

LEARNING MECHANISMS FOR ADDRESSING IMPROVEMENT IN CONSTRUCTION COMPANIES

G. K. Kululanga, F. Edum-Fotwe, R. McCaffer and A. D. F. Price

Dept of Civil and Building Engineering, Loughborough University, Leicestershire, LE11 3TU, UK

This paper presents on-going research within the department of Civil and Building Engineering at Loughborough University on learning of a company as a corporate entity, which is becoming an important feature for corporate improvement. The study focuses on learning media or tools that companies employ to imbibe knowledge and other stimuli from their internal and external business environments for purposes of learning new ways of working. Therefore, the paper presents the results of a survey on the application of various learning mechanisms for addressing improvement to UK construction contractors. Organisational learning concepts and the mechanisms for learning are introduced and the research approach for the initial stage of the study is discussed. The results of the survey show that the use of most learning mechanisms was low.

Keywords: Construction contractors, continuous improvement, learning.

INTRODUCTION

Continuous improvement has become an ever-present reality to construction companies as they seek to adapt to their changing business environment. One major factor driving this continuous improvement agenda is the latent role played by organisational learning (Barnett 1994). Hill (1996) argued that learning and continuous improvement are inextricably linked such that learning is the most compelling reason for undertaking any continuous improvement schemes of a company. Equally, Stata (1989) pointed out that the highly successful companies in today's evolving business environment are differentiated from others not so much by any single set of the knowledge of their employees but equally by the ability to learn as corporate entities. As a result, learning is becoming one of the essential tools for addressing improvement and may soon become the key source of competitive advantage (de Geus 1988). Therefore, learning generative processes should be the focus for construction companies in order to increase their ability to innovate and ensure continuous improvement.

The notion about organisational learning has its genesis in theories of individual learning. Just as learning is crucial for individual capability improvement as a result of the challenges they experience in their environments, it is equally important for improvement of company practices. However, organisational learning is not the same as individual learning (Kolb 1996). There are cases where an organisation knows less than the totality of its individual employees' competencies, a situation where the whole becomes less than the sum of its parts. Equally, the relationship can be characterised by synergy, where the sum of its parts becomes less than the whole. These disparities are accounted for by the way corporate establishments imbibe information and other stimuli in the business environment. Consequently, the learning

of an enterprise transcends the mere learning of individual employees at the microscopic dimension for tacit knowledge improvement. It relates to how companies imbibe knowledge and other stimuli from their internal and external business environments and how the acquired knowledge is applied to meet the challenges they face (Garvin 1993).

In connection to learning of corporate establishments, are the styles which Argyris (1992) describes as characteristics that organisations exhibit when addressing their improvements. Therefore, in adjusting to the constraints imposed by the challenges of the evolving business environment, organisations exhibit one of the following learning styles: single loop actions where companies focus on addressing symptoms of the challenges they experience in the business environment (Argyris 1992); double loop actions where companies address the root causes by changing the values that underpin their practices (Senge 1990); and deutero style that relates to improvement of the learning process of the company itself or where companies become skilled at learning to learn (Redding and Catalanello 1994).

Villegas (1996) pointed out that there are a number of learning types and names in organisational learning theory and their definitions depend on the perspective of analysis. For example, the process and content of learning versus learning for improvement is not the same. Barnett (1994) further noted that the former is a cognitive process of initial learning while the latter involves particular techniques or tools that are described as learning mechanisms for addressing improvement. Learning mechanisms are tools or mediums that in many cases are deliberately employed by corporate establishments to create and imbibe knowledge and other stimuli from their internal and external business environments (Nonaka 1991). Learning mechanisms for improvement derive from various learning dimensions or core processes that contribute to learning of a company. In addition, learning mechanisms are classified according to the dimensions (core processes) that contribute to learning of an enterprise as a corporate entity (Pearn et al. 1995). In order to meet the challenges of the evolving business environment companies deliberately appropriate knowledge from their environments which is then applied to improve their effectiveness.

