Workplace Stress Experienced by Construction Professionals in South Africa

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Abstract: Occupational stress affects the health and wellbeing of people who work. Using an online survey, opinions were sought from architects, civil engineers, quantity surveyors, and project and construction managers in South Africa. The contribution of this work lies in its examination of the work stress experienced by construction professionals in a developing country characterized by economic hardship and social problems, such as inequality and crime. Most respondents experience high levels of stress at work. Architects, more than engineers, quantity surveyors, and project and construction managers; and female, more than male professionals feel stressed. The extent to which professionals are able to control their job situations does not appear to have a major influence on stress. Tight deadlines and long working hours probably play a bigger role. All the professions would appreciate having more time to do a better job. Survey respondents do not expect managers and colleagues to consistently make their work easier, but do believe that they can be relied on in times of difficulty. Appropriate stress management should be implemented within the construction industry, and further research undertaken to explore the relationships between stress and type of work undertaken, and the effectiveness of stress management procedures. **DOI: 10.1061/(ASCE)CO.1943-7862.0000625.**

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Introduction

Construction is a high-risk industry for work-related stress (Lingard and Francis 2004; Pocock et al. 2007; Love et al. 2010). Construction professionals are responsible for the delivery of safe projects, on time and within budget. Project work is characterized by considerable dynamism and uncertainty, elevating its stressful nature (Asquin et al. 2010; Mohr and Wolfram 2010). Work hours in construction are long (Van Wanrooy and Wilson 2006) and the ability to meet project objectives is sometimes compromised by unexpected events (Lingard et al. 2010). The construction industry has also traditionally been characterized by interpersonal and interrole conflict and known work stressors (Loosemore and Galea 2008; Leung et al. 2007).

Work-related stress is a major challenge to the health of working people [Health and Safety Executive (HSE) 2006]. Houtman (2005) reports that, in the 2000 European Working Conditions Survey (EWCS), work-related stress was the second most common work-related health problem across 15 European Union countries. The European Working Conditions Survey indicates that work intensity and quantitative demands in Europe have increased, particularly up to the mid-1990s and in the period 1996–2001, and that job autonomy has decreased (Gallie 2005). However, Houtman (2005) explains that patterns and trends differ between countries and labor markets. The increasing significance of work stress was recognized in the European Commission's Strategy on Health and Safety at Work 2002–2006, which identified psychosocial issues as an emerging occupational health and safety priority risk area (Commission of European Communities 2002).

The paper reports the findings of an investigation into the nature and extent of workplace stress experienced by professionals working in the construction industry in South Africa. The research aimed to compare and contrast the work stress experiences of occupants of different professional roles within the South African construction industry. Previous studies of work stress in construction have focused on the experiences of a single professional group and have largely been undertaken in more industrialized countries. The research presented in this paper thus addresses the work stress experienced in a developing country characterized by economic hardship and social problems, such as inequality and crime. The paper commences with a contextualizing background and a review of occupational stress, followed by a description of the survey design and administration. The comparative findings of the survey response data are presented and discussed.

South African Context

The apartheid legacy in South Africa provides a unique context to examine workplace stress among construction professionals, particularly gender- and race-based differences. Under pre-1994 apartheid legislation, people were racially classified as "white," "black," "coloured," or "Asian." The term "coloured" was used to describe South Africans of mixed race descent. The "Asian" classification included Indians (a large minority grouping in South Africa).

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For the purposes of enforcing apartheid, people were generally categorized as either "white" or "non-white." "Non-white" was a term used for several groups of people who were formerly disadvantaged because of their ethnicity; it has been solely used in that capacity in this research because the distinct subgroups of respondents were mostly too small for reliable statistical analysis. Postapartheid South Africa saw the introduction of "positive discrimination" or affirmative action [Republic of South Africa (RSA) 1996] as a vehicle to assist previously disadvantaged individuals (PDIs: "non-whites" and women). Black Economic Empowerment (BEE) and affirmative procurement policies are examples of mechanisms used to facilitate change. Within the context of the construction industry, affirmative action has, for example, taken the form of preferential procurement in the award of building contracts and the appointment of professional consultants. The latter point has relevance in this paper because anecdotal evidence suggests that some professional practices accelerate the advancement of PDI staff ("window dressing" or "fronting") in order to gain an advantage in the award of public sector commissions, in terms of which the number of PDIs in the practice in general, and in managerial positions in particular, are important considerations. While official BEE procurement policies have only been enforceable for public sector projects, to some extent they have flowed on naturally into private sector construction work. The BEE, PDI, and HDI policies of the current government in South Africa do not target specific racial groups but are aimed at females and all groups other than "white."

South Africa, as a developing country with a unique history, presents a particularly interesting case with respect to understanding equality of opportunity in the industry. This is important because discrimination is a known risk factor for work-related stress (Dollard et al. 2007; De Haas et al. 2009; King 2005). Women, along with "black" people, have been deemed to be "historically disadvantaged individuals" (HDIs) for the purposes of affirmative action policies [see RSA (2000b), Department of Public Works (DPW) (2001), and Department of Transport and Public Works (DTPW) (2002)]. While official statistics indicate that professional women account for 50% of economically active professionals in the economy (Department of Labour 2005), the percentages of professional women in construction are far lower. Statistics obtained from the registrars of South African built environment professions' councils indicate that women represent only 20% of the architecture profession, 12% of quantity surveyors, 2% of civil engineers, 3% of construction project managers, and 0.6% of construction managers. Of particular relevance in the South African context are the ways in which discrimination rooted in gender and racial stereotypes intersect to create an even more stressful environment for professionals working in the sector.

In South Africa, only people registered with their respective statutory councils are permitted to practice. For example, only an engineer registered with the Engineering Council of South Africa (ECSA), a statutory body in terms of the Engineering Profession Act (No. 46 of 2000) (RSA 2000a) and regulations promulgated in terms of the act, is permitted to use the term "professional engineer," adopt the letters "Pr.Eng," and perform work reserved for professional engineers. The requirements for engineering registration generally require candidates to hold a 4-year degree in engineering from an accredited institution, 3 year's postgraduation practical experience ("articles") under the mentorship of a professional engineer, and successful completion of an assessment of professional competence (APC). Other construction professions have similar requirements. Within the context of postapartheid South Africa and the aspirations of HDIs, it is not uncommon to hear the construction professions accused of elitism, exclusivity, and a reluctance to redress the legacy of apartheid. The need to maintain professional standards is the most powerful counterargument to these criticisms, but the professions (and the tertiary institutions that service them) are sensitive to exploring how the rate of entry by HDIs can be improved.

