Measuring the occupational health and safety performance of construction companies in Australia

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Abstract

Many facility managers are now required to deal directly with small firms engaged in the maintenance, alteration and cleaning of physical infrastructure. Increasingly the performance of small firms reflects on the manager of the facility, and so an understanding of their operation is required. It is mandatory for all firms to provide a safe working environment for their workers and subcontractors. Consequently, occupational health and safety (OHS) is a major issue for companies mainly due to the fear of prosecution. The introduction of Zero Tolerance by the Victorian government WorkCover Authority in 1999 provided even higher OHS safety standards for the construction industry. This has placed an increased burden on construction and maintenance companies especially small firms that are not in a position of financial strength. The size of the company has been found to be a major contributing factor to the OHS performance of construction contractors. This research is based on a benchmarking study of 44 construction companies in Victoria, Australia. The results show that the major factors influencing safety performance were; company size, and management and employee commitment to OHS.

Keyword(s): Occupational health/safety; Construction industry; Australia.

Introduction

There was a major change in OHS legislation in Victoria, Australia with the introduction of Occupational Health and Safety Act, 1985. The Act, based on the findings of the Roben Committee of Inquiry in the UK, has the following features (VWA, 1998):

- to focus the attention of the workplace parties on the need to prevent work-related injury, illness and death;
- to impose a duty on the parties in the workplace to ensure that, "so far as is practicable", they exercise their responsibilities in a way that is not harmful to the health and safety of any person;

- to provide mechanisms for consultation between employers and employees on health and safety issues.

Construction and maintenance is dangerous by its nature, and increased emphasis needs to be placed on occupational health and safety (OHS) in order to reduce the cost to the industry. Over the period from 1993 to 1998, the construction industry accounted for 11 per cent of all workplace fatalities in Victoria, yet it only makes up 5 per cent of the workforce (VWA, 1998). Many facility managers are now required to deal directly with small firms engaged in the maintenance, alteration and cleaning of physical infrastructure. Increasingly the performance of small firms reflects on the manager of the facility, and so an understanding of their operation is required.

OHS management system: "does size matter?"

Most research done into occupational health and safety has shown that the high rates of injury are primarily due to inadequate, or non-existent, OHS systems. Therefore, the application of an "effective" management can lead to safer systems of construction and reduce incidence of injuries and work related diseases (Davis and Tomasin, 1999).

Past research has shown that an effective way of measuring the safety performance of a company is by using a combination of both quantitative and qualitative safety measurements (Jaselskis, 1996). To improve construction safety performance statistical data and various management elements need to be analysed. Quantitative measures include; lost time and severity rates, and experience modification rating (EMR), i.e. a measure used to calculate insurance premiums of companies. Qualitative ratings consist of outstanding, average, and below-average project performances, as determined by OHS assessors.

Holmes (1999) conducted research from a sample of Australian companies and found that small construction firms may not manage OHS risks as effectively as larger firms. Data from the Australian Bureau of Statistics shows that the majority of Australian construction firms were small businesses, 97 per cent of general construction businesses employ less than 20 employees, and 85 per cent employ less than five people (VWA, 1998). Holmes commented that small businesses did not feel the need to focus on OHS in their management systems, instead they often believe that the control of risk is the responsibility of employees. This was contrasted with the attitude of large businesses that indicated that OHS should be integrated into their entire management system across all projects within the company.

A similarly study was conducted by Wilson (2000) who found that safety attitudes varied by the size of the company. He suggested that there is some doubt whether smaller companies can benefit from higher standards of OHS practice, due to the implementation costs involved. Other research by Lingard and Rowlinson (1994) showed that firms having more resources and experience tend to deal with health and safety issues more effectively. Therefore in a relative sense, larger companies tend to be more committed to safety. It is also possible that OHS regulations which require formal documentation procedures, do not fit the traditions, competence and needs of very small companies (Hale and Baram, 1998).

Mayhew (1997) states that industries where subcontracting is common, often has a higher incidence of serious injuries and fatalities. In his analysis of United States census data, he found that self-employed workers were more than twice as likely to be killed at work. Subcontractors are generally much smaller companies than main contractors, hence are less well organised and have fewer resources to implement proper OHS systems. According to Holmes (1999) they are also less committed, because of their smaller involvement on site.

