

THE RELATIONSHIP BETWEEN CAREER MATURITY, CAREER EXPECTATIONS AND PERCEPTIONS OF JOB AND ORGANISATIONAL KNOWLEDGE OF ENGINEERING BURSARS

H LE ROUX
J M SCHEPERS
B C LESSING

*Department of Human Resource Management
Rand Afrikaans University*

ABSTRACT

The principal aim of this study was to determine whether there is a statistically significant relationship between career maturity, and career expectations and perceptions of job and organisational knowledge of engineering bursars. The sample comprised 168 engineering bursars from a variety of South African universities. A questionnaire was developed to measure bursars' career expectations and perceptions of job and organisational knowledge. The sample was divided into homogeneous clusters on the basis of two dimensions – career expectations and perceptions of job and organisational knowledge. These clusters were compared in respect of career maturity. Statistically significant differences were found. A secondary aim of the study was to examine the impact of certain demographic variables on career maturity, career expectations and perceptions of job and organisational knowledge. The implications of the findings are discussed.

OPSOMMING

Die hoofdoel van die studie was om vas te stel of daar 'n statisties beduidende verband tussen loopbaanvolwassenheid, en loopbaanverwagtinge en persepsies van beroeps- en organisasiekennis van ingenieursbeurshouers is. Die steekproef het uit 168 ingenieursbeurshouers van 'n verskeidenheid Suid-Afrikaanse universiteite bestaan. 'n Vraelys om loopbaanverwagtinge en persepsies van beroeps- en organisasiekennis te meet, is ontwikkel. Die steekproef is in homogene groepe verdeel aan die hand van twee dimensies, te wete loopbaanverwagtinge en persepsies van beroeps- en organisasiekennis. Hierdie groepe is ten opsigte van loopbaanvolwassenheid vergelyk. Statisties beduidende verskille is gevind. 'n Newedoelstelling van die studie was om na die moontlike impak van sekere demografiese veranderlikes op loopbaanvolwassenheid, loopbaanverwagtinge en persepsies van beroeps- en organisasiekennis, te kyk. Die implikasies van die bevindinge is bespreek.

There is a dearth of high level technical human resources in South Africa. In order to create a sufficiently large pool of engineers for the future, large organisations spend millions of rand annually on sponsoring engineering students at universities and technikons only to find that many of these newly qualified engineers move immediately to other organisations who are prepared to buy them out of their contractual obligations, or they work for their sponsoring organisation for a short time, fulfilling their contractual obligations, and then leave. It is necessary for organisations to improve the retention of bursars upon graduation as in South Africa at present, lost engineering graduates and particularly lost Black engineering graduates cannot be replaced from the marketplace (Adams, 1995). The current scarcity of promising black matriculants with good maths and science matric symbols compounds the problem. Research by Mabey (1984), Mabey and Gardner (1994), and Mabey, Clark and Daniels (1996) indicates that the problem of retention of graduates is not unique to South Africa. While South African organisations may face unique pressures as regards the engineering skills shortage and employment equity issues, it appears that the low retention rate of graduates in their first job is a problem organisations face the world over.

Against this backdrop, the motivation for this study is to examine engineering bursars' attitudes and perceptions as they stand on the brink of careers in engineering. More particularly, the primary objective of this study is to determine the nature of the relationship between bursars' career maturity levels, and their career expectations and perceptions of job and organisational knowledge.

A secondary objective is to determine whether there are differences between bursars of different ethnic groups in respect of career maturity, career expectations and perceptions

of job and organisational knowledge. This is of interest to South African organisations given the current scarcity of technical human resources, and may assist organisations in the planning of programmes to address the problem of the retention of bursars.

The first concept underpinning the objectives of this study is the concept of turnover. Interest in the subject can be seen to stem firstly from the early realisation that the problem of staff turnover is not solely caused by 'bad' employees who have infiltrated organisations (Peskin, 1973), and secondly from the direct and indirect costs, both commercial and human, associated with the premature departure of recruits (Mabey & Gardner, 1996; Robbins, 1989). Mobley (1982), Pettman (1975) and Price (1975; 1977) present several factors which they postulate, based on an analysis of the results of numerous turnover studies, determine labour turnover. These can be grouped into three main categories:

- **External factors** (e.g. geographical location of organisation, sector of activity and state of the labour market)
- **The individual characteristics of employees** (e.g. age, educational level, interests, aptitudes and abilities, commitment, stress, career expectations and aspirations and career maturity)
- **Structural factors** (e.g. work unit size, pay, job content, supervisory style, centralisation of power and intra-organisational communication)

A number of empirical studies linking the various independent variables mentioned above to the dependent variable of labour turnover have been undertaken in South Africa in recent years. They can be grouped under several broad subject headings such as the relationship of job satisfaction to turnover (Baillie, 1991; Vercueil, 1970); the economic climate and labour turnover (Van der Merwe, 1981); organisational structure and labour turnover (Van Daalen, 1980); lifestyle research and labour turnover (Potgieter, 1991); the causative factors of labour turnover (Birkenbach, 1985, Schlemmer & Rawlins, 1978), and the

prevention of labour turnover (Anstey, 1992; Bothma, 1993; Grobbelaar, 1988; Heyns, 1973; Malan, 1987; Miller & Van der Merwe, 1976 & Van Niekerk, 1984).

Hill's (1975) research on turnover emphasises the brittle nature of the employment relationship at the time of the initial contact between employee and employing organisation, and indicated that it is at this time that most terminations occur. He argues that attempts at reducing labour turnover should focus on minimising the severity of the induction crisis by careful and consistent handling of the new employee and sensitivity to stress in her/him. He emphasises the need to determine the causes of turnover, and to move away from only recording the reasons for employees leaving organisations. He suggests also examining the reasons employees join and remain in a particular organisation.