Research of organisational learning antecedents have mainly involved firms in automotive and white goods industries. The first account on organisational learning issues of UK construction industry focused on competitive organisational learning by Jashapara (1995) and advocated for further understanding of learning issues within the industry. Alwani-Starr (1997) equally pointed out that aspects of learning in construction industry have normally focused on training and learning of individual members at the microscopic level where as the antecedents that are associated with learning of a company as a corporate entity have received little attention within the construction industry. This study attempts to investigate the learning mechanisms of construction contractors.

RESEARCH APPROACH

This initial stage of the research into learning of construction contractors employed a questionnaire survey to collect the required preliminary data (Kululanga et al. 1997). The objective of the initial questionnaire survey was to obtain preliminary data on learning mechanisms and to form a basis for selecting companies for the second stage for the detailed case studies. According to Crossan (1995) the two approaches present

an efficient and systematic approach for understanding organisational learning issues. Therefore, the initial stage involved a questionnaire design, which was tested in a piloting stage and culminated in the main preliminary survey. Table 1 lists the fifty-seven learning mechanism variables that were included in the questionnaire together with the learning dimensions. The selection of the learning mechanism variables was based from a literature review and interviews with construction executives. Data was elicited by requesting construction executives to indicate the extent to which their companies employed the learning mechanisms for learning new ways of working.

The inquiry employed a five point ordinal level measurement (always; very often; sometimes; rarely; and never). Mean score values of construction executives' responses were employed to establish a general perspective of the utilisation of learning mechanisms by construction companies for purposes of learning new ways of working.

The research specifically focused on construction contractors that had established businesses, with organisational and operational structures in place as a key sample for the inquiry. Such characteristics provide a platform for exploring the antecedents of learning (Crossan 1995). A sample size of ninety companies with a consistent good performance over the last ten years was drawn from the top one hundred construction contractors file that operate in the UK (Construction News 1996). The questionnaires were administered to construction contractors' executives as the appropriate respondents identified from the pilot survey. Thirty-one construction contractors responded, representing a thirty-four per cent response rate.

ANALYSIS OF RESPONSES

The mean score which, represented the weighted score of the responses of construction executives was used to characterise the application of the learning mechanisms to contractors for purposes of learning new ways of working. To facilitate the analysis, numerical values were assigned to the five-point ordinal scale. This involved rating the measuring instrument as follows: always (4); very frequently (3); sometimes (2); rarely (1); and never (0). The equation shown below presents the formula for calculating the mean scores as outlined by Meddis (1984). Where: q is number of categories employed for the research measuring instrument; m_l is the total number of responses for each level of ordinal scale; A_i is the response for a learning mechanism; and λ_l is the weight assigned to the ordinal scale.

$$\text{Mean score} = R = \sum_{l=1}^q \frac{\lambda_l}{m_l} \sum_{i=1}^{m_l} A_i$$

The mean scores were further interpreted to reflect the responding rating. Such a procedure helps conversion of a continuous index (mean score) into categories of the measuring instrument (Al-Hammad and Assaf 1996). The following are the categories:

- mechanisms that are always employed ($3.5 < R \leq 4.0$);
- mechanisms that are very frequently used ($2.5 < R \leq 3.5$);
- mechanisms that are used sometimes ($2.5 < R \leq 1.5$);
- mechanisms that are rarely employed ($0.5 < R \leq 1.5$);
- and mechanisms that are not employed ($0.0 \leq R \leq 0.5$).

