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Improving Health and Safety Culture – A Guide for Construction Clients

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Abstract
Many accidents and a general poor health and safety performance for both the construction industry and other high reliability industries have been blamed on the poor health and safety (H&S) culture that was prevalent at the time. Addressing H&S culture is therefore a very important step to eliminating accidents and thereby improve the general H&S performance within an organisation or industry. The current paper will therefore report on findings from an empirical study on improving H&S performance in a construction project and will also present a guide of how to improve the construction client's H&S culture.

The research conducted in South Africa and Botswana and whose results were modelled using structural equation modelling, found that with a better H&S culture, clients had a positive influence on H&S performance of construction projects. The client H&S culture was characterized by leadership, involvement, procedures, commitment, communication and competence (LIP+3C). A positive manifest of these factors in the client entity entailed a better H&S performance at project level.

This paper will therefore present a guide on how construction clients may improve their H&S culture and thereby impact positively on project's H&S performance. Further, the guide will exemplify how the concept of H&S culture may be operationalised in order to benefit from a concept that has been mooted as the panacea for the H&S problem in the construction industry as well as the concept that has been at the centre of major industrial disasters.

Keywords: clients, culture, Health and Safety, LIP+3C

1.0 BACKGROUND

Many accidents, incidents and poor health and safety performance for both the construction industry and other high reliability industries have been blamed on the poor health and safety (H&S) culture that was prevalent at the time. It appears therefore that addressing H&S culture would be a very important step towards eliminating these incidents, accidents and poor H&S performance in an organisation or industry. Findings from a study conducted in South Africa and Botswana also revealed that a better clients' H&S culture resulted in a better construction project H&S performance (Musonda et.al, 2012). Based on Musonda et al., (2012) findings, the current paper will present a guide for clients of how they can improve a construction project's H&S performance by improving their H&S culture.

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H&S during the construction process is conventionally considered to be the contractor's responsibility. When construction accidents happen, perceived factors of causation are most of the time associated with the contractor's management failures or site operative failures to control unsafe site conditions or unsafe actions (Abdelhamid & Everett, 2000:55; Suraji et al., 2006:52). The general perception is that construction H&S is a matter of construction management rather than client's management or indeed other participants' management (Suraji et al., 2006:52). Studies concentrating on factors that relate to the contractor create the impression that the main problem is with contractors and therefore H&S performance improvement can only be achieved by addressing contractor issues.

It should be appreciated however, that the H&S of any operation is determined long before people, procedures and equipment are brought together at the work site. In other words before the contractor commences work. As Behm (2005:590) puts it, many if not all hazards are designed into construction projects. Design in this case is a process that happens long before the contractor commences work on site. However, this is not to say contractors have no role in accident causation. To the contrary, contractors are just as guilty as the other parties.

The contractor's influence on H&S can be seen in the studies that have been undertaken before. It has been found that for a number of accidents, the inappropriate construction planning, construction control and operation are some of the frequent contributing factors (Suraji, Duff & Peckitt, 2001:339). Research also indicates that the attitude of contractor's top management impacts on H&S performance. According to Gould & Joyce (2002:367), top management's attitude can be reflected on the job site in many ways, such as training, housekeeping, toolbox talks, meetings, and adherence to H&S measures, maintenance of equipment and tools, and intolerance of violations. It is a natural tendency for those in authority to exert control and show exemplary behaviour to those under them. Managerial commitment is reflected in the H&S culture that is prevalent and the number of accidents that result.

It is however unlikely that H&S performance improvement can be achieved throughout the industry by only focusing on addressing issues at the construction stage and the contractor specifically. This is due partly to the difficulty conditions that contractors operate in. Suraji et al. (2006:59) argue that contractors operate under a number of constraints including the actions of designers as well as the action of clients, and therefore may fail to provide safe working conditions, at least in part as a result of these constraints.

