Justus Agumba, Jan Harm Pretorius & Theo Haupt

Health and safety management practices in small and medium enterprises in the South African construction industry

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Abstract

Considering its share in, and impact on national economies, the construction industry receives additional attention in terms of its performance and productivity, especially among small and medium contractors. However, with the extensive workforce it employs, health and safety (H&S) issues have become important, since the industry still has the reputation of being one of those with the highest fatality and accident rates. It has been well established from literature and previous studies (Fernandez-Muniz, Montes-Peon & Vazquez-Ordas, 2007: 636; Rajendran & Gambatese, 2009: 1072) that managing H&S helps to ensure that construction organisations are achieving their H&S objectives. As such, H&S management practices constitute a vehicle to improve H&S performance. Given the dominance of small and medium contractors in the construction sector, the challenge is to determine what needs to be measured and practised by these Small and Medium Construction Enterprises (SMCEs) at project level. The objective of this article is to validate the H&S practices that small and medium construction enterprises practise in order to improve H&S performance at project level.

A descriptive survey was done and data collected using a structured questionnaire consisting of 31 practices. These practices were categorised in terms of five elements developed from an extensive review of literature and the participation of 20 H&S experts, 16 of whom completed all four iterations of the Delphi survey. A convenience sample of 1.450 SMCEs was used to gather data. A total of 228 questionnaires were returned, of which 216 responses were usable for analysis. The Statistical Package for the Social Sciences (SPSS) version 20 was used to determine the convergent validity and the reliability of the proposed H&S practices. Furthermore, the respondents' perception on H&S practices was also determined.

The five elements, namely upper management commitment and involvement in H&S, employee involvement and empowerment in H&S, project supervision,

Mr Justus N. Agumba, Lecturer, Department of Construction Management and Quantity Surveying, University of Johannesburg, corner Siemert and Beit Streets, Doornfontein, 2028, Johannesburg, South Africa. Phone: +27 11 559 6488, email: <jagumba@uj.ac.za>

Prof. Jan Harm Pretorius, Professor in the Faculty of Engineering and the Built Environment, University of Johannesburg, University Way, Auckland Park, 2028, Johannesburg, South Africa. Phone: +27 11 559 3377, email: <jhcpretorius@uj.ac.za>

Prof. Theo C. Haupt, visiting Professor, Department of Construction Management and Quantity Surveying, University of Johannesburg, corner Siemert and Beit Streets, Doornfontein, 2028, Johannesburg, South Africa. email: <pinnacle.haupt@gmail.com>

project H&S planning and communication in H&S, as well as H&S resources and training were considered key factors of H&S for SMCEs at project level. However, employee involvement and empowerment in H&S was the least rated H&S attribute within the SMCEs. It was, therefore, recommended that employees needed to be engaged in H&S at the project level of SMCEs.

Keywords: Elements, small and medium construction enterprises, validation

Abstrak

Die konstruksiebedryf ontvang op grond van sy aandeel in en impak op die nasionale ekonomie bykomende aandag ten opsigte van sy prestasie en produktiwiteit onder veral klein en medium kontrakteurs. Met 'n uitgebreide werkersmag in hul diens het gesondheids- en veiligheidskwessies (G&V) belangrik geword, aangesien die bedryf steeds die reputasie het van een van die bedrywe met die hoogste sterfte- en ongevallesyfers. Die literatuur en vorige studies (Fernandez-Muniz, Montes-Peon & Vazquez-Ordas, 2007: 636; Rajendran & Gambatese, 2009: 1072) bevestig dat die bestuur van G&V help om te verseker dat die konstruksie-ondernemings hul G&V doelwitte bereik. As sodanig, bied G&V-bestuurspraktykte 'n middel om G&V-prestasie te verbeter. Gegewe die oorheersing van klein en medium kontrakteurs in die konstruksiesektor, is die uitdaging daarin geleë om vas te stel wat op projekvlak deur hierdie klein en medium konstruksie-ondernemings (SMCEs) ondersoek moet word en watter maatreëls ingestel moet word. Die doel van hierdie artikel is om die G&V-maatreëls wat in die klein en medium konstruksie-ondernemings ingestel is geldig te verklaar vir die verbetering van G&V-prestasie op projekvlak.

'n Beskrywende opname is gedoen en data is ingesamel deur die gebruik van 'n gestruktureerde vraelys bestaande uit 31 praktyke. Hierdie bedrywe is geklassifiseer volgens vyf elemente wat uit die uitgebreide literatuurstudie ontwikkel is asook die deelname van 20 G&V-kundiges van wie 16 aan al vier iterasies van die Delphi opname deelgeneem het. 'n Gerieflikheidsteekproef van 1.450 SMCEs is gebruik om die data te versamel. 'n Totaal van 228 vraelyste is terug ontvang waarvan 216 response bruikbaar was vir ontleding. Die Statistiese Pakket vir die Sosiale Wetenskappe (SPSS) Weergawe 20 is gebruik om die konvergente geldigheid en betroubaarheid van die voorgestelde G&V-praktykte te bepaal. Voorts is die respondente se persepsies van die G&V-praktyke bepaal.

