Proactive Monitoring of Health and Safety Performance in Small and Medium Construction Enterprise Using Leading Health and Safety Indicators

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Abstract

Traditional measures or indicators of workplace health and safety (H&S) performance reflect unrecognized hazards, unsafe conditions, reckless behaviour and other H&S program shortcomings. This happens only after a worker is injured, falls ill or a fatality occurs. In contrast to traditional or lagging indicators, leading indicators (LIs) can predict poor H&S performance to ensure that H&S program failings are addressed before occupational injury, illnesses or fatality actually occur. This research project has identified a variety of proactive H&S management practices, and activities shown to influence workplace H&S performance. The researchers have proposed a comprehensive framework of subjective and objective LIs, based on literature review that small and medium construction enterprises (SMEs) in South Africa can use to proactively gauge H&S performance. SMEs could then address unrecognized hazards, unsafe conditions, reckless behaviour and other H&S performance deficiencies at their project level before injuries, illnesses and fatalities occur. The framework consists of ten main elements: upper management commitment, worker/employee involvement, appointment of H&S staff, formal and informal written communication, formal and informal verbal communication, project planning of H&S, H&S resources, H&S policy, training in H&S and project supervision.

Keywords: health and safety; leading indicators; small and medium; performance

1. Introduction

Every employee has a right to a healthy and safe working environment which enables them to live a socially and economically productive life (Loosemore and Andonakis, 2007). 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 are comparably high (Construction Industry Development Board, CIDB 2004). In South Africa, the Compensation Commissioner and Federated Employers Mutual Assurance Company Ltd (FEM) indicated approximately 25,500 reported accidents per annum at a total direct cost (compensation) of approximately R200 million in construction industry (CIDB, 2004). In terms of fatalities, cited in CIDB, (2008) report 160 deaths occurred on site in 2007/2008, while CIDB, (2004) report indicated the construction industry was ranked third after mining and transport with 74 deaths recorded on site in 2003.

The continuing poor H&S performance of the construction industry in the form of fatalities, injuries, and disease, 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. This led to the promulgation of consolidated construction H&S legislation in the form of the Construction Regulations 2003. It requires a range of new multi-stakeholder interventions, inter alia, that designers substitute less hazardous materials,
amend designs that necessitate the use of hazardous processes, and consider ergonomics during commissioning and other phases of projects (Smallwood and Haupt, 2005).

CIDB (2004) revealed that there is a very limited commitment to comply with basic requirements, let alone promote a culture of H&S. Employers view H&S as a cost in the system. Small contractors can barely maintain tools and regard safety equipment as luxury items. Even where protective clothing and equipment are provided, workers often avoid their use, including the use of safety goggles and masks when working with grinders and asbestos. Aside from the direct compensation and medical costs associated with accidents, the costs to the economy are immense and include rework, lost time, damage to plant and equipment, disruption, productivity loss, and loss of skills to the economy. These views highlight the importance of identifying proactive measures for monitoring H&S in SMEs projects in the construction industry in South Africa.

2. Measurement of construction health and safety performance

Health and safety performance measurement allows comparison of H&S performance between projects. Also, measurement can be used by organizations internally to maintain line accountability for H&S and to pinpoint problem areas. Health and safety performance measurement can be broadly classified in terms of two types of indicators, namely lagging indicators such as accident rates, and LIs or positive performance indicators (PPIs) that address H&S climate (Flin et al. 2000) and H&S culture (Grabowski et al, 2010). Grabowski, et al. (2007) asserts that leading indicators can either be subjective or objective indicators. Unfortunately, the construction industry continues to rely heavily on traditional measures such as accident and workers compensation statistics (Mohamed, 2002). This implies that measuring PPIs in construction industry are in their infancy and needs to be addressed especially in SMEs.

When using LIs a more thorough and constant surveillance is required than when using lagging indicators (Hinze, 2005). The real value of using H&S leading indicators on the construction project is that changes can be made early. An intervention can be devised that can address the weakness before there is an accident. Hinze (2005) advocates the need to use LIs in H&S performance, rather than using lagging indicators. A literature review was conducted to identify the H&S leading indicators.