With such contractor problems for instance, there is a need to move upstream for complementary interventions. Bomel (2001:5.3) suggest that the culture of client organisations present considerable opportunities for H&S improvement in the construction industry. Therefore, there should be an increasing interest to find interventions that address client issues and procedures.

Consequently, striving for better H&S performance will remain elusive if the client is not seen to be actively involved in H&S implementation. Huang & Hinze (2006a:164) rightly argue that the involvement of clients is an essential requirement for the zero injuries objective. The importance of the client to H&S management is well documented. Construction H&S can be successfully influenced by clients (Smallwood, 1998:182; Bomel, 2001:5.3; Lingard et al., 2009:132).

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Clients are usually at the centre of most decisions that are made on construction projects; many of these decisions have an impact on the H&S outcome. It is because of this that Suraji et al. (2001:340) for instance, contend that construction accidents may be caused by client's inappropriate responses to certain constraints and the environment. Examples of such constraints could be client responses, which could be actions or omissions in response to constraints that emerge during the development of a project scope such as reducing the project budget, adding new project criteria, changing project objectives and accelerating the design or construction efforts of the project. Suraji et al. (2001:340) argue that all of these examples are factors that may impact negatively on H&S depending on the decisions that clients may make. There is therefore no argument that clients have a positive role to play in lowering injury rates (Smallwood, 1998:181; Huang & Hinze, 2006a:164) and by extension, the possibility of a change in the construction project H&S culture.

Therefore client's role in H&S performance is critical since a successful implementation of H&S depends on the extent to which clients participate in the process (Loosemore et al., 1999:884). Leadership in H&S must come from clients. Without this, the construction industry has a long way to go in changing attitudes and ultimately the H&S culture (Loosemore et al., 1999:884). There are several activities which could for example show client participation. Levitt & Samuelson (1993:215) observed that one of the activities through which the client can make a difference is monitoring.

I addition to monitoring, it is argued that clients must take responsibility to prevent accidents for example by carefully considering H&S control in ordering works, exercising supervision, and issuing instructions (Watanabe & Hanayasu, 1999:60). By so doing, many affirm that project H&S can be influenced (Smallwood, 1998:182; Suraji et al., 2001:339; Huang & Hinze, 2006a:172). Consequently the H&S culture within client organisations is important because it has been identified to have an impact on project H&S goals (Dingsdag et al., 2006:2).

However, from evidence in several earlier studies it seems that most clients have not shown serious commitment to H&S. Consequently, client H&S cultures have remained to be unsatisfactory. A study conducted by Smallwood (1998) in South Africa found that most clients give priority to cost and quality in comparison to H&S with the latter being largely overlooked.

A review of literature confirms that examination of the role and culture of clients are almost absent from most studies. Most studies focus on the construction phase of projects and the related operational processes of contractors (Sawacha et al., 1999; Hudson, 2001; Carder & Ragan, 2003; Saurin et al., 2003; Teo et al., 2005). The exception however, is the study by Huang & Hinze (2006a) which focused on clients.

In view of the absent literature on client H&S performance improvement and the revelations that clients are largely not involved in H&S implementation or are not seriously committed, the current study on which the guide presented in this paper, sought to highlight the importance of client organisations to H&S performance. Further, the guide is designed to help clients achieve a better H&S culture which would positively influence project H&S performance. The current study builds on other studies including that of Huang & Hinze (2006) by using leading indicators of H&S as outcomes. Huang & Hinze (2006) used total recordable injury rate (TRIR), to determine the relationship between H&S Performance and owner involvement. However, TRIR is considered to be a lagging indicator of H&S and may not be a good indicator of H&S performance especially for an environment in the underdeveloped countries.

2.0   THE STUDY

According to Suraji et al. (2006:62), improving H&S means making clients, client representatives, designers and contractors as well as employees be aware of their roles in the improvement process.