Management commitment

Nishgaki (1994) carried out an investigation of 35 cases of construction injuries that occurred between 1981 to 1985. During interviews with construction managers and workers he found that "humanware" accounted for much of the underlying causes of occupational accident recurrence. "Humanware" is defined as a function composed of leadership, fellowship, and the interaction between them. His research suggested that the major causes of OHS failures are; inadequate safety education, inadequate instruction, poor housekeeping and "wilful transgression". According to Nishgaki's research, employers' and employees' attitudes plays a major part in safety on site. Nishgaki's findings showed that management commitment is responsible for the majority of the "humanware" problem.

Jaselskis (1996) commented that management needs to be more active in the safety program and where possible, superintendents should also play a significant role in determining the safety performances on their projects. Research by Dejoy (1985) showed that safety records reflect how upper management perceives the causes of safety performance. The safety program is most effective when it involves two-way communication between workers and managers. However, high level management often has little first hand experience on site; it is therefore difficult for them to relate to the needs of the workers.

The wearing of protective clothing and the use of safety equipment is crucial in reducing the effects of accidents on construction sites. However, both Harper (1998) and Holmes (1999) suggested that management commitment is required to enforce the wearing of safety equipment. It is often the case that safety equipment is provided, but employees are reluctant, or neglect, to wear it. Consequently, the provision of safety equipment alone does not improve construction site safety, there also needs to be a corporate culture that encourages its use.

Safety committee

Employees tend to be more aware of hazards in the work place than employers and therefore should be involved in the safety program. They can relate more easily to the safety program if they are involved. It has been shown that regular meetings held on site help to find OHS problems and solutions and improve accident prevention (Hinze, 1988).

A safety committee often consists of representatives of the employer, worker and subcontractor. This encourages interaction between the parties and helps improve trust and communication and the expertise of each party can be put to use. Safety committees

have proved to be effective in discovering unsafe practices and problems. Nishgaki (1994) suggested that regular inspection of the site by safety patrols promotes good job safety. Similarly, Hinze (1988) found the more site visits by the upper managers the better the site safety. Pre-construction site reviews help establish areas of concern and later "tool box" meetings give the chance for the employee to be involved (Harper, 1998). A safety committee helps to promote accident prevention and safe working habits by the employees.

Nishgaki (1994) found management commitment should be backed up with means such as hardware (safety equipment) and the continued enforcement by software (standard work procedures, safety regulations). Lingard and Rowlinson (1994), found more sophisticated scheduling methods improve OHS standards, but often they can only be carried out with larger companies because of their expertise and resources.

Occupational health and safety policy and training

Davies and Tomasin (1999) suggest that the company policy statements issued by employers should be clearly understood by their employees. Policy statements should indicate how the company is organised with respect to the health and safety responsibilities of the management, and should further state the managers' commitment to providing safety information, training and advice to employees.

It is very important to enhance the ability of the workers and the managers to anticipate possible hazards in the work place. However, according to Wilson (2000), companies with poor safety performance often leave safety training to site experience, and this may be inadequate to prevent occupational accidents. Nishgaki (1994), and Garza (1988) both recommended that educating workers about all aspects of work safety and giving them the skill to look after themselves is the right thing to do. Davies and Tomasin (1999) suggest that effective training in the construction industry is one means by which safety can be improved and company management must be active in order to reduce the number of injuries and fatalities.

The cost of implementing occupational health and safety

Cost has a role in reducing accidents and improving efficiency. According to Hinze (1988) safety is an important issue, but many people do not feel it is vital to the success of projects. Research by Tang (1997) into the injuries on 18 construction projects suggested that the higher the investment in safety, the better the safety performance. However, Holmes (1999) points out that, time and economic constraints appear to influence the way individuals perceive risks and consequently risks should be identified prior to construction.

