A TOOL FOR EFFECTIVE TRANSFERRING OF KNOWLEDGE AND TECHNOLOGY IN CONTRACTING ORGANISATIONS

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Abstract

The project-based nature of contracting organizations creates a learning opportunity from most of its activities. Although knowledge helps to gain valuable experience from construction projects, due to its complex and unique nature, organizations do not systematically secure knowledge for later usage. Due to that, contracting organizations create significant discontinuities in flows of knowledge within members, tasks and tools. Therefore, for contracting organizations to make the use of its knowledge, a mechanism for managing knowledge has to exist. That mechanism should include efficient transferring of knowledge throughout the organization. Such transferring can occur through the organization's various activities and organizations stand to benefit if these activities are done strategically not only to acquire, but also to share and transfer knowledge and ultimately enhance performance. Today, the construction industry is moving towards sustainable solutions for projects. Therefore, necessity of knowledge transferring mechanism has become much more important than ever. The study has henceforth analyzed the knowledge transfer process of contracting organizations in Sri Lanka and explored how these organizations facilitate transfer of knowledge. Three contracting organizations were selected among C1 contractors in Sri Lanka for this case study and the research problem was examined through semi-structured interviews of the key participants of the organizations. The analyses from findings support the propositions set forth in the study: the importance of the knowledge transfer process in contracting organizations, the situational nature of the knowledge being transferred, effects, barriers and measures for its effectiveness for knowledge transfer initiatives. In effect, the study builds a knowledge transfer process reflected in contracting organizations in Sri Lanka by mapping case study findings to the conceptual model and a model for sustainable business process of contracting organizations. Recommendations for contracting organizations at policy and functional level are made based on the findings. Fundamentally, contracting organizations should adapt knowledge transfer process to its organizational strategy to achieve success in their business through sustainable solution.

Keywords: Knowledge transfer, Technology transfer, Sri Lankan contracting organizations, Construction industry

1. Introduction

Organisational effectiveness and development can be improved through learning, where knowledge has incorporated in to the existing business processes in order to form new processes (Armistead, 1999). Khamesh and Jolly (2008) stated that, for long term survival of an organisation, focusing on the creation and accumulation of new knowledge is very important. Therefore, in today's economy, organisations move towards knowledge based views to gain sustainable advantage (Bou-Llusar and Segarra-Ciprés, 2006). But to gain the maximum use of knowledge, management of knowledge is very important. Tan *et al*. (2006, p.149) stated that the ability to manage the knowledge generated from the projects and disseminating lessons learned from problem projects within organisations can help to prevent the "reinvention of the wheel", to avoid the repetition of similar mistakes. Ofek and Sarvary (2001) stipulated that, managing knowledge is in two processes, knowledge creation and knowledge transfer. Sexton and Barrett (2004) stated that, the managing of technology is vital to ensure continuous success of the organisation. Kalkhan (2006) stated the importance of transferring knowledge, because efficient transferring of knowledge throughout the organisation is one of the prerequisites for an organisation to manage knowledge effectively. It is needed in all stages of organisational knowledge management process. In order to develop a framework for effective KT transferring, the aim was broken-down in to six objectives, as study various knowledge transfer models, identify the process, mechanisms, factors, barriers, measuring the effectiveness of knowledge transfer and finally development of the framework.

2. Key Literature Findings

2.1 Knowledge and technology transfer

Knowledge transfer is becoming increasingly important in organisations as today's firms are more often organised on a global basis, so as to take advantage of differences in expertise, labour costs and access to markets around the world (Argote and Ingram, 2000). Kumar and Ganesh (2009) stimulated the importance of knowledge transferring, because it enables exploitation and application of existing knowledge for the purpose of organisational development. Knowledge transfer; is a process of exchange of explicit or tacit knowledge between two agents, during which one agent purposefully receives and uses the knowledge, provided by another (Kumar and Ganesan, 2009, p.16). Technology

transfer is a source, which used to create better organisational performance through innovating new technologies and proper application of existing technology (Sexton and Barrett, 2004). Therefore, Ganesan and Kelsey (2005) emphasised that, technology transfer involves all forms of physical assets, knowledge and human capabilities towards efficiency of the organisation. According to Sexton and Barrett (2004), technology transfer is the movement of knowledge via some channel from one individual or firm to another. It emphasises that knowledge and technology are combined resources, which cannot be separated. Therefore, both knowledge transfer and technology transfer are integrated together as one process forming so many relationships with the environment. Knowledge transfer relationships that are formed in project-based organisation can be shown as in Figure 1. It considers a typical contracting organisation. Knowledge transfer within the organisation is occurred between individuals, groups or teams. Then there are knowledge inflows and outflows with the external environment such as consultants, clients, other contractor firms and etc.