The research extends the work of previous research by examining construction professionals' experiences of stress in the unique context of postapartheid South Africa. In particular, the research examines the applicability of commonly utilized theories of stress (notably the job demands control and job demands control-support theories) in explaining work stress in the South African construction context.

Workplace Stress

It is suggested that the relationship between work and health can be explained by the combination of demands and control inherent in a job (Karasek 1979). Job demands are quantifiable features of work, including time pressures and workload, while control is defined by Karasek (1979, p. 290) as "the extent to which employees have the potential to control their tasks and conduct throughout the working day." According to the job demand–control (JDC) model of workplace stress, work that is simultaneously high in demands and low in control produces the most stressful responses and is most damaging to health (Belkic et al. 2004; De Lange et al. 2004).

There is considerable empirical support for the JDC model. In a large heterogeneous sample of Belgian workers, Schreurs et al. (2010) found that job control buffered the harmful effects of job insecurity, a widely reported work-related stressor. Van der Hulst et al. (2006) considered the need to work overtime as a job demand stressor. In a sample of Dutch workers, they report that when workers have little control over their work and also need to work frequent overtime, they suffer from higher levels of work stress and have a stronger need for rest and recovery away from work. The JDC model of work stress has also proved reliable in predicting workers' psychological well-being, job-related well-being, and burnout (Hausser et al. 2010).

Recent adaptations of Karasek's (1979) JDC model of workplace stress have incorporated workplace support as a resource that, together with control, can mitigate the extent to which job demands induce harmful effects in workers (Schaufeli and Bakker 2004). Thus, Johnson et al. (1989) suggest that social support from one's colleagues or supervisor serves to reduce the damaging impact of stressful work situations on workers' health. Social support is defined as "instrumental aid, emotional concern, informational, and appraisal functions of others in the work domain that are intended to enhance the wellbeing of the recipient" (Michel et al. 2010, p. 92).

According to the job demands–control–support (JDC-S) theory of workplace stress, jobs that are high in demands, low in control, and low in workplace social support are experienced as the most stressful and produce the most damaging health impacts. There is emerging evidence that the JDC-S model explains workers' stress and health outcomes quite well. For example, Hausser et al. (2010) report that both social support and control contributed significantly to health and well-being outcomes in 60% of a total of 83 studies published between 1998 and 2007. Thus the JDC-S theory has received substantial support in empirical studies, but less than that for the JDC model.

Organizational stressors can take the form of quantitative demands (e.g., time pressure or volume of work) or qualitative demands (e.g., cognitive or emotional role requirements). Work stressors may also be physical or environmental, for example, heavy, manual work in extreme temperatures, in awkward postures, or uncomfortable conditions. When employees perceive an imbalance

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between work demands and their personal or environmental resources, a range of stress responses can occur. These can include physiological, emotional, and behavioral responses that have a damaging impact on workers' health, work performance, and relationships (Houtman 2005).

Workplace Stress and the Construction Industry Professions

The construction industry is a high-risk industry for work stress (Pocock et al. 2007). Sutherland and Davidson (1989) identify inadequacy of information flow, onerous paperwork, and excessive workload as the top three stressors among construction site managers. Leung et al. (2007) also report high levels of objective stress (i.e., stress associated with external demands such as deadlines, time constraints, and workload) in construction estimators, associated mainly with a perceived lack of autonomy and/or low levels of reward. In a study of Hong Kong construction industry employees, onerous bureaucracy, a lack of opportunity to learn new skills, and work–family conflict were ranked the three most difficult stressors to manage (Ng et al. 2005).

Consistent with research conducted in other industries, the experience of work stress is associated with low levels of job performance in construction. For example, Djebarni (1996) reports a curvilinear relationship between stress and leadership performance among construction site managers. Djebarni's model indicates that the performance of site managers is relatively poor under conditions of both very low and very high stress, and performance is at its highest when stress levels are moderate (i.e., Djebarni's results suggest the stress–performance relationship resembles an inverted U-curve). In contrast to this model, Leung et al. (2008) provide no evidence for a curvilinear relationship between stress and performance. Indeed, they report that the task performance of construction project managers is inversely and linearly linked to stress. Leung et al. (2008) suggest that the stress levels of construction project managers in their sample may be higher than the threshold value at which the inverted U-curve effect would apply. Research has also linked work stress to the occurrence of workplace incidents and occupational injuries in the construction context [see, for example, Goldenhar et al. (2003) and Leung et al. (2010)]. The link with occupational injuries suggests that many facets of work performance and effectiveness are impacted negatively by work stress.

In Australia, Haynes and Love (2004) identified workload, long hours, and insufficient time with family as the three most significant stressors experienced by construction project managers. However, there is evidence that work stress is experienced to varying degrees depending on the nature of employment in the construction industry. Love et al. (2010) report that construction professionals working for construction contracting organizations experience higher levels of stress and lower levels of workplace support than construction professionals working for consulting organizations. Similarly, Lingard and Francis (2004) found that site-based construction professionals worked longer hours and experienced higher levels of burnout, a chronic outcome resulting from sustained exposure to stressful situations, than their counterparts working in the head or corporate offices of the same organizations.

Some research suggests that female construction professionals experience higher levels of work stress than their male counterparts. In a comparative analysis of male and female architects, Sang et al. (2007) report that female architects experienced significantly higher levels of work–family conflict and reported lower levels of job satisfaction and higher turnover intention than their male counterparts. There is a growing recognition that work and nonwork environments interact in complex ways to shape the experiences of construction industry workers [see, for example, Leung et al. (2009)]. In particular, social support both at work and in the family context can provide a protective buffer and help construction workers to better cope with stressful work conditions (Lingard and Francis 2006).

Research Method and Questionnaire Design

Questionnaire survey was chosen as a suitable method of collecting data for the initial stage of the research because it allows wide coverage of the relevant construction professions in South Africa and follows the approach used by earlier researchers. Surveys are probably the most convenient and effective way of obtaining a broad snapshot view of peoples' perceptions and opinions regarding multiple issues pertaining to a particular topic (e.g., national opinion surveys). The inability to explore issues in great depth with questionnaires is conceded but, should the survey findings warrant it, more extensive case-based research is contemplated.

