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Impact of the South African construction regulations as perceived by project managers

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Abstract

International research indicates that construction clients and built environment consultants such as project managers, designers, and quantity surveyors influence and can contribute to construction health and safety (H&S). This article focuses on the influence and contribution of project managers only.

Although they are not required to undertake any specific interventions in terms of the South African Construction Regulations (SACR) promulgated in July 2003, project managers by virtue of their unique contributions in the form of managing design delivery, the integration of design and construction, and their monitoring of construction, need to ensure that many of the requirements of the SACR are met.

A perception-based survey conducted among member practices of the Association of Construction Project Managers (ACPM) determined the following: the traditional project parameters in the form of time, cost, and, quality are still perceived to be substantially more important than H&S; the manifestations of the impact of the SACR are wide spread, namely in the form of increased consideration for / reference to H&S by project managers and general contractors, increased H&S awareness, and impact of H&S on various project parameters.

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Abstrak

Internasionale navorsing dui aan dat kliente, projek-bestuurders, ontwerpers en bourekenaars invloed uitoefen asook bydrae verleen ten opsigte van gesondheid en veiligheid (G&V) in die konstruksie-industrie. Hierdie artikel fokus slegs op die invloed en bydrae van projek-bestuurders.

Alhoewel projek-bestuurders nie volgens die Suid-Afrikaanse Konstruksie Regulasies versoek word om enige spesifieke handeling toe te pas nie, moet hulle egter seker maak dat daar aan die meeste van die vereistes/behoeftes voldoen word, as gevolg van hulle unieke posisie in hul hoedanigheid as besturende ontwerp lewering, die integrasie van ontwerp en konstruksie en hulle monitering/analise van die konstruksie proses.

'n Studie wat onderneem is tussen praktyke wat lede is van die Assosiasie van Konstruksie Projek Bestuurders (AKPB) het die volgende bepaal: die tradisionele projek paradigmas in die vorm van tyd, koste en kwaliteit word steeds aanvaar as baie meer belangrik as G&V; die manifestering van die impak van die Konstruksie Regulasies is wyd bekend — toenemende inagneming vir/verwysing na G&V deur projek-bestuurders en algemene kontrakteurs en toenemende G&V bewustheid is aan die orde van die dag en G&V vier hoogty in terme van die uitstek waarteen die Konstruksie Regulasies impak sal uitoefen op verskeie projekte se omvang.

Sleutelwoorde: projek-bestuurders, konstruksie, gesondheid en veiligheid

1. Introduction

Traditionally, cost, quality and time have constituted the parameters within which projects have been managed. However, increasing awareness relative to the role of H&S in overall project performance and the inclusion of H&S as a project performance measure by inter alia, petro-chemical organisations, has engendered focus on H&S by a range of stakeholders. The number of large-scale construction accidents in South Africa during the last decade and more, and the consequential media coverage has further raised the level of awareness. Furthermore, the SACR promulgated on 18 July 2003, require a range of interventions by clients and designers.

Given the abovementioned, the general need to assess the impact of interventions, and the first anniversary of the promulgation of the Construction Regulations, a perception-based survey was conducted to ascertain the views of member practices of the Association of Construction Project Managers (ACPM) relative to the:

- Importance of various project parameters;
- Manifestation of the impact of the SACR, and
- Extent of the impact of the SACR on various project parameters.

2. Literature survey

2.1 Statistics

During 1999, the latest year for which occupational injury statistics are available, a total of 14 418 medical aid cases, 4 587 temporary total disablements, 315 permanent disablements, and 137 fatalities were reported (Compensation Commissioner in South Africa, 2005). These equate to 1 temporary disablement for every 102 workers, 1 permanent disablement for every 1 041 workers, and 1 fatality for every 3 925 workers. The disabling injury incidence rate of (DIIR) 0.98 means that 0.98 workers per 100 incurred disabling injuries compared against the all industry average of 0.78. The number of fatalities among the workers insured by the Accident Fund (AF) is the equivalent of a fatality rate of 25.5 fatalities per 100 000 full-time equivalent construction workers. These statistics do not compare favourably with international rates.

The severity rate (SR) indicates the number of days lost due to accidents for every 1 000 hours worked. The construction industry SR of 1.14 is the fourth highest, after fishing, mining, and transport, compared against the all industry average of 0.59. Given that the average worker works 2 000 hours per year, and the SR therefore is multiplied by 2, the average number of days lost per worker per year can be computed. Using this approach the construction industry arguably lost 2.28 working days per worker during 1999. This equates to about 1.0% of total working time.