Gowler and Legge (1975) suggest that it is important not only to examine the new employee's feelings during the induction process but also to examine the pre-entry career expectations of employees as possible determinants of turnover/retention. They argue that career expectations, which are defined as the feelings, values and beliefs that the employee brings to and develops in his/her occupational role, whether consciously expressed or not, are derived from fundamental human needs. Therefore, if they are not provided for by satisfactory job requirements, the result is likely to be job dissatisfaction with its consequences, namely alienation, low productivity, conflict, absenteeism and labour turnover. Mobley (1982) supports this contention, noting that the literature on turnover and the conceptual models of turnover explain the relevance of a variety of employee perceptions, values, attitudes and expectations to the turnover process. A study by Birkenbach (1985) focused on labour turnover as a function of career expectations in a group of professional nurses. He did not find direct support for the hypothesis that unrealistic expectations lead to higher levels of withdrawal but concluded, and this is supported by Gowler and Legge (1975), that it may be necessary to view turnover as a process in which independent variables are only seen to affect dependent variables **indirectly** through their interactions with intervening variables. In other words, the direct effects on the dependent variables may in fact only be trivial, while their indirect effects through intervening variables such as satisfaction, commitment and behavioural intention to leave, may be substantial.

Having established from the relevant theories that the determinants of turnover can be grouped into three broad categories, namely external factors, the personal characteristics of employees, and structural factors (Mobley, 1982, Pettman, 1975 & Price, 1975; 1977), that most turnover occurs in the early stages of employment (Hill, 1975), and that career expectations are of relevance to the issue of turnover (Gowler & Legge, 1975; Mobley, 1982), consideration will be given to pertinent aspects of career theory which underlie the concept of pre-entry career expectations and career maturity.

A career can be defined as the evolving sequence of a person's work experiences over time (Arthur, Hall & Lawrence, 1989). A number of career theorists have developed lifespan models, conceptualising careers from a developmental point of view. Both Miller and Form (1964) and Super (1957) present models which postulate a pre-entry stage of career development in which the adolescent is socialised at home and at school into the work patterns of society (Miller & Form, 1964) and where the self concept of the young individual emerges through a process of experimentation and reality-testing (Super, 1954). Schein (1978) formulated the concept of a psychological contract that is formed between the individual and the organisation where there is a matching of what the individual will give with what the organisation expects to receive, and what the organisation will give with what the individual expects to receive. Furthermore, individuals are attracted by different aspects of an organisation, and the relative importance they attach to particular aspects varies in terms of their personal goals, work expectations and their stage of life and/or career (Miller, 1986). An individual on the brink of entering an

organisation may have expectations for his/her future job in a variety of areas including the use and development of skills and knowledge, achievement, recognition, responsibility and status, the acceptability of controls, particularly those which regulate the relationship between effort and reward, the match between an individual and his/her employer's values and standards, psychological involvement, need for feedback, and challenges (Hall, 1976 & Mumford, 1972). These job expectations may not, however, be realised when the individual actually enters the organisation. Both Greenhaus and Callanan (1994) and Nicholson and West (1989) note that disillusionment is a common experience among individuals in career entry level jobs. Greenhaus and Callanan (1994) list the following as possible generators of unrealistic expectations:

- Career transition, e.g. from university to the organisation
- The recruitment process
- Organisational stereotypes
- The educational process: technically-oriented courses in engineering or business rarely dwell on the problems inherent in working within an organisational structure as a new employee
- Self-delusion.

Mabey (1984), Mabey and Gardner (1994), and Mabey, Clark and Daniels (1996) conducted a six year longitudinal study of professional graduates in order to identify the potential predictors of turnover. Of the sample for the study, 85% were science and engineering graduates, and 45% were what is termed 'sandwich graduates', i.e. employees whose studies at university are sponsored by their employer. The results of the study highlight the importance of pre-entry career expectations as a variable which could lead new recruits to either remain loyal to their employing organisation or quit.

In discussing their findings, Mabey and Gardner (1994) conclude that graduate entrants who are well informed, are able to build a positive set of expectations regarding the job and the organisation prior to entry, and show an interest in the job, are likely to establish a good foundation for job satisfaction early on in their careers and are less likely to consider leaving their employing organisation. They indicated that the beginnings of organisational commitment are also influenced by these processes, and that together with job satisfaction, combines to play a strong role in actual turnover decisions.

In the light of Mabey and his associates' research (1984; 1994; 1996) that points to the importance of graduate entrants being **well informed** about their prospective jobs and employers on the one hand, and **interested** in their jobs on the other, the concept of career maturity can be explored. Career maturity is defined as an individual's readiness to cope effectively with the developmental tasks of her/his life stage, in relation to other individuals in the same life stage, and her/his readiness to make good choices (Hall, 1979; Sharf, 1992). A measure of career maturity can therefore give an indication of an individual's ability to deal with her/his career planning requirements (Langley, du Toit & Herbst, 1996). The major contributors to this area of career theory are Super (1957) and Crites (1978), who have developed inventories to measure career maturity, namely the Career Development Inventory and the Career Maturity Inventory. Sharf (1992) describes five major components of vocational maturity as follows:

- Orientation to vocational choice: concern about career choice and using occupational information.
- Information and planning around a preferred occupation.
- Consistency of vocational preference: stability of an occupational choice over time and consistency within occupational fields and levels.
- Crystallisation of traits, including various indices of attitudes towards work.
- The wisdom of vocational preference: the relationship between choice and abilities, attitudes and interests.

From the discussion on career maturity, it is apparent that career mature persons are persons who have a high and consistent level of knowledge about their career/planned

occupation. Thus it would be of interest to compare measures of career maturity with measures of perceptions of job and organisational knowledge. Furthermore, in light of the secondary objective of this study, it is of interest to note that research carried out in both the United States and South Africa has shown that there are differences between race groups with regard to career maturity (Langley, du Toit & Herbst, 1996; Reid-van Niekerk & van Niekerk, 1990).

The discussion thus far has emphasised that disillusionment is a common experience among individuals in career entry positions (Greenhaus & Callanan, 1994; Nicholson & West, 1989), that pre-entry career expectations are important factors in subsequent turnover (Gowler & Legge, 1975; Mobley, 1982), that well informed job entrants, demonstrating an interest in their job, are less likely to leave their organisations (Mabey et al., 1984; 1994; 1996), and that career maturity gives an indication of an individual's readiness to deal with career planning requirements (Langley, du Toit & Herbst, 1996). The concepts of career expectations and career maturity have been discussed and the link between career maturity and perceptions of job and organisational knowledge suggested.