Hinze (1988) has found that injury rate tends to be higher on those projects that were competitively bid. It is common practice for contractors to discount their jobs just to win the tender, as a result OHS often suffers. Safety is sometimes found to be the first item to face cost cutting as the employers who often believe that implementing a safety system will cost more. In addition, managerial focus tends to concentrate on production "at cost" and safety does not help production therefore it suffers when a project runs over budget.

Methodology

In order for this study to be effective a method was required to standardise the measurement of each construction company's safety performance. A number of previous researchers have considered this issue.

Jaselskis (1996) recommended that companies should set OHS benchmarks; his methodology was based on collecting, demographic, occupational data, Lost Time Accident Rate and information about the company's safety policy to determine OHS performance. Other research by Garza (1988) compared safety standards using four indicators, these were; Experience Modification Rate, Recordable Incident Rate, the Lost Time Incident Rate and the Worker's Compensation Claims Frequency Indicator.

The Health and Safety Continuous Improvement Matrix developed by the Construction Industry Development Agency (CIDA, 1995) is a benchmarking system for the comparison of OHS performance across the Australian construction industry. The CIDA system allows a company's occupational health and safety performance to be measured against the Australian Construction Industry Pre-Qualification Criteria. The system allows the grading of companies' occupational health and safety between 0 and 5 against 17 OHS system elements that are set out on the CIDA matrix (Table I). The system elements are matched to the quality assurance Australian Standard AS 3901.

In addition the handbook *SAA HB53-1994, A Management System for OHS and Rehabilitation in the Construction Industry* provides the minimum OHS and rehabilitation management system requirements in situations where "a contract between two parties requires the demonstration of a capability to design and implement and auditable system". The system is suitable for both large and small companies and is considered the most appropriate research mechanism for the evaluation of OHS performance of Australian construction companies.

There are six performance levels (0-5). The questionnaire requires the respondents to objectively assess their own OHS performance within the system. The general descriptions of the levels are as follows:

- Level 5 – sustaining best practice.
- Level 4 – high level of continuous improvement.
- Level 3 – committed to improvement beyond minimum regulatory requirements.
- Level 2 – satisfies regulatory requirements, adequate understanding of duty of careing.
- Level 1 – awareness of need and in process of changing inadequate understanding of duty of care.
- Level 0 – total ignorance[1].

The questionnaire was developed based on the CIDA's Health and Safety Continuous Improvement Matrix. Also included were some demographic questions relating to the type of company, and the type of projects that they undertake. Initially a pilot study was conducted to examine the ability of the questionnaire to obtain the information necessary for the research.

Pilot studies are an effective way of improving question wording and avoiding mistakes in the questionnaires. They allow researchers to identify potential problems and errors, including improvement of wording for a better understanding of the questions. The pilot study showed that the questionnaire was too long. The final questionnaire was reduced in size to approximately half of the original pilot study questionnaire.

A total of 230 questionnaires were sent to Victorian construction companies by mail. The sample of companies was obtained from the authors' own private contacts and from the *Yellow Pages* listing of the Melbourne telephone directory. The questionnaire comprised two parts.

Part A investigated the demographics of the company, its characteristics, in relation to contract size, contract duration, number of employees and other factors found in the literature review which have an influence on the company's OHS standards. Also there were other questions relating to attitude of the company management, OHS tender costs, and the effectiveness of safety committees. These results were compared with score obtained from Part B of the questionnaire.

Part B comprised the CIDA's Health and Safety Continuous Improvement Matrix using the original 17 elements; three were deleted due to a perceived lack of relevance, and only a brief description of each element was given.

Responses were received from 44 organisations, the range of returns was considered to be representative of construction firms in Victoria, Australia. The data from each response was entered onto an Excel spreadsheet, and used for analysis.

Results and discussion

The major finding of this research was that company size had a significant influence on a company's OHS performance. This result was consistent with research by Hinze (1988), Wilson (2000) and Holmes (1999). The study shows that there were important differences between the larger and smaller contractors on all CIDA elements (Figure 1). This is not a surprising finding because smaller companies lack the resources to perform at a high level of OHS performance. In general, smaller companies have poorer standards, all of the bottom five performing companies had less than ten employees.

