EVALUATING THE EFFECTIVENESS OF ECONOMIC INCENTIVES ON CONSTRUCTION CLIENTS' HEALTH AND SAFETY PERFORMANCE – A DELPHI STUDY

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ABSTRACT: The use of economic incentives to improve H&S performance in the construction industry in general, has been investigated by various scholars. However, few studies have looked at the impact of economic incentives on construction clients especially in the developing world. Therefore it was necessary to investigate specifically the impact of the economic incentive on client's H&S performance. Economic incentives are considered to be a proactive way of improving H&S performance.

The investigation was conducted using a Delphi technique to determine the impact significance of the economic incentive or disincentive on construction clients' H&S performance. Findings from the study were that the economic factor had critical impact significance on clients' H&S performance. Further clients were 'very likely to' implement various H&S elements as a result of the economic incentive and disincentive.

The paper will report on the findings from an analysis of impact significance of the economic incentives on clients. It will underscore the point that economic incentives or disincentives on construction clients are necessary to encourage them to actively participate in H&S performance improvement.

Keywords: Clients, economic incentives, Health and safety, Impact significance.

1.0 INTRODUCTION

Construction clients lack the motivation to actively be committed to H&S performance improvement in the construction industry. Possible reasons may include the view that clients do not directly suffer loss. A question arises therefore as to what would motivate clients to actively be committed to H&S performance. Economic incentives have been reported to produce favourable results on other H&S stakeholders. However there is no reported evidence on the effectiveness of economic incentives on clients. Therefore it was necessary to investigate the effectiveness of economic incentives to influence clients to actively participate in H&S performance improvement.

Literature informs that the use of incentives as a method to promote a culture within which technical and process innovation can flourish is critical to project success [1]. Similarly, economic incentives have been shown to yield positive results in H&S performance [2]. It is in view of this that Elsler & Nikov [3] contend that there is a need for economic incentives to proactively promote H&S.

Some of the reasons why economic incentives have been contemplated include the failure of strict regulation approaches, the costs involved in bringing organisations to courts for non-compliance and the low level of fines which have failed to encourage organisations to comply [3]. However, it is also acknowledged that economic incentives are only effective when they are directed at organisation or national level [2]. Consequently, the economic incentives may entail linking fiscal incentives such as lower accident insurance premiums or tax rates to a good H&S performance for an organisation. Other methods to incentivise for example employers to implement H&S may include matchup funds where a grant is given to an employer equal in amount to the amount to be spent on H&S or linking an incentive amount to a voluntary audit or inspection [2].

In order to achieve the desired goals from the economic incentives, their design and use should take into account the constraints and risks of a project, organisation or indeed the Nation [1, 3]. Incentives should make risk allocation fairer, because incentives can be seen as the sharing of rewards from good

performance and this may motivate the participants to perform better [1].

The reason why economic incentives are said to work on the contractors' side or are seen as one of the solutions to proactively improve H&S, is partly because of the cost of ensuring H&S which is usually borne by the contractors [3]. Contractors work at reducing the cost in order for them to remain competitive. Bishop et al [4] rightly argue that the unacceptability of occupational H&S performance of the building and construction industry is attributed to the powerful competitive forces in the industry which ultimately work against H&S. He observed that the industry strives to complete projects on time in order to reduce costs and too often H&S is neglected. The solution may be a cultural and behavioural change and this may only come about by harnessing the competitive forces in the industry to work for occupational H&S.

Both organisations and government departments at times lack the requisite resources and therefore this inhibits a meaningful improvement of H&S. A lack of resources or underfunding for H&S programs limits any action. For example, in Tanzania, less than 1% of the Labour Department's budget was allocated to occupational H&S [5].This kind of allocation can result in a low capacity to enforce legislation and failure to conduct inspection and surveillance. According to Cotton et al. [6], contractors or indeed other stakeholders are unlikely to see the need of implementing H&S without the application of incentives or sanctions especially in the developing countries.

The benefits of incentives are clear. The European Agency for Safety and Health and Work [2] demonstrated from a case study of six organisations in Europe that improvements of 25 to 70% were possible with economic incentives. However for the incentives to be effective, they should be provided by national and or international organisations. Consequently political will is necessary for the national or international organisations to be involved.