Die vyf elemente, naamlik topbestuur se verbintenis tot en betrokkenheid in G&V, werknemerbetrokkenheid en -bemagtiging in G&V, projektoesig, G&V-projekbeplanning en kommunikasie in G&V en G&V-hulpbronne en -opleiding is beskou as die sleutelfaktore van G&V vir SMCEs op projekvlak. Werknemerbetrokkenheid en -bemagtiging in G&V was as die swakste attribuut binne die SMCEs beskou. Dit word dus aanbeveel dat werknemers op projekvlak binne SMCEs daadwerklik by G&V betrek moet word.

Sleutelwoorde: Elemente, klein en medium konstruksie-organisasies, bekragtiging

1.   Introduction

The South African Occupational Health and Safety Act No 85 (South Africa, 1993: 8) highlights that every worker has a right to a healthy and safe working environment. However, poor health and safety performance within the construction industry in South Africa,

especially among small and emerging construction enterprises, has been anecdotally experienced (Construction Industry Development Board [CIDB]), 2008: 22). This poor H&S performance has, therefore, driven H&S stakeholders, the South African government, in particular, to take H&S seriously. Arguably, the poor H&S performance could inevitably be helped by continuous monitoring and review of H&S management practices.

H&S management refers to the tangible practices, responsibility and performance related to H&S, including the association between H&S management, climate and culture. H&S climate is perceived to be the precise indicator of overall H&S culture, while H&S management practices reflect the H&S culture of upper management. Consequently, good H&S management practices are reflected in the enhanced H&S climate of all employees (Mearns, Whitaker & Flin, 2003: 644). According to Azimah, Abdullah, Spickett, Rumchev & Dhaliwal (2009: 55), H&S management will not only resolve H&S challenges, but also enhance overall legal compliance. However, legislation by itself is inadequate to address the problems of managing workplace H&S.

1.1 Challenges and constraints facing Small and Medium Construction Enterprises (SMCEs)

The South African SMCE sector is, to a large extent, underdeveloped and lacking the managerial and technical skills and sophistication enjoyed by larger well-established contractors. SMCEs are left on the periphery of the mainstream economy and do not participate fully in the economy (Department of Public Works [DPW], 1999). Martin (2010) opined that lack of knowledge, including knowledge of pricing procedures, contractual rights and obligations, law, management techniques and principles as well as technology are a challenge to SMCEs. Despite these general challenges faced by SMCEs, the CIDB 2008 report highlighted specific challenges faced by small contractors to manage H&S. Anecdotally, the report indicated that medium to large contractors and subcontractors working with large contractors tended to address H&S to greater degrees than small and emerging contractors, as well as the majority of housing contractors (CIDB, 2008: 22).

Further, small and emerging contractors faced challenges and constraints in H&S training and competence. The contractors registered in the lower grades of the CIDB Register of Contractors were more likely to have limited formal education, based on a construction craft or trade training such as carpentry, plumbing,

electrical installation and bricklaying. This training was probably in the form of the recently introduced learnerships (CIDB, 2008: 22).

Financial resources for H&S were more likely to be provided for by contractors in the upper grading of the CIDB Register of Contractors who were normally large contractors in grades 7, 8 and 9. SMCEs did not provide sufficient H&S financial resources in their projects (CIDB, 2008: 22). Past studies in South Africa had revealed constraints and challenges of capacity and financial resources among SMCEs (Agumba *et al.*, 2005: 63). Given their limited resources and capacity, smaller contractors in grades 2 to 4 would demonstrate poorer H&S practices and H&S culture (CIDB, 2008: 23).

The effective implementation of H&S management systems, rules and procedures were challenges facing small contractors. They were less likely to possess any formal H&S management systems. Furthermore, management of H&S in SMCEs would, to a large extent, be less structured and based on the prior contract experience of the owners. It was also likely that these contractors would not be aware of the demands and requirements of the South African generic Occupational Health and Safety Act and construction H&S legislative framework (CIDB, 2008: 23).

Furthermore, small contractors were exposed to H&S risks when they used power tools and working where they could be struck by falling objects. These challenges reinforce the need to develop an H&S performance improvement model tailored for SMCEs in the South African construction industry (CIDB, 2008: 23). These challenges and constraints exacerbated the current state of poor H&S performance of SMCEs in South Africa.

2.   Health and safety status of the South African construction industry

While recent South African government initiatives to improve safety and quality performance on construction sites have reduced accidents, construction sites continue to be among the most dangerous workplaces in the economy, and rework levels remain comparably high (CIDB, 2004). Approximately 160 deaths occurred on construction sites in 2007/2008 (CIDB, 2008: 3). The construction industry was ranked third after mining and transportation, with 74 deaths recorded on site in 2003 (CIDB, 2004: 33). Furthermore, the most recent report by the Department of Labour (2012) indicated that, in the period 2007 to 2010, the construction industry incurred 171 fatalities and 755 injuries. The industry further paid over R287

million for occupational injuries in 2010/2011. These statistics are inclusive of SMCEs.

