

THE MANAGEMENT OF CONSTRUCTION HEALTH AND SAFETY: INVESTIGATING THE COST-BENEFIT

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The Construction (Design and Management) Regulations (1994) require that every construction project gives due consideration to health and safety management. According to a UK Health and Safety Executive- (HSE) report published in 2003, work-related injuries and ill health result in a loss of over 30 million working days per year. The annual costs of work-related injury and ill health are estimated to be in excess of £10 billion to society taken as a whole. Unfortunately, most construction organisations are not aware or do not know the cost of accidents and ill health to their businesses. Evidence suggests that about 3 to 6% of the total project cost can be lost as a result of accidents. Furthermore, the rate of fatalities, major injuries and ill health are likely to increase if nothing is done to reduce accidents to the barest minimum. However, it is envisaged that the construction industry would do more to improve health and safety management if stakeholders were made to perceive the financial benefits of proactive and efficient health and safety management procedures. To date, health and safety management is still perceived as being costly and counterproductive in the construction industry. However, the need to constantly investigate the cost of accidents in relation to overall profits and productivity is deemed necessary. A cost benefit analysis approach to construction health and safety management is proposed as a means of providing the required motivation to ensure improvements to current levels of implementation. The study identifies and evaluates a cost benefit analysis technique that may be relevant to the management of construction health and safety. The results of this investigation will form part of an ongoing study of cost benefits of construction health and safety management.

Keywords: cost benefit analysis, framework, health and safety management

INTRODUCTION

According to the Health and Safety Executive (2004) statistics the UK construction industry has an annual turnover of £65 billion, contributing 8% to the UK Gross Domestic Product (GDP). The industry has 1.4 million workers with 0.3 million associated professionals and half a million construction work sites of which around 160,000 are notifiable by virtue of size and duration under the Construction (Design and Management) Regulation 1994. The HSE estimated the total economic cost to Great Britain of employers and other duty holders failing to comply with health and safety requirements to be up to £18 billion each year (HSE, 2004). The construction industry contributes more than any other industry to these appalling statistics. As a result of such estimates, there is huge scope for making savings by investing in health and safety (HSE, 2003).

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The management of health and safety in the UK construction industry is covered by the Construction (Design & Management) Regulations 1994 with the accompanying Approved Code of Practice (ACOP). The construction industry is regarded as a hazardous and a high-risk environment where fatal accidents occur. According to Egan (1998) the construction industry has the second worst industry record for health and safety than any other industry. In addition, Bomel (2001) also rates the construction industry as the second most hazardous sector to agriculture, hunting, forestry and fishing. In terms of rates of fatal accidents to employees the latest HSE figures show the construction industry to be the 6th worst in the UK (HSC, 2005).

Despite the increasing number of studies and the introduction of the CDM Regulations in 1994 by the UK government in order to help reduce accidents, ill health and costs, HSE (2005) statistics show that accidents in the construction industry continue to occur at a high rate. This poses a major challenge to the industry. The key question to be addressed is why do these accidents continue to occur at such a high rate in spite of the greater awareness. A need therefore arises to investigate the cost of accidents in relation to overall profits and productivity to help reduce the rate of accidents in the construction industry. Based on the foregoing this paper presents a discussion of literature on accidents, the cost of accidents and benefits of accident prevention. This is to set the context for further quantitative research into the cost-benefit of accident prevention.

BACKGROUND

Construction industry problems such as health and safety management are a serious concern to the society and also have negative impacts on project performance. This concern requires a cost-benefit analysis approach to enable the stakeholders in the industry to perceive the financial benefits of proactive and efficient health and safety measures. HSE (2003) indicates that an average of 85 workers are killed on construction sites in the UK every year. In addition the HSE (2004) also indicates that each year an estimated 6000 (Six thousand) die from cancer due to past work exposure. Perry (2003) notes that much emphasis has hitherto been placed on investigating problems related to legislation and documentation.

An accident is defined by the HSE as an unplanned event that results in injury or ill health of people, or damage or loss to property, plant, material or the environment or a loss of a business opportunity. Accidents in the construction industry are often classified as

- Fatal;
- Non-fatal injuries.

FATAL INJURIES

According to Barnard (1998) most fatal accidents are caused by falls from height, objects falling from height on workers and movement of vehicles on the same route with pedestrians. HSE (2005) statistics for 2004/2005 indicate that in the UK construction industry alone there were 72 fatal injuries to workers of which 15 were self-employed and 57 were direct employees. The occurrences of these fatal injuries are considered in greater detail below in table 1 and figure 1.

