and 5 respondents (4% of the total) would have been classified by path 2b.

Path 2b therefore does not represent a significant addition to the scope of the unfolding model in and of itself, but when compared with the relative failure of some of the other paths (notably paths 1, 2 and 4a which together account for only 2 respondents) there is perhaps a case for its consideration in future trials.

6.1.4 Decision path 4 – affect initiated

According to the model, those leavers who do not experience shock leave as a result of continuous re-evaluation of their jobs, which ultimately results in the development of a misalignment between the individual and the job, and eventually job dissatisfaction. Those who leave as a direct result of this dissatisfaction, without a search for alternatives or a firm offer of alternative employment, are classified by path 4a. Those who leave via the traditional method of first conducting a search for alternative employment and/or evaluating those alternatives, and then waiting for a firm offer before leaving, are classified by path 4b.

6.1.4.1 Decision path 4a – affect initiated (searchless)

Of the 36 respondents who did not experience shock, did not engage a script, experienced image violation and were not satisfied with their jobs, 13 (36%) did not search for alternatives. Of those 13, only 1 (8%) did not wait for a firm offer of alternative employment. This constitutes 0.8% of the total number of eligible respondents.

The fact that 12 out of 13 respondents who did not search for and/or evaluate alternatives are not classified by the model may be related to the relatively high unemployment rate in South Africa (as seen in paths 1 and 2), and despite not actively searching for a new job, it might be that they should be classified by path 4b, or at least a more relaxed definition of path 4b where the search for alternative employment is unnecessary since a firm offer is already in play.

6.1.4.2 Decision path 4b – affect initiated (traditional)

Of the 36 respondents who did not experience shock, did not engage a script, experienced image violation and were not satisfied with their jobs, 23 (64%) both searched for and/or evaluated alternatives, and waited for a firm offer before leaving the organisation. This constitutes approximately 19% of the total number of eligible respondents. Path 4b was the path most effective at describing the turnover of South African engineers in this survey.

6.1.5 Path 5 – non shock-initiated script driven

Of the 74 respondents who did not experience a shock, 33 (45%) were not classified by the model as they admitted to having a script, or a prepared response to a particular event or set of circumstances. This is a significant portion of the survey sample (27%) of the total number of eligible respondents, and the model does not make allowance for them.

Applying a similar logic to that used in paths 1a and 1b, but obviously without the shock element, we can create paths 5a and 5b, which are analogous to paths 1a and 1b, respectively. These paths are shown in Figure 6:

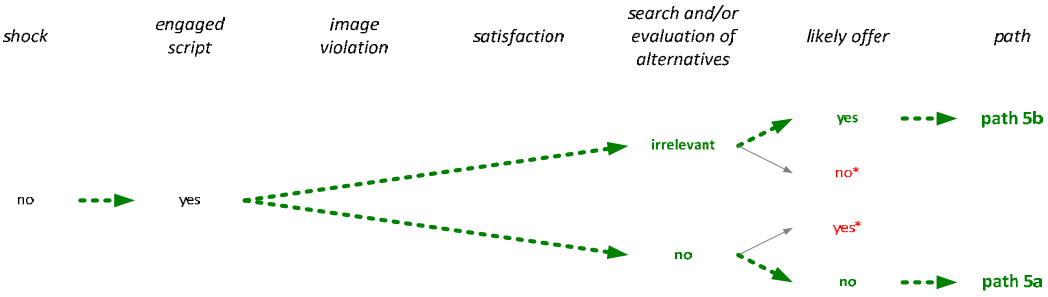

Figure 6 – Paths 5a and 5b – non shock-initiated script driven decisions (traditional and tempered, respectively)

6.1.5.1 Path 5a – non shock-initiated script driven (traditional)

Path 5a describes those leavers who do not experience a shock, but engage a script and leave without searching for and/or evaluating alternatives or waiting for a likely offer. Of the 33 respondents who did not experience shock, but did engage a script, 1 (3%) is classified by this path.

6.1.5.2 Path 5b – non shock-initiated script driven (tempered)

Path 5b describes those leavers who do not experience a shock, but engage a script and leave only once they have received a likely offer. Of the 33 respondents who did not experience shock, but did engage a script, 32 (97%) are classified by this path. This accounts for more survey participants (26%) than any other considered path.

6.1.6 The modified unfolding model

The unfolding model, with all the new paths suggested above, is given in Figure 7.