Using an eight-part structure, the survey questionnaire sought demographic, cultural, and professional background information from respondents; determined current perceived levels of workplace stress; explored work situations in terms of job demands and job control; examined organizational stressors, such as job security, perceived support, and harassment and discrimination in the workplace; explored the effects of stress (psychological, physical, and on home life); and sought information on coping mechanisms, such as relaxation methods and substance use (or abuse). The catalogue of questions draws on the work of Sutherland and Davidson (1989), Haynes and Love (2004), Ng et al. (2005), Leung et al. (2007, 2008, 2009), and Love et al. (2010), and includes closed, dichotomous, declarative, rating, and multiple-choice questions. Five-point Likert scales [see Nunnally and Bernstein (1994)] are generally used for rating-type questions.

Survey Instrument Administration

The questionnaire survey was administered as an Internet web-based on-line instrument [see Fielding et al. (2008)] because this allowed easy and inexpensive coverage of four professional disciplines involved in the construction industry in South Africa. These professions comprise architects (Pr.Arch), civil engineers (Pr.Eng), quantity surveyors (Pr.QS), and project and construction managers (Pr.CPM and Pr.CM) whose members are registered with their relevant statutory councils. The governance and conduct of most professions in South Africa are regulated by statute, and registration is a requirement for professional practice. In addition, many professions have separate self-governing associations, with voluntary membership, which set codes of professional conduct and engage in promotional and professional development activities.

Using a web-based distribution method encourages potential respondents to express their views in a simple and safe way, particularly when issues may be sensitive. Undertaking this through the auspices of respected statutory councils and professional institutions provides a valid way of targeting sample groups. Care is needed in generalizing the findings of such surveys because to a large extent the sample is self-selecting.

A pilot (web-based) study was conducted with the cooperation of a branch office of a national firm of professional quantity surveyors to confirm the adequacy of the survey instrument and the feasibility of its administration. The full survey was launched in late September 2010 and remained accessible online until mid-November 2010. Registered professionals were emailed by

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their respective statutory bodies (assisted where necessary by the voluntary associations), provided with a URL where the questionnaire could be accessed online, and asked to participate.

A total of 3,025 architects received the request to participate in the survey and 269 completed the questionnaire online ($N = 3,025$; $n = 269$), yielding a response rate of 8.9%. Establishing the response rate of the civil engineers is problematic because Engineering Council of South Africa (ECSA) is unable to provide registration figures for the different engineer subgroups. The voluntary associations, namely, Consulting Engineers South Africa (CESA) and the South African Institute of Civil Engineers (SAICE), emailed their professional civil engineers ($N = 1,842$) and civil engineering practices ($N = 457$), respectively. The survey response of 168 civil engineers is therefore indicative but suitable for this stage of the research. It is estimated, however, that the response rate approximates 9.1% ($N = 1,842$; $n = 168$). Disregarding notified email rejection messages (bounces), a response rate of 12.4% ($n = 179$) was achieved with respect to quantity surveyors ($N = 1,449$). Sixty project and construction managers participated out of a total of 3,359 ($N = 3, 359$; $n = 60$). Disregarding email bounces, a response rate of 1.8% was achieved. In reality the latter response rate is likely to be higher because many professionals registered with the South African Council for the Project and Construction Management Professions (SACPCMP) are also likely to be practicing architects, engineers, and quantity surveyors. These response rates are not unusual for web-based surveys of this nature [see Fricker (2008)].

Of the respondents to the survey, 29% of architects, 5% of engineers, 20% of quantity surveyors, and 0% of construction managers/project managers were female. In terms of sample bias with respect to gender, female architects, engineers, and quantity surveyors are slightly overrepresented compared with the registered population of professionals, while female project and construction managers are not represented at all. Cognizance needs to be taken of this bias in interpreting the results. With regard to the ethnicity of participants, 87% of respondents were "white" and 13% were "non-white." Unfortunately, there are no published data indicating the ethnicity of construction professionals in South Africa so it is not possible to indicate whether these proportions are representative of the population. On the other hand, only the opinions of female construction/project managers are entirely missing, and the survey responses show broad correspondence with the demographics of the professions.

Survey Respondent Profile

The majority of the respondents are male (82%), "white" (87%), and older than 40 years (63%). Gender is significantly related to professional group ($p < 0.001$). Proportionately more females were found in the architectural profession compared with the other groups. The civil engineers and project and construction manager respondent groups reflect greater proportions of males than do their counterparts. Ethnicity and professional grouping are also significantly related, with proportionately more "non-white" ($p = 0.011$) and "black" ($p = 0.050$) respondents in the quantity surveying group. While nearly two-thirds of all respondents are at least 40 years old, 40% are older than 50 years. A significant relationship exists between responding professional group and age ($p < 0.001$), with proportionately more senior professionals (>40 years old) in the civil engineering (80%) and project and construction manager (71%) groups. Only 50% of respondent architects are 40 years and older. The biases of the sample in terms of gender, ethnicity, and age need to be to be acknowledged when drawing inferences from the data.

Years of experience in the construction industry differ significantly ($p < 0.001$) between the four responding groups. More architects (37%) and quantity surveyors (25%) have less than 10 years of experience compared to engineers (9%) and project and construction managers (4%). Architect respondents have significantly less professional experience than respondents in all the other groups.

The number of years respondents have spent with their present organization is also significantly different ($p = 0.002$) between the discipline groups. While a majority of all respondents have been with their present firm for 6 or more years, proportionately more architects (49%) have been in their current jobs for 5 or less years.

Overall, the construction industry professionals who participated in the survey may generally be described as experienced practitioners in private practice, mostly "white," male, English-speaking, and in a stable work environment. The response sample shows some bias toward the perspective of smaller firms for quantity surveyors and architects. These sample characteristics will be borne in mind in the following sections.

Data Analysis

The data have been analyzed using the Statistical Package for the Social Sciences (SPSS V18.0 for Mac) (SPSS 2010) software application. Unless otherwise stated, the percentages stated relate to the responses to individual questions. The same questionnaire was used for all four participating groups. Where appropriate, cross tabulation has been used to establish degrees of association between categorical variables, using the Pearson's chi-square test (or the Fisher's exact test where appropriate) at the 5% ($p = 0.05$) level of significance. Ethnic differences were analyzed by grouping the "non-white" categories ("black," "Indian," "coloured," and "other") together because of the smaller numbers of respondents in each of these four categories.

Overall Levels of Workplace Stress

Using a 10-point scale (1 = minimum stress; 10 = maximum stress, with no defined intermediate scale intervals), survey respondents were asked to rate the level of stress that they perceive themselves to experience at work. The results are shown in Table 1.