Table 1: Number of fatal injuries in the UK construction industry

Year	Employees	Self-employed	Total Workers
1999/00	61	20	81
2000/01	73	32	105
2001/02	60	20	80
2002/03	56	14	70
2003/04	52	19	71
2004/05	57	15	72

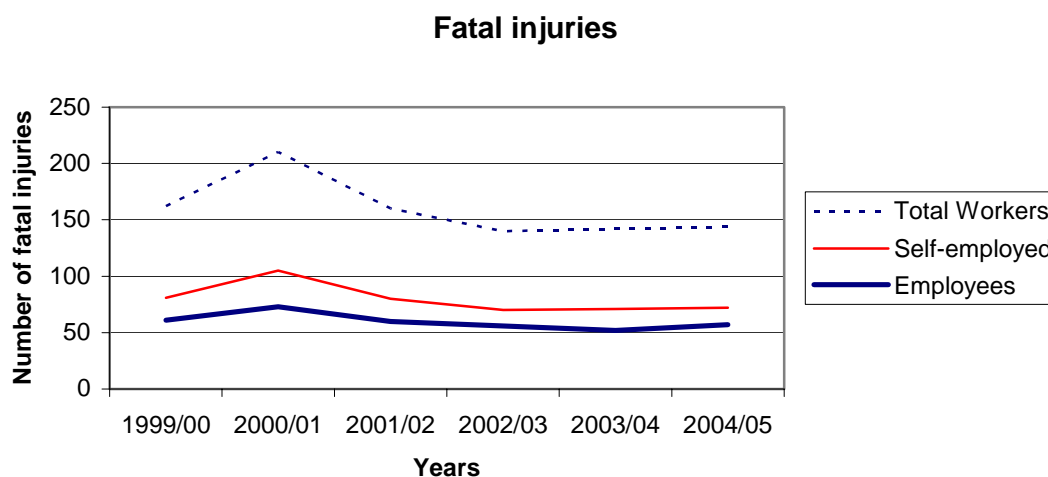


Figure 1: Fatal injuries

The number of total fatal injuries to workers increased from 71 in 2003/04 to 72 in 2004/05 and rose from 52 in 2003/04 to 57 in 2004/05 for direct employees but fell from 19 in 2003/04 to 15 in 2004/05 for self-employed. The number of fatal accidents has been in decline for the last 5 reporting years, which is a positive indication for the industry. Although the overall fatality figures had reduced considerably from 2000/01-2002/03 and rose in 2003/04, the numbers are still significantly high. The number of fatalities will increase if the current trend continues and this poses significant problem to the construction industry. However, there is a wide spread consensus that one life lost is too many and the current accident levels and the resulting fatalities are still high.

NON- FATAL INJURIES

Non-fatal injuries are classified in two categories: Major or over-3-day injuries.

Major injuries

Major injuries are defined as broken bones, dislocation or amputation that may result in permanent disability. According to the HSE (2005) statistics there were 3760 major injuries to direct employees, 726 to self-employed and 4486 total to workers respectively in the UK construction industry. The occurrences of these major injuries are demonstrated in table 2 and figure 2

Table 2 Number of major injuries in the UK construction industry

Year	Employees	Self-employed	Total Workers
1999/00	4386	363	4749
2000/01	4303	405	4708
2001/02	4055	540	4595
2002/03	4031	690	4720
2003/04	3978	750	4728
2004/05	3760	726	4486