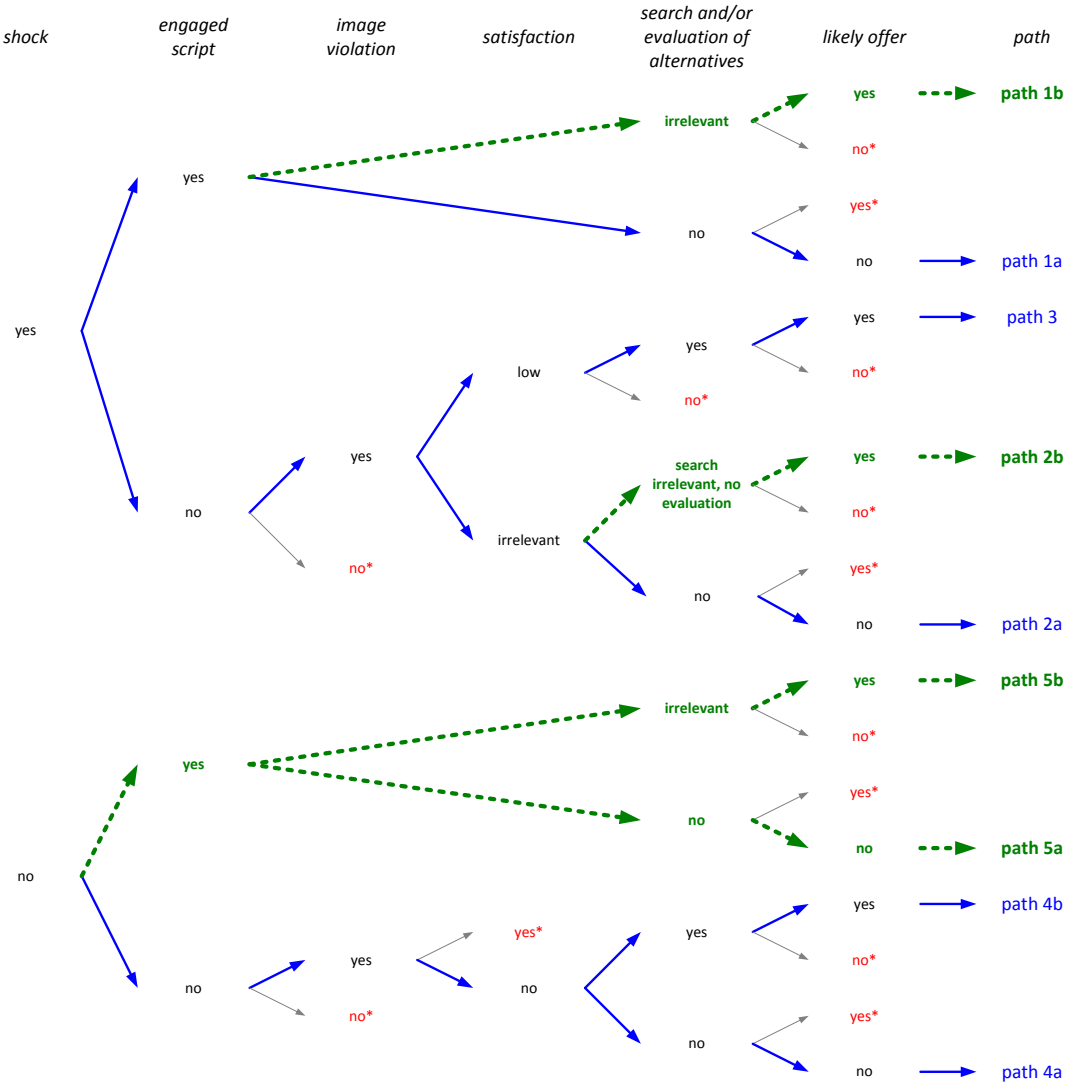

Figure 7 – The expanded unfolding model, updated with paths proposed by this research

It should be noted that Figure 7 represents the result of empirical observations from the responses of South African engineers in this survey. As stated earlier, the results of

unreplicated studies should be used with caution. It is therefore suggested that the above model, which we shall call the *expanded* unfolding model, be subjected to testing on a variety of sectors of the employed population, in different countries, with different unemployment rates, different cultures, and different economic structures. As with the original unfolding model, only when the results have been replicated, and empirical evidence found to support the use of the proposed paths, should the theory be considered to provide useful insight into the problem of understanding voluntary turnover.

6.1.7 Critical evaluation of the unfolding model

The results obtained highlight problems with the model, but these problems may also be rooted in the questionnaire.

6.1.7.1 The model assumes some leavers do not wait for an offer

The model failed to adequately describe the voluntary turnover of South African engineers. One of the primary areas of attrition in the model was the voluntary leavers' decisions to wait for a firm offer before leaving the current job. Within the model, only paths 3 and 4b account for leavers who wait for a firm offer before leaving their employer, and it was these paths that accounted for the vast majority of model matches. Paths 1, 2 and 4a presume that if the leaver has either engaged a shock-induced script (path 1,) experienced a shock-initiated image violation (path 2) or a non-shock-initiated image violation, then the leaver will immediately tender his or her resignation without searching for a new job, evaluation the alternatives to the current job, or waiting for a firm offer of employment at a new firm.

However, if the leaver considers the impact of a decision to leave an organisation, the most obvious being the cessation of income, and that impact is considered to be worse than remaining in the job, then it is not unreasonable to expect the employee to remain in that position. The causes of that decision to quit may result in other effects, including disengagement and decreased performance, but the physical act of quitting might not take place. The expanded unfolding model (Figure 7) therefore proposes several new paths, two of which (paths 1b and 2b) account for the type of leaver described above. The testing of this updated version of the model is a suggestion for future research.

6.1.7.2 The model does not allow for script without shock

The model also does not allow for the engagement of a script in the absence of a shock. Certainly one of the primary triggers of scripted behaviour would be a jarring event, but if a script exists as a result of the observed actions of others, and the result of those actions is perceived to be desirable (or undesirable, as the case may be, but nevertheless appropriate to the circumstances of the potential leaver), then that script may be engaged without the existence of a shock.

For example, if an employee's co-worker reached the conclusion that his or her strategic goals would not be achieved by staying at the firm (image violation,) subsequently leaves and is successful in his or her new position or career choice, then a script is created inside the mind of the employee. If that employee later experiences an image violation, then he or she may engage that script and leave the organisation. Paths 5a and 5b were incorporated into the expanded model (Figure 7) to accommodate this eventuality.

6.1.7.3 Questionnaire does not account for degrees of dissatisfaction

The study was conducted as a replication of previous efforts, and as such made use of the questionnaire that was used in those studies. The questionnaire itself, or rather the interpretation of the questionnaire, may be the source of some error when classifying respondents.