In the light of the stated objectives of this study, two major hypotheses have been formulated. In order to elucidate the hypotheses outlined below, two points deserve mentioning. Firstly, the heterogeneous sample will be divided into a small number of homogeneous clusters on the basis of the two subscores of the Career Expectations Survey (CES), namely career expectations and perceptions of job and organisational knowledge – this will be elaborated on at a later stage. Secondly, the reader must bear in mind that Langley's (1992) Career Development Questionnaire (CDQ), comprises five subscores.

Hypothesis 1

There is a statistically significant difference in the **vectors of means** of the identified clusters in terms of the **measures of career maturity**. Furthermore, it is postulated that the **means** of the identified clusters differ statistically significantly in respect of **each of the measures of career maturity**.

Hypothesis 2

There is a statistically significant difference in the **vectors of means** of the **three ethnic groups** in terms of **career expectations, perceptions of job and organisational knowledge and career maturity**.

It is further postulated as follows:

Hypothesis 2.1: The **means** of the **three ethnic groups** differ statistically significantly in respect of **career expectations**.

Hypothesis 2.2: The **means** of the **three ethnic groups** differ statistically significantly in respect of **perceptions of job and organisational knowledge**.

Hypothesis 2.3: The **means** of the **three ethnic groups** differ statistically significantly in respect of **each of the measures of career maturity**.

METHOD

Sample

In South Africa, some 20-30 large organisations offer contractual bursaries to students, primarily in the field of engineering. Bursars from three large organisations sponsoring engineering students at various South African universities were invited to participate in this study. Of the 350 bursars who were invited to participate, 172 volunteered. Only bursars in their third and final year of study who had already had some, albeit limited, work experience in their sponsoring organisation and who were therefore able to form an impression of their future job, were eligible to participate in the study. Personnel from each of the participating organisations assisted in the administration of the questionnaires during their annual mid-year visits to the various university campuses.

The final sample consisted of 162 males and six females. Eighty eight of the respondents were in their third year of study and 80 in their final year. On average, the respondents have held their

bursaries for three years and have completed an average of four months of vacation work at their sponsoring organisations. Of the total sample, 57 are Black, 88 White, two Coloured, and 21 Asian. Universities from which the sample was drawn include the University of the Witwatersrand, the University of Pretoria, the Rand Afrikaans University, the University of Cape Town, the University of Stellenbosch, the University of Durban-Westville and the University of Natal. The bursars who participated in the study were drawn from a variety of disciplines within the engineering field, as well as the geological field. The engineering disciplines included mechanical, electrical, industrial, metallurgical, mining and chemical. Complete records in respect of all the scores were obtained from 151 of the sample of 168. Seventeen respondents did not complete the questionnaire on career maturity.

Measuring instruments

In order to assess the career expectations, perceptions of job and organisational knowledge and career maturity levels of bursars, appropriate measuring instruments needed to be identified.

A suitable instrument to measure career expectations and perceptions of job and organisational knowledge, containing all the appropriate dimensions identified during the literature survey for this study, could not be found. A questionnaire was therefore constructed, drawing on the relevant literature and on Mabey and Gardner (1994) and Mabey, Clark and Daniels' (1996) questionnaire entitled 'Graduates and Work', which was used to measure pre-entry career expectations in the first phase of their six year longitudinal study.

The newly constructed questionnaire, entitled the 'Career Expectations Survey', which explores the attitudes of soon-to-be graduates to the world of work, comprises 51 items and is divided into four sections. The first section consists of seven biographical items. The second section is designed to measure the respondent's perceptions of their knowledge of the world of work and their sponsoring organisation. The third section requires of respondents, on the basis of what they already know, to rate on a seven point intensity scale, the various aspects of their sponsoring organisation. The final section requires of respondents, on the basis of the particular item's importance to themselves, to rate on a seven point intensity scale, what they would want from their first job.

The career maturity levels of the respondents will be measured using Langley's (1992) Career Development Questionnaire (CDQ), published by the Human Sciences Research Council. The CDQ consists of 100 items covering five scales, namely Self Information (20 items), Decision-making (20 items), Career Information (20 items), Integration of Self Information with Career Information (20 items) and Career Planning (20 items). Each of the five scales relates to a common dimension of career maturity (Langley, du Toit & Herbst, 1996). The reliability coefficients of the CDQ for different language groups (English, Afrikaans, African languages) range from 0,66 to 0,82, and for first year university students (University of Zululand and RAU) from 0,57 to 0,83. Thus the scales are satisfactory if used for guidance purposes. Only the content validity of the CDQ was addressed by the author and this was done by examining the items for face validity, examining the wording of the items, and examining the item-total correlations. Intercorrelations of the scales were also computed. They ranged from 0,45 (between the Self Information scale and the Career Planning scale) to 0,65 (between the Career Information scale and the Career Planning scale). The various CDQ sub-samples of the original research project consisted of first year university students and Std 8 and 10 pupils (Langley, du Toit & Herbst, 1996).

Statistical analysis

A factor analysis was carried out on the Career Expectations Survey to ascertain the dimensionality of the item space. A first-order factor analysis yields more factors than exist in the real test space due to the presence of differentially skewed items. A multiplicity of factors are produced during a first-order factor

analysis, some of which are artefactors (artificial factors). A second-order factor analysis then becomes necessary to identify the real factors.

To perform a second-order factor analysis, simplified factor scores in respect of each of the first-order factors need to be calculated for each respondent. These simplified factor scores are then intercorrelated and subjected to a second-order factor analysis (Schepers, 1992). It is expected that the second-order factor analysis will yield the true factors of the instrument. A separate item analysis was done in respect of all the items having a bearing on the identified second-order factors. The item analyses are done to ensure that items with low indices of reliability ($r_{\text{ex},s,g}$) are excluded. Cronbach's coefficient alpha was also computed as part of the item analysis. The NP50 programme of the NIPR was used to carry out the item analysis.