According to Monk (1994) many occupational accidents and injuries are due to a breakdowns in the existing OHS management systems. The result shown in (Table II) was found to be consistent with this research. When contractors scored highly in the management responsibility and health and safety system elements their total OHS standards tended to be higher. These two elements have the highest overall average scores, and it is likely that many of the respondents recognised their importance. (Figure 2).

The provision of the safety equipment is not a major OHS contributing factor in distinguishing between the OHS performance of firms. This is because employers have a legal duty to provide protective clothing and equipment free of charge. All respondents except one provide safety equipment to their employees. However, OHS is likely to be

improved if contractors are committed to ensuring that their workers use the safety equipment, i.e. management commitment.

Wilson (2000) found that safety training plays a part in the OHS standard. The results of the research found that smaller companies perform poorer in this element compared to larger companies. However, it does not seem to be a major factor that influences the overall safety standards.

One of the unexpected findings in this research was that all the companies' scores for inspection and testing were the lowest amongst all the other elements. The reason is that there are few regulatory guidelines or mandatory requirements for this element.

Hinze (1988) found that injury rate tends to be higher when projects are competitively bid. Although the majority of the contractors obtain their work from selective tendering, findings in this research do not show that to be the case. Instead, when comparing contractors who obtain their work via competitive tendering with contractors who obtain work from negotiation, there does not seem to be much difference in the standard of OHS performance.

Holmes (1999) suggested that OHS risk should be identified prior to construction and the costs of OHS should be included in the tender. Companies that allow OHS costs in their tenders have a much higher standard in all elements, on average one standard level higher (Figure 3).

It was not surprising to find that the majority of firms that do not allow for OHS cost in their tenders were the small firms (Table III). This seems to suggest that these firms will find it difficult to implement the most effective OHS during the construction phase of their projects. It is more likely that these firms have an *ad hoc* approach to the OHS; this may lead overtime to greater risks of serious injury, and a lower overall performance.

The results of this research show that when comparing contractors who have allowed OHS costs in their tenders the two elements with the biggest variances in the average standard level, are contract review and design control. The contract review element assesses the procedures of OHS reviews in tender documents. Therefore, if contractors scored poorly in this element it is likely that they did not allow OHS cost in their tender. The design control element deals with the risk assessment of the construction site. Poor performance in this element means that inadequate costs and resources have been allocated. The bottom five companies all perform poorly in these two elements compared to the top five companies, this supports the findings of Holmes (1999).

Both Nishgaki (1994) and Hinze (1988) and found that regular involvement by the company management improved the safety standards. This research also found that to be true; all the top five contractors have regular OHS reviews compared to only one of the bottom five contractors. The involvement of workers in the OHS design process was found to have positive results. All of the top five companies have workers involved in their design process; in contrast the bottom five companies only had managers involved.

As previously mentioned, the bottom five companies were smaller firms. It is possible that the company management of those companies perceives that there is less risk associated with small value contracts. As a result there may be an expectation that workers are to cope without further assistance.

Nishgaki (1994) showed that safety committees encourage the interaction between the parties on-site which helps promote accident prevention and safe work habits. Although some respondents did not have experience with safety committees (25 per cent), the remainder of the respondents had experience with them and found it to be extremely positive. Again, the results from the questionnaire show that size of the company influences OHS standards; the majority of the smaller contractors do not have safety committee experience.

In 1994 Monk performed a similar questionnaire in New South Wales using the same CIDA matrix system. Her results showed a large difference between the OHS performance for small contractors (10-19 employees) compared to large companies (150 plus employees). The study concluded that on average, smaller contractors did not perform up to level 2 of the matrix, which is below the minimum level required to meet legislative compliance. The results of this survey did not show such a poor OHS performance for small contractors, although the level achieved by these firms was still much lower than larger firms. This was not surprising, and this may have resulted from the significant push by Victoria's WorkCover authority for better OHS in recent years.

The results in Figure 2 show that the average for each element in the Lin study was higher than Monk's research, the difference ranges from 0.15 to 1.16. Monk's survey displays some similar patterns in the first few elements, but some larger differences occur in some middle elements.