For instance, the model reduces the responses gathered, often in Likert scale format, to a set of binary inputs that determine, when combined, the paths that categorise the leavers. The section of the questionnaire dealing with job satisfaction consists of thirteen questions, and a negative response to any one of the thirteen questions immediately classifies the respondent as unsatisfied with the job he or she left. As an extreme example, a respondent may respond that he or she is "*very satisfied*" with twelve of the thirteen elements, but may be "*somewhat dissatisfied*" with one, and according to the interpretation of the questionnaire be classified as being dissatisfied with the job. No attempt is made to weight the influence or importance of each aspect of the job, and the assumption is implicitly made that if an employee is dissatisfied with a particular element of his or her job, for example the supervisor, remuneration,

recreational activities or time flexibility, he or she is by default dissatisfied with the job as a whole.

A potential solution would be to include a set of questions intended to establish the importance of each of the thirteen potential causes of dissatisfaction, and apply them to the responses to determine a "weighted satisfaction." This would add complexity to the questionnaire, and the model, but may lead to better understanding of the drivers of job dissatisfaction.

6.2 Shocks have some influence on the decision to quit

Shocks were involved in 40% of quits, which represents a significant portion of the respondent population. 73% of those respondents who acknowledged the involvement of a shock in the decision to quit acknowledged that the shock was either the main influence or had an overwhelming influence in that decision. Therefore the understanding of shocks is a critical element in the quest to understand voluntary turnover.

6.2.1 Work-relatedness and negativity are not related

The relationship between the work-relatedness of shocks and the negativity of shocks was very weak, indicating that both positive and negative shocks occur both inside and outside the influence of the organisation. However, Table 8 indicates that there are a disproportionately high number of respondents who had positive personal shocks, and similarly, negative work-related shocks. Since the distribution does not satisfy the χ^2 test, we cannot comment with a great degree of certainty, but there does appear to be evidence, however tentative, that there are negative work-related shocks and positive personal shocks.

One area that is not considered by the questionnaire is the realm of macroeconomic factors. In a nation with a high unemployment rate, citizens may seek employment in other countries, and this may play a large role in voluntary turnover. Of course, the fact that the turnover is voluntary implies that the employee chooses to leave a job he or she already has, but the desire may also be to find greater job security, with the knowledge that, if a time comes when the company chooses to downsize or retrench its employees, there is a better chance of finding new employment. There is also the possibility that

South Africa's political legacy and the actions intended to correct injustices of the past may cause some citizens to emigrate, and therefore leave their jobs.

6.2.2 Shocks can occur in any part of life

17 of the 49 shocks (35%) were at least more work-related than personal, and 15 of the 49 (31%) were at least more personal than work-related. The remaining 17 (35%) were as much personal as work-related. Approximately as many shocks were work-related as personal, indicating that an organisation does not necessarily have control over the factors that contribute to voluntary turnover among South African engineers.

6.2.3 Shocks tend to be negative

30 of the 49 shocks (61%) were at least somewhat negative, while only 11 (22%) were positive and 8 (16%) were neither positive nor negative. It appears therefore that the majority of shocks affecting the turnover of South African engineers are negative.

6.2.4 The organisation can influence personal issues

The relationship between the work-relatedness of shocks and the degree to which the resultant decisions to quit were avoidable was found to be very weak. This might indicate that organisations are not in control of the leaver's decision to quit, even when the trigger is work-related. However, as indicated in Chart 8, 23 (47%) of those eligible respondents who experienced shock agreed to some extent that there was something the organisation could have done to prevent the individual from leaving. This is more than the number of work-related shocks, and an indication that even events that occur outside the control of the organisation can be, at least to some extent, mitigated by the organisation. Therefore, organisations may have a greater influence over the voluntary turnover of South African engineers than they may realise.

One might also surmise that perhaps South African engineers want their company to play a larger role in their personal lives. This may be particularly relevant to those companies whose operations (where engineers tend to work) are based in relatively small towns and cities that are dominated by engineering firms. Due to South Africa's early developmental history, which was driven almost exclusively by mining operations, several such towns exist and account for the employment of many engineers. In such a town, an engineering firm may exert a massive influence on the

lives of the inhabitants, and if engineers perceive the company as having a positive influence on lifestyle factors in the town, the engineer may be more likely to stay with the firm in order to remain in the town. The effect this has on retention and turnover is beyond the scope of this study, but would make for a valuable topic of future research.

However, according to Table 12, and despite the distribution of responses failing the χ^2 test, we can tentatively say that there are a disproportionate number of South African engineers who claim that, although the nature of their particular shock was exclusively work-related, there was definitely nothing the company could have done to change their decision to leave.

This can be due to two reasons. The first is that the root of the shock was at or near the core of the company's identity, and that the employee reached the conclusion that there was no chance for reconciliation in the work relationship. If this is the case, then the interests of both the company and the employee are most likely best served by the employee moving on to a different employer, where there is better alignment between the two parties.

The second is more unsettling. If there *is* something that the company can do to prevent the employee from leaving, and in the process reconcile the employer-employee relationship, but the employee believes, due to his or her understanding of the company, perhaps from previous experiences, that the company lacks either the competence or the willingness to take the appropriate action, then the company may be losing employees unnecessarily. In fact the employee may be so disillusioned with the organisation that he or she does not mention the root of the problem or the potentially corrective action at any stage, even during an exit interview, thinking that it would make no difference. If this is the case, the company may continue with whatever actions, structures and policies that lead to the shock which in turn lead to the employee's resignation, completely oblivious to the true nature of, and possible mitigating actions for, the voluntary turnover of its employees.