The use of economic incentives to improve H&S performance in the construction industry in general, has been investigated by various scholars. However, few studies have looked at the impact of economic incentives on construction clients especially in the developing world. Therefore it was necessary to investigate specifically the impact of the economic incentive on client's H&S performance. Studies have shown that economic incentives have produced positive results for contractors and employees. However it is not clear how economic incentives would impact H&S performance of clients. The focus was placed on clients because they can influence project H&S performance [7].

2.0 THE STUDY

A Delphi study technique was used to explore the impact significance of economic incentives on client's H&S performance. The Delphi method was preferred to common survey methods as the current study was addressing the 'what could' kind of question as opposed to the 'what is' kind of question [8]. The Delphi method was also considered to be much stronger for its rigorous query of experts which is achieved through many iterations and feedback.

The Delphi study involved 11 panel members. This number of panellists was considered adequate based on what other Delphi studies have used and recommended. Delbecq, Van de Ven and Gustafson [9] suggest that 10 to 15 panellists could be sufficient if the background of the panellists is homogenous. A review by Rowe and Wright [10] indicates that the size of a Delphi panel has ranged from three to 80 in peer reviewed studies. Okoli and Pawlowski [11] and Skulmoski, Krahn and Hartman [12] also mention a panel size of about 10 to 18 members. Hallowell and Gambatese [13] suggest a minimum of eight panellists. Based on the above and the fact that the Delphi method does not depend on statistical power [11], but rather on group dynamics for arriving at consensus among experts, a panel of 11 members was considered adequate.

However, the choice of panel members was critical. Delphi is a group decision mechanism requiring qualified experts who have deep understanding of the issues [11]. Therefore, one of the most critical requirements is the selection of qualified experts as it is the most important step in the entire Delphi process because it directly relates to the quality of the results generated [8]. In view of the above, successful panel members had to meet a set criteria which included, qualification, experience, publication record, and capacity and willingness to participate in the study.

Panel members were identified from three sources. The first source was the CIB W099 register of members located on the CIB WO99 website [14]. The CIB W099 is a working commission that was set up on royal appointment to enable researchers on construction H&S in the world collaborate as well as protect H&S. The second source was the conference proceedings of the CIB WO99 from year 2005 to 2009. Individuals who had frequently appeared as authors or keynote speakers were identified as potential experts on the study. The third and last source was identifying through references of individuals working in the area of H&S in the local construction industry in Southern Africa.

The panel consisted of two members from South Africa, three each from United States of America (USA), and the United Kingdom (UK), one each

from Singapore, Hong Kong, and Sweden. All the panellists specialized in construction safety. In terms of their current occupation, three of the panellists were employed by contracting organizations, one by a consulting organization, and six by Universities. All panellists held very senior positions in their organizations and were involved in community service. The panel had a cumulative of 243 years of experience. The lowest number of years of experience was seven and the highest was 45 years.

The calculated mode of years of experience was 15, the mean was 22.1 years and the median was 15 years. Experience was an important factor in determining who an expert was and therefore a minimum number of years was set to be five years. In terms of publications, 10 of the panellists had published in peer reviewed journals, conference proceedings and books. Between them, they had published 57 books and monographs, 19 chapters in books, 187 peer reviewed academic journals, 345 recent conference papers and 341 other publications comprising of articles in professional journals, technical reports, policy papers, expert witness documentation and key note addresses. In addition to their publication, the panel had led and managed 108 funded research projects. Three panellists served on editorial boards of 43 peer reviewed journals and conference proceedings (Figure 1.0)

Table 1: Panellists publications

Panel publications	No. of publications
Books and monographs	57
Chapters in books	19
Peer reviewed Journals	187
Peer reviewed Conference proceedings	345
Funded research	108
Other publications	341
Editorial board membership	43
Referee for journals	22
Referee for Conference proceedings	30