3. Literature review

The Occupational Health and Safety Act (OH&S Act) 1993, mandates that the employer i.e. the principal contractor creates a conducive, environment for the employee and reaffirmed in Construction Regulation 2003. Based on the aforementioned, Levitt and Parker (1976) studied the role of top management in construction firms in reducing construction injuries. They established that: companies whose top managers talked about safety when they visited jobsites had lower Experience Modification Rating (EMR’s) than companies in which safety was not mentioned during these events. They also found that companies with formal orientation programs had lower EMR’s compared to companies with no orientation programs. Cooper (1998) indicated the importance of communication in influencing H&S performance improvement and categorized communication into formal and informal, verbal and written
communication. Kheni et al. (2006) further indicated the need for verbal communication as a good measure for safety management practice. Sawacha et al. (1999) established that the most important factors to improve H&S performance under organization safety policy are: management communication in regards to safety, provision of safety booklets, provision of safety equipment, assuring a tidy site, appointing safety representatives and training of operatives on safety.

Jaselskis et al. (1996) assert that to achieve better construction safety performance at the company level the related H&S factors/elements to be in place are: upper management support, time devoted to safety issues from company safety coordinator, number of informal safety inspections made by the company coordinator, meetings with field safety representatives and craft workers, length and detail of company safety program, and safety training for new foremen and safety coordinators. The authors also indicated that at the project level, the H&S factors/elements that are important for achieving better safety performance are: increased project manager experience level, more supportive upper management attitude towards safety, reduced project team turnover, increased time devoted to safety representative, more formal meetings with supervisors and specialty contractors, more informal safety meetings with supervisors, a greater number of informal site safety meetings with supervisors, a greater number of informal site safety inspections, reduced craft worker penalties, and increased budget allocation to safety awards. Toellner, (2001) established LIs that are essential to improving safety performance. These measures are: safety walkthroughs by management, barricading a given place, tool box talk meeting and housekeeping. Jannadai et al. (2002) revealed that management involvement, personal protective equipment, and emergency planning and preparation were considered to be extremely important factors in influencing safety performance as they reveal the greatest impact.

Fernandez-Muniaz et al. (2007) developed a positive safety culture model that consisted of management commitment, employee involvement and safety management system (SMS). The SMS included safety policy, incentives, training, communication, planning, and control. Their model was generic to represent industries of different types and sizes. Their results indicated improvement when these elements are used, and especially when top management and employees are involved. Aksorn et al. (2008) in a validated study revealed 16 critical H&S factors that will influence H&S performance improvement. The factors were later categorized into four major dimensions namely; 1) Worker involvement, 2) safety prevention and control system, 3), safety arrangement and 4), management commitment.

In a recent study by Rajendran et al. (2009), the authors identified 50 elements considered essential by experts. These were categorized into 14 categories i.e.; project team selection, contract safety requirement, safety and health professionals, safety commitment, safety planning, training and education, safety resources, drug and alcohol program, accident investigation and reporting, employee involvement, safety inspection, safety accountability and performance measurement and industrial hygiene practices. The literature result synthesized is tabulated in Table1, based on the authors’ interpretation of the meaning of core elements and leading indicators. This comprehensive framework of LIs comprises of both subjective and objective indicators.
Table 1: Framework of H&S leading indicators

<table>
<thead>
<tr>
<th>Core elements</th>
<th>Leading indicators</th>
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<tr>
<td><strong>Appointment of H&amp;S staff</strong>, Sawacha et al., 1999; Vredenburgh, (2002)</td>
<td>Employing at least one qualified manager with H&amp;S training to oversee H&amp;S [on multiple projects] At least one staff member with H&amp;S training is employed on each project Employing at least one H&amp;S representative on each project</td>
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<td><strong>Formal and informal written Communication</strong> Cooper, (1998); HSE, (2008)</td>
<td>Provision of written information about H&amp;S procedures Provision of written information about the correct way to perform tasks Written circular/brochure that informs workers about the risks associated with their work Written circular/brochure that inform workers about the preventive measures to reduce risk Provide clear verbal instructions to both literate and illiterate employees about H&amp;S H&amp;S information verbally communicated to workers before changes are made to the way their work activities are executed Organize regular meetings to verbally inform workers about the risks associated with their work Organize regular meetings to verbally inform workers about the preventive H&amp;S measures of risky work</td>
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<tr>
<td><strong>H&amp;S resources</strong> Abudayyeh et al., (2006); Rajendran et al., (2009)</td>
<td>Provision of personal protective equipment (PPE) Training in H&amp;S through attending seminars/workshops Material schedule data sheets provided for all hazardous materials on site Employing technically skilled employees with H&amp;S training Adequate information brochures given on H&amp;S Provision of a budget for H&amp;S Provision of correct tools, equipment and plant to execute construction Provision of good welfare facilities such as showers, canteens, toilets</td>
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<tr>
<td><strong>Project planning of H&amp;S</strong> Sawacha et al., (1999); Rajendran et al., (2009)</td>
<td>Ergonomics is considered when deciding the method of construction Reengineering is considered to reduce hazards When head office decides on the method of construction H&amp;S is included in decision making process Each project has a site-specific H&amp;S plan Layout of the site considers H&amp;S aspects Use hazard identification procedures Constructability of project is reviewed Scheduling for H&amp;S</td>
</tr>
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</table>
### Table 1: Framework of H&S leading indicators