The continuing poor H&S performance of the construction industry in terms of fatalities, injuries, and diseases, the number of large-scale construction accidents, and the general non-participation by key project stakeholders such as clients and designers, provided the catalyst for a new approach to construction H&S in the form of consolidated construction H&S legislation such as the Construction Regulations of 2003. This framework required new multi-stakeholder interventions (Smallwood & Haupt, 2005). However, according to the CIDB, there was very limited commitment to complying with basic requirements, let alone promoting a culture of H&S. SMCEs could barely maintain their tools and equipment and regarded H&S interventions as luxury items. Even where protective clothing and equipment were provided, workers often avoided their use (CIDB, 2004: 33).

2.1   Measurement of construction health and safety performance

Health and safety performance measurement permits the comparison of H&S performance between projects and can be used internally to maintain line accountability for H&S and to pinpoint problem areas where preventive action should be undertaken. It also provides feedback regarding H&S initiatives (Mitchell, 2000: 326).

Health and safety performance measurement can be broadly classified in terms of two types of indicators, namely lagging indicators and leading indicators or positive performance indicators (PPIs) (Toellner, 2001: 42). Leading indicators can either be subjective in the form of perception measures or objective indicators in the form of the number of occasions an activity has been administered (Grabowski, Ayyalasomayajula, Merrick, Harrald & Roberts, 2007: 1019). Unfortunately, the construction industry continues to rely heavily on traditional lagging indicators such as accident and workers compensation statistics (Mohamed, 2002: 375).

When using leading indicators, a more thorough and constant surveillance is required than when using lagging indicators. The real value of using leading H&S indicators on construction projects lies in the changes that can be made and interventions that can be introduced early to address weaknesses before an accident occurs. The use of leading indicators instead of lagging indicators is increasingly advocated (Hinze, 2005: 10-11). Unfortunately, there is no consensus of what elements and measuring indicators are considered to be critical for improvements to H&S culture

(Fernandez-Muniz *et al*., 2007: 628) which, according to Grabowski *et al*. (2010: 264) and Hinze, Thurman & Wehle (2013: 24), is a leading indicator of H&S.

2.2 Previous H&S performance improvement models

Many H&S performance improvement and measurement models have been developed in recent years. For example, Teo & Ling (2006: 1587) developed a model to measure the effectiveness of H&S management of construction sites. The model was based on 3P + I, namely policy, process, personnel and incentive factors. These core factors were measured by 590 attributes. The large number of attributes might not be practical in the context of SMCEs.

Fernandez-Muniz *et al*. (2007: 636) developed a positive H&S culture model that consisted of management commitment, employee involvement and H&S management system (SMS). The SMS included H&S policy, incentives, training, communication, planning and control. The model could be applied to more than one type of industry of different sizes.

Chinda & Mohamed (2008: 127) developed an H&S culture model adapted from the European Foundation Quality Model (EFQM). The enablers that were identified were leadership, policy and strategy, partnerships and resources, and processes and H&S outcome or goals. The model was validated using large contractors in Thailand. It might be possible to test this model or a modified model within SMCEs. This is because SMCEs and large organisations are different in terms of their characteristics. Large organisations are more properly resourced and organised than SMCEs.

Molenaar, Park & Washington (2009: 495) established that, for H&S performance to improve the corporate H&S culture, it should include H&S commitment, H&S incentives, subcontractor involvement, H&S accountability and disincentives.

It is, therefore, evident that there is no consensus on what the critical H&S elements on construction projects are and their impact on H&S performance at that level.

2.3 Elements of health and safety management

The literature review identified a number of potential H&S elements as important H&S attributes that could improve H&S performance. Many studies have indicated the importance of upper management commitment and involvement in H&S (Fernandez-Muniz *et al*., 2007: 636; Aksorn & Hadikusumo, 2008: 725; Agumba & Haupt, 2008: 197)

as an element to improve H&S performance. It is important for upper management to be committed and involved in H&S matters at SMCE project level.

Employee involvement and empowerment has been identified as influential in enhancing H&S performance improvement (Fernandez-Muniz *et al.*, 2007:636; Aksorn & Hadikusumo, 2008: 725). It is important for employees to be empowered and involved in H&S by, for example, being able to refuse to do dangerous and unsafe work (Teo, Theo & Feng, 2008: 494; Agumba & Haupt, 2008: 196). Workers should further be involved in developing H&S policy, providing written suggestions on H&S, being informed of the provisions of H&S plans, being involved in H&S inspections, being consulted when the H&S plan is compiled, and being involved in the development of H&S rules and safe work procedures (Teo *et al.*, 2008: 494; Agumba & Haupt, 2008: 196).