If this is the case, and even if it is not, employers should ensure that the true reasons employees leave are documented and understood, whether or not they form part of an academic turnover model. If this is to be achieved, open and honest communication needs to be facilitated between the firm and its employees, whether this is achieved through works discussions with existing employees, during exit interviews, during

interviews conducted months or years after the employee has departed the company, or through surveys (anonymous or otherwise) conducted on current employees. The firm that is able to measure, and thereby control voluntary turnover has a significant advantage over those that do not.

6.3 The future of the relationship

An understanding of employee turnover is worthless unless actions can be taken to address it. Although no specific actions are suggested for addressing the turnover of any particular subset of South African engineers who voluntarily leave organisations, e.g. path-specific recommendations, and while it is strongly recommended that any breakthrough or model match regarding voluntary turnover be paired with an appropriate recourse for a firm's human resource function to pursue, there are some useful insights that can be gleaned from the results of this research.

6.3.1 Many would return…

59% of respondents said they would consider working for the organisation in the future. This implies that the relationship between the employer has not been permanently damaged, or that the employee left for reasons that he or she perceived to be either not applicable to the organisation as a whole (for example, an unfair supervisor) or *despite* being satisfied with the company, or for a multitude of other possible reasons, including personal circumstances.

No matter the underlying reason, the result does suggest that organisations should remain in contact with former employees. These former employees are not only familiar with the organisational culture, but having experienced a work environment outside the paradigm of that organisation, may be a source of new ideas that could provide the organisation with a competitive advantage. This may be an excellent, yet until now untapped source of diversity.

6.3.2 …but many would not

However, 41% of respondents stated that they would never consider working for that organisation again. This implies that permanent, irreconcilable damage has been done to the relationship between the employee and the employer. If one considers that the employees most likely to leave voluntarily are the best performing employees (due to

their desirability and resulting mobility), it seems that the organisation would be well-advised to ensure that employees part of good terms.

Certainly there is a desirable level of turnover in any organisation, but if 41% of the best employees are leaving organisations under such circumstances that they would never return, then perhaps the organisations themselves need to consider their policies and practices, and make the necessary changes to ensure that at least some part of this labour pool is not permanently inaccessible. That being said, organisations should take care not to mistake what appears to be avoidable turnover with avoidable turnover, as illustrated in Figure 1.

It should also be considered that the questionnaire only allowed for a binary yes/no response to the question, "*Would you consider working for this company/firm again?*" There may be conditions in the organisation that, if changed, would have retained the employee, but that the employee believed that these conditions would never change. This is an area for further investigation.

6.4 What makes South African engineers tick?

From the breakdown of the causes of image violation (Table 2) and the areas where respondents were dissatisfied with their jobs (Table 3), it appears that South African engineers are motivated by the desire to achieve personal and professional goals. Approximately half cited personal goal achievement, career goal achievement, personal goal compatibility, personal goal progress, professional goal compatibility and/or career progress as cause of an image violation, with only approximately one third citing either professional and/or personal values or ethics compatibility as the cause. The leading cause of job dissatisfaction appears to be career opportunities, and the second leading cause is remuneration, which may be seen as a means to achieving personal goals. This implies that South African engineers are ambitious both personally and professionally, and companies may find this knowledge useful when attempting to retain and attract talent.

6.5 What can the company do?

Whatever the cause of voluntary turnover, its impact can only be addressed if a company has the will and ability to take action. The research seems to indicate that this is the case.

6.5.1 There is time to act

It would appear that almost all South African engineers do not leave their current jobs until they have a definite job with which to replace it. The reason for this may be multifaceted. The job market may so competitive (as a result of the high unemployment rate) that the risk of unemployment outweighs the desire to leave the organisation. There may be cultural issues that are specific to South Africa, or developing nations, that create a necessity in the mind of the employee for confirmed employment before changing jobs. Alternatively, the behaviour observed may be a characteristic of engineers, who may tend to be more rational as a group than those who pursue other career paths due to the nature of their work. The underlying cause may be a useful area for future research.

Whatever the reason, the time taken to search for a new job, apply, attend interviews and wait for a response from the potential new employer provide the firm with a window of opportunity to identify potential leavers, determine the nature of the cause for their considering leaving, and take action that might cause the employee to reverse the decision to leave.

6.5.2 Does the company know to act?

This research dealt exclusively with those employees who had already left an organisation, but it is not unreasonable to assume that similar research, using the same model, can be conducted on current employees. Of course, since the unfolding model was not successful at describing the turnover of South African engineers, it may not be the most reliable tool to apply to current employees. If a model that has been applied successfully in the United States and the United Kingdom proves unsuccessful in South Africa, it may even be an indication that models that apply to first world nations may not apply in the developing world. This is, of course, a tentative extrapolation at best, but certainly worth considering.

Nevertheless, if a model can be found that adequately describes the voluntary turnover of employees, and that model can be adapted to indicate where current employees lie relative to the decision to and act of quitting, then that model would prove a very useful tool for dealing with voluntary turnover. Not only would the company be able to predict who is considering leaving, and who is likely to leave, but the model may also give an indication of the time it has to take corrective action, if such action is possible. All that is then required is the action itself.

6.5.3 Can the company act?

As discussed above, companies have some influence over the voluntary turnover of their employees even when that turnover results from shocks that are not work-related. Companies may also be able to act when the employees have concluded that they cannot, but such actions may be associated with policies, procedures, structures and cultures that are deeply entrenched and difficult to alter.

In such cases, depending on the extent to which those conditions affect turnover, how widespread their effect is, and which employees they affect, the company may decide *not* to act as the consequences of the action may be worse than inaction. If that is the case, the company must accept the level of turnover as part of the way in which it does business.