The statistics provide motivation from a humanitarian point of view for the need for occupational health and safety related legislation resulting in the promulgation of the OH&S Act of 1993 and the SACR in 2003, and consequently mandatory multi-stakeholder contributions to construction H&S.

2.2 Cost of accidents (CoA)

The CoA can be categorised as being either direct or indirect. Direct costs tend to be those associated with the treatment of the injury and any unique compensation offered to workers as a consequence of being injured and are covered by workmen's compensation insurance premiums.

The indirect costs which are borne by contractors include, *inter alia*,

- Reduced productivity of both the returned worker(s) and the crew or workforce;
- Clean-up costs;
- Replacement costs;
- Costs of delays;
- Costs of supervision;
- Costs related to rescheduling;
- Costs of transportation; and
- Wages paid while the injured is non-productive and recuperating (Hinze, 1997).

Recent research conducted in the United Kingdom (UK) determined indirect costs to be 11 times the direct costs — 11:1 (Movement for Innovation, 2003). Similarly, research conducted in South Africa determined the indirect costs to be 14.2 times the direct costs (Smallwood, 2000).

Research in the United States of America suggests the total cost of accidents to constitute about 6.5% of the value of completed construction (The Business Roundtable, 1995). UK-based research indicates that the total CoA could be approximately 8.5% of tender price (Anderson, 1997).

Using the respective indirect cost multipliers determined in the UK and South Africa, namely 11 and 14.2, and the estimated compensation insurance for 2002, the total cost of accidents could arguably have been between:

- R 200.1m + (R 200.1m x 11) = R 2 401.2m, and
- R 200.1m + (R 200.1m x 14.2) = R 3 041.5m

Further, based upon the value of construction work completed in the year 2002, namely R 56 343m (South African Reserve Bank, 2003) the total COA could have been between 4.3% (R 2 401.2m /

R 56 343m), and 5.4% (R 3 041.5m / R 56 343m) (Smallwood, 2004).

Importantly, clients ultimately incur the CoA as contractors attempt to recover these costs in their tenders. Project managers who are concerned with the optimisation of value should endeavour to contribute to efforts to mitigate accidents and thereby reduce the cost to the SA construction industry.

2.3 Legislation and recommendations pertaining to project managers

The Occupational Health and Safety Act (OH&S Act) (Republic of South Africa, 1993) schedules comprehensive requirements for employers. Project management practices are employers and therefore need to address H&S in that capacity. Furthermore, project managers invariably visit projects, and consequently are exposed to hazards and risk.

The SACR with respect to clients and designers that by definition include project managers prescribes important duties and responsibilities.

Clients shall, *inter alia*:

- prepare H&S specifications for the construction work — given that designers may specify materials that are hazardous due to the non-availability of alternative non-hazardous substance containing materials, or require hazardous processes, for which there are no alternatives, designer and project manager input may be required;

- ensure that principal contractors (PCs) have made provision for H&S costs in their tenders — a design may require a specific method and sequence of construction as scheduled by the designer, and therefore the designer and project manager may need to assess the contractors' financial provision at tender or bidding stage;
- provide PCs with any information that might affect H&S — designers or project managers may be the source of the requisite information, such as the actual position of a high voltage cable;
- appoint PCs for projects — project manager input may be necessary in terms of the assessment of contractors' suitability for a project in general, but possibly relative to a project that entails a high level of risk;
- ensure that PCs implement their H&S plans — a design may require a specific method and sequence of construction as scheduled by the designer, and therefore the designer and project manager may need to assess the contractors' performance during construction;
- stop work that is not in accordance with the H&S plans — non-conformance to the method and sequence of construction in terms of the implementation of H&S plans by PCs may require intervention by project managers, and
- ensure that sufficient H&S information and resources are available to the PC where changes to the design or construction are made — project managers should ensure that designers supplement the design change details with H&S information if necessary, particularly if the design change entails the use of hazardous materials or hazardous processes.