This may be due to the difference between the OHS regulations in New South Wales and Victoria. Firstly, the WorkCover authority in Victoria has introduced more regulations and tougher penalties since 1994. They have also increased field inspection hours and standards of compliance. When Monk performed the survey, it was at the end of a construction recession, and it may have been possible that fewer resources were concentrated in OHS at that time

Secondly, Monk's survey was carried out in person, therefore if a respondent raised a query it could be answered on the spot. This research, on the other hand, was based on a mailed questionnaire which was totally self assessed by each respondent. This may have led to some respondents exaggerating their OHS performance.

It is interesting to note that when respondents were asked to rank the factors that were associated with the project success, client satisfaction was ranked the highest, followed by quality, profit, schedule and lastly safety. This supports research by Jaselskis (1996), that showed the same rank order for project success factors (Table IV). Jaselskis (1996) speculated that the reason safety was ranked the lowest was that contractors do not make a profit from OHS, also it does not improve construction time or quality. This was reflected also in Hinze's statement that employers often believe that "implementing an effective OHS safety system does not contribute to improving project success".

Conclusion

As expected the major factor affecting the OHS standard was found to be the company's size. This research found that larger contractors tend to perform better compared to smaller companies generally because they have greater resources to do so. Large firms are associated with larger projects containing more risks and so are typically required to implement better OHS procedures.

Small contractors and subcontractors on the other hand, generally perform poorly for similar reasons, their projects are generally smaller and have lesser OHS risks. Many occupational health and safety professionals believe that the application of effective occupational health and safety management systems will lead to a better OHS performance. Management commitment plays a major role in OHS performance. However, small companies seem to lack both the financial resources and management commitment to improve their own OHS performance.

This research has shown that small contractors tend not to include OHS costs in their tenders, reducing their ability to deal with potential problems. The industry contains a very large proportion of small firms that may not be in a strong position to implement good OHS systems. Existing government safety regulations place considerable pressure on all firms, large and small, to protect the construction workforce. This research has shown that small firms do not seem to have the ability or motivation to achieve high levels of OHS when benchmarked against larger firms. This calls into the question the notion that OHS performance can be achieved by simply raising government OHS regulations.

The construction, refurbishment and maintenance of facilities involve many small firms that seem to take large risks. Increasingly the performance of these firms reflects on the manager of the facility, which may lead to liability. Future research is needed to investigate how best to improve OHS within small enterprises; risk compensation theory and homoeostasis theory may be useful areas for further investigation.

Note

1. Level 0 is disregarded in the author's questionnaire. It was assumed that the contractors who responded have at least some appreciation and awareness of OHS.

Table I OHS elements

CIDA system element descriptions	
Management responsibility	Inspection, measuring and test equipment[a]
Health and safety system	Inspection and test status[a]
Contract review	Control on non-conformance
Design control	Corrective and preventive action
Document control[b]	Handling, storage, packaging and delivery[b]
Purchasing	Health and safety records
Purchaser supplied product[b]	Health and safety auditing
Product identification and traceability[a]	Training
	Servicing[a]
Work method control	Statistical techniques
Inspection and testing	

Notes: [a]Not included in the CIDA Health and Safety Continuous Improvement Matrix
[b]Deleted from the questionnaire due to lack of relevance to the study and to reduce the length of the questionnaire

Table I*OHS elements*

Table II Average OHS matrix score by number of company employees

	Number of employees					
CIDA element	0-25	25-50	50-75	75-100	100+	Average
Management responsibility	3.05	3.71	4.25	5	4	3.88
Health and safety system	2.86	3.86	4.5	5	4.2	3.81
Contract review	2.05	2.29	3.75	3	3.7	3.24
Design control	2.57	3.43	3.5	4	3.7	3.57
Purchasing	2.76	3	4	3.5	3.4	3.06
Work method control	2.76	3.57	4.75	5	3.5	3.46
Inspection and testing	1.67	2.86	3	4.5	2.5	2.7
Control on non-conformance	2.29	2.86	4.25	4.5	3.8	3.25
Corrective and preventive action	2.81	4	4	5	3.6	3.61
Health and safety records	2.86	3.71	4.25	4.5	3.7	3.71
Health and safety auditing	2.24	3.43	4	3.5	3.2	3.19
Training	2.71	3.14	4	4.5	3.5	3.39
Statistical techniques	1.95	2.57	3.5	5	3.5	3.25
Average score	2.51	3.26	3.98	4.38	3.56	3.39
No. of firms	21	7	4	2	10	44