For SMCEs to improve their H&S performance, upper management or owners and their workers need to adhere to the proper implementation of occupational H&S management systems (OHSMS). Eight elements or leading indicators were identified that constituted an OHSMS:

- Appointment of H&S staff (Sawacha, Naoum & Fong, 1999: 313; Findley, Smith, Tyler, Petty & Enoch, 2004: 20). The employment of staff members with H&S training on each project was advocated by Ng, Cheng & Skitmore (2005: 1352).

- Formal and informal written communication in the form of, for example, written circulars or brochures that inform workers about the risks associated with their work and the preventive measures to reduce risk (Sawacha *et al.*, 1999: 314).

- Formal and informal verbal (oral) communication (Fernandez-Muniz *et al.*, 2007: 636). Various forms of this type of communication include providing clear verbal instructions to both literate and illiterate employees about H&S; H&S information verbally communicated to workers before changes are made to the way their work activities are executed; organising regular meetings to verbally inform workers about the risks associated with their work, and organising regular meetings to verbally inform workers about the preventive H&S measures of risky work.

- H&S resources (Abudayyeh, Fredericks, Butt & Shaar, 2006: 173; Fernandez-Muniz *et al.*, 2007: 636). The allocation

of resources will include human, financial and personal protective equipment.

- Project planning of H&S involves procedures to evaluate risks and establish necessary H&S measures to avoid accidents and includes organised planning in the case of emergencies (Sawacha *et al*., 1999: 313; Fernandez-Muniz *et al*., 2007: 636).

- Project supervision is an internal concept that verifies the extent to which goals have been fulfilled, as well as compliance with internal norms or work procedures (Fernandez-Muniz *et al*., 2007: 636; Aksorn & Hadikusumo 2008: 725).

- Training in H&S (Sawacha *et al*., 1999: 313; Ng *et al*., 2005: 1351; Fernandez-Muniz *et al*., 2007: 636; Aksorn & Hadikusumo, 2008: 725).

- H&S policy includes a proper implementation of H&S management system; written in-house H&S rules and regulations for all workers reflecting management's concern for H&S; principles of actions to achieve H&S, and objectives to be achieved (Ng *et al*., 2005: 1351; Fernandez-Muniz *et al*., 2007: 636).

3.   Research approach

A survey instrument was developed after four iterations of a Delphi study, in which 16 international H&S experts participated. The panel of experts concurred on those H&S practices that were considered to be important and could have a major impact on improving the H&S performance of SMCEs at the project level. The Delphi questionnaire consisted of 64 H&S practices categorised in terms of 10 H&S elements. After the fourth iteration, 31 H&S practices emerged as being very important and having a major impact on improving H&S performance at the project level of SMCEs. A few of these H&S elements were combined in the final survey instrument completed by SMCEs. These elements were formal and informal verbal communication and project planning of H&S. They were renamed H&S planning and communication. Furthermore, H&S resources and training in H&S were combined and renamed H&S resources and training. The combination of these elements was based on the reduced number of H&S practices that achieved consensus. According to Kline (2013: 178), this situation would make it difficult to conduct factor analysis when an element contained fewer than three measurable attributes. Furthermore, three H&S elements were eliminated as their H&S practices did not attain

consensus. These H&S elements were appointment of H&S staff, formal and informal written communication, and H&S policy.

Eight SMCEs piloted the survey instrument to establish whether they easily understood the questions and the expected rate of response for the final administration of the survey. The pilot survey satisfied the face validity of the 31 H&S practices presented to the construction SMCEs. These H&S practices addressed five H&S elements. They constituted the final questionnaire that was administered to the sample of SMCEs.

A part of the questionnaire was designed to profile the participants in terms of their position in the company, gender, race, their experience in the construction industry and qualification. The questionnaire also profiled the organisation in terms of its type of business and geographic location. After pre-testing via the pilot study, the final version was presented to 1.450 conveniently sampled SMCEs. The data was collected using email and drop-and-collect methods. Only 228 questionnaires were returned, representing a 15.72% response rate. This low response rate concurs with the findings of Kongtip, Yoosook & Chantanakul (2008: 1358). Furthermore, 216 questionnaires were deemed eligible for analysis. The Statistical Package for Social Science (SPSS) version 20 was used to conduct descriptive statistical analysis of the data computing the frequencies, mean scores and standard deviation. SPSS was further used to determine the factor analysability of the H&S practices. Similarly, exploratory factor analysis (EFA) was used to determine the unidimensionality of the H&S elements and their reliability. Reliability was tested using Cronbach's *alpha* with a cut-off value of 0.70 as recommended by Hair, Black, Babin, Anderson & Tatham (2006: 102).