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Huang & Hinze (2006a:164) further argue that participation of clients is an essential requirement for the zero injuries objective. In fact according to Gambatese (2000:668), owners should participate with contractors in all project's H&S activities. Clients could be involved in setting up work procedures, raising awareness, requiring attendance at meetings and appointments because these have been found to be effective in H&S performance improvement (Smallwood 1998:189; Said, Shafiel & Omran, 2009:129). Clients could further show commitment and involvement by conducting regular audits and inspections (Smallwood 1998:189; Human Engineering, 2005:9). Huang & Hinze (2006a:172) further elucidate that clients could show commitment, by providing adequate resources for H&S instead of relying on contractors. This could include inter alia, providing financial support, the inclusion of H&S as a prequalification criterion for contractors, scheduling H&S requirements prior to bidding process structuring contract documentation to allow for H&S, and selecting suitable contractors (Smallwood 1998:182; Huang & Hinze, 2006a:165). Successful implementation of H&S depends on the extent to which construction clients participate and assign resources to the process.
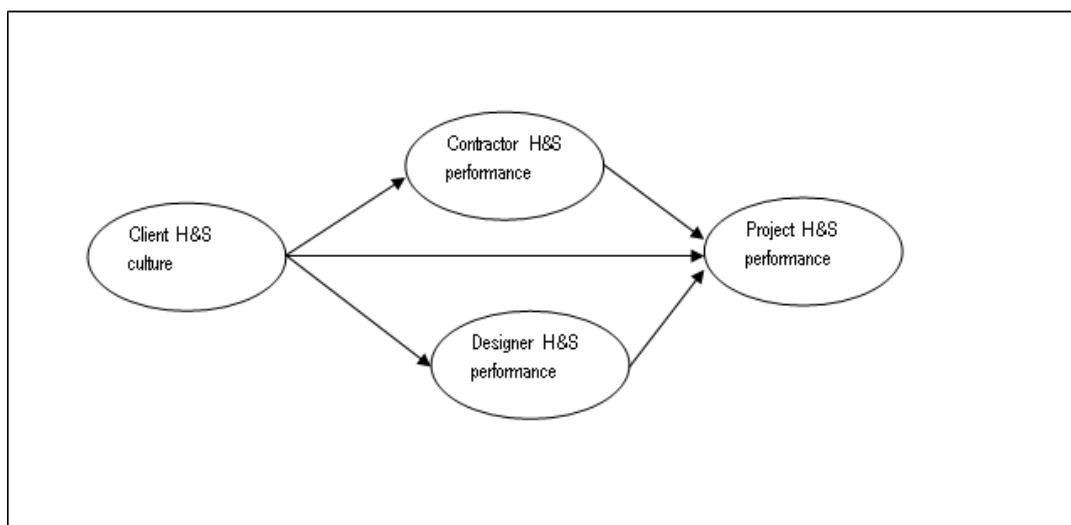
Further, H&S performance improvement depends on the extent to which clients provide leadership on H&S matters. Loosemore, Lingard, Walker, & Mackenzie (1999:884) argue that the lead must come from clients themselves on H&S. They maintain that without client's leadership, the construction industry has a long way to go in changing attitudes and the H&S culture. According to Levitt & Samuelson (1993:215) simple monitoring exercises can show leadership, as it makes a difference, and that excellent H&S performance can be obtained with the active participation of clients, even from average contractors. It is argued that clients have the moral if not the legal duty to take reasonable care to ensure H&S to all workers on construction sites (Suraji et al., 2006:55). Client leadership can be achieved by the client considering carefully H&S control in ordering works, exercising supervision, and providing instructions. According to Huang & Hinze (2006b:181), clients set the H&S culture tone for a project.

The above literature coupled with findings from the Delphi study whose results were published in Musonda et. al., (2012), indicated that client H&S culture may be characterized as a six factor model made up of (1) leadership (2) involvement (3) procedures (4) commitment (5) communication and (6) competence (Figure 1). These six factors were collectively referred to as the LIP+3C, an acronym standing for Leadership, Involvement, Procedures, Commitment, Communication and Competence.

The collective and individual influence of the client H&S factors on contractor, designer and overall project performance was investigated through an empirical questionnaire survey and analysed using the structural equation modelling.