| **Project supervision/inspection** | Proper supervision by staff trained in H&S  
| Rajendran et al., (2009) | Identification of hazards by at least *one staff member trained in H&S*  
| | Results of inspections discussed at H&S meetings  
| | H&S inspections done at least daily  
| | Local authorities and H&S enforcement agencies visit sites for inspection  
| | Ad hoc informal H&S inspections of work place  
| | Regular H&S audits of projects  

| **Training in H&S** | Workers undergo induction on H&S before commencing work on a particular site  
| | Workers trained in proper use of personal protective equipment  
| | Workers are regularly trained in H&S  
| | Instruction manuals or safe work procedures are used to aid in preventive action  
| | Employer helps employees to train in-house (study leave, grants)  
| | Workers are given time off for training  

| **Worker/employee involvement in H&S** | Workers are involved in production of H&S policy  
| Aksorn et al., (2008); Fernandez-Muniz et al., 2007 | Workers are involved in H&S inspections  
| | Workers are consulted when the H&S plan is compiled  
| | Workers are involved in development of H&S rules and safe work procedures  
| | They have the explicit right to refuse to work in potentially unsafe, unhealthy conditions  

| **Upper management commitment in H&S** | Managers encourage and support worker participation, commitment and involvement in H&S activities  
| Levitt et al., (1976); Fernandez-Muniz et al., 2007 | Managers encourage and support training of employees in H&S  
| | Communicate regularly with workers about H&S  
| | Actively monitor the H&S performance of their projects and workers  
| | Take responsibility for H&S outcomes  
| | Actively and visibly lead in H&S matters  
| | Regularly visit workplaces to check work conditions or communicate with workers about H&S  
| | Encourage and arrange meetings with employees & other managers to discuss H&S matters  
| | Conduct toolbox talks themselves  
| | Ensure that the H&S budget is adequate  
| | Recognize and reward outstanding H&S performance of workers  

| **H&S policy** | Proper implementation of safety management system  
| Shannon et al., (1997); Fernandez-Muniz et al., 2007 | Company has H&S policy  
| | Written in-house H&S rules and regulations for all workers  
| | Reflecting management concern for safety, principles of action and objectives of achievement  
| | The firm coordinates its H&S policies with other human resource policies to ensure the well-being of workers  


4. Problem statement

The challenges and the current state of poor H&S in the construction industry in South Africa advocates for better ways of monitoring and measuring H&S in SMEs projects in order to reduce occupational injuries, illnesses and fatalities in their projects. The overarching research question is:

*What are the core H&S elements and leading indicators that will be used to monitor H&S performance at project level of SMEs?*

In order to achieve the stated research question the following specific objectives were set:

- To identify core H&S elements through literature;
- To identify H&S leading indicators through literature; and
- To develop a proactive H&S framework based on the identified core elements and leading indicators.

5. Discussion of Results

A number of H&S studies (Levitt et al., 1976, Askorn et al., 2008) have established that management commitment to H&S is a major factor influencing the success of an organization’s safety program. Management commitment is monitored when managers encourage and support worker participation, further encourage and support training of employees in H&S (Abudayyeh et al., 2004) and communicating regularly with workers about H&S (Toellner, 2001). Management should be seen to actively monitor the H&S performance of projects and workers, taking responsibility for H&S, be actively and should visibly lead in H&S matters. The literature further advocates for regular workplace visits by management to check work conditions arrange meetings with employees and other managers to discuss H&S issues. Toolbox talks should be monitored if they are conducted and ensuring adequate H&S budget. The recognition and reward of outstanding H&S performance of workers should also be monitored.

Involving and empowering employees provides them with authority, responsibility and accountability. It has been established that in order for employees to be involved and empowered they should be allowed to participate in the H&S policymaking i.e. developing the H&S safety rules and procedures, provide written suggestions on H&S, the employees are updated on H&S plan, be involved in H&S inspections, consulted when the H&S plan is compiled, and refuse to work in potentially unsafe, unhealthy conditions these indicators need to be monitored to improve H&S performance.