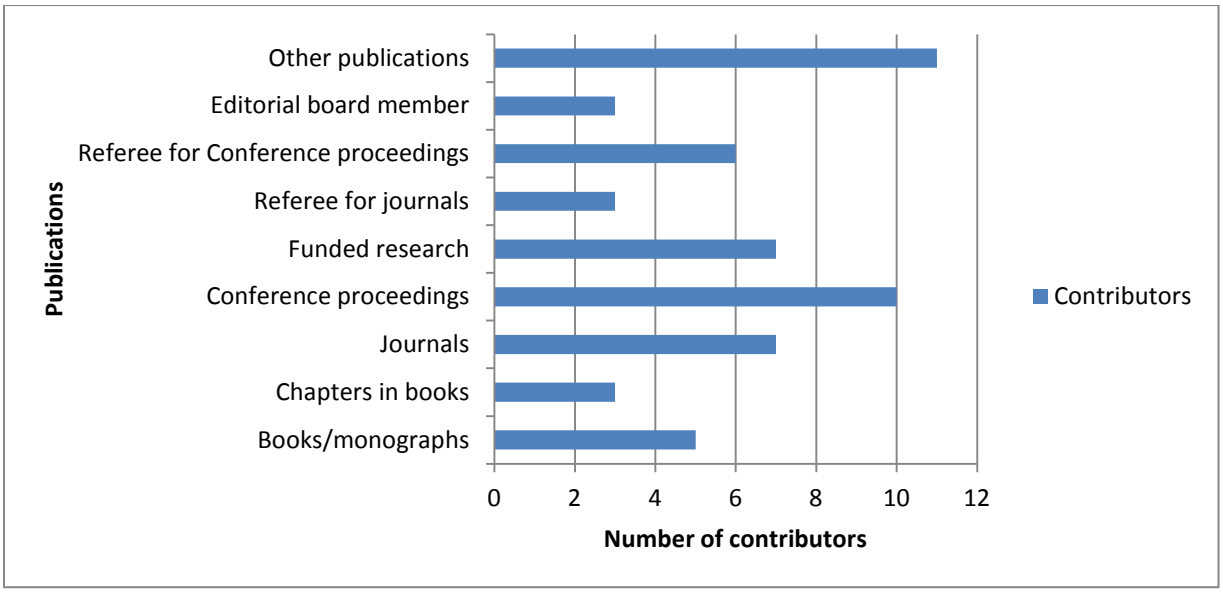

Figure 1: Publications by panel members

The Delphi study involved three rounds of an iterative process before consensus between the panel members on the impact significance of economic incentives on clients' H&S performance was reached. Panellists were requested to rate the probability that clients would implement H&S elements as a result of influence from external environment factors including economic incentives. The probability scale ranged from 1 to 10 representing 0 to 100%. Further, panellists were requested to rate the impact of external environment factors on client performance. The impact scale was based on a 10 point rating scale ranging from low to critical. This aspect indicated the severity of a factor.

A two stage analysis of data from the Delphi was conducted using Microsoft office Excel, a spreadsheet software program. The first stage involved analysis to establish or confirm consensus on responses to the predetermined criteria. This involved determining the group median responses for each question. After the third round of the Delphi, absolute deviations (D_i) about the group medians ($m(X)$) of each rating for every question were calculated using equation 1.0. In addition, mean absolute deviations (MAD) were calculated for every question. This is a calculated mean of all absolute deviations for all panellists about the median on each question. Further analysis involved determining the statistical range in ratings by panellists on each question and the percentage of panellists with a similar opinion inclination on each and every question. Consensus was determined to have been achieved when the MAD was less than one unit below or above the group median, the range in ratings on each question between all panellists was below 4.0 and the percentage of panellists that were of a similar inclination in opinion was 60% and above on a particular question.

$$D_i = \left| x_i - m(X) \right|$$

Equation 1

Where:

D_i = Absolute deviation

x_i = Panellist rating

$m(X)$ = Measure of central tendency

The second stage of Delphi data analysis, involved determining the impact significance of environmental factors on client H&S performance. The significance of the impact of environmental factors was categorised as critical, major, moderate, minor or low. The categorisation was helpful in determining which environmental factor was more critical to client H&S performance. The impact significance of a factor was obtained as a product of the overall rated probability (likelihood) that an environmental factor would influence client to implement H&S elements and the rated negative impact (severity) on the client implementing the elements that would result if the environmental factor was absent. This relationship is illustrated in equation 2.0 below.

$$Impact\ Significance = Likelihood \times Severity$$

Equation 2

3.0 RESULTS

The influence of external environment factors on client H&S performance was evaluated. The external environment was defined by six factors, namely: political, social, economic, legislative, professional bodies and technology. The impact significance of these factors' influence on client H&S performance was obtained as a product of client's likelihood to implement H&S elements and the severity rating or negative impact on client's H&S performance if the factors were absent.