Table II*Average OHS matrix score by number of company employees*

Table III Number of employees in firms by whether OHS costs are included in tenders

Employees	No	Yes
0-25	6	15
25-50	2	5
50-75	1	3
75-100		2
> 100	2	8
Total	10	33
%	25	75

Table III*Number of employees in firms by whether OHS costs are included in tenders*

Table IV The mean rank of project success factors scores

Factor	Jaselskis (1994) (n = 7)	Lin (2000) (n = 44)
Client satisfaction	1	1
Quality	2	2
Profit	3	3
Budget	4	4
Schedule	5	5
Safety	6	5

Table IV*The mean rank of project success factors scores*

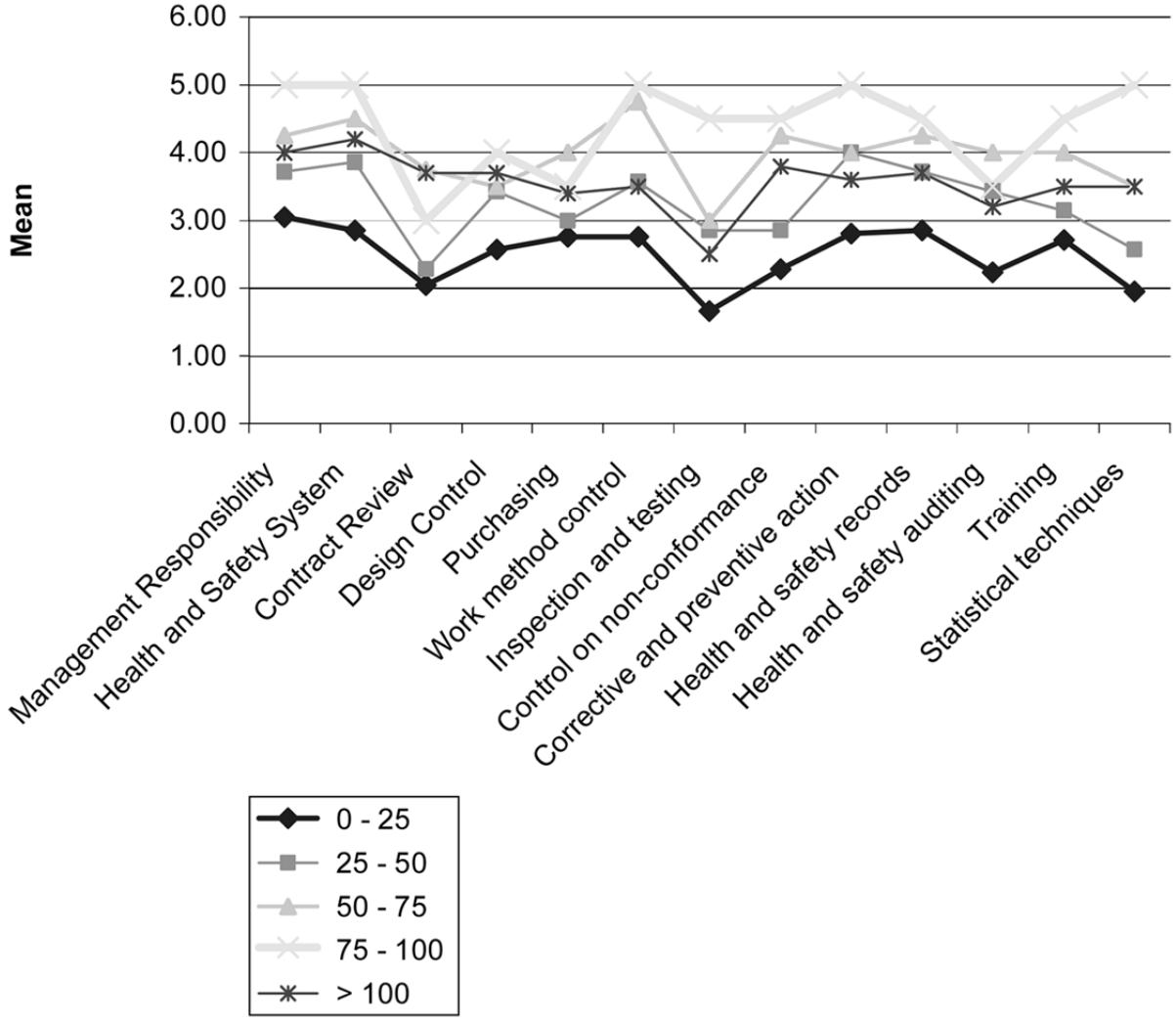

Figure 1*Average OHS performance by company size*