In order to determine whether the sample can be divided into homogeneous groups on the basis of the respondents' scores on the two expected scales of the Career Expectations Survey, namely career expectations and job and organisational knowledge, a cluster analysis was done. Cluster analysis is a method whereby objects, events or persons can be classified into clusters. A detailed account of the cluster technique has been given by Friedman and Rubin (1967). The locally known Clix programme, based on their method, was used to perform the analysis. A large number of clusters are firstly postulated and the programme then iteratively reduces the number of clusters until only two remain (Muller, 1975). The objective of the analysis is to minimise the variance within clusters and to maximise the variance between clusters. Thus the aim of a cluster analysis is to find an optimum number of clusters that differ from one another but have a great degree of internal homogeneity. There are no hard and fast rules to estimate the optimum number of clusters, the final number of clusters is most often determined through an inspection of the clusters obtained.

In order to ascertain whether the vectors of means of the clusters in respect of each of the five subscores of career maturity will differ statistically significantly from one another, multivariate analysis of variance (MANOVA) was used. Following the MANOVA, one way analysis of variance (ANOVA) was used to determine whether there are statistically significant differences in respect of group means. Finally, Tukey's Studentised range test was used to determine which groups differed from one another.

In order to ascertain whether there are statistically significant differences between ethnic groups in respect of career expectations, job and organisational knowledge, and career maturity levels, a MANOVA followed by ANOVAs and the Tukey test was used again.

RESULTS

The Career Expectations Survey

The 168 returned questionnaires were statistically analysed. Of the 44 items of the questionnaire, two were rejected out of hand – C4 and C11 – due to the poor level of response on the two items. Two other items – B1 and B3 – could not be included in the subsequent statistical procedures as they were not in an appropriate format. The remaining 40 items were intercorrelated and subjected to a first-order factor analysis which yielded 13 factors. According to Kaiser (1961), only those factors with eigenvalues larger than unity should be used. As the intercorrelation matrix is of magnitude 40 x 40, it is too large for reproduction in this article. Factor 13 was subsequently discarded as only one item had a significant loading on it. The remaining 12 factors were rotated to simple structure by means of the Varimax rotation.

Simplified factor scores in respect of the 12 factors were computed following Schepers' (1992) procedure. These simplified factor scores were intercorrelated (Table 1). The eigenvalues of the intercorrelation matrix were then computed. Four eigenvalues were greater than unity. Accordingly four factors were extracted (Table 2). The obtained factor matrix was rotated to simple structure using the Direct Oblimin procedure (Table 3). The correlations between the factors were low (Table 4). Factor IV only had one item at first-order level and was discarded. Using the NP50 programme, item analyses were done in respect of all the items having a bearing on the remaining three second-order factors. An examination of the items in each scale showed that Scales 1 and 3 both contained items relating to career expectations and Scale 2 only contained items relating to perceptions of job and organisational knowledge. A second second-order factor analysis was performed postulating only two factors with the expectation that Scales 1 and 3 would combine. The obtained factor matrix was rotated to simple structure using the Direct Oblimin procedure (Table 5). The correlations between the two factors was low (Table 6). Subsequent item analyses were done in respect of the 23 items having a bearing on Factor I (career expectations) (Table 7) and on the 15 items having a bearing on Factor II (job and organisational knowledge) (Table 8). During the iterative process for Scale 1, all the items were retained. This scale has an overall reliability of 0,785 according to Cronbach's coefficient alpha. The iterative process for Scale 2 resulted in two items being rejected – D14 and D23. This scale has an overall reliability of 0,840 according to Cronbach's coefficient alpha.

Having identified the two scales of the Career Expectations Survey, a cluster analysis was performed. It was decided to start the analysis with 10 clusters. After a thorough examination of the clusters, it was decided that four clusters were the optimum as the four clusters represented four contrasting groups. Only the four cluster solution is shown (Table 9).

TABLE 1
MATRIX OF INTERCORRELATIONS OF SIMPLIFIED FACTOR SCORES (SFS's)
IN RESPECT OF THE CAREER EXPECTATIONS SURVEY

	SFS 1	SFS 2	SFS 3	SFS 4	SFS 5	SFS 6	SFS 7	SFS 8	SFS 9	SFS 10	SFS 11	SFS 12
SFS 1	1,000											
SFS 2	0,2439	1,000										
SFS 3	0,1101	0,1611	1,000									
SFS 4	0,2061	0,1398	0,4380	1,000								
SFS 5	-0,0748	-0,0097	0,2354	0,3316	1,000							
SFS 6	0,5814	0,2103	0,1491	0,2522	-0,0490	1,000						
SFS 7	-0,0814	0,1011	0,2778	0,2637	0,1930	-0,0338	1,000					
SFS 8	0,0425	0,0529	0,2731	0,2056	0,1434	0,0156	0,2782	1,000				
SFS 9	-0,0493	0,0847	0,3343	0,1260	0,2114	-0,0150	0,2813	0,2405	1,000			
SFS 10	0,1675	-0,0442	0,1102	0,3195	0,1180	0,2010	0,1237	0,1876	0,0289	1,000		
SFS 11	0,0137	-0,0611	0,0204	0,1078	0,0030	0,0712	-0,0827	-0,0900	0,0087	0,1104	1,000	
SFS 12	-0,1050	0,1637	0,0194	0,0354	0,0419	0,0145	0,1844	-0,0806	0,0194	-0,1766	-0,0183	1,000

TABLE 2
EINGEVALUES OF THE INTERCORRELATION
MATRIX (12 X 12)

ROOT	EIGENVALUE
1	2,523410
2	1,800510
3	1,348850
4	1,100440
5	0,919824
6	0,853032
7	0,717470
8	0,684154
9	0,652246
10	0,567769
11	0,438758
12	0,393541
TRACE =	12,00000

TABLE 3
ROTATED FACTOR MATRIX OF CAREER EXPECTA-
TIONS SURVEY (DIRECT OBLIMIN ROTATION)