Significant differences exist between groups ($p = 0.042$). Architects appear to be the most highly stressed at work (64% reporting a stress level of 7 or above), followed by civil engineers, quantity surveyors, and project and construction managers. Fewer architects (18%) reported stress levels below 5 on the scale, compared with engineers (27%), quantity surveyors (29%), project and construction managers (35%), and the value for all groups (24%). Overall, more than half (55%) of all respondents report a stress level of 7 or above, and the mean stress level scale value reported (for all groups) exceeds 6.00, i.e., respondents perceive themselves as experiencing more stress than not.

Stress level is not significantly related to ethnicity ($p = 0.611$), but is to gender ($p = 0.001$) and age ($p < 0.001$), with proportionately more women respondents than men reporting high levels of stress compared to their male counterparts, and younger respondents feeling more stressed than older colleagues.

It can be inferred, therefore, that stress levels experienced by construction professionals in South Africa are relatively high, particularly for architects and among female and young professionals.

Job Demands

Respondents were asked to rate the nature and effect of their workplace demands. Issues examined include working to tight

Table 1. Survey Respondents' Self-Assessment of Workplace Stress

Perceived levels of workplace stress	Architects ($n = 232$) (%)	Engineers ($n = 146$) (%)	Pr.QS ($n = 160$) (%)	Pr.CPM and Pr.CM ($n = 52$) (%)	All ($n = 590$) (%)
Level 1 (minimum)	1 ($n = 3$)	6 ($n = 9$)	4 ($n = 6$)	2 ($n = 1$)	3 ($n = 19$)
Level 2	4 ($n = 9$)	5 ($n = 7$)	6 ($n = 10$)	8 ($n = 4$)	5 ($n = 30$)
Level 3	9 ($n = 22$)	10 ($n = 15$)	10 ($n = 16$)	17 ($n = 9$)	10 ($n = 62$)
Level 4	4 ($n = 9$)	6 ($n = 8$)	9 ($n = 14$)	8 ($n = 4$)	6 ($n = 35$)
Level 5	10 ($n = 22$)	8 ($n = 12$)	10 ($n = 17$)	11 ($n = 6$)	10 ($n = 57$)
Level 6	8 ($n = 19$)	12 ($n = 18$)	16 ($n = 25$)	4 ($n = 2$)	11 ($n = 64$)
Level 7	22 ($n = 50$)	24 ($n = 35$)	21 ($n = 33$)	27 ($n = 14$)	22 ($n = 132$)
Level 8	25 ($n = 59$)	19 ($n = 28$)	17 ($n = 27$)	15 ($n = 8$)	21 ($n = 122$)
Level 9	10 ($n = 24$)	8 ($n = 11$)	6 ($n = 10$)	6 ($n = 3$)	8 ($n = 48$)
Level 10 (maximum)	7 ($n = 15$)	2 ($n = 3$)	1 ($n = 2$)	2 ($n = 1$)	4 ($n = 21$)
Mean score (+/− standard error)	**6.62** ($+/-0.15$)	5.93 ($+/-0.20$)	5.76 ($+/-0.18$)	5.63 ($+/-0.32$)	6.12 ($+/-0.09$)

Note: $n = 590$; Scale values: 1 = minimum stress, 10 = maximum stress (no intermediate scale interval definitions). Pearson's chi-square test p-value = 0.042 for between groups comparison. The values that are bold are statistically significant.

deadlines, having to work long hours (at work and/or at home), inadequate time to balance work/family responsibilities, being kept busy and occupied, being given opportunities to improve one's skills, and the need to work harder than others to prove oneself. The results are shown in Table 2.

Significantly more project and construction managers report having to work to tight deadlines than respondents in the other professional groups ($p = 0.014$). When having to work long hours is considered, the differences between groups are also significant ($p = 0.050$), with proportionately more engineers working long hours. All groups report having to work long hours more often than not (in Table 2, mean group rating scores are all less than 2.5). These findings differ somewhat from the actual hours worked per week reported by the different groups (see Table 3). Proportionately more architects report working fewer hours per week that the other groups, followed by quantity surveyors, engineers, and project and construction managers. The differences between groups are significant ($p < 0.001$). For project and construction managers, 18% report working more than 60 hours per week. Overall, at least 18% of respondents in each professional group claim to work more than 55 hours per week.

When hours worked are considered in terms of gender and age, a significant relationship exists with gender ($p < 0.001$), but not with age ($p = 0.066$). More specifically, proportionately more

Table 2. Survey Respondents' Self-Assessment of Job Demands at Work

Job demand factors	Architects ($n = 261$) mean rating value (+/− standard error)	Engineers ($n = 163$) mean rating value (+/− standard error)	Pr.QS ($n = 175$) mean rating value (+/− standard error)	Pr.CPM and Pr.CM ($n = 56$) mean rating value (+/− standard error)	All ($n = 655$) mean rating value (+/− standard error)	Between groups p-value
Work to tight deadlines	1.74 ($+/-0.05$)	1.52 ($+/-0.05$)	1.65 ($+/-0.05$)	**1.43** ($+/-0.08$)	1.63 ($+/-0.03$)	$\mathbf{p = 0.014}$
Work long hours	2.06 ($+/-0.06$)	**1.80** ($+/-0.06$)	2.09 ($+/-0.07$)	1.91 ($+/-0.10$)	1.99 ($+/-0.03$)	$\mathbf{p = 0.050}$
Inadequate time to balance work/family responsibilities	2.29 ($+/-0.07$)	2.27 ($+/-0.09$)	2.45 ($+/-0.08$)	2.45 ($+/-0.12$)	2.34 ($+/-0.04$)	$p = 0.205$
Kept busy and occupied	**1.41** ($+/-0.05$)	1.21 ($+/-0.05$)	1.35 ($+/-0.05$)	1.27 ($+/-0.09$)	1.33 ($+/-0.03$)	$\mathbf{p = 0.021}$
Opportunities to improve skills	3.05 ($+/-0.08$)	2.73 ($+/-0.08$)	2.90 ($+/-0.09$)	2.84 ($+/-0.15$)	2.91 ($+/-0.05$)	$p = 0.177$
Need to work harder than others to prove yourself	**2.94** ($+/-0.10$)	3.48 ($+/-0.13$)	3.35 ($+/-0.13$)	3.56 ($+/-0.21$)	3.25 ($+/-0.06$)	$\mathbf{p = 0.001}$

Note: $n = 655$; Scale values: 1 = most of the time, 2 = frequently, 3 = sometimes, 4 = seldom, 5 = very seldom. The p-values are from the Pearson chi-square test. The values that are bold are statistically significant.