Designers that include project managers by definition shall, *inter alia*:

- make available all relevant information about the design such as the soil investigation report; design loadings of the structure, and methods and sequence of construction. The rationale for the latter being that a design may require a method and sequence of construction, which is hazardous and which cannot be averted, and in which case the risk can be mitigated through specific interventions. However, the intention of this is that designers deliberate a design in terms of the hazards and the risk;

- inform PCs of any known or anticipated dangers or hazards or special measures required for the safe execution of the works — the high voltage cable referred to above is an example, and
- modify the design or make use of substitute materials where the design necessitates the use of dangerous structural or other procedures or materials hazardous to H&S — the specification of a water vis-à-vis a solvent based application, constitutes an example of an appropriate response to a hazard.

Furthermore, the International Labour Office (ILO) (1992) specifically states that designers should:

- integrate the H&S of construction workers into the design and planning process;
- not include anything in a design which would necessitate the use of dangerous structural or other procedures or hazardous materials which could be avoided by design modifications or by substitute materials, and
- take into account the H&S of workers during subsequent maintenance.

2.4 Project management and health and safety

According to the Project Management Institute (PMI) (2004), all project managers should be proficient with the nine knowledge areas including among other, project integration, project scope and project risk management, in order to meet their client's requirements. These management knowledge areas are concerned with planning, controlling and executing all works required to complete the project, while managing project risk exposure. Brown (1996) concludes that project managers can mitigate risk exposure by consciously considering the potential H&S implications of any scope or programme changes before and during the construction phase, as well as in the choice of suitable construction methods / materials in the early phases of the project. He suggests the integration of H&S considerations in all project decisions. Lester (2000) developed this theory to propose that the traditional project performance parameters of cost, quality, and time, be expanded upon to include H&S. Hence sub-standard H&S performance will adversely affect overall project performance. Hislop (1999) and Burke (2003) concur that it is the project manager's responsibility to

their client, in their role as project manager, to integrate and co-ordinate all the stakeholder contributions and in particular the timely contributions of the design team followed by the general contractor, their co-contractors and any direct co-contractors. The project manager also has to oversee and monitor any design development or any proposed changes to project scope during the construction phase to ensure that H&S is not marginalised in order to comply with budgetary or programme constraints.

2.5 Project Integration Management

Obligations of project managers in terms of project integration management (PMI, 2004) include the proper planning and controlling of the project throughout all of its phases, albeit primarily in an overseeing role after the appointment of a PC (PMI, 2004). Project managers can use a number of planning and control techniques, such as work breakdown structures (WBSs), organisational breakdown structures (OBSs), critical path method (CPM) to assist in making trade-offs between competing objectives and alternatives in the early phases in order to meet the various stakeholder requirements. Smallwood (1999) opines that H&S pre-planning is an intrinsic part of the project manager's overall planning responsibility. It is their duty to ensure that adequate pre-planning of H&S is included in the overall planning since much of the initial project planning is completed by or under the supervision of the project manager during the first two phases of the project life cycle. After the appointment of the PC the project manager's role shifts to overseeing the works and monitoring performance against the baseline plan (Burke, 2003). The Project Management Body of Knowledge (PMBOK) does not explicitly include or discuss this H&S component of the project manager's overall planning responsibility (Smallwood & Venter, 2002).

2.6 Project manager instigated H&S related interventions

According to Hislop (1999), Davies & Tomasin (1996) and Strank (1994) there are numerous interventions that project managers can introduce to engender a positive H&S culture, *inter alia*: reinforcing the client's commitment to improving H&S among design team members and tenderers; determining suitable resource levels required to complete the project without compromising H&S including information, competent staff, time, and finance; establishing a project H&S management framework; determining tender pre-qualification criteria; conducting risk assessments, and formulating project H&S plans.

2.7 Importance of H&S

Table 1: Importance of various project parameters to project management practices.

Parameter	Response (%)					II	Rank
	Not ..... Very						
	1	2	3	4	5		
Client satisfaction	0.0	0.0	0.0	23.3	76.7	3.77	1
Project quality	0.0	0.0	3.3	23.3	73.3	3.70	2
Project cost	0.0	0.0	6.7	23.3	70.0	3.63	3
Project time	0.0	0.0	6.7	33.3	60.0	3.53	4
Project health and safety	0.0	3.3	16.7	20.0	60.0	3.37	5
Public health and safety	0.0	6.7	30.0	6.7	56.7	3.13	6
Labour productivity	0.0	10.0	13.3	40.0	36.7	3.03	7
Environment (natural)	0.0	10.0	23.3	23.3	40.0	2.97	8
Worker satisfaction	0.0	13.3	23.3	43.3	20.0	2.70	9
Designer satisfaction	0.0	13.3	26.7	40.0	20.0	2.67	10
Contractor satisfaction	0.0	13.3	33.3	36.7	16.7	2.56	11