	FACTOR I	FACTOR II	FACTOR III	FACTOR IV
SFS 1	-0,080	0,821	-0,009	-0,140
SFS 2	0,123	0,358	-0,100	0,263
SFS 3	0,547	0,148	0,129	0,048
SFS 4	0,383	0,191	0,652	0,106
SFS 5	0,353	-0,131	0,251	0,049
SFS 6	-0,066	0,694	0,128	0,003
SFS 7	0,537	-0,060	0,013	0,160
SFS 8	0,547	0,036	-0,099	-0,217
SFS 9	0,523	-0,034	-0,106	0,002
SFS 10	0,178	0,129	0,301	-0,291
SFS 11	-0,100	0,002	0,241	-0,023
SFS 12	-0,000	-0,005	0,023	0,610

TABLE 4
MATRIX OF INTERCORRELATIONS OF ROTATED
FACTORS

	FACTOR I	FACTOR II	FACTOR III	FACTOR IV
FACTOR I	1,000			
FACTOR II	0,100	1,000		
FACTOR III	0,128	0,126	1,000	
FACTOR IV	0,098	-0,008	-0,132	1,000

TABLE 5
ROTATED FACTOR MATRIX OF
CAREER EXPECTATIONS SURVEY

	FACTOR I	FACTOR II
SFS 1	-0,096	0,780
SFS 2	0,119	0,249
SFS 3	0,601	0,174
SFS 4	0,546	0,332
SFS 5	0,442	-0,058
SFS 6	-0,026	0,747
SFS 7	0,546	-0,083
SFS 8	0,432	0,035
SFS 9	0,464	-0,068
SFS 10	0,219	0,251
SFS 11	-0,013	0,084
SFS 12	0,084	-0,074

TABLE 6
MATRIX OF INTERCORRELATIONS OF ROTATED
FACTORS

	FACTOR I	FACTOR II
FACTOR I	1,000	
FACTOR II	0,076	1,000

TABLE 7
ITEM STATISTICS IN RESPECT OF THE FIRST SCALE
OF THE CAREER EXPECTATIONS SURVEY

Item	$r_{gx}S_g$	r_{gx}	S_g
B2	0,395	0,224	1,764
D1	0,843	0,472	1,786
D2	0,466	0,451	1,031
D3	0,755	0,469	1,609
D4	0,429	0,480	0,894
D5	0,560	0,414	1,353
D6	0,336	0,506	0,663
D7	0,390	0,465	0,838
D8	0,423	0,445	0,951
D9	0,577	0,550	1,050
D10	0,626	0,451	1,388
D11	0,560	0,418	1,340
D12	0,603	0,467	1,291
D13	0,612	0,400	1,529
D15	0,543	0,475	1,144
D16	0,375	0,394	0,952
D17	0,501	0,463	1,081
D18	0,492	0,374	1,318
D19	0,392	0,480	0,816
D20	0,349	0,448	0,779
D21	0,483	0,555	0,870
D22	0,323	0,301	1,070
D24	0,416	0,427	0,973

$r_{gx}S_g$ = Index of reliability of item g
 r_{gx} = Correlation of item g with total score
 S_g = Standard deviation of item g

TABLE 8
ITEM STATISTICS IN RESPECT OF THE SECOND SCALE
OF THE CAREER EXPECTATIONS SURVEY

Item	$r_{gx}S_g$	r_{gx}	S_g
B4	0,558	0,452	1,237
B5	0,593	0,433	1,370
B6	0,537	0,436	1,230
B7	0,508	0,506	1,004
C1	0,747	0,603	1,239
C2	0,798	0,578	1,380
C3	0,844	0,654	1,289
C5	0,871	0,668	1,304
C6	0,887	0,678	1,308
C7	0,646	0,444	1,456
C8	0,696	0,611	1,139
C9	0,729	0,586	1,243
C10	0,890	0,520	1,712
C12	1,216	0,664	1,832
C13	0,639	0,571	1,118
D14*	0,004	0,003	1,536
D23*	0,151	0,146	1,309

$r_{gx}S_g$ = Index of reliability of item g
 r_{gx} = Correlation of item g with total score
 S_g = Standard deviation of item g
 * = Rejected items

TABLE 9
MEAN SCORES IN RESPECT OF CAREER EXPECTA-
TIONS AND PERCEPTIONS OF JOB AND ORGANISA-
TIONAL KNOWLEDGE FOR THE FOUR CLUSTERS

CLUSTERS	N	MEANS		TYPE
		1	2	
1	35	56,7860	38,5535	HL
2	42	59,9348	58,1814	HH
3	36	37,2719	44,0223	LL
4	55	46,4218	54,9479	A-A+

N = Number of persons in cluster
 L = Low
 H = High
 A- = Average minus
 A+ = Average plus

The Career Development Questionnaire

The five subscores of the Career Development Questionnaire (CDQ) were analysed and descriptive statistics computed (Table 10). Bearing in mind that the CDQ scales are binary and that there are 20 items per scale, mean scores of this magnitude reflect a high level of career maturity amongst the respondents which was to a degree expected given that they are in their third or final year of study. Intercorrelations of the five scales of the instrument were also computed. They ranged from 0,416 (between the self-information and career information scales) to 0,720 (between the career information and integration of self-information and career information scales).