If no action is to be taken to address the turnover directly, mitigation actions should be taken. For instance, hiring procedures could be streamlined to enable the organisation to pre-emptively search for replacement candidates and fill vacancies *before* the current employee leaves. This would result in an interesting shift in the balance of power, where the company which has until now been somewhat helpless an uninformed regarding the turnover intent of its employees, and thus almost exclusively *reactive* to voluntary turnover, will be able to *proactively* address voluntary turnover. This might enable the incumbent to train his or her successor, or even result in the incumbent reversing his or her decision to quit since the job security (which was very prevalent among South African engineers) on which that employee depends while searching for a new job will be considerably diminished.

For now, however, this remains in the realm of potential, but not probable scenarios.

7 Conclusions

Despite its relatively novel approach when compared with more established turnover models, whose success is known to be questionable, the unfolding model is an inadequate tool for categorising and understanding the voluntary turnover of South African engineers. Only one of the five possible paths was useful in categorise a moderate portion of the group, while the rest fell well short of any degree of utility. Many of the largest *potential* decision paths applicable to the turnover of this set were not included in the model. These paths have been added to an *expanded* version of the model, but this version of the model can only be considered a useful contribution to turnover theory once its validity has been successfully confirmed in replication studies.

One failing of the model is related to the search for alternatives to employment, the evaluation of alternatives to employment, and the decision to wait for a firm offer of alternate employment before leaving the current position. The model assumes that, given a sufficient triggering event of dissatisfaction with the current job, employees will leave without searching for, evaluating or confirming an alternative. The set of South African engineers who participated in this survey proved that assumption to be false.

In fact, South African engineers appear to behave logically and conservatively, and usually only leave a job once they have ensured there is a suitable alternative. Such alternatives preferably support ambitious career paths, and offer better pay to enable the achievement of personal ambitions. Organisations should be able to leverage this by offering clear career paths, as well as flexible remuneration packages that suit the ambitions of their employees.

An understanding of the degree of dissatisfaction of an employee might improve the model's ability to classify leavers. There are several aspects of a job with which an employee may be either satisfied or dissatisfied to one extent or another. Although we might be able to measure the level of satisfaction with each component, the overall level of satisfaction, which may or may not be a function of the satisfaction with each component, cannot easily be measured. Since job satisfaction is acknowledged extensively in literature as a significant factor in employee turnover, its importance within the constructs of the unfolding model should not be underestimated.

The model also failed to accommodate the possibility that some decisions to quit arise from a predetermined course of action that may be engaged without the presence of a particular triggering event. The assumption is that such a course of action, like the decision to leave an organisation, will only be enacted if a particular event takes place. A large portion of the respondent set indicated that this assumption might also be false.

However, single events do play a significant role in the voluntary turnover of South African engineers, and organisations should be wary of the impact of sudden events on their employees. The research indicates that such events not only influence between one third and one half of decisions to quit, but that when these events do occur, they play a significant role in at least half the cases. Such events may take place within the firm or in the employee's personal sphere, and whether they occur at work or at home, they tend to be negative. Any organisation that is considering embarking on, for instance, a change or transformation programme, or making a change to remuneration or promotion policies, should consider the impact it may have on its employees. Preferably, before such a change is made, the organisation should seek honest feedback from its employees regarding their opinions and feelings regarding the intended change.

Strangely though, regardless of the source of the event, the organisation often has some control over the employee's decision to quit, perhaps more so that might be expected, indicating that South African engineers may want the company to play a larger role in their personal lives. This may be particularly prevalent in relatively a small town which is dominated by a single firm, or whose economy is dependent on an industry that employs a significant number of engineers, for instance mining. Such firms may choose to embark on community projects that enhance the living standard of the town's inhabitants, reducing the desire to leave the town, and thereby the organisation.

Some employees have such bad relationships with their former employer that they would never return, but a good deal would. It is therefore advisable for employers to remain in contact their former employees, both to keep them informed of new job opportunities and to achieve greater insight, through surveys, into how they might improve their human resource policies. There is always the possibility that a company may insist that any employee who chooses to leave does so of his or her own accord, that the company has nothing to learn from former employees, and that the company is

greater than any individual. But such individuals, as a collective, are certainly an important component of how that company creates value, and therefore its right to exist.

There is evidence to suggest that South African engineers leave companies because they believe that the company is either unwilling or lacks the competence to take action to retain them. This implies that much of what the company perceives as unavoidable turnover is actually avoidable. There may also be sufficient time between the decision to quit and the actual act of quitting to enable firms to take the action necessary to avert some turnover decisions. All that is required is the willingness and ability of the firm to take the appropriate action.

Nevertheless, the grand theory of turnover remains elusive. Perhaps this is because such a theory does not exist. A theory that would describe the actions of all individuals would have to take into account each person's unique outlook, and would therefore have to account for almost 7 billion such outlooks. What is good for the goose may be totally unacceptable to another goose, never mind the gander. Such a model may be so comprehensive that becomes difficult, or even confusing to use. Utility should be the foundation of any model, and the primary measure of the utility of a turnover model is its ability to guide the actions of firms in their attempt to control the rate and impact of turnover.

Hamel and Prahalad (1989) lament that "it is not very comforting to think that the essence of Western strategic thought can be reduced to eight rules for excellence, seven S's, five competitive forces, four product life-cycle stages, three generic strategies, and innumerable two-by-two matrices." Alas, turnover does not share this predicament.

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Appendix A Questionnaire

The questionnaire is taken directly from the work of Lee *et al*., (1999) and Morrell *et al*. (2008). Some of the questions dealing with the personal characteristics of respondents have been modified for the purposes of this specific study.