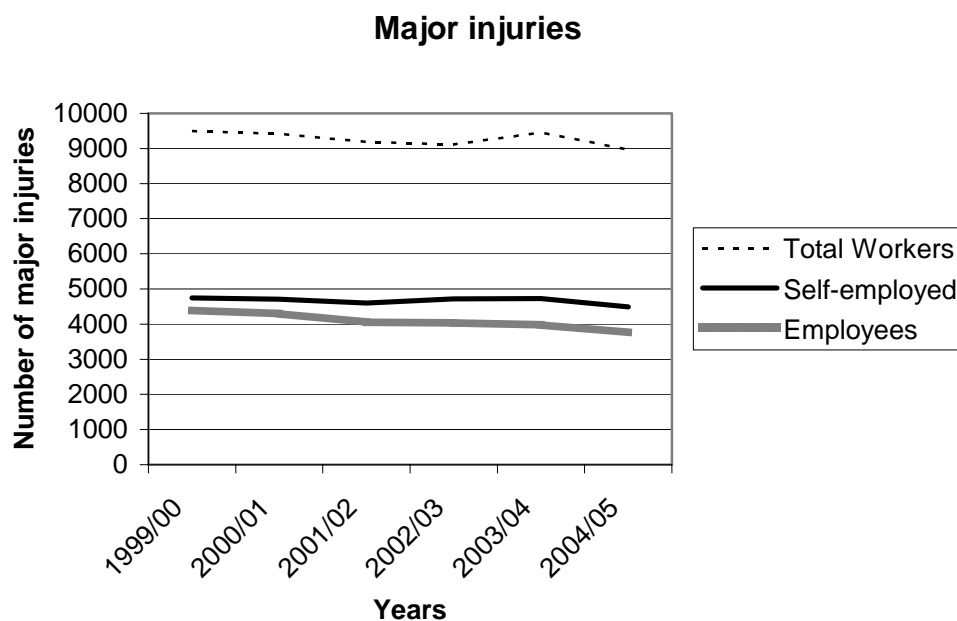


Figure 2: Major injuries

Over-3-day injuries

According to the HSE (2005) statistics for 2004/05 there were 7509 over-3-day injuries to direct employees, 741 to self-employed and 8250 total to workers in the UK construction industry. The occurrences of these injuries are shown in table 3 and figure 3.

Table 3 Number of over-3-day injuries in the UK Construction industry

Year	Employees	Self-employed	Workers
1999/00	10159	345	10514
2000/01	9367	429	9796
2001/02	9100	595	9695
2002/03	8949	629	9578
2003/04	8256	739	8995
2004/05	7509	741	8250

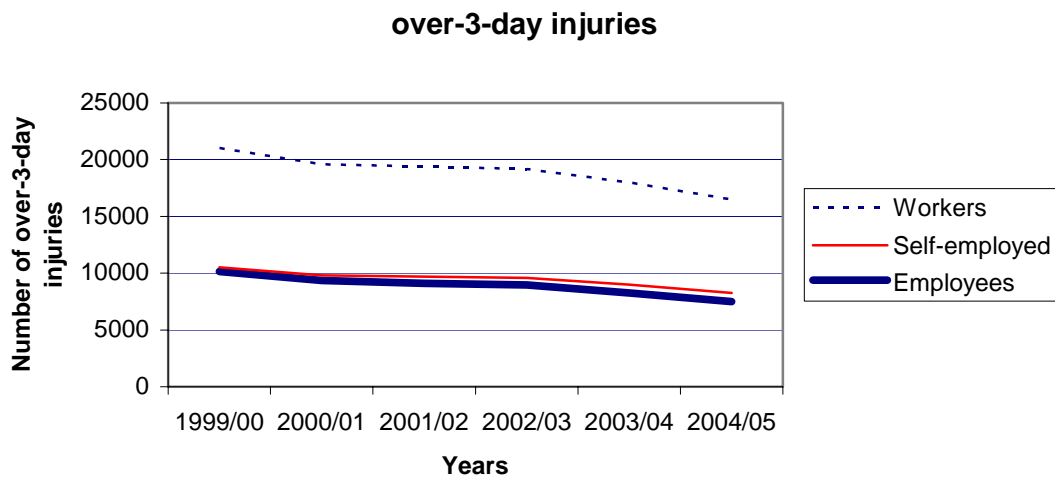


Figure 3: Over-3-day injuries

On over-3-day injuries, there were 7509 to employees in 2004/05 a decrease from 2003/04. The number of over-3-day injuries to self-employed rose slightly from 739 in 2003/04 to 741 in 2004/05 and the total number of injuries to workers declined considerably from 8995 in 2003/04 to 8250 in 2004/05. Handling, lifting or carrying caused two fifths of these injuries. The number of non-fatal injuries has been in decline for the last 5 reporting years. Despite this decrease the number is still significantly high and poses problem to the construction industry.

As can be seen from the above statistics, it is clear that having a positive health and safety management is important in the construction industry. Research on cost-benefit analysis of construction health and safety management is needed to identify methods for reducing accidents in this identified second worst hazardous industry. In addition to the fatalities, injuries and illnesses resulting from accidents, there is also a cost implication element that needs to be addressed. The construction industry has to rethink the process through which it delivers its project within the aim of achieving continuous improvement (Egan, 1998).