The relationship between career maturity, career expectations and perceptions of job and organisational knowledge

In order to determine whether there are statistically significant differences in the vectors of means of the four clusters in respect of the five subscores of career maturity, and further whether the mean scores of the four clusters differ statistically significantly in respect of the five subscores of career maturity, a multivariate analysis of variance (MANOVA) and one way analyses of variance (ANOVA) were used, followed by Tukey's Studentised range test. The results of the MANOVA and associated ANOVAs are presented in Table 11. The results of Tukey's test are presented in Table 12. From Tables 11 and 12, the following deductions can be drawn:

TABLE 10
MEANS AND STANDARD DEVIATIONS OF THE FIVE SUBSCORES OF THE CAREER DEVELOPMENT QUESTIONNAIRE

	Mean	Std. Dev.
CDQ1 (Self-information)	16,64	2,219
CDQ2 (Decision-making)	17,41	2,636
CDQ3 (Career information)	17,36	2,913
CDQ4 (Integration of self-information and career information)	17,63	2,399
CDQ5 (Career planning)	17,21	3,034

TABLE 11
MANOVA AND ASSOCIATED ANOVAs OF THE FIVE CAREER MATURITY SUBSCORES IN RESPECT OF THE FOUR CLUSTERS

L Ratio	F	df	p
0,834088	1,79	15 & 395	0,0341*
CDQ1	3,11	3 & 147	0,0282*
CDQ2	2,68	3 & 147	0,0492*
CDQ3	1,77	3 & 147	0,1563
CDQ4	3,36	3 & 147	0,0205*
CDQ5	2,92	3 & 147	0,0363*

* Statistically significant

TABLE 12
TUKEY'S STUDENTISED RANGE TEST: PAIRWISE COMPARISONS BETWEEN THE FOUR CLUSTERS IN RESPECT OF THE FIVE CAREER MATURITY SUBSCORES

VARIABLES	MEANS OF CLUSTERS				GROUPS									
	1 HL N = 29	2 HH N = 39	3 LL N = 32	4 A-A+ N = 51	1-2	1-3	1-4	1-5	2-3	2-4	2-5	3-4	3-5	4-5
CDQ1	15,93	17,23	16,06	16,96										
CDQ2	16,31	18,05	17,28	17,63	*									
CDQ3	16,79	18,18	17,50	16,96										
CDQ4	17,07	18,54	16,97	17,67						*				
CDQ5	16,14	18,21	16,81	17,31	*									

* Statistically significant at 5%

There are statistically significant differences between the vectors of means of the four clusters in respect of the five subscores of career maturity (p=0,0341). In particular, there are statistically significant differences between the mean scores of the four clusters in respect of four of the five subscores of career maturity. There is therefore partial support for hypothesis 1.

According to Tukey's test, there is a statistically significant difference in respect of the mean scores of CDQ 2 (Decision-making) between Cluster 1 (HL) and Cluster 2 (HH) – the group with high career expectations scores but low scores on perceptions of job and organisational knowledge have lower scores in respect of the decision-making subscale than the group with high scores on both career expectations and perceptions of job and organisational knowledge; there is a statistically significant difference between the mean scores in respect of CDQ 4 (Integration of self-information and career information) between Cluster 2 (HH) and Cluster 3 (LL) – the group with low career expectations scores and low scores on perceptions of job and organisational knowledge have lower scores in respect of the integration of self-information and career information subscale than the group with high scores on both career expectations and perceptions of job and organisational knowledge; there is a statistically significant difference between the mean scores in respect of CDQ 5 (Career planning) between Cluster 1 (HL) and Cluster 2 (HH) – the group with high career expectations scores and low scores on perceptions of job and organisational knowledge have lower scores in respect of the career planning subscale than the group with high scores on both career expectations and perceptions of job and organisational knowledge. Attention must be drawn to

TABLE 13
MANOVA AND ASSOCIATED ANOVAs OF THE THREE ETHNIC GROUPS IN RESPECT OF CAREER EXPECTATIONS, PERCEPTIONS OF JOB AND ORGANISATIONAL KNOWLEDGE AND CAREER MATURITY

L Ratio	F	df	p
0,852847	2,39	10 & 288	0,0099
SCALE 1	6,04	2 & 165	0,029*
SCALE 2	6,19	2 & 165	0,026*
CDQ1	0,62	2 & 148	0,5395
CDQ2	5,12	2 & 148	0,0071*
CDQ3	1,50	2 & 148	0,2264
CDQ4	4,13	2 & 148	0,0180*
CDQ5	3,12	2 & 148	0,0472*

* Statistically significant

the fact that one is dealing with a highly selected group of persons in this sample, those who have reached their third or final year of study in engineering, therefore the range of scores will be restricted and the magnitude of the differences in mean scores reduced.

Ethnic group differences in respect of career expectations, perceptions of job and organisational knowledge and career maturity

In order to determine whether there are statistically significant differences in the vectors of means of the three ethnic groups, namely Black, White and Coloured and Asian, in respect of career expectations, perceptions of job and organisational

TABLE 14
TUKEY'S STUDENTISED RANGE TEST: PAIRWISE COMPARISONS BETWEEN THE THREE ETHNIC GROUPS IN RESPECT OF CAREER EXPECTATIONS, PERCEPTIONS OF JOB AND ORGANISATIONAL KNOWLEDGE AND CAREER MATURITY

VARIABLES	MEANS OF ETHNIC GROUPS			A-B	A-C	B-C
	A	B	C			
	BLACKS N = 48	WHITES N = 84	COLOUREDS & ASIANS N = 19			
SCALE 1	138,02	131,66	136,35	**		
SCALE 2	72,96	79,26	78,78	**		
CDQ1	16,44	16,82	16,37			
CDQ2	16,69	17,49	18,89		**	
CDQ3	16,85	17,46	18,16			
CDQ4	16,83	17,95	18,21	*		
CDQ5	16,50	17,33	18,47		*	

*Statistically significant at 5%

**Statistically significant at 1%

knowledge and career maturity, multivariate analysis of variance (MANOVA) and one way analysis of variance (ANOVA) were used, followed by Tukey's Studentised range test. It must be noted here that Coloured and Asian respondents were grouped together due to the low number of Coloured respondents. The results of the MANOVA and associated ANOVAs are presented in Table 13. The results of Tukey's test are presented in Table 14. From Tables 13 and 14, the following deductions can be drawn:

There are statistically significant differences between the vectors of means of the three ethnic groups in respect of career expectations (Factor 1), job and organisational knowledge (Factor 2) and the five subscores of career maturity ($p=0,0009$). In particular, there are statistically significant differences between ethnic groups in respect of Scale 1 of the CES ($p=0,029$), Scale 2 of the CES ($p=0,026$), CDQ2 ($p=0,0071$), CDQ4 ($p=0,0180$) and CDQ5 ($p=0,0472$).