Table 3. Survey Respondents' Reported Hours Worked per Week

Hours per week	Architects ($n = 260$) (%)	Engineers ($n = 163$) (%)	Pr.QS ($n = 175$) (%)	Pr.CPM and Pr.CM ($n = 56$) (%)	All ($n = 654$) (%)
31–35 h (1)	4	2	3	2	3
36–40 h (2)	11	1	5	5	6
41–45 h (3)	16	15	23	4	17
46–50 h (4)	34	35	34	27	34
51–55 h (5)	17	23	17	30	19
56–60 h (6)	12	15	14	14	13
>60 h (7)	6	9	4	18	8
Mean score (+/− standard error)	4.07 ($+/-0.09$)	4.55 ($+/-0.10$)	4.17 ($+/-0.10$)	**4.93** ($+/-$ **0.19**)	4.29 ($+/-0.06$)

Note: $n = 654$; Pearson's chi-square test p-value < 0.001 for between groups comparison. The values that are bold are statistically significant.

respondent males claim to work longer hours than do the females. The factor cross tabulation is not shown in this paper.

Lingard and Francis (2009), against a background of the changing nature of the workforce, changing family structures and dynamics, and the demands of organizations, emphasize the importance of work–life balance in the construction industry. In the current survey, the mean rating scores for all respondents (in Table 2, they are all less than 2.5) indicate that their inability to successfully balance work/family responsibilities occurs more often than not. Differences between professional groups are not significant ($p = 0.205$), nor are differences in terms of gender ($p = 0.221$), but in terms of age proportionately more younger respondents ($p = 0.005$) express concern about work–family life balance.

While the majority of survey respondents claim to be kept busy and occupied at work most of the time, significant differences emerge between the professional groups ($p = 0.021$). Fewer architects consider themselves to be invariably kept busy compared with quantity surveyors, project and construction managers, and engineers. Notwithstanding this finding, proportionately more architects than the other groups perceive a need (self-imposed) to work harder than other colleagues in the same firm in order to prove themselves. Differences between groups are significant for this factor ($p = 0.001$).

When opportunities at work to improve skills are considered, the mean rating scores for this factor (in Table 2, they are all greater than 2.5) suggest that the frequency of opportunities for skills improvement is not entirely satisfactory. Differences between groups are not significant nor are differences for gender and age.

Job Control

Survey participants were asked to rate their perceived degree of control over workplace tasks, their pace of work, and their work environment. The results are depicted in Table 4.

Project and construction managers consistently appear to be able to exercise the most job control. There are significant differences between the professional groups, with architect respondents reporting less control over workplace tasks ($p = 0.019$), pace of work ($p = 0.040$), and work environment ($p = 0.005$) compared with the other groups. However, all groups report having at least some control over these factors. In general, the workplace environment is the factor over which participants claim to enjoy the least amount of control.

Gender and age are significantly related to control over what work is done ($p < 0.001$, in both instances), the pace of work ($p = 0.032$ for gender and $p < 0.001$ for age, respectively), and the work environment ($p = 0.023$ and $p < 0.001$, respectively). Male and older respondents enjoy more control over all these factors compared with their female and younger counterparts. The factor cross tabulation is not shown in this paper.

Job Support

Using six-point Likert scales (1 = most of the time, 2 = frequently, 3 = sometimes, 4 = seldom, 5 = very seldom, 6 = not applicable) survey participants were asked about the extent of support received from line managers and colleagues at work. The results are given in Table 5. The option of not applicable was included to cater for instances such as one-person practices or branch offices. The analysis excludes those responses.

Of all respondents to this question, only 20% report that their line managers most of the time or frequently make an effort to make their lives easier at work. Differences between groups are not significant ($p = 0.772$). When support from line managers in difficult situations at work is considered, however, nearly half (44%) of all respondents believe that such support is forthcoming most of the time or frequently. Differences between groups are not significant.

Identical questions were posed to participants with respect to support emanating from colleagues. While generally perceived as making more of an effort in making their lives easier at work, the overall situation is perceived as being much the same. Only 29% of all respondents think that their colleagues make their lives

Table 4. Survey Respondents' Self-Assessment of Degree of Job Control at Work

Job control factor	Architects ($n = 265$) mean rating value (+/− standard error)	Engineers ($n = 166$) mean rating value (+/− standard error)	Pr.QS ($n = 177$) mean rating value (+/− standard error)	Pr.CPM and Pr.CM ($n = 57$) mean rating value (+/− standard error)	All ($n = 665$) mean rating value (+/− standard error)	Between groups p-value
Type of work assigned	**1.94** (+/ − 0.06)	1.65 (+/ − 0.06)	1.86 (+/ − 0.06)	1.53 (+/ − 0.09)	1.80 (+/ − 0.03)	**0.019**
Pace of work	**2.23** (+/ − 0.07)	1.87 (+/ − 0.08)	2.12 (+/ − 0.08)	1.77 (+/ − 0.11)	2.06 (+/ − 0.04)	**0.040**
Work environment	**2.39** (+/ − 0.07)	2.12 (+/ − 0.06)	2.30 (+/ − 0.07)	2.11 (+/ − 0.11)	2.27 (+/ − 0.04)	**0.005**

Note: $n = 665$; Scale values: 1 = total control, 2 = a lot of control, 3 = some control, 4 = a little control, 5 = no control. The p-values are from the Pearson chi-square test. The values that are bold are statistically significant.

Table 5. Survey Respondents' Self-Assessment of the Frequency of Support Experienced at Work

Types of support received at work	Architects (most of the time/frequently) (%)	Engineers (most of the time/frequently) (%)	Pr.QS (most of the time/frequently) (%)	Pr.CPM and Pr.CM (most of the time/frequently) (%)	All (most of the time/ frequently) (%)	Between groups p-value
Effort by line manager to make work life easier ($n = 408$)	18 ($n = 157$)	18 ($n = 100$)	23 ($n = 111$)	25 ($n = 40$)	20 ($n = 408$)	0.772
Assistance by line manager in difficult situations ($n = 427$)	40 ($n = 161$)	44 ($n = 108$)	46 ($n = 113$)	58 ($n = 45$)	44 ($n = 427$)	0.648
Efforts by colleagues to make work life easier ($n = 544$)	25 ($n = 208$)	35 ($n = 142$)	29 ($n = 145$)	31 ($n = 49$)	29 ($n = 544$)	0.113
Assistance by colleagues in difficult situations ($n = 568$)	43 ($n = 217$)	46 ($n = 147$)	47 ($n = 151$)	53 ($n = 53$)	46 ($n = 568$)	0.661

Note: The p-values are from the Pearson chi-square test. The statistics exclude not applicable responses.

easier most of the time or frequently, while 46% think that colleagues assist with difficult situations frequently or most of the time. Differences between groups are not significant for either factor.