ACCIDENT COSTS

According to Kartan (1995) construction accidents cause many human tragedies, demotivate construction workers, disrupt construction processes, delay progress and adversely affect the cost, productivity and reputation of the construction industry. Accidents in the construction industry represent a substantial ongoing cost to employers, workers and society (Haslam, *et al.* 2004). In order to understand what the benefits of accident prevention are, it is vital to define what are the costs of accident. Boot, *et al.* (2005) defines accident costs as any cost resulting from an accident occurrence. Mitropoulos *et al.* (2004) observes that cost pressure may prevent management from providing the required safety measures or appropriate tools and equipment. The cost of accidents affect the profit of the construction companies so it is uneconomical to allow workers to give up work as a result of work-related accidents and ill health (Carcoba 2005) The true cost of accidents is not only the economic costs to the construction industry but also the social costs such as pain and sufferings of the affected workers, emotional and psychological impacts caused to friends, families and

co-workers. Additionally, Ferret (2005) identifies that any accident or incidence of ill health will cause both direct and indirect costs.

Direct costs

The direct costs according to Ferret (2005) are claims on employers and public liability, insurance, damage to buildings and equipments or vehicles, damage to the product; cost of health or expenditure on medical care, cost of investigation, death, permanent disability; worker illness; losses of current production; pains and discomfort associated with accidents, cost of penalties.

Indirect costs.

According to HSE (2005), indirect or hidden costs are the cost incurred by the diversion of people's time to deal with the consequences of an accident which includes, giving first aid, accident investigation, preparing reports, repairs, the costs of changing machinery, hire costs of temporary equipment, waste disposal, temporary labour, customer penalties, and possibly fines and costs from prosecution.

ACCIDENT PREVENTION

Accident prevention begins with having a clear understanding of those factors that may play key roles in their causation (Hinze, *et al.* 1997). Accidents will sometimes occur because construction workers want to be 'macho' and may not follow safe systems of work (Perry, 2003). Barnard (1998) classifies the most dangers on construction sites as:

1. Falls from height by worker;
2. Objects falling from height on worker;
3. Fall into excavation;
4. Excavation collapsing;
5. Movement of vehicles especially on the same routes with pedestrians.

The aforementioned constitute the major dangers on the construction site and can result in death, disability or subject workers to illness. Evidence suggests that the falls from height are the most common cause of fatal accidents and major injuries that result in various costs to the construction industry. The most common falls according to Croner (1995) are off ladders, from scaffolding, through fragile roofs, through holes in roofs, off roof edges, from structural steel work, from temporary working platforms and during demolition. In addition Bomel (2001) identified the possible cause of these accidents can be attributed to inadequate planning, inadequate supervision, inadequate design, lack of training and awareness, ineffective policy of the management and failure to comply with operating instructions and lack of communication.

The first major step to prevent accidents from occurring is planning, education, workers awareness, training and also the designers and planners have greater roles to play during design and planning stages. Accidents can also be prevented if the cause is investigated and necessary steps are taken to avoid reoccurrence on site. Strong commitment to implement health and safety management by organisations and active involvement of employees will greatly prevent accidents in the construction industry (Ferret and Hughes 2005). Carcob (2005) observes that prevention of accidents and illness would not only prevent suffering by workers and their families, but would also remove cause of social inequality, and also genuinely uphold the rights of workers

within the companies. Furthermore, the UK government's HSE has demonstrated that improved health and safety management can prevent 70% of accidents on site (Kheni *et al.* 2005).

The Construction (Design and Management) Regulations 1994 (CDM) came into force in 1995 in response to EU Directive on 'Temporary and Mobile construction sites (Joyce 2001). According to CDM Regulations 1994 under which Health and Safety management should apply the employer must:

- Identify what actions are necessary to eliminate or reduce risks to health and safety of their employees and others
- Make appropriate arrangements for managing health and safety, including planning, organisation, control, monitoring review of preventive and protective measures, co-operate with employees to share a common workplace and to co-ordinate preventive and protective measures for the benefit of all employees and others;
- Ensure that employees are given suitable training and also any temporary workers are provided with relevant health and safety information in order to carry out their work safely

The purpose of the CDM Regulations 1994 is to ensure that health and safety is co-ordinated and managed through all stages of a construction project in order to help reduce accidents, ill health and costs (Joyce, 2001). The HSE observed that the CDM Regulations 1994 were not effective enough and did not meet the expectations of accident reduction. This informed the Health and Safety Commission (HSC) to propose and seek for modified CDM Regulations. These views were supported by an industry wide consultation in September 2001, and led to the decision to revise the current Regulations (HSE, 2006). According to HSE (2005) the proposed revisions are intended to refocus attention on effective, but practical, planning and management of construction projects.