The H&S policy allows an organization to follow a set of rules and regulations in order to operate efficiently. The monitoring of organizational H&S policy and proper implementation of safety management system should be undertaken; further monitoring is on the comprehensive written in-house H&S rules and regulations for all workers reflecting management concern for safety taking into consideration the, principles of action and objectives to be achieved. It is also
essential that the firm monitor its coordination of H&S policies with other human resource policies to ensure the well-being of workers' health and safety.

Planning for H&S has been considered vital in influencing H&S performance improvement. For H&S planning to be able to influence H&S performance, SMEs, will have to monitor if ergonomics is considered when deciding the method of construction and considering reengineering to reduce hazards, on the other hand head office should decide on the method of construction considering H&S in their decision making process. It has been implied in literature that each project should have a site-specific H&S plan to enhance H&S performance improvement. The layout of the site should consider H&S aspects, taking into consideration the use of hazard identification procedures and risk assessment procedures. The constructability of project should be reviewed and monitored to enhance H&S performance of the workers and finally, the scheduling for H&S is monitored to ensure H&S activities are programmed in the project to enhance improvement.

Appointing H&S staff according to Sawacha et al. (1999) and Vredenburgh, (2002) is important in influencing H&S performance. Monitoring those getting employed by ensuring at least one qualified manager with H&S training to oversee H&S [on multiple projects], employ at least one staff member with H&S training on each project and employing at least one H&S representative on each project.

Formal and informal written communication is the transfer of information through writing to employees about the possible risks in the workplace and the correct way to combat them. Necessary written information about H&S procedures should include, correct way to perform tasks, information about risks associated with their work, materials necessary to reduce risks with job.

Formal and informal verbal communication is the conveying of information verbally to employees. This requires clear verbal instructions to both literate and illiterate employees about H&S. It is necessary to convey H&S information verbally to workers before changes are made to the way their work activities are executed. The need to organize regular meetings and verbally inform workers about the risks associated with their work and about the preventive H&S measures of risky work are indicated to be effective in monitoring H&S.

In order for H&S to be effective, occupational H&S training is required according to (Sawacha et al., 1999; Kheni et al., 2006). Monitoring effective training in H&S can reduce the number of injuries and fatalities. Monitor when workers undergo induction on H&S before commencing work on a particular site they are aware of H&S. It is also essential that workers demonstrate proper care and use of personal protective equipment as this has been proved to influence H&S performance improvement and further ensuring workers are regularly trained in H&S. The issuing of instruction manuals or safe work procedures to aid in preventive action is deemed to be essential in construction projects and ensuring workers are given time off for training in H&S will further assist workers to understand the importance of H&S.

Supervision of construction projects is vital (see OH&S Act 1993 amendment Construction Regulation 2003). The need for proper supervision by staff trained in H&S is required taking into
consideration the, identification of hazards by at least (one staff member trained in H&S), and allowing results of inspections to be discussed at H&S meetings. The study has revealed that, H&S inspection should be done at least daily on projects and allowing local authorities and H&S enforcement agencies to visit sites for inspection. Due to the nature of the construction projects the study further revealed ad hoc informal H&S inspections of workplace should be conducted and allow regular H&S audits of projects to monitor H&S performance.

According to Abudayyeh et al. (2006), Rajendran et al. (2009) they assert that H&S resources are important in influencing H&S performance. The monitoring of the provision of PPE, training in H&S through attending seminars/workshops, ensuring material schedule data sheets are provided for all hazardous materials on site to improve H&S performance. The employment of technically skilled employees with H&S training, and providing adequate information brochures on H&S needs to be monitored, further monitoring of the provision of H&S budget, correct tools, equipment and plant and the provision of good welfare facilities, such as showers, canteens, toilets, need to be undertaken to improve H&S performance.

6. Conclusions

The 64 leading indicators identified were either subjective or objective indicators and were categorized in 10 elements which will need to be monitored to indicate early warning before an accident occurs. The elements were upper management commitment, worker/employee involvement, appointment of H&S staff, formal and informal written communication, formal and informal verbal communication, project planning of H&S, H&S resources, H&S policy, training in H&S and project supervision. The framework of LIs in Table 1 will be used to develop a conceptual model for H&S performance improvement. The results are based on literature review and hence might be biased. It is worth noting this is a research project in progress.

7. Further studies

The effectiveness of using H&S leading indicators to reduce injuries, illnesses and fatalities is a logical area for further studies and verifying the importance and impact of these LIs in improving H&S performance at project level of SMEs is advocated.

8. References