A.1 Personal characteristics

question	*response type*	*interpretation*	*source*
1) Age [years]	Numerical		Lee *et al*., 1999
2) Gender	M/F		Lee *et al*., 1999
3) Nationality	Open	not South African = exclusion	
4) Do you have a valid South African identification document or passport?	Y/N	N = exclusion	

5) Do you have an engineering degree?	Y/N	N = exclusion	
a) From which institution did you graduate?	Open	not accredited = exclusion	
b) In which year did you graduate?	Numerical	not accredited in that year = exclusion	
6) Name of the company/firm you left	Open		
a) For how long did you work at this company/firm [months]?	Numerical		Lee *et al.*, 1999
b) Would you consider working for this company/firm again?	Y/N		

A.2 Volition

question	*response type*	*interpretation*	*source*
7) Did you leave voluntarily (this includes early retirement)?	Y/N	N = exclude	Morrell *et al.*, 2008
8) What was the primary reason for leaving your prior post?	Open	may lead to exclusion	Morrell *et al.*, 2008
a) Please describe any other important reasons	Open	may lead to exclusion	Morrell *et al.*, 2008

A.3 Shock

question	*response type*	*interpretation*	*source*
9) Was there a single, particular even that caused you to think about leaving?	Y/N	Y = shock	Lee *et al*., 1999
a) Please describe the event:	Open		Lee *et al*., 1999
b) To what extent was the event a positive or negative experience?	5-point Likert scale (very negative - very positive)		Morrell *et al*., 2008
c) Did the event involve personal or work issues?	5-point Likert scale (exclusively personal - exclusively work-related)		Morrell *et al*., 2008
d) How much did the event influence your final decision to leave?	5-point Likert scale (not at all - overwhelming influence)		Morrell *et al*., 2008

A.4 Script

question	*response type*	*interpretation*	*source*
10) I have left a job before essentially for the same reasons (i.e. very similar circumstances)	5-point Likert scale (strongly disagree - strongly agree)	4,5 = script	Lee *et al*., 1999
11) At the time I left my job, I had already determined that I would leave the firm IF a certain event were to occur (e.g. not receiving a promotion)	5-point Likert scale (strongly disagree - strongly agree)	4,5 = script	Lee *et al*., 1999
12) My decision to leave was influenced by a colleague (or colleagues) leaving	5-point Likert scale (strongly disagree - strongly agree)	4,5 = script	Morrell *et al*., 2008

A.5 Image violation

question	*response type*	*interpretation*	*source*
13) How compatible were your personal values/ethics with those of your former company?	5-point Likert scale (not compatible - compatible)	1,2 = image violation	Lee *et al*., 1999
14) How compatible were your professional values/ethics with those of your former company?	5-point Likert scale (not compatible - compatible)	1,2 = image violation	Lee *et al*., 1999
15) How compatible were your personal goals with those of your former company?	5-point Likert scale (not compatible - compatible)	1,2 = image violation	Lee *et al*., 1999
16) How compatible were your professional goals with those of your former company?	5-point Likert scale (not compatible - compatible)	1,2 = image violation	Lee *et al*., 1999
17) If I had stayed, I would have been able to achieve most of my career goals	5-point Likert scale (strongly disagree - strongly agree)	1,2 = image violation	Lee *et al*., 1999

18) If I had stayed, I would have been able to achieve most of my personal goals	5-point Likert scale (strongly disagree - strongly agree)	1,2 = image violation	Lee *et al*., 1999
19) At my former company, my career was progressing as I expected	5-point Likert scale (strongly disagree - strongly agree)	1,2 = image violation	Lee *et al*., 1999
20) At my former company, my personal goals were progressing as I expected	5-point Likert scale (strongly disagree - strongly agree)	1,2 = image violation	Lee *et al*., 1999

A.6 Job satisfaction

question	*response type*	*interpretation*	*source*
21) At your former company, how satisfied were you with the supervision you received?	5-point Likert scale (very dissatisfied - very satisfied)	1,2 = dissatisfaction	Lee *et al*., 1999
22) At your former company, how satisfied were you with the firm as an employer?	5-point Likert scale (very dissatisfied - very satisfied)	1,2 = dissatisfaction	Lee *et al*., 1999
23) At your former company, how satisfied were you with the career opportunities?	5-point Likert scale (very dissatisfied - very satisfied)	1,2 = dissatisfaction	Lee *et al*., 1999
24) At your former company, how satisfied were you with the financial rewards?	5-point Likert scale (very dissatisfied - very satisfied)	1,2 = dissatisfaction	Lee *et al*., 1999
25) At your former company, how satisfied were you with your coworkers?	5-point Likert scale (very dissatisfied - very satisfied)	1,2 = dissatisfaction	Lee *et al*., 1999

26) At your former company, how satisfied were you with the nature of the work?	5-point Likert scale (very dissatisfied - very satisfied)	1,2 = dissatisfaction	Lee *et al*., 1999
27) At your former company, how satisfied were you with recreational activities?	5-point Likert scale (very dissatisfied - very satisfied)	1,2 = dissatisfaction	Lee *et al*., 1999
28) At your former company, how satisfied were you with the fringe benefits (e.g. vacation, holiday time, insurance coverage, retirement plans, sick leave, family leave)?	5-point Likert scale (very dissatisfied - very satisfied)	1,2 = dissatisfaction	Lee *et al*., 1999
29) At your former company, how satisfied were you with the work environment related to generating new client business?	5-point Likert scale (very dissatisfied - very satisfied)	1,2 = dissatisfaction	Lee *et al*., 1999
30) At your former company, how satisfied were you with the work environment related to competitive pressures?	5-point Likert scale (very dissatisfied - very satisfied)	1,2 = dissatisfaction	Lee *et al*., 1999
31) At your former company, how satisfied were you with the work environment related to autonomy of the work?	5-point Likert scale (very dissatisfied - very satisfied)	1,2 = dissatisfaction	Lee *et al*., 1999