4.   Research results and discussion

4.1   Respondents' profile

Table 1 shows the profile of respondents. It is evident that the majority of the respondents were either owners or managers of their SMCEs (67%), male (87%), Black African (62%), had either Matriculation (28.4%) or a Certificate (24.7%) or a Higher National Diploma (HND)/Diploma (24.7%), and had 10 years' or less experience in construction (51.4%).

Table 1:   Respondents' profile

	Frequency	*Percentage*
Position		
Owner	63	30.00%
Manager	24	11.00%
Owner/manager	32	15.00%
Project manager	25	12.00%
Other	67	32.00%
	211	100.00%
Gender		
Male	186	87.00%
Female	29	13.00%
	215	100.00
Race		
Asian/Indian	7	3.00%
African/Black	132	62.00%
Coloured	7	3.00%
White	65	31.00%
Other	2	1.00%
	213	100.00%
Highest education qualification		
Doctorate degree	2	0.90%
Master's degree	6	2.80%
Honours/BTech/BSc	12	5.60%
HND/Diploma	53	24.70%
Certificate	53	24.70%
Matriculation	61	28.40%
Basic schooling	26	12.10%
No qualification	2	0.90%
	215	100.00%
Years of experience in construction		
1-5 years	40	18.90%
6-10 years	69	32.50%
11-15 years	39	18.40%
16-20 years	32	15.10%
21-25 years	6	2.80%
26-30 years	12	5.70%
31-35 years	6	2.80%
Over 36 years	8	3.80%
	212	100.00%

4.2   SMCEs profile

It is evident from Table 2 that most SMCEs were either subcontractors (37.56%) or general contractors (36.15%), operating in Gauteng province (91.16%). However, the subcontractors either worked for a main contractor or were single trade contractors.

Table 2:   SMCEs profile

Type of contractor	Frequency	Percentage
General contractor	77	36.15%
Subcontractor	80	37.56%
Civil contractor	9	4.23%
Specialist contractor	21	9.86%
Home building contractor	12	5.63%
Other	14	6.57%
	213	100.00%
Province		
Eastern Cape	3	1.40%
Free State	5	2.33%
Gauteng	196	91.16%
KwaZulu-Natal	1	0.50%
Limpopo province	4	1.86%
Mpumalanga	4	1.86%
North-West province	0	0.00%
North Cape	0	0.00%
Western Cape	2	0.93%
	215	100.00%

4.3   Factor analysis

The five H&S elements, namely upper management commitment and involvement in H&S, employee involvement and empowerment in H&S, project supervision, project H&S planning and communication in H&S, and H&S resources and training, were subjected to exploratory factor analysis (EFA) to assess their unidimensionality and reliability. Maximum Likelihood with Promax Rotation was selected as the extraction and rotation methods. The respondents' perception on element was also measured.

4.3.1   EFA upper management involvement and commitment in H&S

It is evident from Table 3 that there were 11 practices measuring upper management commitment and involvement in H&S.

Table 3:   Upper management commitment and involvement in H&S

Eigen value 5.107 % of variance 46.427		Cronbach alpha 0.868				
Item	Action	Mean	Standard deviation	Cronbach level after deletion	Factor loading	Rank
UMC 1	I/We encourage and support worker participation, commitment and involvement in H&S activities.	4.48	0.751	0.867	0.452	1
UMC 5	I/We take responsibility for H&S by, for example, stopping dangerous work on site, and so on.	4.48	0.678	0.854	0.667	1
UMC 10	I/We ensure that the H&S equipment is bought, for example hardhats, overall, and so on.	4.55	0.585	0.857	0.618	3
UMC 9	I/We regularly conduct toolbox talks with the workers.	4.44	0.776	0.857	0.604	4
UMC 8	I/We encourage discussions on H&S with employees.	4.43	0.661	0.849	0.728	5
UMC 6	I/We actively and visibly lead in H&S matters by, for example, walking through the site, and so on.	4.42	0.600	0.855	0.672	6
UMC 7	I/We regularly visit workplaces to check work conditions or communicate with workers about H&S.	4.42	0.650	0.850	0.717	6
UMC 3	I/We communicate regularly with workers about H&S.	4.40	0.663	0.847	0.786	8
UMC 4	I/We actively monitor the H&S performance of the projects and workers.	4.32	0.706	0.844	0.778	9
UMC 2	I/We accord workers H&S training when there is less work in the project.	3.95	0.882	0.865	0.491	10
UMC 11	I/We reward workers who make an extra effort to do work in a safe manner.	3.79	1.025	0.873	0.465	11

The Cronbach *alpha* was greater than 0.70 at 0.868, indicating acceptable internal reliability, as recommended by Hair *et al*. (2006: 102). The Kaiser-Meyer-Olkin (KMO) of 0.890 with Bartlett's Test of Sphericity of $p<0.000$ were also obtained, indicating consistency

with the recommended KMO cut-off value of 0.60 and Bartlett's Test of Sphericity of $p<0.05$, as suggested by Pallant (2007: 190). These results suggest that factor analysis could be conducted with the data.