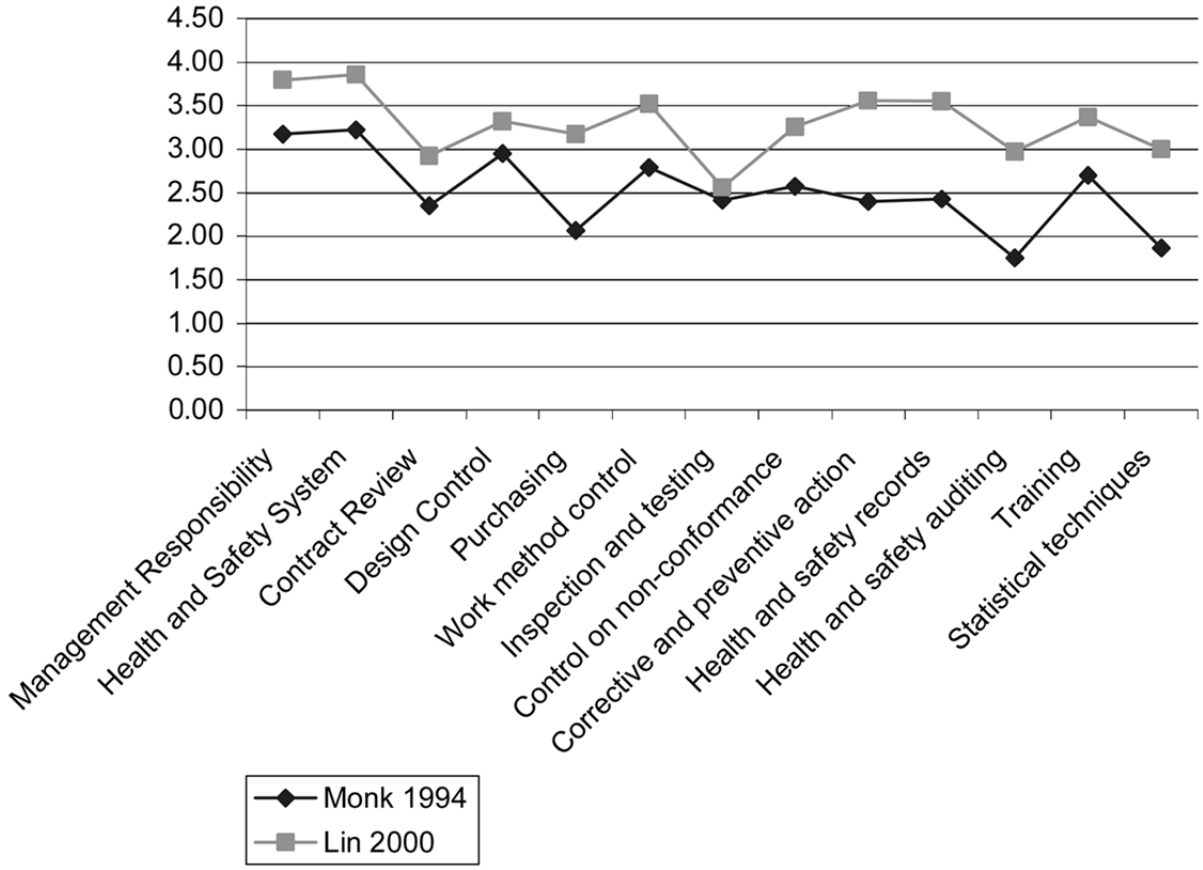

Figure 2 *Average OHS standards levels between Monk, 1994 and the current study*

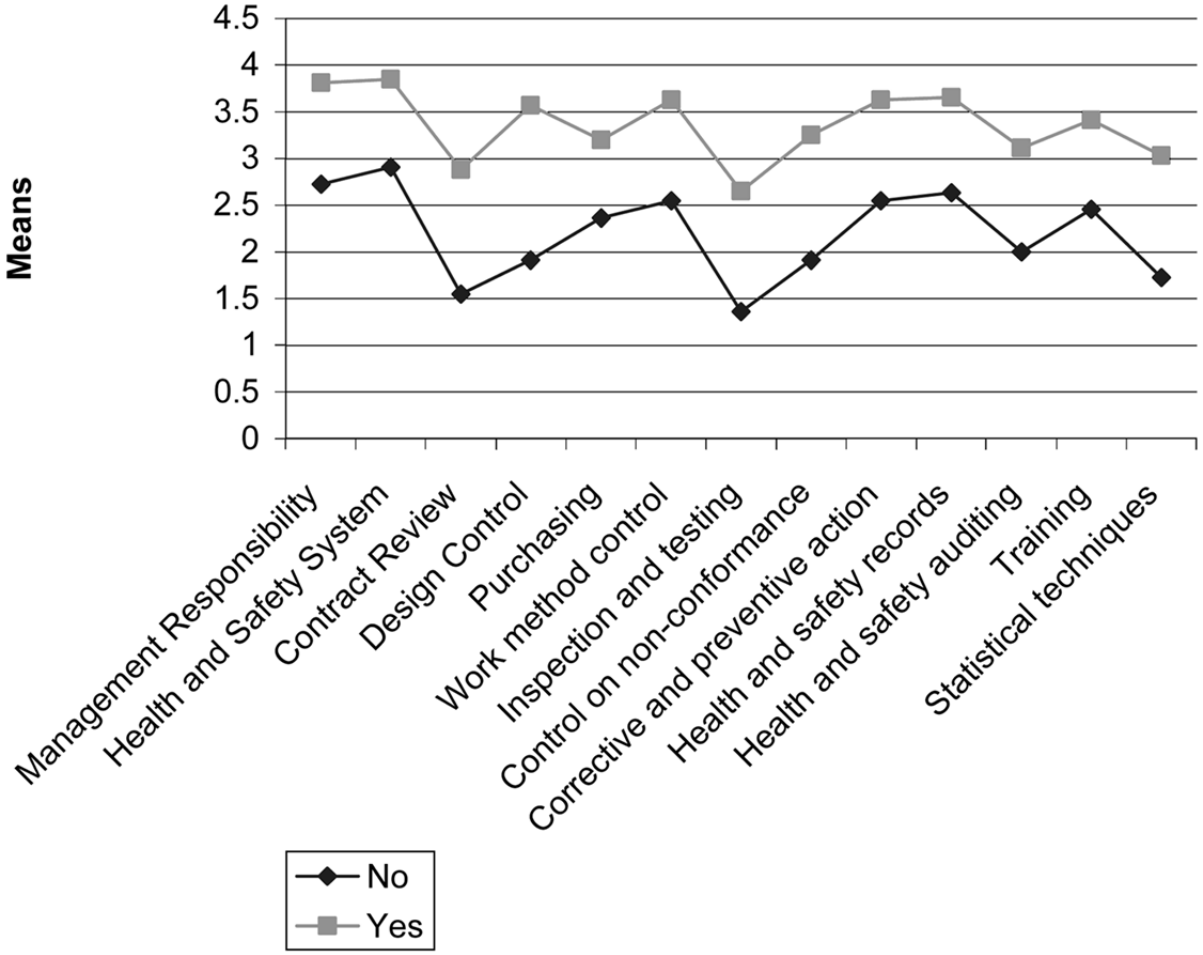

Figure 3*Average OHS standards levels between Monk, 1994 and the current study*

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