Table 1: Learning mechanisms and dimensions

| Learning dimension | Learning mechanism as enablers |
|--|---|
| Addressing improvement through continuous learning of employee (microscopic level) | Training of employees, self-learning of individuals and individual learning schemes supported by a firm e.g. learning contracts |
| Addressing improvement through use of teams | Work groups, project teams, value analysis teams, internal benchmarking teams, quality circles and re-engineering teams |
| Internal exchange of knowledge (inter-learning within the company) | Informal networking, cross functional based teams and group-ware supported learning |
| Addressing improvement from lessons from past experiences | Review of failures and review of successes |
| Integrating learning with work through collaborative and non-collaborative work arrangements | Subcontracts, partnering, joint ventures, consortia, engineering agreements, alliancing, acquisitions and mergers |
| Addressing improvement through investigations or intellectual property | In-house research, joint research with university, joint research with construction firms, communication of expertise, license agreements with other construction firms and licence agreements with non-construction firms, |
| Addressing improvement through learning from or with other firms | Tutored by consultants, tutored by experienced practitioners, corporate mentoring, ad hoc work groups (team learning between firms), external benchmarking and inter-company based networks |
| Addressing improvement through continuous renewal or adaptation | Mirroring the variety in the environment, continuously changing shape and minimising structure and maximising autonomy |
| Addressing improvements from new developments in the business environment | External seminars, professionally based networks, employed based networks, review of innovations, technology based networks, research and development based networks, theme focused base networks, socially based networks, internationally based networks, trade shows/ Exhibitions, contacting staff from firms with innovative methods, attracting staff and internal / external seminars on new ways of working |
| Addressing improvement by learning about future possibilities (vision learning) | Search conferences and multi-scenario planning |

RESULTS

The majority of construction contractors surveyed were characterised by a low utilisation of the various learning mediums for the purpose of learning new ways of working as reflected in Figure 1. Addressing improvement through learning from the microscopic dimension, in particular by training stands out, whereas learning mechanisms through non-collaborative arrangements attained the least mean scores.