The level of influence was determined by assessing the extent to which client would implement various H&S elements if pressured by the external environment. Severity of an environmental factor was the rated negative effect on client H&S performance that would result from an environmental factor's absence. The severity rating was based on an ordinal scale of 0 to 10 with 0 being negligible and 10 critical. The Impact significance was obtained as a product of the severity rating of an environmental factor and the likelihood of client implementing a particular H&S element (Refer to equation 2).

Of the six environmental factors, three of them namely, political, economic and legislative, were determined to have an impact significance of over 5.0. The economic and legislative factors had an impact significance of 7.77 each (Figure 2). According to the classification scale used in this study a rating of 7.77 was considered to be 'critical'. The rating suggested that economic incentive was critical to client implementing the required H&S elements or programmes.

The likelihood of clients implementing H&S elements, as a result of external environment's influence was 67% on average (Figure 3). The standard deviation in the likelihood ratings was 0.06. The small standard deviation suggested that the likelihood of the client implementing the H&S elements was almost the same.

However, clients were least likely to be involved in design and planning of H&S activities. The likelihood for this element was determined to be 60% (see Figure 3). On the other hand, clients were most likely to conduct H&S audits and inspections and have H&S policies, procedures and goals. The likelihood for these H&S elements was determined to be 76% each. However, with economic incentive, clients were more likely to implement the H&S elements. The average likelihood was determined to be 86% of the client implementing the elements with economic incentive (Figure 4).

With economic incentives, clients were 'very likely' to implement all H&S elements (Figure 4). In comparison to the average likelihood of all other environmental factors namely: political, legislation, social, technological and professional bodies, the clients were merely 'likely' to implement the H&S elements. The average likelihood was determined to be 63% that the client would implement H&S elements as a result of political, legislation, social, technological and professional bodies' influence (Figure 4).