All 11 practices (UMC1, UMC2, UMC3, UMC4, UMC5, UMC6, UMC7, UMC8, UMC9, UMC10 and UMC11) expected to measure the upper management commitment and involvement in H&S loaded together on this factor. The factor loadings for all practices were greater than 0.452 which were greater than the recommended value of 0.40, as suggested by Field (2005: 647) and Hair *et al.* (2006: 128). An Eigen value greater than 5.107 was established in this factor which explains 46.427% of the variance in the data. Therefore, sufficient evidence of convergent validity was provided for this construct. This finding is in line with the study of Fernandez-Muniz *et al.* (2007: 634) and that of Findley *et al.* (2004: 19). They found that the practices were valid and reliable measures of upper management commitment and involvement.

The result in Table 3 indicates that nine of the 11 practices were considered to be practised by the SMCEs, as their mean was above 4.00. The two highest ranked H&S practices were: "encouraging and supporting worker participation", "commitment and involvement in H&S activities" and "taking responsibility for H&S by, for example, stopping dangerous work on site, and so on", with a mean value of 4.48. These were also reliable measures of upper management commitment and involvement in H&S. The reliability values were above the recommended value of 0.70, as recommended by Hair *et al.* (2006: 102). However, the least ranked H&S practice was "rewarding of workers who make an extra effort to do work in a safe manner", with a mean value of 3.79.

4.3.2 EFA employee involvement and empowerment in H&S

It is evident from Table 4 that there were five practices measuring worker involvement and empowerment construct.

Table 4:   Employee involvement and empowerment in H&S

Eigen value 3.079 % of variance 61.577		Cronbach alpha 0.842				
Item	Action	Mean	Standard deviation	Cronbach level after deletion	Factor loading	Rank
WIS 3	Our workers can refuse to work in potentially unsafe, unhealthy conditions.	4.26	0.788	0.857	0.458	1

Eigen value 3.079 % of variance 61.577				Cronbach alpha 0.842		
Item	Action	Mean	Standard deviation	Cronbach level after deletion	Factor loading	Rank
WIS 1	Our workers are involved in H&S inspections.	4.04	0.884	0.832	0.598	2
WIS 2	Our workers help in developing H&S rules and safe-work procedures.	3.87	0.931	0.776	0.839	3
WIS 5	Our workers are consulted when the H&S plan is compiled.	3.68	1.047	0.791	0.814	4
WIS 4	Our workers are involved in the production of H&S policy.	3.64	1.006	0.778	0.863	5

The findings indicate that the Cronbach *alpha* was greater than 0.70 at 0.842, indicating acceptable internal reliability, as recommended by Hair *et al*. (2006:102). The Kaiser-Meyer-Olkin (KMO) of 0.819 with Bartlett's Test of Sphericity of *p*<0.000 were also obtained, indicating consistency with the recommended KMO cut-off value of 0.60 and Bartlett's Test of Sphericity of *p*<0.05, as suggested by Pallant (2007: 190). These results suggest that factor analysis could be conducted with the data.

The factor loadings for all practices were greater than 0.458 reported in Table 4, which were greater than the recommended value of 0.40, as suggested by Field (2005: 647) and Hair *et al*. (2006: 128). An Eigen value greater than 3.079 was established in this factor which explains 61.557% of the variance in the data. Therefore, sufficient evidence of convergent validity was provided for this construct. This finding concurs with the study of Fernandez-Muniz *et al*. (2007: 634) and that of Agumba *et al*. (2008: 196). They found that the practices were reliable and valid for this element.

Furthermore, the findings in Table 4 indicate that two of the five practices were considered to be practised by the SMCEs as their mean was above 4.00. These highest ranked practices were: "workers can refuse to work in potentially unsafe, unhealthy conditions" and "workers are involved in H&S inspections", with mean values of 4.26 and 4.04, respectively. They were also reliable measures of employee involvement and empowerment in H&S. The reliability values were above the recommended value of 0.70, as recommended by Hair *et al*. (2006: 102). However, the least ranked H&S practice within employee involvement and empowerment in H&S was "workers are involved in the production of H&S policy", with a mean value of 3.64.

4.4.3   EFA project supervision

It is evident from Table 5 that there were six practices measuring project supervision.