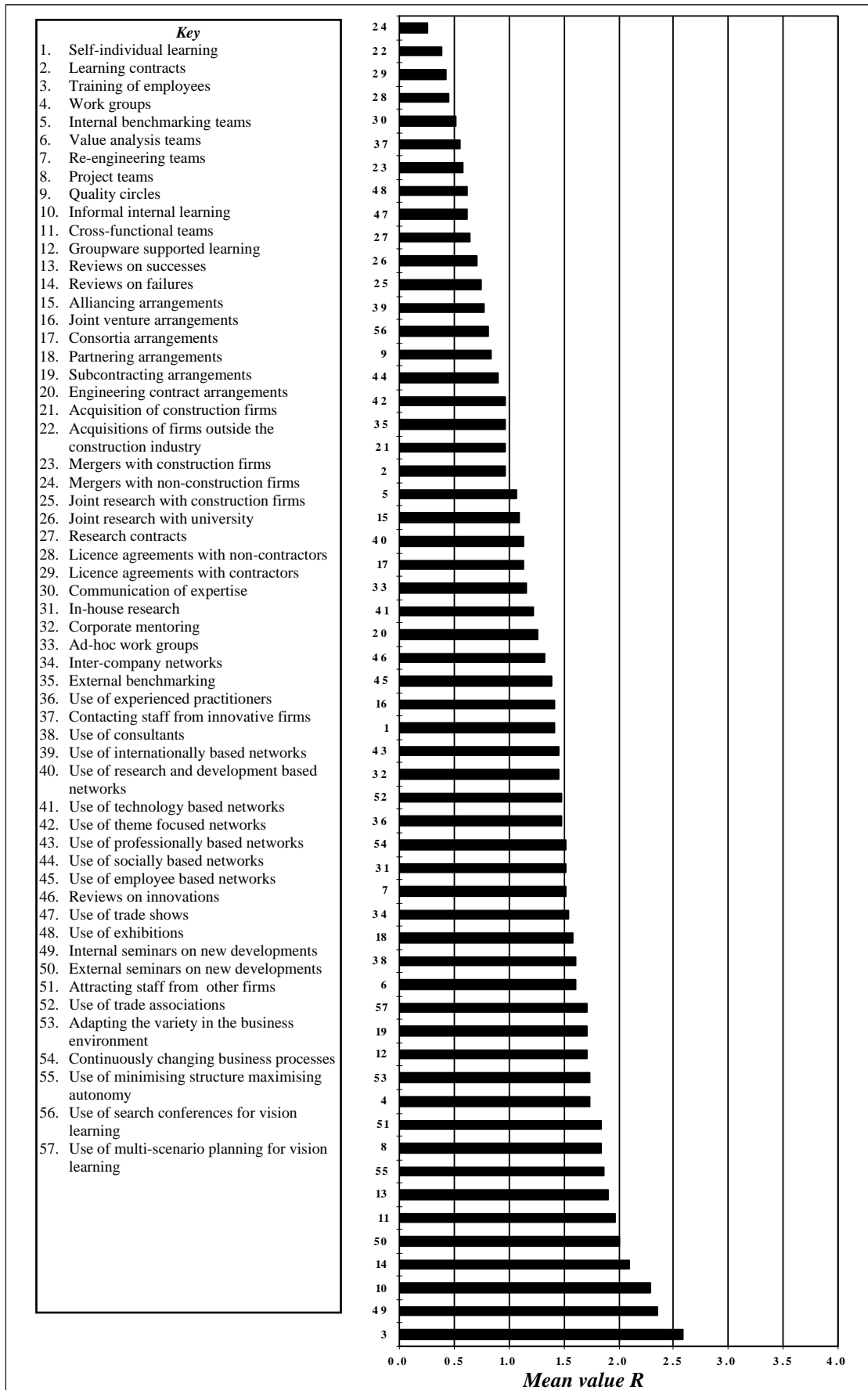


Figure 1: Mean scores on learning mechanisms

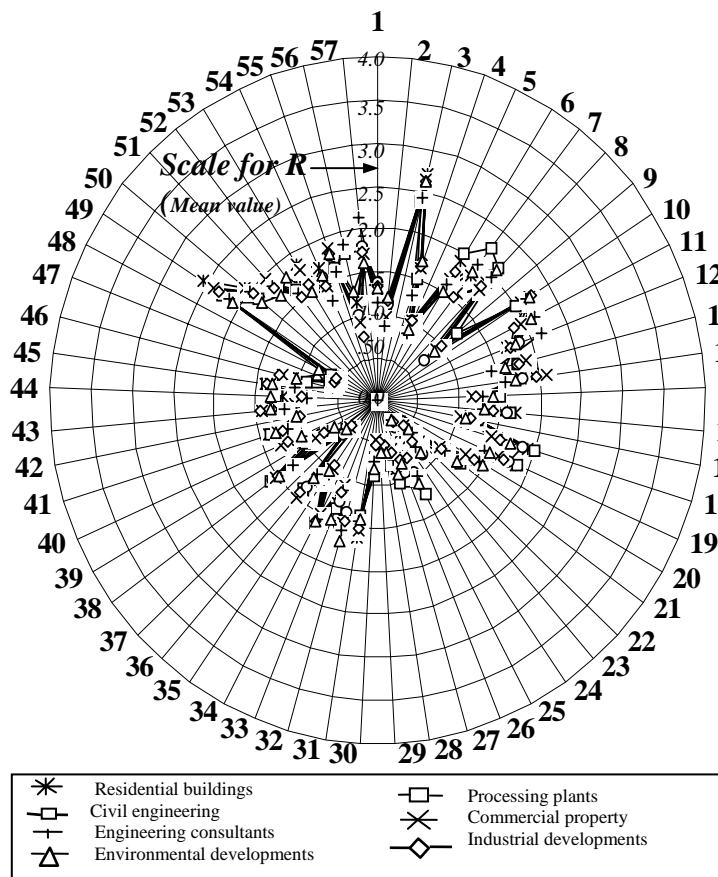


Figure 2: Attributes of contractors and leaning mechanisms

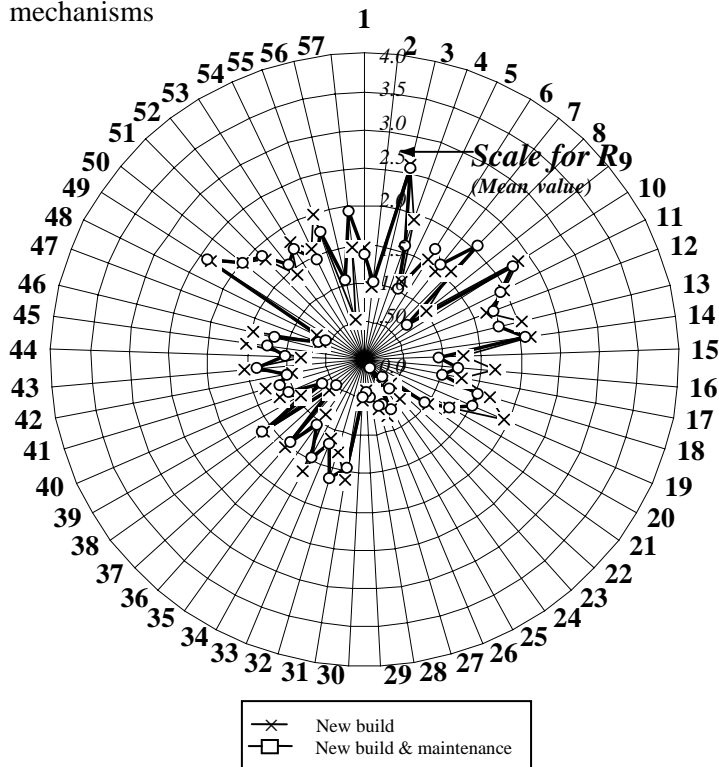


Figure 3: Learning mechanisms and type of build attributes

- Key for Figure 2& 3**
1. Self-individual learning
 2. Learning contracts
 3. Training of employees
 4. Work groups
 5. Internal benchmarking teams
 6. Value analysis teams
 7. Re-engineering teams
 8. Project teams
 9. Quality circles
 10. Informal internal learning
 11. Cross-functional teams
 12. Groupware supported learning
 13. Reviews on successes
 14. Reviews on failures
 15. Alliancing arrangements
 16. Joint venture arrangements
 17. Consortia arrangements
 18. Partnering arrangements
 19. Subcontracting arrangements
 20. Engineering contract arrangements
 21. Acquisition of construction firms
 22. Acquisitions of firms outside the construction industry
 23. Mergers with construction firms
 24. Mergers with non-construction firms
 25. Joint research with construction firms
 26. Joint research with university
 27. Research contracts
 28. Licence agreements with non-contractors
 29. Licence agreements with contractors
 30. Communication of expertise
 31. In-house research
 32. Corporate mentoring
 33. Ad-hoc work groups
 34. Inter-company networks
 35. External benchmarking
 36. Use of experienced practitioners
 37. Contacting staff from innovative firms
 38. Use of consultants
 39. Use of internationally based networks
 40. Use of research and development based networks
 41. Use of technology based networks
 42. Use of theme focused networks
 43. Use of professionally based networks
 44. Use of socially based networks