According to Tukey's test, there is a statistically significant difference between the mean scores in respect of Scale 1 of the CES between Blacks and Whites – Blacks having higher career expectations scores; there is a statistically significant difference between the mean scores in respect of Scale 2 of the CES between Blacks and Whites – Whites having higher scores on perceptions of job and organisational knowledge, but with Coloureds and Asians having the highest mean score; there is a statistically significant difference between the mean scores in respect of CDQ2 between Blacks and Coloureds and Asians – Coloureds and Asians having a higher mean score on the decision-making subscale than Blacks; there is a statistically significant difference between the mean scores in respect of CDQ4 between Blacks and Whites – Whites having a higher mean score on the integration of self-information and career information subscale than Blacks, but Coloureds and Asians having the highest mean score; and there is a statistically significant difference between the mean scores in respect of CDQ5 between Blacks and Coloureds and Asians – Coloureds and Asians having a higher mean score on the career planning subscale than Blacks. In view of the results of Tukey's test in respect of hypotheses 2.1, 2.2 and 2.3, hypothesis 2 is supported. It merits mentioning, however, that the differences in mean scores in respect of this sample are small. This may not be true of students in their first year of study, but is true of this highly selected group who have survived for three or four years in their chosen course of study.

DISCUSSION

The primary objective of this study was to examine the relationship between career maturity, and career expectations and perceptions of job and organisational knowledge. The results indicate that engineering bursars may be divided into four categories in respect of the Career Expectations Survey: those who have high career expectations and perceive themselves to have high job and organisational knowledge, those who have low career expectations and perceive themselves to have low job and

organisational knowledge, those who have high career expectations but perceive themselves to have low job and organisational knowledge and those who have relatively low career expectations but perceive themselves to have relatively high job and organisational knowledge. The results show that there are statistically significant differences in the levels of career maturity of the engineering bursars, as measured by the five scales of the Career Development Questionnaire, depending on which cluster they fall into. Furthermore, the results indicate that engineering bursars who perceive themselves to have low levels of job and organisational knowledge also have lower levels of career maturity. Given that there are statistically significant findings among bursars in their third and final year, it can be assumed that there would be far more pronounced differences for bursars who are in their first and second years' of study, and those who drop out during the course of their studies.

The secondary objective of this study was to examine whether there are any differences between ethnic groups in respect of the three variables measured. The results indicate that there are statistically significant differences between ethnic groups in respect of career expectations, perceptions of job and organisational knowledge and career maturity. An explanation for this may lie in the history of poor vocational guidance and educational disadvantage afforded to certain sections of the South African population. However, it must be noted that **overall**, the career expectations of the respondents are high, the perceptions of job and organisational knowledge of the respondents are above average, and the career maturity levels of the respondents are quite high. While engineering bursars have high career expectations, they also know what their future job entails and what their future employing organisations are like. Furthermore, they know themselves, they can make effective decisions, they know about the world of work and they are able to plan their careers. This puts the statistically significant findings in perspective and caution should therefore be exercised in generalising the findings.

To a certain extent, the results of this study could have been anticipated due to the fact that the sample was restricted to third and final year students who have had some work experience, and who should be career mature at this point in their studies. Nonetheless, the results are of value as statistically significant differences were found even in this highly selected sample. Caution should, however, be exercised in generalising the findings given that the sample was made up of volunteers.

Organisations sponsoring students at tertiary levels in the engineering field should take heed of the high expectations of bursars and make attempts to address these, given the scarcity of high level technical human resources in South Africa. Of significance here is the fact that the mean scores on career expectations for Black bursars were higher than those for Whites and Coloureds and Asians, albeit slightly so. This should furthermore be seen in the light of the fact that both White and Black bursars perceive it to be relatively easy to find an alternative job should they not wish to be employed by their

sponsoring organisation, in other words they perceive their marketability to be relatively high. This perception does not hold for the Coloured and Asian respondents in this sample.

Although this is not part of the scope of this study, it is thought appropriate to include Mabey's (1984) conclusion regarding what he terms 'sandwich training', and what we, in South Africa, would term the contractual bursary system. He notes that while 'sandwich' graduates hold more realistic expectations, the absence of the freedom to choose their employer upon graduation becomes a crucial issue, and can have the effect of diminishing commitment to the employer. He suggests that 'sandwich' graduates are more likely to be satisfied and committed employees if they have the freedom to choose their final employing organisation. A suggestion to overcome the problem highlighted by Mabey (1984) could be for South African organisations sponsoring sorely needed engineers at university to join forces and together offer bursaries to a pool of candidates. At the end of the study period, both bursar and organisation would then have a choice as to the future employment relationship.