Table 5:   Project supervision

Eigen value 3.640 % of variance 60.662		Cronbach alpha 0.868				
Item	Action	Mean	Standard deviation	Cronbach level after deletion	Loading factor	Rank
PSP 1	I/We allow supervision of work by staff trained in H&S.	4.23	0.768	0.837	0.786	1
PSP 4	I/We allow local authorities and H&S enforcement agencies to visit sites for inspection.	4.22	0.759	0.850	0.693	2
PSP 5	I/We undertake informal H&S inspection of the workplace daily.	4.17	0.801	0.837	0.781	3
PSP 2	One of our employees trained in H&S identifies dangerous activities.	4.09	0.878	0.848	0.718	4
PSP 3	I/We undertake formal H&S inspection of the workplace daily.	4.08	0.870	0.850	0.714	5
PSP 6	I/We regularly undertake H&S audits of projects.	4.07	0.845	0.854	0.666	6

The result indicates that the Cronbach *alpha* was greater than 0.70 at 0.868, indicating acceptable internal reliability (Hair *et al.*, 2006: 102). The Kaiser-Meyer-Olkin (KMO) of 0.868 with Bartlett's Test of Sphericity of $p<0.000$ were also obtained, indicating consistency with the recommended KMO cut-off value of 0.60 and Bartlett's Test of Sphericity of $p<0.05$, as suggested by Pallant (2007: 190). These results suggest that factor analysis could be conducted with the data.

All six practices (PSP1, PSP2, PSP3, PSP4, PSP5 and PSP6) expected to measure the factor project supervision loaded together on this factor. The factor loadings for all practices were greater than 0.666 reported in Table 6, which was greater than the recommended value of 0.40, as suggested by Field (2005: 647) and Hair *et al.* (2006: 128). An Eigen value greater than 3.640 was established in this factor which explains 60.662% of the variance in the data. Therefore, sufficient evidence of convergent validity was provided for this construct. This finding is in line with the study of Fernandez-Muniz *et al.* (2007: 634).

Furthermore, the result in Table 5 indicates that all six practices were considered to be practised by the SMCEs, as their mean was above 4.00. The two highest ranked practices were: "allow supervision of work by staff trained in H&S" and "allow local authorities and H&S enforcement agencies to visit sites for inspection", with mean values of 4.23 and 4.22, respectively. They were also established to be reliable measures of project supervision. The reliability values were also above the recommended value of 0.70 considered by Hair *et al*. (2006: 102).

4.4.4 EFA project health and safety planning and communication

It is evident from Table 6 that there were four practices measuring project H&S planning and communication.

Table 6:   Project health and safety planning and communication

Eigen value 2.786 % of variance 69.644		Cronbach alpha 0.852				
Item	Action	Mean	Standard deviation	Cronbach level after deletion	Factor loading	Rank
PPC 4	I/We organise regular meetings to verbally inform workers about the risks and preventive measures of their work.	4.27	0.779	0.850	0.665	1
PPC 3	I/We include H&S in our projects programme.	4.23	0.753	0.784	0.822	2
PPC 2	Our firm uses procedures to identify possible H&S dangers on site.	4.16	0.790	0.788	0.833	3
PPC 1	I/We consider H&S when layout of site is done.	4.08	0.858	0.823	0.769	4

The result indicates that the Cronbach *alpha* was greater than 0.70 at 0.852, indicating acceptable internal reliability, as indicated by Hair *et al*. (2006: 102). The Kaiser-Meyer-Olkin (KMO) of 0.764 with Bartlett's Test of Sphericity of $p<0.000$ were also obtained, indicating consistency with the recommended KMO cut-off value of 0.60 and Bartlett's Test of Sphericity of $p<0.05$, as suggested by Pallant (2007:190). These results suggest that factor analysis could be conducted with the data.

The factor loadings for all practices were greater than 0.665, as reported in Table 5, which were greater than the recommended value of 0.40, as suggested by Field (2005: 647) and Hair *et al*. (2006: 128). An Eigen value greater than 2.786 was established

in this factor which explains 69.644% of the variance in the data. Therefore, sufficient evidence of convergent validity was provided for this construct.

The findings in Table 6 indicate that all four practices were considered to be practised by the SMEs, as their mean was above 4.00. The two highest ranked practices were: "organising regular meetings to verbally inform workers about the risks and preventive measures of their work" and "include H&S in our projects programme", with mean values of 4.27 and 4.23, respectively. These practices were also established to be reliable measures of project health and safety planning and communication. The reliability values were also above the recommended value of 0.70, as recommended by Hair *et al.* (2006: 102).

4.4.5 EFA health and safety resources and training

It is evident from Table 7 that there were five practices measuring H&S resources and training.

Table 7:   Health and safety resources and training

Eigen value 3.281 % of variance 65.628		Cronbach alpha 0.864			
Item	Action	Mean	Standard deviation	Cronbach level after deletion	Factor loading	Rank
HSR 2	I/We provide correct tools and equipment to execute construction work.	4.61	0.561	0.832	0.782	1
HSR 1	I/We buy hardhats, gloves, overalls, and so on for workers.	4.59	0.678	0.847	0.708	2
HSR 5	I/We ensure that workers are trained to do the work safely.	4.49	0.692	0.830	0.771	3
HSR 3	I/We conduct induction of all workers on H&S before commencing work on a particular site.	4.46	0.793	0.835	0.751	4
HSR 4	I/We ensure that our workers are properly trained to take care of and use personal protective equipment.	4.41	0.726	0.834	0.763	5

The result indicates that the Cronbach *alpha* was greater than 0.70 at 0.864, indicating acceptable internal reliability, as suggested by Hair *et al.* (2006: 102). The Kaiser-Meyer-Olkin (KMO) of 0.801 with Bartlett's Test of Sphericity of $p<0.000$ were also obtained, indicating

consistency with the recommended KMO cut-off value of 0.60 and Bartlett's Test of Sphericity of $p<0.05$ recommended by Pallant (2007: 190). These results suggest that factor analysis could be conducted with the data.