 45. Use of employee based networks
 46. Reviews on innovations
 47. Use of trade shows
 48. Use of exhibitions
 49. Internal seminars on new developments
 50. External seminars on new developments
 51. Attracting staff from other firms
 52. Use of trade associations
 53. Adapting the variety in the business environment
 54. Continuously changing business processes
 55. Use of minimising structure maximising autonomy
 56. Use of search conferences for vision learning
 57. Use of multi-scenario planning for vision learning

Equally, learning mechanisms that are employed for addressing improvement by undertaking investigations within a firm or with other firms were less popular within the sample surveyed. No particular learning mechanisms were captured under the range of $3.5 < R \leq 4.0$ category. Very few learning mechanisms were represented by $2.5 < R \leq 3.5$ category. The majority of the learning mediums were represented in $2.5 < R \leq 1.5$ and $0.5 < R \leq 1.5$ categories. While the category of $0.0 \leq R \leq 0.5$, captured very few learning mechanisms of the various learning dimensions.

Figures 2 and 3 compare the application of the learning mechanisms by construction organisational attributes. It can be observed that the application of the learning mechanisms in terms of the type of work undertaken by the construction contractors such as: residential buildings; civil engineering; engineering consultants; environmental developments; processing plants; commercial property and industrial developments mapped a common learning practice. Equally, comparison of their utilisation of the learning mechanisms by work type in terms of new build or both new build and maintenance depicted a similar application of the learning mechanisms.