32) At your former company, how satisfied were you with the work environment related to pressures at work?	5-point Likert scale (very dissatisfied - very satisfied)	1,2 = dissatisfaction	Lee *et al*., 1999
33) At your former company, how satisfied were you with the work environment related to time flexibility?	5-point Likert scale (very dissatisfied - very satisfied)	1,2 = dissatisfaction	Lee *et al*., 1999

A.7 Job search

question	*response type*	*interpretation*	*source*
34) Before you left the company, how comprehensive was your search for another job?	5-point Likert scale (no search - very comprehensive search)	2,3,4,5 = search	Lee *et al*., 1999

A.8 Evaluation of alternatives

question	*response type*	*interpretation*	*source*
35) I weighed up a range of work and/or non-work alternatives before leaving	5-point Likert scale (strongly disagree - strongly agree)	4,5 = evaluation; 3 not counted; 1,2 = no evaluation	Morrell *et al.*, 2008
36) I left without evaluating any alternatives	5-point Likert scale (strongly disagree - strongly agree)	4,5 = no evaluation, supercedes previous answer	Morrell *et al.*, 2008

A.9 Job offers

question	*response type*	*interpretation*	*source*
37) I had at least one definite job offer before I finally left	5-point Likert scale (strongly disagree - strongly agree)	4,5 = job offer	Morrell *et al.*, 2008
38) I didn't leave until I had a definite job to go to	5-point Likert scale (strongly disagree - strongly agree)	4,5 = job offer	Morrell *et al.*, 2008
39) How many acceptable alternative jobs did your search produce before you left (i.e. how many could you have realistically accepted)?	Numerical	>0 = job offer	Lee *et al.*, 1999
40) How many total job offers did you have before you left?	Numerical	>0 = job offer	Lee *et al.*, 1999

A.10 Degree to which decisions to quit were avoidable

question	*response type*	*interpretation*	*source*
41) There are things that the company could have done that might have caused me to stay	5-point Likert scale (strongly disagree - strongly agree)	4,5 = avoidable	Morrell *et al.*, 2008
a) If so, what could have been done?	Open		Morrell *et al.*, 2008

A.11 Informed consent

question	*response type*	*interpretation*	*source*
42) Were all your responses to this questionnaire, to the best of your knowledge, honest, and do you consent to having your responses used as part of the research?	Y/N	N = disregard questionnaire	

Appendix B Consistency matrix

hypothesis	*literature review*	*data collection tool*	*analysis*
1) Does the unfolding model of employee turnover adequately describe the voluntary turnover of South African engineers?	Lee *et al*., 1999; Morrell *et al*., 2008	Questions 9-40 in questionnaire	Total number of matches with the model divided by total number of voluntary leavers
2) Are all paths utilised by the model useful in describing the turnover of South African engineers?	Lee *et al*., 1999; Lee *et al*., 2008; Morrell *et al*., 2008	Questions 9-40 in questionnaire	Total number of matches with each path divided by total number of voluntary leavers
3) What is the impact of shocks on the voluntary turnover of South African engineers?	Lee *et al*., 1999; Morrell *et al*., 2004a; Morrell *et al*., 2008; Symons and Johnson, 1997; Wheeler *et al*., 1997	Questions 9 and 9d in questionnaire	Number who cite a shock as being the "main influence" or having an "overwhelming influence" as a percentage of total number who cite the presence of shocks

4) Do work-related shocks that contribute to a decision to leave tend to be negative?	Blau and Boal, 1987; Cohen, 1999; DeCottis and Summers, 1987; Iverson, 1999; Jenkins, 1993; Kammeyer-Mueller *et al*., 2005; Lee, 1988; Lee and Maurer, 1999; Lee *et al*., 1999; Lum *et al*., 1998; Mitchell *et al*., 2001; Mobley *et al*., 1979; Morrell *et al*., 2004b; Morrell *et al*., 2008; Muchinsky and Tuttle, 1979; Price and Mueller, 1981; Porter *et al*., 1974; Rusbult and Farrell, 1983; Sheridan and Abelson, 1983; Spreitzer and Mishra, 2002; Trevor, 2001	Questions 9, 9b and 9c in questionnaire	Correlation between work-relatedness and negativity of shocks
5) Is voluntary turnover that results from work-related shocks avoidable?	Lee *et al*., 1999; Morrell *et al*., 2004b; Morrell *et al*., 2008	Questions 9, 9c, 41 and 41a in questionnaire	Correlation between work-relatedness of shocks and whether decisions to quit were avoidable

Appendix C Chi-squared distribution table

df	*P = 0.05*	*P = 0.01*
1	3.84	6.64
2	5.99	9.21
3	7.82	11.35
4	9.49	13.28
5	11.07	15.09
6	12.59	16.81
7	14.07	18.48
8	15.51	20.09
9	16.92	21.67
10	18.31	23.21
20	31.41	37.57
24	36.35	42.90
30	43.77	50.89
40	55.76	63.69
50	67.51	76.15
60	79.08	88.38
63	82.52	91.99
70	90.53	100.43
80	101.88	112.33
90	113.15	124.12
100	124.34	135.81

Table 14 – Chi-squared distribution table (mips.stanford.edu)