The conceptual model depicting the relationships between client H&S culture, contractor, designer and overall project H&S performance are shown in Figure 1. The postulated relationships in the conceptualised model were that:

H1. client H&S culture has a direct positive influence on contractor H&S performance;
H2. client H&S culture has a direct positive influence on designer H&S performance;
H3. client H&S culture has a direct positive influence on project H&S performance;
H4. contractor H&S performance has a direct positive influence on project H&S performance;
H5. designer H&S performance has a direct positive influence on project H&S performance

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3.0   FINDINGS

Results from an SEM analysis of 259 responses indicated a good fit of the model to the sample. The analysis yielded a *chi*-square statistic (χ^2) of 2,966.661 with 1,342 degrees of freedom. The associated p-value was determined to be 0.000. From these values, the normed chi-square value was determined to be 2.211. The normed values of up to 3.0 or even 5.0 are recommended.

Further, other fit indices for the postulated model were evaluated. The root mean square error of approximation (RMSEA) with 90% confidence interval was determined to be 0.068 (lower bound value = 0.065 and upper bound value = 0.072). The RMSEA index was just above the upper limit value of 0.050 for the model to be described a good fit. Nonetheless, a value of 0.068 was indicative of an adequate fit. A model with RMSEA values of up to 0.080 is considered to be acceptable (Hu & Bentler; 1999:27; Kline, 2005:139; Bartholomew et al., 2006:73; Dion, 2008:367). In addition the upper confidence interval of 0.072 did not exceed the upper acceptable value of 0.08 as recommended by Hu & Bentler (1999:27).

The Standardised root mean square residual (SRMR) was determined to be 0.045. The SRMR of 0.045 was much lower than the upper cut-off value of 0.05. The SRMR value also meant that the postulated model had a good fit. On the other hand, the comparative fit index (CFI) yield a value that was close to the lower limit value of 0.90 at 0.88. The CFI index was not greater than 0.90 which is the lower limit value for model acceptance if the CFI is considered in the combination rules. However, a two statistic model fit evaluation strategy as proposed by Hu & Bentler (1999:16) was followed in the current study.

An evaluation of the SRMR, RMSEA and the CFI fit indexes indicated that the postulated model reasonably fit the sample data.

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Table 1: Robust fit indexes for the postulated Model

Fit Index	Cut-off value	Model 1.0	Comment
χ^2		2966.661	
Df	0≥	1342	Acceptable
CFI	0.9≥ acceptable 0.95≥Good fit	0.88	Barely acceptable
SRMR	0.08≤acceptable 0.05≤ Good fit	0.045	Good fit
RMSEA	0.08≤acceptable 0.05≤Good fit	0.068	Acceptable
RMSEA 90% CI	0.08≤	0.065:0.072	Acceptable range

A further evaluation of the effect of individual client factors on project H&S performance was conducted. The individual client factors were leadership (CLLP), involvement (CLIP), procedures (CLPP), commitment (CLTP), communication (CLNP) and competence (CLCE). The effect of client factors on project H&S performance was found to be indirect and mediated by both designer and contractor H&S performance. The effect of three factors of client H&S culture, namely involvement, procedures, and commitment, mediated by contractor H&S performance were found to be statistically significant at 5% probability level. The standardised indirect effects of the involvement factor, yielded parameter estimates λ= -0.362, Z= -2.335 and P= 0.020. The estimates for the factor, procedures, were λ = 0.270, Z= 3.877 and P= 0.000 indicating that the effect was statistically significant. The specific standardised indirect effects of the commitment factor, on project H&S performance mediated by contractor H&S performance yield parameter estimates of λ = 0.337, Z= 2.303 and P=0.021. These estimates indicated a statistically significant effect. Although the effect of three factors of client H&S culture namely communication, leadership and competence, was evident, it was found to be statistically insignificant when client influence on project H&S performance was mediated by contractor (Table 2).