DISCUSSION

The results show that there was a low usage of learning mechanisms for the purpose of learning new ways of working. However, training (Figure 1) and internal seminars on new developments (Figures 2 and 3) for addressing improvement of construction contractors were rated highly by construction executives. These learning mechanisms were captured in the two upper categories ($2.5 < R \leq 4.0$) and represented a common practice of addressing improvement. Other frequently used mechanisms were learning from review on their failures, use of external seminars on new developments and use of informal learning procedures within their corporate establishments. In general, the extent to which various learning mechanisms were employed by contractors to imbibe knowledge for improvement of their corporate establishments was rather low. A number of reasons could be advanced for the low usage of learning mechanisms. For example, Senge (1990) pointed out that learning of a company as a corporate entity as opposed to individual learning is a new paradigm shift within the business environment. As such, the link between learning of an enterprise and improvement may still be unclear to some executives of companies. Equally, Alwani-Starr (1997) suggested that learning, requires being acquainted with the dynamics that underpin the learning mechanisms and may be unknown to some construction executives. Some learning mechanisms are relatively new concepts to construction companies and both researchers and academia alike are still grappling with their application principles. In addition, the construction business environment has been described as slow changing in the past. McGill and Slocum (1993) pointed out that static or slow changing business environments have enabled firms to operate without the need for learning new ways of working to sustain their competitive advantage. As such, the importance of learning in such slow changing business environments may be unappealing to firms.

The third and fourth categories, i.e. $0.5 < R \leq 2.5$ represented a group of learning mechanisms that offer potential for impacting improvement on construction contractors. Hasegawa and Shimizu Group (1988) argued that construction companies will need to adapt to the changing business environment in order to survive and the perception that construction business processes will ever remain the same is a feature of the past. Therefore, the various options for learning mechanisms from the dimensions that contribute to learning of a company as a corporate entity present the

possibility of influencing improvement on construction contractors. Just as quality must be built into the organisation's processes rather than being assured, or in extreme cases hoped for, the way forward for learning of construction companies should aim at using learning mechanisms as part of their corporate activities.

The last category i.e. $0.0 \leq R \leq 0.5$ comprised learning mechanisms that were hardly used by construction contractors for purposes of learning of learning. The knowledge about effective learning mechanisms for meeting the challenges that companies experience in the evolving business environment is an important part of acquiring a core competence of learning (Argyris 1992). Therefore, it can be argued that some learning mechanisms may not be particularly important depending on the nature of business of an organisation and circumstances surrounding the business environment. As a result, they may be scarcely used within certain circles of the business community. However, unawareness of the learning tools for imbibing knowledge and other stimuli in their internal and external business environments by the respondents may also have contributed to this category.

The individual learning dimension featured out prominently in the results. Generally, the individual learning dimension is one of the sources for tacit knowledge that may appeal more to a construction contractor in view of the required capability for project businesses especially at the operational level. However, concentrating learning at one dimension does not entail the totality of learning of a company as a corporate entity. In reality, it is only a small part of the true learning needs of an organisation that can be satisfied by means of training provisions. Such an approach, overlooks the potential benefits offered from other learning dimensions of a company (Isaac 1993).

CONCLUSION

The results of the study are subject to the limitations of a small number of respondents. However, the initial survey has shed some light on the extent to which learning mechanisms were used by construction contractors to imbibe knowledge and other stimuli in their internal and external business environments. The generic tools employed by companies for learning (thereby achieving continuous improvements) were captured by the mean score values. The extent to which learning mechanisms were used for the purposes of learning new ways of working was rather low. However, the majority of learning mechanisms from the various learning dimensions offer potential for addressing improvement of construction contractors. The study will be extended to the investigation of the antecedents of learning mechanisms with focused case studies to elicit data through interviews that may not have been captured by the questionnaire survey.

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