Table 1 indicates the importance attached to eleven traditional and non-traditional project parameters to project management practices in terms of percentages relative to importance on a scale of 1 (not) to 5 (very), and a ranking based upon an importance index (II) value, ranging between a minimum of 0.00 and 4.00 (Smallwood & Venter, 2002). Given that all the project parameters have II values above the midpoint value of 2.50, the parameters can be deemed to be important to practices. It is notable that four of the five project parameters have II values > 3.2, which indicates that they are perceived to be between more than important to very important / very important. It is significant that project H&S, the subject of the study falls within this range and is ranked 5th. It is notable that the three traditional project parameters (quality, cost, and time) achieved rankings in the top four. However, the II value of project quality, which was ranked second, is effectively 10% more important than fifth ranked project H&S. Client satisfaction, which was ranked first, is a function of general performance; certainly cost, quality, and time, but increasingly, project H&S included. Public H&S probably achieved the ranking of sixth due to the possible exposure thereof to construction activities during new build and certainly recycling projects. Furthermore, public H&S is pertinent during the use of buildings and structures.

2.8 Potential consequences of inadequate integration of OH&S interventions

Inadequate planning, including the omission of H&S pre-planning, or the lack of adherence to these plans and interventions will negatively affect the level of H&S seen on site and will according to Smallwood (1999), be accompanied by an increase in the number of accidents. Davies & Tomasin (1996) concur that accidents can marginalise the project team's efforts at achieving the project deliverables on time and within budget due to the direct and indirect costs associated with accidents. Accidents also lead to substantial bad publicity, which may tarnish the client's name and strain relations among project stakeholders.

3. Research

3.1 Sample stratum and response

The sample stratum consisted of 124 member practices of the ACPM who returned 19 questionnaires in response to the postal survey were included in the analysis of the data, constituting a response rate of 15.3%.

3.2 Analysis

The analysis of the data consisted of the calculation of descriptive statistics to depict the frequency distribution and central tendency of responses to fixed response questions to determine the degree of importance of various parameters, the manifestation of the impact of the Construction Regulations, and the likely extent of the future impact of the SACR.

3.3 Findings

Almost all the respondents (94.7%) were from project management practices

Table 2: Degree of importance of various parameters to respondents' organisations.

Parameter	*Response (%)*						*Mean score*	*Rank*
	Unsure	*Not .....Very*						
		1	*2*	*3*	*4*	*5*		
Project time	0.0	5.3	0.0	0.0	10.5	84.2	4.68	1
Project cost	0.0	0.0	5.3	0.0	21.1	73.7	4.63	2
Project quality	0.0	5.3	0.0	5.3	31.6	57.9	4.37	3
Project H&S	0.0	5.3	0.0	21.1	42.1	31.6	3.95	4
Environment	0.0	10.5	5.3	31.6	36.8	15.8	3.42	5

Table 2 indicates the importance of five parameters in terms of percentage responses to a range of 1 (not important) to 5 (very important), and in terms of a mean score ranging between 1 and 5. It is notable that the mean scores are all above the midpoint score of 2.50, which indicates that in general the respondents can be deemed to perceive the parameters as important. However, given that the mean scores for the top three parameters are > 4.20 ≤ 5.00, the respondents can be deemed to perceive them to be between more than important to very important / very important. Given that the mean scores for project H&S and environment are > 3.40 ≤ 4.20, the respondents can be deemed to perceive them to be between important to more than important / more than important. It is significant that the traditional project parameters (time, cost and quality) are ranked in the first three. Furthermore, it is notable that the subject of the study, H&S, has a mean score 0.73 below that of first ranked project time — project time is effectively 24.8% more important than H&S.

Table 3: Awareness of the Construction Regulations

Response	*%*
Yes	84.2
No	5.3
Unsure	10.5

Table 3 indicates that most respondents are aware of the SACR. However, 10.5% were unsure. Furthermore, the 'No' and 'Unsure' responses total 15.8%, which effectively means 1 out of every 6.33 respondents is not aware of the SACR and/or its provisions and requirements.

Table 4: Project stakeholders which are affected by the Construction Regulations.