Appendix D Table of the standard normal (*z*) distribution

z	*0*	*0.01*	*0.02*	*0.03*	*0.04*	*0.05*	*0.06*	*0.07*	*0.08*	*0.09*
0.0	0	0.004	0.008	0.012	0.016	0.02	0.024	0.028	0.032	0.036
0.1	0.04	0.044	0.048	0.052	0.056	0.06	0.064	0.068	0.071	0.075
0.2	0.079	0.083	0.087	0.091	0.095	0.099	0.103	0.106	0.11	0.114
0.3	0.118	0.122	0.126	0.129	0.133	0.137	0.141	0.144	0.148	0.152
0.4	0.155	0.159	0.163	0.166	0.17	0.174	0.177	0.181	0.184	0.188
0.5	0.192	0.195	0.199	0.202	0.205	0.209	0.212	0.216	0.219	0.222
0.6	0.226	0.229	0.232	0.236	0.239	0.242	0.245	0.249	0.252	0.255
0.7	0.258	0.261	0.264	0.267	0.27	0.273	0.276	0.279	0.282	0.285
0.8	0.288	0.291	0.294	0.297	0.3	0.302	0.305	0.308	0.311	0.313
0.9	0.316	0.319	0.321	0.324	0.326	0.329	0.332	0.334	0.337	0.339
1.0	0.341	0.344	0.346	0.349	0.351	0.353	0.355	0.358	0.36	0.362
1.1	0.364	0.367	0.369	0.371	0.373	0.375	0.377	0.379	0.381	0.383
1.2	0.385	0.387	0.389	0.391	0.393	0.394	0.396	0.398	0.4	0.402
1.3	0.403	0.405	0.407	0.408	0.41	0.412	0.413	0.415	0.416	0.418
1.4	0.419	0.421	0.422	0.424	0.425	0.427	0.428	0.429	0.431	0.432
1.5	0.433	0.435	0.436	0.437	0.438	0.439	0.441	0.442	0.443	0.444
1.6	0.445	0.446	0.447	0.448	0.45	0.451	0.452	0.453	0.454	0.455
1.7	0.455	0.456	0.457	0.458	0.459	0.46	0.461	0.462	0.463	0.463
1.8	0.464	0.465	0.466	0.466	0.467	0.468	0.469	0.469	0.47	0.471
1.9	0.471	0.472	0.473	0.473	0.474	0.474	0.475	0.476	0.476	0.477
2.0	0.477	0.478	0.478	0.479	0.479	0.48	0.48	0.481	0.481	0.482
2.1	0.482	0.483	0.483	0.483	0.484	0.484	0.485	0.485	0.485	0.486
2.2	0.486	0.486	0.487	0.487	0.488	0.488	0.488	0.488	0.489	0.489
2.3	0.489	0.49	0.49	0.49	0.49	0.491	0.491	0.491	0.491	0.492
2.4	0.492	0.492	0.492	0.493	0.493	0.493	0.493	0.493	0.493	0.494
2.5	0.494	0.494	0.494	0.494	0.495	0.495	0.495	0.495	0.495	0.495
2.6	0.495	0.496	0.496	0.496	0.496	0.496	0.496	0.496	0.496	0.496
2.7	0.497	0.497	0.497	0.497	0.497	0.497	0.497	0.497	0.497	0.497
2.8	0.497	0.498	0.498	0.498	0.498	0.498	0.498	0.498	0.498	0.498
2.9	0.498	0.498	0.498	0.498	0.498	0.498	0.499	0.499	0.499	0.499
3.0	0.499	0.499	0.499	0.499	0.499	0.499	0.499	0.499	0.499	0.499
3.1	0.499	0.499	0.499	0.499	0.499	0.499	0.499	0.499	0.499	0.499
3.2	0.499	0.499	0.499	0.499	0.499	0.499	0.499	0.5	0.5	0.5
3.3	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
3.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

Table 15 – Table of the standard normal (z) distribution (www.isixsigma.com)

Appendix E Pearson product-moment correlation coefficient – critical values

	level of significance (p) for two-tailed test			
df = n-2	*0.1*	*0.05*	*0.02*	*0.01*
1	0.988	0.997	0.9995	0.9999
2	0.9	0.95	0.98	0.99
3	0.805	0.878	0.934	0.959
4	0.729	0.811	0.882	0.917
5	0.669	0.754	0.833	0.874
6	0.622	0.707	0.789	0.834
7	0.582	0.666	0.75	0.798
8	0.549	0.632	0.716	0.765
9	0.521	0.602	0.685	0.735
10	0.497	0.576	0.658	0.708
11	0.476	0.553	0.634	0.684
12	0.458	0.532	0.612	0.661
13	0.441	0.514	0.592	0.641
14	0.426	0.497	0.574	0.623
15	0.412	0.482	0.558	0.606
16	0.4	0.468	0.542	0.59
17	0.389	0.456	0.528	0.575
18	0.378	0.444	0.516	0.561
19	0.369	0.433	0.503	0.549
20	0.36	0.423	0.492	0.537
21	0.352	0.413	0.482	0.526
22	0.344	0.404	0.472	0.515
23	0.337	0.396	0.462	0.505
24	0.33	0.388	0.453	0.496
25	0.323	0.381	0.445	0.487
26	0.317	0.374	0.437	0.479
27	0.311	0.367	0.43	0.471
28	0.306	0.361	0.423	0.463
29	0.301	0.355	0.416	0.456
30	0.296	0.349	0.409	0.449
35	0.275	0.325	0.381	0.418
40	0.257	0.304	0.358	0.393
45	0.243	0.288	0.338	0.372
50	0.231	0.273	0.322	0.354
60	0.211	0.25	0.295	0.325
70	0.195	0.232	0.274	0.303
80	0.183	0.217	0.256	0.283
90	0.173	0.205	0.242	0.267
100	0.164	0.195	0.23	0.254

Table 16 – Critical values of the Pearson product-moment correlation coefficient (www.gifted.uconn.edu)