When these same four issues of support received at work from line managers and colleagues are considered in terms of gender, differences between groups are not significant. However, when gender differences within groups are considered, a significant relationship exists between male and female quantity surveyors and reliance on colleagues to help with difficult situations ($p = 0.044$), with more males (51%) than females (31%) claiming to be able to rely on their colleagues for assistance. None of the other relationships within groups (in terms of gender) are significant.

Similarly, when support at work from line managers and colleagues is considered in terms of ethnicity (see Table 6), differences between groups are not significant. However, within groups, proportionately more "white" (50%) quantity surveyors ($p = 0.003$) than their "non-white" counterparts (30%) report receiving support from line managers frequently or most of the time in difficult situations ($p = 0.003$). No other significant differences were found within responding groups. The factor cross tabulation (for gender and ethnicity) is not shown in this paper.

Organizational Stressors

Job Certainty and Opportunities

Survey respondents reported their perceptions of job security, the existence of promotion opportunities within the industry, and alternative job opportunities. The results are given in Table 7. Mean rating scores (in Table 7, they are greater than 2.5) for all factors and all groups (except engineers and project and construction managers) indicate that the issues of job security and promotion and alternative employment opportunities are more negatively than positively perceived. Architect respondents are significantly more pessimistic than other groups about their existing job security ($p < 0.001$) and their ability to obtain another job reasonably quickly ($p < 0.001$).

Gender is significantly related to feelings of job security ($p = 0.003$) and perceived ability to acquire a similar job without undue delay ($p = 0.025$). In both instances, proportionately more male respondents than females are optimistic. When age is considered, proportionately more younger respondents are optimistic regarding promotion possibilities ($p = 0.047$) and job security ($p = 0.002$). The factor cross tabulation is not shown in this paper.

Work Environment

Survey participants were asked to comment on their work environment with respect to a variety of issues, namely, their freedom to speak freely and frankly about matters concerning them; whether the job possesses the requisite authority to match the responsibility; whether or not they argue frequently with line managers, colleagues, or clients; whether they feel that they could do a better job if more time was available; and whether or not they feel fairly compensated for the work done and hours devoted. The results are depicted in Table 8.

Respondent architects are the least able (among the professional groups) to speak openly about matters of concern, followed by quantity surveyors and engineers. Project and construction managers are most able to do so. Differences between groups are significant ($p = 0.008$).

Architect respondents, followed by the quantity surveyors, are the most inclined to claim that their work lacks the necessary authority to match the responsibility of the job. Proportionately fewer engineers and project and construction managers agree. Differences between groups are significant ($p = 0.025$).

When arguments with line managers, clients, and colleagues are considered, only 16% to 19% of respondents among the groups agree that this occurs frequently.

Significantly stronger agreement, that they could do a better job if given more time, is reported by the architect respondents ($p = 0.001$), but all groups report some measure of agreement

Table 6. Cross Tabulation of Types of Support at Work by Gender and Race

	Architects		Engineers		Pr.QS		Pr.CPM and Pr.CM		All	
Types of support at work	Gender	Race	Gender	Race	Gender	Race	Gender	Race	Gender	Race
Effort by line manager to make work life easier ($n = 399$; 408)	$p = 0.610$	$p = 0.052$	$p = 0.985$	$p = 0.606$	$p = 0.830$	$p = 0.889$	—	$p = 0.116$	$p = 0.479$	$p = 0.094$
Assistance by line manager in difficult situations ($n = 417$; 427)	$p = 0.721$	$p = 0.305$	$p = 0.232$	$p = 0.688$	$p = 0.832$	$\mathbf{p = 0.003}$	—	$p = 0.089$	$p = 0.881$	$p = 0.216$
Efforts by colleagues to make work life easier ($n = 530$; 542)	$p = 0.595$	$p = 0.216$	$p = 0.185$	$p = 0.754$	$p = 0.316$	$p = 0.886$	—	$p = 0.958$	$p = 0.674$	$p = 0.776$
Assistance by colleagues in difficult situations ($n = 556$; 568)	$p = 0.982$	$p = 0.571$	$p = 0.790$	$p = 0.251$	$\mathbf{p = 0.044}$	$p = 0.178$	—	$p = 0.195$	$p = 0.259$	$p = 0.325$

Note: The p-values are from the Pearson chi-square test. These statistics exclude not applicable responses. The values that are bold are statistically significant.

Table 7. Survey Respondents' Self-Assessment of Their Agreement with the Existence of Job Certainty Issues

Existence of job stability and prospects	Architects ($n = 260$) mean rating value (+/− standard error)	Engineers ($n = 161$) mean rating value (+/− standard error)	Pr.QS ($n = 170$) mean rating value (+/− standard error)	Pr.CPM and Pr.CM ($n = 55$) mean rating value (+/− standard error)	All ($n = 646$) mean rating value (+/− standard error)	Between groups p-value
Job security	**3.14** (+/ − 0.07)	2.46 (+/ − 0.08)	2.68 (+/ − 0.08)	2.36 (+/ − 0.14)	2.78 (+/ − 0.04)	$\mathbf{p < 0.001}$
Job promotion	3.13 (+/ − 0.06)	2.90 (+/ − 0.07)	2.90 (+/ − 0.08)	2.80 (+/ − 0.13)	2.98 (+/ − 0.04)	$p = 0.170$
Ability to secure a similar level job reasonably quickly	**3.55** (+/ − 0.06)	2.66 (+/ − 0.08)	3.12 (+/ − 0.08)	2.82 (+/ − 0.16)	3.15 (+/ − 0.04)	$\mathbf{p < 0.001}$

Note: $n = 646$; Scale values: 1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree. The p-values are from the Pearson chi-square test. The values that are bold are statistically significant.