Stakeholder	*%*
Clients	100.0
Contractors	100.0
Architects	93.8
Engineers	93.8
Project managers	87.5
Quantity surveyors	87.5
Co-contractors	87.5
Interior designers	68.8
Landscape architects	68.8
Materials manufacturers	43.8
Materials suppliers	31.3

The majority of respondents indicated that clients, contractors, architects, engineers, project managers, quantity surveyors, co-contractors, interior designers, and landscape architects are affected by the SACR. Less than 50% indicated that materials manufacturers, and materials suppliers are. However, all the stakeholders presented in Table 4 are affected by the SACR.

Table 5: Manifestation of the impact of the Construction Regulations.

Aspect	*Response (%)*							*Mean score*	*Rank*
	Unsure	*No impact*	*Minor .....Major*						
			1	*2*	*3*	*4*	*5*		
Increased consideration for / reference to H&S by project managers	0.0	0.0	0.0	0.0	6.3	43.8	50.0	4.44	1
Increased consideration for / reference to H&S by general contractors	0.0	0.0	0.0	0.0	12.5	31.3	56.3	4.44	2
Increased H&S awareness	6.3	0.0	0.0	0.0	25.0	25.0	43.8	4.20	3
Increased consideration for / reference to H&S by co-contractors	0.0	0.0	0.0	12.5	31.3	25.0	31.3	3.75	4
Improvement in H&S	6.3	0.0	0.0	0.0	43.8	37.5	12.5	3.67	5
Improved conditions on site	0.0	0.0	0.0	0.0	50.0	43.8	6.3	3.56	6

Review of provision for H&S - other e.g. H&S plan, programme	6.3	0.0	0.0	12.5	37.5	25.0	18.8	3.53	7
Review of forms of contract	0.0	0.0	0.0	18.8	37.5	25.0	18.8	3.44	8
More structured / deliberated approach to work	0.0	0.0	0.0	21.4	21.4	57.1	0.0	3.36	9=
Reduction in accidents	31.3	0.0	0.0	12.5	25.0	25.0	6.3	3.36	9=
Change in work practices	6.7	0.0	0.0	13.3	40.0	40.0	0.0	3.29	11
Review of provision for H&S - financial	6.3	0.0	0.0	31.3	25.0	18.8	18.8	3.27	12
Review of procurement practices	6.3	0.0	0.0	25.0	37.5	18.8	12.5	3.20	13
Increased consideration for / reference to H&S by quantity surveyors	0.0	0.0	6.3	25.0	43.8	12.5	12.5	3.00	14
Increased consideration for / reference to H&S by designers	6.7	0.0	13.3	33.3	20.0	6.7	20.0	2.86	15
Pre-qualification on H&S	0.0	0.0	12.5	43.8	18.8	12.5	12.5	2.69	16

Table 5 indicates the impact of the SACR in terms of percentage responses to 'no impact' and a range of 1 (minor) to 5 (major), and in terms of a mean score ranging between 0 and 5.

Given that effectively a six-point scale ('no impact' linked to a five-point) was used and that the difference between 0 and 5 is five, ranges with an extent of 0.83 (5 / 6) are used to discuss the degree of central tendency. The ranges relative to the mean score categories are as follows:

- $> 4.17 \leq 5.00$ — between a near major impact to major impact / major impact;
- $> 3.33 \leq 4.17$ — between an impact to near major impact / near major impact;
- $> 2.50 \leq 3.33$ — between a near minor impact to impact / impact, and
- $> 1.67 \leq 2.50$ — between a minor impact to near minor impact / near minor impact.

It is notable that the mean scores for all sixteen manifestations are above the midpoint score of 2.50, which indicates that in general the related manifestations can be deemed to be prevalent.

The manifestations falling within the higher range of mean scores > 4.17 ≤ 5.00 — between a near major impact to major impact / major impact, are discussed first.

Increased consideration for / reference to H&S by project managers, and general contractors, and increased H&S awareness, predominates. Increased consideration for / reference to H&S by project managers is a significant manifestation as project managers in their capacity as project leaders and coordinators, are uniquely positioned to integrate H&S into projects, in particular the design and development, and construction phases (Smallwood, 1996; Hinze, 1997). Given that project managers coordinate design and / or design delivery, they can influence designers, and therefore increased consideration for / reference to H&S by them is likely to result in increased consideration for / reference to H&S by designers. Further, it is notable that the latter manifestation is ranked fifteenth with a mean score of 2.86, which is 35.6% lower than that relative to increased consideration for / reference to H&S by project managers. Increased H&S awareness is a significant manifestation, as awareness is a pre-requisite for commitment and the allocation of resources.