All five practices (HSR1, HSR2, HSR3, HSR4 and HSR5) expected to measure H&S resources and training loaded together on this factor. The factor loadings for all practices were greater than 0.708, as reported in Table 7, which were greater than the recommended value of 0.40, as suggested by Field (2005: 647) and Hair *et al*. (2006: 128). An Eigen value greater than 3.281 was established in this factor which explains 65.628% of the variance in the data. Therefore, sufficient evidence of convergent validity was provided for this construct. This finding is supported by Choudhry, Fang, Lew & Jenkins (2007) and Agumba *et al*. (2008: 196-197).

Furthermore, the findings in Table 7 indicate that all five practices were considered to be practised by the SMCEs, as their mean was above 4.00. The two highest ranked practices were: "providing correct tools, equipment to execute construction work" and "buying hardhats, gloves, overalls, and so on for workers", with mean values of 4.61 and 4.59, respectively. They were also established to be reliable measures of project supervision. The reliability values were also above the recommended value of 0.70 considered by Hair *et al*. (2006: 102).

4.4.6   Reliability of the five H&S elements

The result in Table 8 indicates the reliability of the five H&S elements.

Table 8:   Summary of statistics and Cronbach's *alpha* coefficient of the H&S elements

Construct	Mean	Standard deviation	Number of items	Cronbach alpha	Rank
H&S resources and training.	4.51	0.56	5	0.864	1
Upper management commitment and involvement.	4.33	0.48	11	0.868	2
Project H&S planning and communication.	4.19	0.66	4	0.852	3
Project supervision	4.14	0.64	6	0.868	4
Employee involvement and empowerment.	3.90	0.73	5	0.842	5

The Cronbach *alpha* values for each element are satisfactory. They were all above the cut-off point of 0.70, which is the minimum recommended value by Hair *et al*. (2006: 102). The result further

indicates that H&S resources and training was ranked higher than the other four H&S elements, with a mean value of 4.51. However, employee involvement and empowerment in H&S was the least ranked, with a mean value of 3.90.

5.   Conclusions

This research established that the H&S elements, namely upper management commitment and involvement in H&S, employee involvement and empowerment in H&S, project supervision, project H&S planning and communication in H&S, and H&S resources and training, that were identified through literature review and verified by H&S experts using the Delphi process and a pilot survey with eight construction SMCEs, were valid and reliable H&S practices performed/implemented by the SMCEs in the South African construction industry.

The respondents' perception on the various H&S practices of the five H&S elements indicated that, of the 31 individual practices, 26 were rated above the mean value of 4.00, indicating strongly agree to agree. However, five individual H&S practices were rated below the mean rate of 4.00, namely accord workers H&S training when there is less work in the project, and reward workers who make an extra effort to do work in a safe manner. These two practices were measured under the element upper management commitment and involvement in H&S. Previous studies by Fernandez-Muniz *et al*. (2007: 636) and Aksorn & Hadisukumo (2008: 725) established that upper management commitment and involvement in H&S was an important element that influences H&S performance. The low rating of these two practices within the South African context could be driven by the financial constraints experienced within construction SMCEs, as indicated in the CIDB report (2008: 22). These H&S practices were financially driven and could, therefore, lead SMEs not to favour practices which would impact on their limited budgets.

The other practices were measuring employee involvement and empowerment in H&S, namely:

- Our workers help in developing H&S rules and safe work procedures;
- Our workers are consulted when the H&S plan is compiled, and
- Our workers are involved in the production of H&S policy.

This finding suggests that the low rating of these three practices could be the result of employees who are employed in projects

when such practices have already been carried out by upper management personnel; for example, the owner as indicated by Maloney, Cameron & Hare (2007: 303).

Furthermore, the respondents' overall perception was that employee involvement and empowerment in H&S was the least practised. This is an indication that SMCEs did not involve and empower their employees to a great degree in H&S. However, the SMCEs indicated that they provided resources and training of H&S at their project level. This H&S element might be implemented because of the current requirements of the South African government through occupational H&S legislation, regulations and trade unions that all stakeholders such as, for example, employers and contractors should observe health and safety in their projects. It can, therefore, be concluded that the findings of this study enhance H&S knowledge in the South African construction industry especially within SMCEs.

These H&S elements are proactive measures and could inform SMCEs of their H&S performance. As proactive measures, they could also be used to alleviate any accidents or incidents before they occurred. These H&S practices also reflected the H&S culture of SMCEs at project level in South Africa.

Acknowledgement

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