Table 8. Survey Respondents' Self-Assessment of Their Agreement with Work Environment Factors

Work environment factors	Architects mean rating value (+/− standard error)	Engineers mean rating value (+/− standard error)	Pr.QS mean rating value (+/− standard error)	Pr.CPM and Pr.CM mean rating value (+/− standardd error)	All mean rating value (+/− standard error)	Between groups p-value
Freedom to honestly say what I feel and get things off my chest ($n = 658$)	**2.55** (+/− 0.07)	2.17 (+/− 0.07)	2.34 (+/− 0.08)	1.98 (+/− 0.11)	2.35 (+/− 0.04)	$\boldsymbol{p = 0.008}$
Job lacks the requisite authority to match the responsibility ($n = 662$)	**2.84** (+/− 0.08)	3.33 (+/− 0.10)	2.95 (+/− 0.10)	3.39 (+/− 0.17)	3.04 (+/− 0.05)	$\boldsymbol{p = 0.025}$
Argue frequently with line managers, colleagues or clients ($n = 664$)	3.35 (+/− 0.06)	3.55 (+/− 0.08)	3.55 (+/− 0.08)	3.64 (+/− 0.14)	3.48 (+/− 0.04)	$p = 0.210$
Could do a much better job if there was more time ($n = 653$)	**2.05** (+/− 0.06)	2.32 (+/− 0.07)	2.20 (+/− 0.08)	**2.66** (+/− 0.13)	2.21 (+/− 0.04)	$\boldsymbol{p < 0.001}$
Fairly compensated for the work I do and the hours I devote ($n = 654$)	**3.27** (+/− 0.07)	2.47 (+/− 0.08)	2.62 (+/− 0.08)	2.34 (+/− 0.13)	2.80 (+/− 0.04)	$\boldsymbol{p < 0.001}$

Note: Scale values: 1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree. The p-values are from the Pearson chi-square test. The values that are bold are statistically significant.

(in Table 6, the mean rating scores for all groups is less than 3.0), with project and construction managers showing least agreement.

With regard to fair remuneration in terms of work done, differences between groups are also significant ($p < 0.001$). In contrast to the other groups, architect respondents tend to disagree that they are fairly compensated for their work (in Table 6, the mean rating score for architects is greater than 3.0).

Discussion

Discussion of the survey findings proceeds with some consideration of the nature of professional work in the construction industry and how this might relate to stress. The focus then shifts to stress-related issues such as job demands, job control, support at work, job opportunities, work–life balance, and the work environment. Where relevant, factors such as gender, age, and ethnicity are included.

Nature of Professional Work in the Construction Industry

Professional work in the construction industry is characterized by two features that are common to the professions of architecture, engineering, quantity surveying, and project and construction management.

First, more often than not, the work involves multitasking on multiple projects. Few construction industry professionals enjoy the luxury of engaging in one task on one project only. In addition, high levels of task differentiation and interdependence are usually encountered, i.e., the multitasking involves a substantial number of different tasks (frequently across different projects). Many of those tasks have interrelated dependencies, thus rendering the professional work itself as complex as the projects on which it is performed (Williams 1999).

Second, the work of professionals in the construction industry inevitably involves making professional judgments and decisions under conditions of uncertainty. The uncertainty may be associated with the search for solutions to problems relating to project design and construction and/or to the need to model or plan for situations and actions that may (or may not) occur in a future that is not known with certainty. Uncertainty is recognized as a substantial contributor to human stress (Miceli and Castelfranchi 2005).

However, the research results suggest that the various professions within the construction industry have different experiences of work-related stress. For example, architects work fewer hours than other construction professions yet perceive that they have less control over their work than other professional groups and report higher levels of stress. It is possible to speculate about how environmental factors might impact the construction professions differently. For example, in terms of the critical parameters of every construction project, time, cost, quality, and safety, it can be argued that the professions will place different emphasis on each criterion and will be impacted by different uncertainties that arise in relation to project objectives, which sometimes conflict.

Architects and engineers will largely be focused on project quality in terms of form, function, and integrity (e.g., structural), and are likely to place less emphasis on issues of time and cost. For designers, an infinite solution space may exist, which may be constrained by cost and schedule considerations. There will always be uncertainty as to whether or not the best solution has been chosen (or that a better alternative has been missed). Professional quantity surveyors are concerned with project cost (in terms of forecasting and financial administration) and uncertainty on this issue is similar to uncertainty associated with the macroeconomic systems of society. The overarching interest of project and construction managers is time in terms of planning and organizing construction activities in the face of technology and resource constraints. Considerable uncertainty may exist in terms of the estimation of task durations and/or the availability, acquisition, and use of multiple technologies and resources. Mutual exclusivity is not being argued here—each professional group will have overlapping interests in project time, cost, and quality—but each group will also tend to focus more on one parameter than another, and inevitably encounter uncertainties associated with professional decision making.

Stress Levels

The survey findings show that that high stress levels exist for professionals working in the South African construction industry (in Table 1, 55% of all respondents report levels greater than 7),

confirming the Hong Kong findings of Leung et al. (2007). However, support is not found (in South Africa at least) for the contention of Love et al. (2010) that professionals in construction organizations (contractors) experience higher levels of stress than professionals working as consultants. In the current survey, architects (who are more likely to be working in consultancies) report significantly higher levels than other professional groups. The fact that architects reported higher levels of stress as well as indicating that they work fewer hours suggests that the relationship between time demands of work and the experience of stress may be complex and be moderated by other variables. The results suggest that it is not just the quantity of work but the quality of the work experience that determines perceived stress levels and there may be qualitative differences between professions. Architects reported significantly lower levels of job security than other professionals in the research. This is important because job insecurity has been shown to impact negatively on the job satisfaction of permanent workers, increase worker stress, and detrimentally affect work–life balance (Burke and Greenglass 2001; De Cuyper and de Witte 2007; Probst et al. 2007; Schreurs et al. 2010).

The findings of this research are also consistent with previous research that has revealed that women working in the construction industry, and particularly those engaged as professional architects, experience higher levels of stress than males in similar employment [e.g., Goldenhar et al. (1998), Caven (2004), and Sang et al. (2007)]. Similarly, previous research has reported higher levels of job stress and burnout among younger employees, which is consistent with the findings of the current research (Brewer and Shapard 2004; Soares et al. 2007). This warrants further investigation to examine the role played by family status, life stage, and the number of years of professional experience in determining stress levels and coping among construction professionals.