The second range of manifestations, those with mean scores > 3.33 ≤ 4.17 — between an impact to near major impact / near major impact, are discussed below.

Increased consideration for / reference to H&S by co-contractors is ranked fourth, whereas increased consideration for / reference to H&S by general contractors is ranked second. However, on the scale of 0 to 5, the latter mean score of 4.44 is 18.4% higher the former of 3.75. Although fifth ranked improvement in H&S is probably attributable to a qualitative as opposed to a quantitative based opinion, it is nevertheless notable. However, the level of response relative to this manifestation and consequent ranking thereof, is validated by the level of response to and consequent sixth ranking of improved conditions on site — effectively 3.0% lower.

Seventh ranked review of provisions for H&S such as H&S plan, programme is ranked higher than review of forms of contract

ranked eighth, and substantially higher than review of financial provision, ranked twelfth, and review of procurement practices ranked thirteenth — both these have mean scores < 3.33. The ranking of review of provision for H&S is notable, as planning is a prerequisite for H&S (Hinze, 1997). Furthermore, *inter alia*, enhanced planning for H&S was a desired outcome of the SACR. However, the low mean score relative to review of procurement practices is significant as the SACR explicitly and implicitly require a range of procurement related interventions. Furthermore, procurement can impact on *inter alia*, H&S, either positively or negatively. The SACR also require the client to ensure that the PC has made adequate financial allowance for H&S. This and other requirements explicitly and implicitly require that the PC and Co-Contractors (CCs) be pre-qualified on H&S. More structured / deliberated approach to work is ranked joint ninth with reduction in accidents. The former is related to and a function of planning — review of provision for H&S — other e.g. H&S plan, programme is ranked seventh.

The third range of manifestations, those with mean scores > 2.50 ≤ 3.33 — between a near minor impact to impact / impact, are discussed below.

Eleventh ranked change in work practices, which essentially is a function of joint ninth ranked more structured / deliberated approach to work, falls within this range with a mean score of 3.29. Given the designer specific requirements and that in terms of the Construction Regulations the definition of designer includes quantity surveyors: "surveyor specifying articles or drawing up specifications", the ranking of increased consideration for / reference to H&S by quantity surveyors, increased consideration for / reference to H&S by designers is significant. Although these rankings are based upon project managers' perceptions, project managers are best positioned to comment. Pre-qualification on H&S is ranked last. This too, is significant as the Construction Regulations also require the client to ensure that the PC has made adequate financial allowance for H&S. This and other requirements explicitly and implicitly require that the PC and SCs be pre-qualified on H&S.

Table 6: Extent to which the Construction Regulations will impact on various project parameters ExEExtent to which the CponParameter

	Response (%)						Mean score	Rank
	Unsure	Minor ..... Major						
		1	2	3	4	5		
Project H&S	7.7	0.0	6.2	13.8	30.8	41.5	4.17	1
Project cost	7.6	9.1	18.2	22.7	25.8	16.7	3.25	2
Project time	7.6	18.2	9.1	27.3	21.2	16.7	3.10	3
Project quality	12.1	10.6	10.6	39.4	16.7	10.6	3.07	4
Environment	15.4	13.8	13.8	24.6	23.1	9.2	3.00	5

Table 6 indicates that the respondents perceive that the SACR will have between: an impact to near major / near major impact on H&S; a near minor impact to impact / impact on time, cost , and the environment, and a minor to near minor impact / near minor impact on quality.

4. Conclusions and recommendations

4.1 The importance of various project parameters

Despite the promulgation and implications of the SACR, the traditional project parameters in the form of cost, quality, and time are still perceived to be substantially more important than H&S.

This conclusion amplifies the need for project management practices to make a paradigm shift in terms of the status of H&S. Furthermore, the ACPM and related international associations should engender such a paradigm shift through: the requirement that H&S be addressed in project management tertiary education and continuing professional development (CPD) programmes, and the provision of H&S related practice notes and guidelines.

4.2 The manifestation of the impact of the Construction Regulations

Generally, the SACR are perceived to have had an impact on construction H&S in South Africa. The manifestations of the impact are wide spread. These include partially achieving the intention of

the SACR in the form of increased consideration for and/or reference to H&S by project managers and general contractors, increased H&S awareness, and to a lesser extent, increased consideration for and/or reference to H&S by co-contractors. These are important manifestations as they occur 'upstream' and are necessary to influence the downstream process.