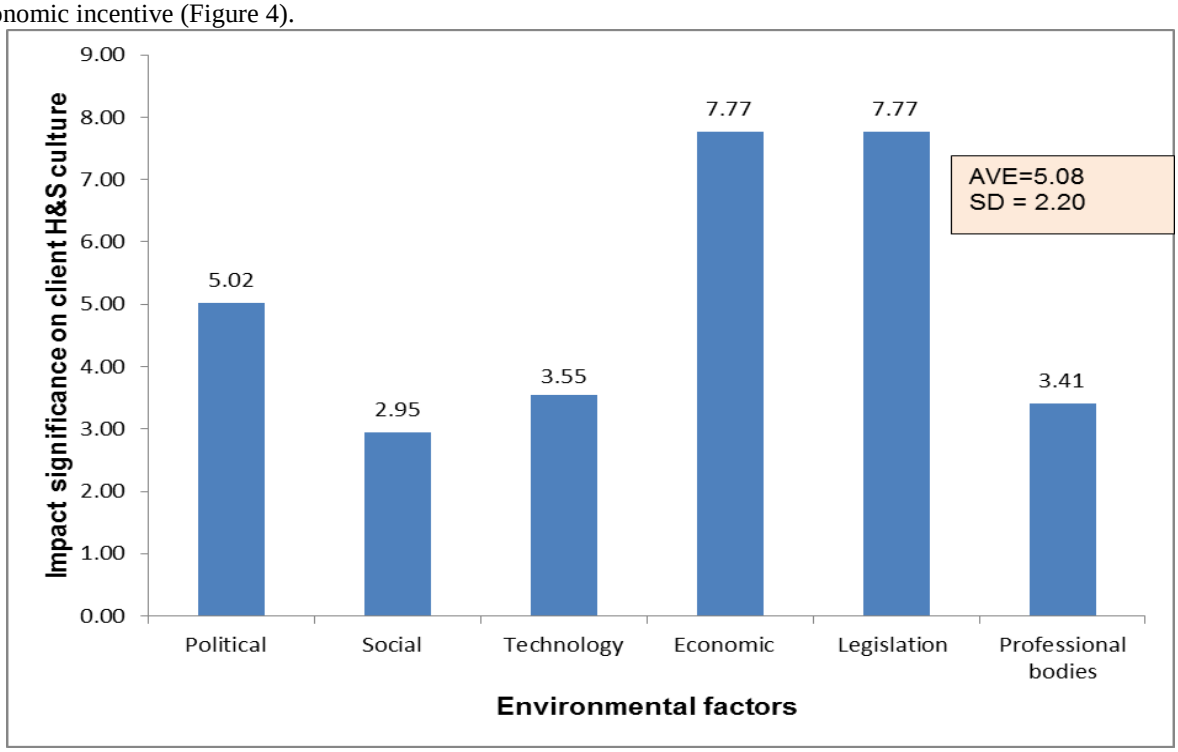

Figure 2: Impact significance of external environment factors to client culture

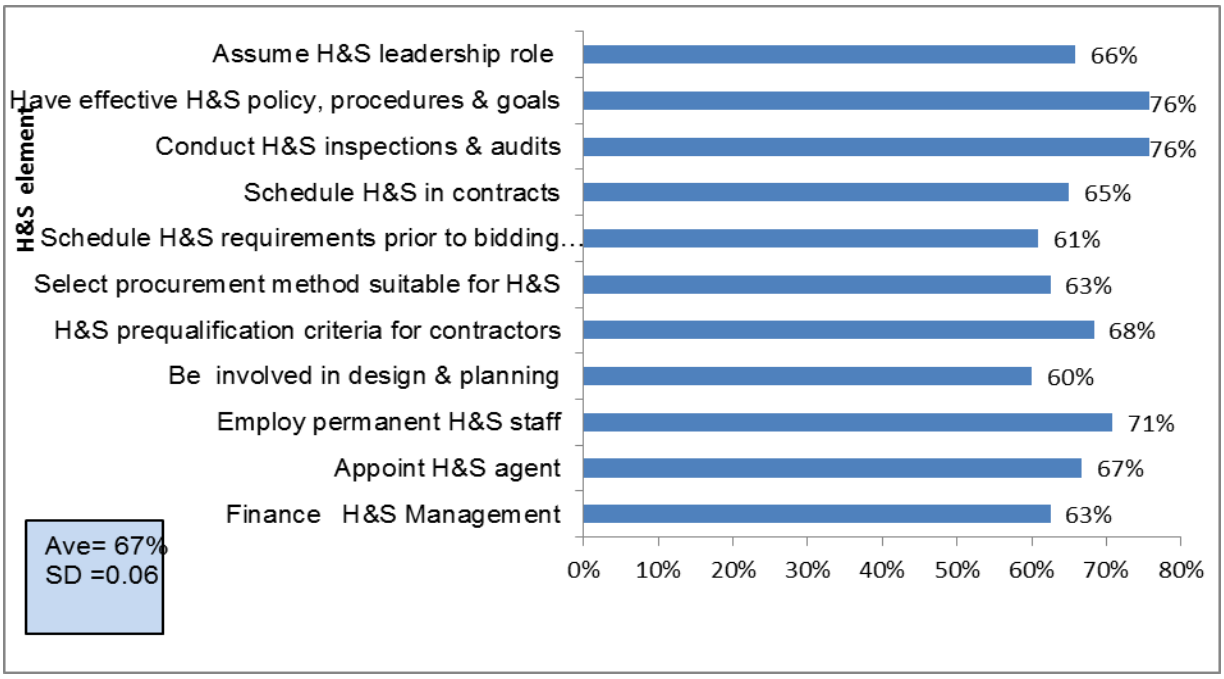

Figure 3: Client likelihood to implement H&S elements

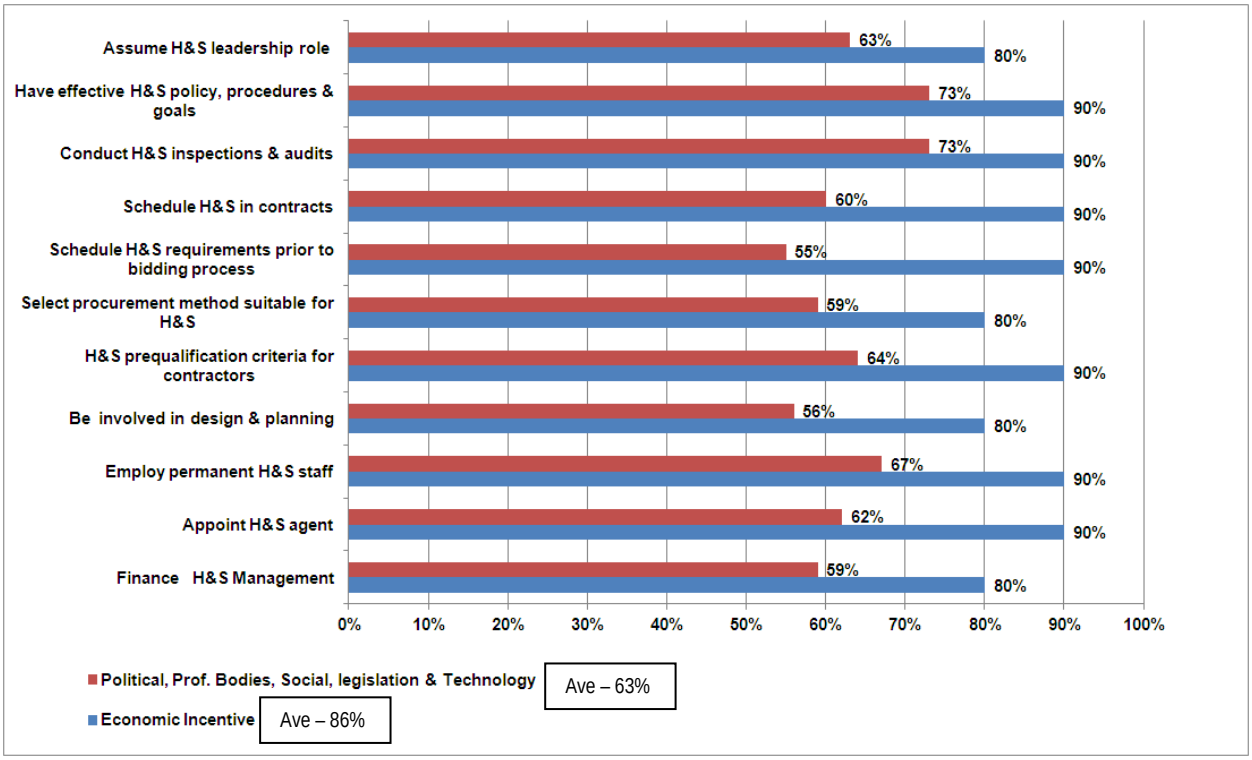

Figure 4: Client likelihood to implement H&S elements

4.0 DISCUSSION AND CONCLUSION

Findings in the current study indicated that economic incentives had critical impact significance on client H&S performance and that clients were very likely to implement H&S elements with economic incentives when compared to other factors such as political influence. The finding in the current study collaborate that of the European Agency for Safety and Health at Work. The European Agency for Safety and Health at Work [2] demonstrated from a case study of six organisations in Europe that improvements of about 25 to 70% were possible with economic incentives. It is envisioned that similar results may be obtained with the client considering that they were very likely to implement H&S elements (above 80% likelihood) if economic incentives were present.

Economic incentives may be effective to motivate clients to participate in H&S management. Without economic incentives, clients may continue to consider themselves not part of the H&S stakeholders and therefore not participate effectively in implementing H&S. According to Cotton et al. [6], stakeholders are unlikely to see the need of implementing H&S without the application of incentives or sanctions especially in the developing countries.

The finding in the current study indicate that economic incentives may not be overlooked in trying to get clients involved in H&S implementation. With economic incentives, they are likely to implement all H&S elements. On the other hand, when compared to other factors, only legislation seems to have a similar effect. although political, social, technology and professional bodies have influence on clients, economic incentives was found to have a more effective impact. The study does not however mean that these other factors do not matter. to the contrary, the finding suggest that economic incentives may not be omitted from a basket of measures that need to be applied to motivate clients to be effectively involved in H&S management.

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