Stress Factors

The job demand/job control nexus with stress found in earlier research [e.g., Karasek (1979) and Houtman (2005)] is strongly supported. The higher stress levels reported by South African architects is matched by their significantly diminished control (compared with the other professional groups) over the type of work undertaken, the pace of that work, and the environment in which it is carried out (Table 4). The nexus strain is exacerbated for all professional groups by having to work long hours, meet tight deadlines, and by finding it difficult to balance work/family responsibilities successfully (Table 2). Of particular concern are the long working hours reported by project and construction managers (Table 3), with more than half of the respondents reporting working over 50 hours per week, and for nearly 20% of this group the reported hours exceed 60 per week. Fewer than 10% of all respondents report working a normal week of 40 hours or less. The long hours worked appear to be a particularly male condition, which would tend to aggravate work/family imbalances for male professionals. The long hours worked also match the general agreement among respondents that they could do a better job if given more time (Table 8), thus providing fertile grounds for job frustration.

The high burnout rate associated with all these demand/control factors (Hausser et al. 2010) provides a clear warning signal to the construction professions that will be to their long-term detriment if it is ignored.

However, the research findings do not fully support Sutherland and Davidson (1989), nor Leung et al. (2007), in their endorsement of excessive workload as a stress factor. Architect respondents in this survey report significantly higher levels of stress, but also report working fewer hours than other professional groups and having less frequent perceptions of being constantly busy. If anything, slight support is found for Djebarni's (1996) curvilinear relationship between stress and performance, but the current research does not explore that specifically. It seems likely that the relationship is more subtle and complex than straightforwardly inverse. A future strand of the current research plans to use the survey response data set and multiple regression modeling to explore the relationships between the factors of the JDC and JDC-S models from a predictive perspective.

Similar comments regarding the complexity of the job demand/job control issue could be made with regard to internal and external factors, although neither the extant nor the current research has addressed these explicitly. For example, senior professionals (e.g., at partner level in a consultancy) may enjoy high intraorganizational control, but at the same time face high levels of job demand in terms of extraorganizational engagement (dealing with multiple clients, soliciting work, representing the organization) in which their level of control is far more limited.

The high architect stress levels reported in the survey do not fully support onerous paperwork demand (Sutherland and Davidson 1989) and onerous bureaucracy (Ng et al. 2005) as inevitably critical stress factors because, of all the professional groups, architects are the least likely to encounter either condition on a frequent basis. That said, however, the legendary antipathy of architects to all forms of administrative paperwork and bureaucracy might be influencing their responses in the survey.

The survey findings (Table 5) show that expectations of receiving support at work run along fairly predictable lines. Most respondents do not expect their line managers, supervisors, and colleagues to make constant efforts to make their work life easier. This suggests that a healthy acceptance of the need for self-motivation exists among professionals in the South African construction industry. At the same time, under difficult circumstances, direct help from managers and colleagues is generally not found wanting.

With regard to construction industry professionals' ability to balance work/family life (Table 2), while no significant differences are found with respect to professional group, gender, or ethnicity, the finding that younger rather than older respondents report imbalances occurring more often is explained by the sample demographics. The younger respondents—generally less than 40 years old—are more likely to have small children, while older respondents are more likely to have mature families with adult children requiring less intensive attention. Nevertheless, the fact that respondents generally report negatively on their ability to maintain work/family life balances (to their satisfaction) should be a matter of concern for all the construction professions.

A grumbling issue—rather than an acute stressor—might be the relative lack of opportunity to improve skills reported by all professional groups in the survey (Table 2). While clearly this is not felt to be an acute concern, it is the sort of frustration that could eventually become intolerable for professionals eager to advance their careers.

Job security (Table 7) appears to be another grumbling issue for construction industry professionals in South Africa. No respondent group is overly optimistic about its chances of keeping a current job, achieving promotion, or quickly securing a new job. With the exception of architects, who are significantly more pessimistic about these concerns, survey respondents tend to hover on the negative side of neutrality over job security. It is perhaps more of a background uncertainty for most professionals, but felt more strongly by older workers and by female workers.

The research addresses an important gap in work stress research in examining experiences across different construction disciplines,

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when most previous studies have focused on a particular group or discipline. The research also provides new knowledge in providing the first understanding of work stress among construction professionals in postapartheid South Africa. The majority of studies of work stress in construction have focused on workers' experiences in industrialized countries of Western Europe, Australia, the United States, and East Asia. South Africa is substantially different to these countries. South Africa is characterized by poverty and economic hardship. Although the economy of South Africa is the largest in Africa, the unemployment rate is very high at over 25%, and the poor have limited access to economic opportunities and basic services [Organisztion for Economic Cooperation and Development (OECD) 2010]. Social problems, including high rates of crime, have impacted investment and hindered economic development (C. Stone, Working Paper, Center for International Development, Harvard University, Cambridge, Massachusetts). While there are some unique features of South Africa, such as the legacy of apartheid, its social and economic problems are similar to those experienced in many developing countries. The findings of this study cannot be generalized to other countries; however, the findings indicate that explanatory models of work stress that apply to developing countries (such as the JDC model), have some applicability to workers in the developing world.

While the findings from this survey take the research forward in many respects, explanations of the relative levels of stress experienced by different professions in the construction industry may require more profound forensic exploration of the questions of what architects, engineers, quantity surveyors, and project and construction managers actually do and how they go about doing it. Further qualitative research using a case-based approach [see Byrne (2009)] is intended to enhance the validity of the survey data by permitting triangulation (Mathison 1988). This research will follow the clue referred to at the start of this discussion and track the latent uncertainties associated with the decision making undertaken by each professional group.

Conclusions

The survey and its findings perhaps raise more questions than they provide answers. Nevertheless, a clear starting point is provided for further investigation. The contribution of this work lies in its examination of the work stress experienced by construction professionals in a developing country characterized by economic hardship and social problems, such as inequality and crime. The stress levels experienced by construction industry professionals in South Africa are sufficiently high so as to cause concern, not only for the health of individual professionals but also for the continuing effectiveness of their contribution to the construction industry. The bodies responsible for guiding and promoting the work of the construction professions should take careful note of this and consider what measures of support are needed for their members.

The negative ramifications of stress (including excessive use of alcohol, nicotine and other drugs, and increasing pressure on public and private health resources) have an inevitable ripple effect, spreading from individuals through families and extended families to communities and thus to society as a whole. The issues they represent are too important to ignore.

More needs to be known about the nature of the work undertaken by each construction profession, which aspects are unique to each group and which are common, and what might make some tasks more stressful than others. Besides seeking more intraprofessional understanding, interprofessional issues should be explored as well. While uncertainty, in relation to decision making, cannot be entirely eliminated, it may be possible to mitigate it and manage it.

Addressing the root causes of stress and developing measures to deal with them will almost certainly have to proceed on a broad front. Future regression modeling and case-based research will explore more fully some of the pressing issues raised in this paper.

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