Increased provision for H&S, both financial and other, and review of forms of contract are important 'midstream' manifestations as they also influence the downstream process.

Improvement in H&S, improved conditions on site, and reduction in accidents are all significant and 'downstream' manifestations. Consequently, it can be concluded that the SACR have had the desired 'upstream', 'midstream', and 'downstream' impact.

4.3 The extent to which the SACR will impact on various project parameters

The findings in the form of the perceived extent to which the SACR will impact on various project parameters justifies their promulgation, particularly relative to H&S, but to a lesser extent, time and cost, and also the environment, and quality.

Recommendations include that H&S be addressed in all built environment and CPD programmes, and that the related voluntary and mandatory associations provide H&S related practice notes and guidelines, which address the synergy between H&S and the other project parameters.

References

Anderson, J. 1997. The problems with construction. *The Safety and Health Practitioner*, pp. 29-30, May.

Brown, P.E. 1996. Total integration of the safety professional into the project management team. In: Alves Dias, L.M. & Coble, R.J. (eds.). *First International Conference of CIB Working Commission W99 Implementation of Safety and Health on Construction Sites*, Lisbon, 4-7 September. Rotterdam: AA Balkema, pp. 137-143.

Burke, R. 2003. *Project Management: Planning & Control Techniques.* 4th Edition. Cape Town: Promatec International.

Compensation Commissioner. 2005. *Report on the 1999 Statistics*. Pretoria.

Davies, V.J. & Tomasin, K. 1996. *Construction Safety Handbook*. London: Thomas Telford.

Hinze, J.W. 1997. *Construction Safety*. New Jersey: Prentice Hall Inc.

Hislop, R.D. 1999. *Construction site safety: a guide for managing contractors*. New York: Lewis Publishers.

International Labour Office (ILO). 1992. *Safety and health in construction*. Geneva: ILO.

Lester, A. 2000. *Project planning and control*. Oxford: Butterworth-Heineman.

Movement for Innovation (M4I). 2003. *A Commitment to People "Our Biggest Asset"*. http://www.rethinkingconstruction.org/rc/publications/reports/rfp_report.pdf

Project Management Institute (PMI). 2004. *A Guide to the Project Management Body of Knowledge*. Newtown Square, Pennsylvania: PMI.

Republic of South Africa. 1993. Government Gazette No. 14918. *Occupational Health & Safety Act: No. 85 of 1993*. Pretoria.

Republic of South Africa. 2003. *Government Gazette No. 25207. Construction Regulations*. Pretoria.

Smallwood, J.J. 1996. The role of project managers in occupational health and safety. In: Alves Dias, L.M. & Coble, R.J. (eds.). *First International Conference of CIB Working Commission W99 Implementation of Safety and Health on Construction Sites*, Lisbon, 4-7 September. Rotterdam: AA Balkema, pp. 227-236.

Smallwood, J.J. 1999. Pre-planning of health and safety. In: Singh, A. Hinze, J.W. & Coble, R.J. (eds.). *Second International Conference of CIB Working Commission W99: Implementation of Safety and Health on Construction Sites*. Honolulu, Hawaii, 24-27 March. Rotterdam: AA Balkema, pp. 695-702.

Smallwood, J.J. 2000. *A study of the relationship between occupational health and safety, labour productivity and quality in the South African construction industry. Unpublished PhD Thesis*. Port Elizabeth: University of Port Elizabeth.

Smallwood, J.J. 2004. Optimum cost: The role of health and safety (H&S). In: Verster, J.J.P. (ed.). *International Cost Engineering Council (ICEC) 4th World Congress, Cape Town, 17-22 April*. Cape Town: ICEC, CD-Rom Smallwood-J — Optimum Cost-Health & Safety.pdf

Smallwood, J.J. & Venter, D. 2002. The influence of project managers on construction health and safety in South Africa. *The Australian Journal of Construction Economics and Building*, 2(1), pp. 57-69.

South African Reserve Bank. 2003. *Quarterly Bulletin*. Pretoria: South African Reserve Bank.

Strank, J. 1994. *Handbook of Health and Safety Practice*. London: Pitman Publishers.

The Business Roundtable. 1995. *Improving Construction Safety Performance Report A — 3*. New York: The Business Roundtable.