REFERENCES

- Adams, M.E. (1995). *High level technical manpower supply and retention: an overview of the current situation, implications for development*. Unpublished report – Employment Equity Workshop on Retention (Anglo American Corporation of South Africa Ltd.)
- Anstey, M. (1992). *Survey of current labour turnover in Port Elizabeth/Uitenhage*. Unpublished paper. University of Port Elizabeth.
- Arthur, M.B., Hall, D.T. & Lawrence, B.S. (1989). Generating new directions in career theory. In M.B. Arthur, D.T. Hall & B.S. Lawrence (Eds.), *Handbook of career theory*. Cambridge: Cambridge University Press.
- Baillie, G.S. (1991). *Lending bankers: perceived job satisfaction and labour turnover*. Unpublished master's thesis. University of the Witwatersrand.
- Birkenbach, X.C. (1985). An investigation into the causative factors of employee turnover among a sample of hospital nurses. Unpublished report. University of Port Elizabeth.
- Bothma, F.C. (1993). *An industrial psychological investigation into the consequences of voluntarily controllable labour turnover for technicians in a service organisation*. Unpublished master's thesis. University of the Orange Free State.
- Crites, J.O. (1978). *The career maturity inventory: theory and research handbook*. Monterey, C.A.: McGraw-Hill.
- Friedman, H.P. & Rubin, J. (1967). On some invariant criteria to grouping data. *Journal of American Statistical Association*, 62, 1159-1178.
- Gowler, D., & Legge, K. (1975). Occupational role integration and the retention of labour. In B.O. Pettman (Ed.), *Labour turnover and retention*. Westmead, Hants: Gower.
- Greenhaus, J.H., & Callanan, G.A. (1994). *Career management* (2nd ed.), Dryden.
- Grobbelaar, N.J. (1988). *An investigation into the labour turnover among process supervisors in a petro-chemical plant*. Unpublished master's thesis. University of the Orange Free State.
- Grobler, L.P. (1972). *A psychological investigation with regard to labour turnover and absence from work among non-white workers in the construction industry*. Unpublished master's thesis. University of Stellenbosch.
- Hall, D.T. (1976). *Careers in organisations*. Santa Monica, Calif.: Goodyear.
- Heyns, G.J. (1973). *An investigation into the labour turnover among clerical personnel in a tertiary enterprise*. Unpublished paper. University of Port Elizabeth.
- Hill, J.M. (1975). The representation of labour turnover as a social process. In B.O. Pettman (Ed.), *Labour turnover and retention*. Westmead, Hants: Gower.
- Kaiser, H.F. (1961). A note on Guttman's lower bound for the number of common factors. *British Journal of Statistical Psychology*, 14(10), 1.
- Langley, R. (1992). *Career development questionnaire (CDQ)*. Pretoria: HSRC.
- Langley, R., du Toit, R. & Herbst, D.L. (1996). *Manual for the career development questionnaire (CDQ)*. Pretoria: HSRC.
- Mabey, C. (1984). Managing graduate entry. *Journal of General Management*, 19(2), 67-79.
- Mabey, C. & Gardner, A. (1994). *Why do graduates stay with or quit their first employer? A six year longitudinal analysis of the turnover decision process*. Paper submitted to the Second Biennial International Conference on Advances in Management. Alberta, Canada.
- Mabey, C., Clark, T. & Daniels (1996). A six year longitudinal study of graduate expectations: the implications for company recruitment and selection strategies. *International Journal of Selection and Assessment*, 4(3), 140-150.
- Malan, A.J. (1987). *An industrial psychological investigation into combating labour turnover and the retention of clerical personnel in an insurance company*. Unpublished doctoral thesis. University of Stellenbosch.
- McKenzie, M.I. (1988). *Understanding and improving labour turnover during the entry year of field staff of life offices in South Africa*. Unpublished master's thesis. University of Cape Town.
- Miller, D.C. (1986). *Managing professionals in research and development: a guide for improving productivity and organisational effectiveness*. San Francisco: Jossey-Bass.
- Miller, D.C. & Form, W.H. (1964). *Industrial sociology: the sociology of work organisations* (2nd ed.), New York: Harper & Row.
- Miller, S. & Van der Merwe, R. (1976). *Labour turnover in secondary industry: an analysis of leaving patterns among a sample of workers in secondary industry in the Port Elizabeth-Uitenhage manufacturing sector*. Unpublished paper. University of Port Elizabeth.
- Mobley, W.H. (1982). *Employee turnover: causes, consequences and control*. Reading, Mass.: Addison-Wesley.
- Muller, M.W. (1975). *A comparison of some clustering techniques*. Unpublished master's thesis. University of the Witwatersrand.
- Mumford, E. (1972). *Job satisfaction: a study of computer specialists*. London: Longman.
- Nicholson, N. & West, M. (1989). Transitions, work histories and careers. In M.B. Arthur, D.T. Hall & B.S. Lawrence (Ed.), *Handbook of career theory*. Cambridge: Cambridge University Press.
- Peskin, D.B. (1973). *The doomsday job: the behavioural anatomy of turnover*. New York: Amacom.
- Pettman, B.O. (1975). External and personal determinants of labour turnover. In B.O. Pettman (Ed.), *Labour turnover and retention*. Westmead, Hants: Gower.
- Potgieter, A. (1991). *Life-style research as forecaster of labour turnover of insurance representatives*. Unpublished paper. University of Stellenbosch.
- Price, J.L. (1975). A theory of turnover. In B.O. Pettman (Ed.), *Labour turnover and retention*. Westmead, Hants: Gower.
- Price, J.L. (1977). *The study of labour turnover*. Ames, Iowa: The Iowa State University Press.
- Reid-van Niekerk, H.H. & van Niekerk, E.C. (1990). Career maturity of Black, Coloured and White university students. *Journal of Industrial Psychology*, 16(1), 1-4.
- Robbins, S.P. (1989). *Organisational behaviour: concepts, controversies and applications* (4th ed.), Prentice-Hall International Inc.
- Schein, E.H. (1978). *Career dynamics: matching individual and organisational needs*. Reading, Mass: Addison-Wesley.
- Schepers, J.M. (1992). *Toetskonstruksie: teorie en praktyk*. Johannesburg: Rand Afrikaans University.
- Schlemmer, L. & Rawlins, C. (1978) *Process technicians in the working environment: a study of factors relating to labour stability, race relations and performance in a major chemical process plant*. Unpublished paper. University of Natal.
- Sharf, R.S. (1992). *Applying career development theory to counseling*. Pacific Grove, Calif.: Brooks/Cole.
- Super, D.E. (1957). *The psychology of careers*. New York: Harper & Row.
- Van Daalen, H.J. (1980). *An investigation into some aspects of organizational structure and possible connections with labour turnover*. Unpublished master's thesis. University of Port Elizabeth.
- Van der Merwe, R. (1981). *Labour turnover and the economic climate*. Port Elizabeth: University of Port Elizabeth.
- Van Niekerk, J.P. (1984). *Labour turnover in the insurance industry*. Unpublished master's thesis. University of the Western Cape.
- Vercueil, J.C. (1970). *Die verband tussen sekere persoonlikheids-eienskappe, werkstevredenheid en personeelomset in 'n hoogs gespesialiseerde industriële onderneming*. Unpublished master's thesis. University of Pretoria.