The indirect influence of client H&S culture on project H&S performance mediated by designers revealed that two relationships were significant. The effect of communication, on project H&S performance mediated by designer was determined to be statistically significant. The standardised parameter estimates of communication and project H&S performance were; λ = 0.055, Z = 1.977 and P= 0.048. The effect of the procedures factor, had un-standardised parameter estimates of λ= 0.063, Z= 1.968 and P= 0.049. However the standardised estimates for the factor, procedures, were found to be insignificant (Table 2).

The total indirect effect of client H&S culture on project H&S performance showed that two factors namely procedures and commitment, had a statistically significant total indirect effect on project H&S performance. This indirect effect was mediated by contractor and designer elements. The standardised estimates for the total indirect effect was found to be λ = 0.340, Z = 4.619 and P= 0.000 for the procedures factor and λ= 0.366, Z = 2.052 and P= 0.040 for the commitment factor.

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Table 2: Specific indirect effects of client H&S culture on Project H&S Performance

Parameter	Un-standardised			Standardised estimates		
	Indirect effect	Z-statistic	P-Value	Indirect effect	Z-Statistic	P-Value
CLLP→ CONT →PROJ. H&S	0.118 -0.315	1.738 -2.258	0.082 0.024	0.111 -0.362	1.738 -2.335	0.082 0.020
CLIP→ CONT →PROJ. H&S	0.245 0.320	3.748 2.216	0.000 0.027	0.270 0.337	3.877 2.303	0.000 0.021
CLPP→ CONT →PROJ. H&S	0.012 0.047	0.211 0.667	0.833 0.505	0.014 0.044	0.211 0.667	0.833 0.505
CLTP→ CONT →PROJ. H&S	0.031 -0.021	1.412 -0.533	0.158 0.594	0.029 -0.025	1.413 -0.534	0.158 0.593
CLNP→ CONT →PROJ. H&S	0.063 0.028	1.968 0.662	0.049 0.508	0.070 0.030	1.948 0.665	0.051 0.506
CLCE→ CONT →PROJ. H&S	0.049 -0.033	1.999 -1.488	0.046 0.137	0.055 -0.031	1.977 -1.427	0.048 0.153
CLLP→ DESG →PROJ. H&S						
CLIP→ DESG →PROJ. H&S						
CLPP→ DESG →PROJ. H&S						
CLTP→ DESG →PROJ. H&S						
CLNP→ DESG →PROJ. H&S						
CLCE→ DESG →PROJ. H&S						

The finding on the effect of client H&S culture on project H&S performance that it was indirect, confirmed the mediatory role that contractor and designer H&S performance played in the postulated model. In addition, the findings also confirmed that although the client H&S culture did not exhibit a direct positive influence on project H&S performance, its indirect influence on project H&S performance was statistically significant and is in line with the traditional contractual relationships that are in place for most projects.

The conclusion therefore was that client H&S culture generally had an indirect positive influence on project H&S performance, mediated by both contractor and designer H&S performance. The effect of individual factors of procedures and commitment were found to be statistically significant at 5% probability level. The effect of other client factors on project H&S performance was also found to be evident.

4.0   CLIENT GUIDE

The conceptualised model developed from literature and the Delphi process was validated in an alternative questionnaire survey and whose results were analysed using structural equation modelling.

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The model fit the sample findings and the factors of client H&S culture collectively referred to as LIP+3C where found to have an effect on project H&S culture. Some of the effects such as for the commitment and procedures factors were found to be statistically significant while the other factors' effect was also evident. Consequently, if clients exhibited the LIP+3C factors, a corresponding better project H&S performance was observed. The suggestion was therefore that improving the LIP+3C factors in client organisations, would lead to a better project H&S performance.

In order to operationalize the model and concept of H&S culture improvement in client organisations, it is easier and practical to view the identified factors of client H&S culture namely; leadership, involvement, procedures, commitment, communication and competence (LIP+3C), as action items. Continuous assessment and control of these items could be used to improve the client H&S culture and therefore H&S performance in a project. The LIP+3C could therefore be used as a tool to check on the practice of these factors.