The revised Regulations aim to reduce construction accidents and ill health by:

- Being clearer in order to make it easier for duty holders to know what is expected of them;
- Being flexible and accommodating the wide range of contractual arrangements to be found in the construction industry.
- Emphasising the need to plan and work rather than the bureaucracy associated with it
- Emphasising the communication and co-ordination advantages of duty holders working in integrated teams; and
- Simplifying the way duty holders assess competence.

The proposal was accepted and the CDM was modified to give rise to CDM Regulations 2006. The modified Regulations will come into force on 1st October 2006 (HSE, 2006).

BENEFIT OF ACCIDENTS PREVENTION

Benefits are usually assessed in terms of the value of goods or services that a person would be prepared to give up in order to be able to enjoy the facilities (Ashworth,

2005). Benefits to society can be gained in terms of reduced fatalities, major injuries and ill health through prevention of accident occurrences in the construction industry (Williams, 2005). Tracey (2005) notes that the cost of an accident in the construction industry cannot be compared to benefits that would arise from preventing the accident from occurring. According to Shearn, (2003) cost-benefit is perceived to offer both direct and indirect implications on construction health and safety management

The indirect benefits include reducing absenteeism, improving corporate images, improving job satisfaction, an increasing chances of winning more contracts.

Despite this finding, very little has been done to date in facilitating a better understanding of health and safety cost benefit analysis (Ferret & Hughes 2005). Though, there is a significant cost in improving health and safety management in construction, the benefits gained in improving health and safety are greater than the cost in terms of social benefit and also human health and life is surely greater than any economic cost to the contractor. Nevertheless, the requests from one business survey indicate that 10% of UK businesses would be prompted to do more for health and safety management if they were provided with evidence that business benefits would arise (Wright *et al.* 2003) as cited in (Shearn 2003). A need therefore arises for adequate information on cost-benefit analysis so that the construction industry can understand the benefits they stand to gain by practising health and safety management in their organisation. The number of lives saved and illnesses prevented as well as increases in profitability can be viewed as the real benefit to the construction industry and society as a whole. For this reason, investigating cost benefit analysis of construction health and safety management is necessary to prevent accidents on construction sites as well as to preserve life.

COST-BENEFIT TECHNIQUE

The UK construction industry is under pressure to reduce cost both the Latham (HMSO 1994) and Egan HMSO 1998) as cited in Marsh *et al.* (2000). This challenge prompted the use of Cost Benefit Analysis (CBA) to improve performance and reduce costs of accident. According to Carcoba (2004) cost-benefit analysis can be defined as a technique designed to determine the feasibility of a project by quantifying its costs and benefits, which can be used to evaluate the social costs and benefits of investment project. Furthermore, Moore (1995) notes that cost can be determined by placing economic values on the amount of resource required to plan, implement and complete a programme. This cost can be financial or social. The financial cost may be fixed or variable depending on the type of construction project, while the social cost is the increase in the number of accidents, which affects workers skills and reduce health.. The relevance of cost-benefit analysis in the construction industry is not only the financial aspect but also social effects, emotional and psychological impacts caused to the affected persons and their families. The financial benefit is cost reduction while the non-financial is reduction in the number of accidents. A clearer understanding of the cost benefits analysis would help to motivate an improvement in construction health and safety management. This may be used to estimate the direct and indirect costs to the construction industry when accidents occur and also can be used to enumerate the positive aspects of accident prevention. The cost-benefit approach can therefore potentially lead to reduction in costs, death and injuries.

CONCLUSION

A cost-benefit analysis approach is hereby proposed as a means of enhancing construction health and safety management. It is envisaged that the approach will help duty holders gain a better insight into the underlying cost implications of health and safety management. It is expected that these will improve the health and safety management process and improve systems of work. Workers in the construction industry will improve productivity if they are motivated to implement health and safety policy. The construction industry can do a better job and improve productivity if there is a systematic management approach to health and safety and work quality. The cost of accidents in terms of financial benefits and productivity in the construction industry cannot be compared to the benefits that will arise from preventing the accident from occurring. The value of human life, pain and sufferings inflicted on the affected person and their family does not have a price. In order for the construction industry to enhance its performance, management must avoid putting undue pressure on workers to get things done as quickly as possible at the expense of health and safety because it will be counter productive. Effective implementation of health and safety management should benefit the project in respect to time, budget as well as reduction of legal issues. The health and safety problems in the construction industry has been in existence for decades, which suggests that lessons from the past have still to be learnt

Despite the enormous benefits of accidents prevention, many sections of industry are not proactive in implementing measures to further drive down accident rates. This may be because of the lack of detailed information on the cost-benefit analysis of accident prevention. It is anticipated that the outcome of the study will significantly improve overall health and safety management performance in the construction industry.

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