Consequently, the process of H&S performance improvement could simply follow the following cycle:

1. Assess LIP +3C;
2. Develop strategies in consultation with stakeholders to enhance LIP + 3C;
3. Implement strategies;
4. Assess LIP +3C;
5. Act to improve LIP+3C;
6. Repeat process 1-5.

The above is based on Deming's PDCA cycle and a similar approach is suggested by IOSH (2004:9). The measures or descriptors of each client factor used in the current study are presented in Table 3. The indicators of each factor can be modified and or improved depending on the environment.

Table 3: Standardised coefficients and test statistics of indicator variables (Robust statistical significance at 5% level

Factor	Indicator (The client...)
Leadership	Considers H&S implications before making decisions on the project
	Has an effective H&S policy
	Monitors H&S on the project throughout all stages
	Monitors designers' H&S implementation
	Monitors contractor's H&S implementation
	Mandated designers to manage project H&S
	Requires that the contractor manages project H&S
	Coordinates designers & contractor to ensure good H&S
Commitment	Demonstrated positive attitude toward H&S
	Actively promoted H&S in a consistent manner across all levels
	Provided finance for H&S
	Supported implementation of H&S activities
	Put in efforts to ensure every aspect of work & operations are routinely evaluated for H&S
	Conducted regular H&S tours on the project

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	Been involved in investigations of accidents, incidents & ill-health on the project
	Set H&S as an important agenda item in every project progress meeting
	Set H&S as a No.1 priority on the project
Involvement	Is personally active in critical project H&S activities
	Is always present in project H&S meetings
	Contributes to H&S training
	Is active in overseeing of H&S on critical operations
	Has constantly stayed "in-touch" on H&S issues
	Always communicates information on H&S to all parties
	Conducts regular audits & inspections
Communication	Has set up a formal reporting system of incidents & accidents on the project
	Involved all parties in planning for H&S on the project
	Involves all parties in H&S review
	Has provided timely feedback on reported accidents & incidents on the project
	Communicates risk findings to all parties on the project
	Clearly made H&S policy statements for the project
	Has clearly outlined H&S roles & responsibilities for all parties on the project
	Has clearly communicated expected performance on H&S to all
	Has provided Information on H&S risk control to all parties
Competence	Representatives have demonstrated knowledge of H&S
	Conducts H&S training for its own staff
	Deployed staff on the project that are qualified to manage H&S
	Ensured that H&S induction to client staff was done on the project
Procedures	Has programs to monitor and analyse H&S implementation
	Has clear project H&S goals
	Scheduled H&S as a key contract prequalification criteria for all parties involved in the project
	Scheduled H&S in all contracts for the parties involved in the project
	Conducts regular H&S performance measurement
	Has its own H&S committee
	Conducts Hazard identification & risk assessment
	Required that designers adequately address H&S in their designs

The assessment of the extent to which clients provided leadership, involvement, had procedures in place, showed commitment, communicated and were competent could be achieved by using a questionnaire or checklist on which employees of client organisations could rate the extent to which they agreed that the client exhibited these indicators. A specified minimum and upper level score of the indicators for each factor would indicate the probable project H&S performance that should be expected. This way, the client H&S culture would be used as a leading indicator of project H&S performance.

5.0 CONCLUSION

Most Clients have not realised the significance of their participation in H&S management. However Delphi results have indicated that contractors and designers were likely to implement H&S elements on a project with clients' influence. Further, SEM results indicated that client H&S culture had influence on contractor, designer and on project H&S performance.

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Knowledge of the influence of client H&S culture particularly the effect of the factors namely: procedures, commitment and communication on contractor, designer and project H&S performance could help clients to plan, organise, coordinate, control and improve all aspects relating to H&S implementation on construction projects. Clients could use this knowledge to help with decisions on how to allocate financial and human resources on H&S performance and more importantly to predict the probable project H&S performance.

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