2.2 Knowledge transfer in construction industry

Construction industry has a unique and complex nature itself. However, if the collecting of relevant information, including experience that has been gained, and if making available to those in need of it, it will become easy to handle this complexity (Persson and Landin, 2007). Knowledge possessed by participants in a construction process is identified as the knowledge assets for organisations. Eliufoo (2007) critically analysed knowledge assets possessed by participants in construction. Generally, it includes constructability, cost, time and quality matters, maintenance, safety, productivity and suitability of the final product on functional, comfort and durability, comfort, marketability of final product, regulatory matters and insurance matters. These knowledge assets should be manage and disseminating to gain maximum use of it. Construction sector is lack of a well- functioning system for collecting and distributing knowledge and technology.

2.3 Knowledge transfer process

Szulanski (1996) introduced a framework for intra firm knowledge transfer. Through a questionnaire survey, Holsapple and Joshi (1999) critically analysed Szulanski (1996)'s model. The model has identified four stages in knowledge transferring process: initiation, implementation, ramp-up and integration Initiation comprises all events that lead to the decision to transfer. According to Szulanski (1996), knowledge transfer occurs only if both need and knowledge which meet the need are

available. Implementation begins with the decision to transfer is taken. At this stage, flow of knowledge between recipient and the source, establishment of social ties between them, customising of transfer to suit the recipient's needs and reducing of problems of previous transfers are the activities used to implement. Then recipient will start to use the transferred knowledge. While attempting to identify and resolve problems of new knowledge, expected post-transfer performance will be achieved at the ramp-up stage. Finally, the transferred knowledge will become stored and institutionalised at the integration stage.

In Sung and Gibson (2000)'s model includes some other knowledge management areas. Therefore, for further analysis it cannot be used, because it may cause conflicts with other knowledge management aspects. Although Argote and Ingram (2000)'s model gives better practice for knowledge transfer process, It does not specify step by step process. For instance, the model encourages movement of networks to minimise knowledge spill over to other firms but it does not suggest methods or mechanisms to do that. Further, moving of networks of KT transfer is difficult in practice. Szulanski (1996), Sverlinger (2000) and Liyanage *et al*. (2009), give more reasonable models for knowledge transferring. It does not conflict with other knowledge management aspects. Those three models have similarities with each other. Initiation stage of Szulanki (1996) model is similar to awareness stage in Liyanage et al. (2009) model. Sverlinger (2000) introduced three stages as acquisition, distribution and make meaning for transfer stage while Liyanage *et al*. (2009) introduced two stages called acquisition and transformation for the same purpose. But Szulanski (1996) covered all those things through single stage called implementation. Integration, association and organisation memory have same purpose in each model. Both Szulanski (1996) and Sverlinger (2000) have a stage for problem solving as ramp-up and retrieval of information while it is not in Liyanage *et al*. (2000)'s model. But it has an application stage which is already covered through other stages in other two models. Therefore, this research takes Szulanski (1996)'s knowledge transfer process (Initiation, Implementation, Ramp-up and Integration) as the knowledge transfer process for further analysis, because it covers all the transfer stages while Liyanage *et al*. (2000) missed ramp-up stage and Sverlinger (2000) missed initiation stage.

3. Research approach and methodology

The aim of this research was to develop a framework for effective transferring of knowledge and technology in construction organisations. Qualitative study was selected as it emphasises the importance of subjective meanings, symbols and descriptions of corporate cases. Three cases were

selected for the study, which are having good knowledge management practice, with C1 – ICTAD (Institute of Construction, Training and Development) grading and undertaking large scale projects. Further, from the selected three cases, each organisation undertakes only building projects, only civil projects or both buildings and civil projects. Altogether, nine semi-structured interviews were conducted. While interviewing, note taking and tape recording were done to maintain the accuracy of data collection. All interview transcripts and notes were used for the data reduction and concept identification through code-based content analysis, using NVivo 9 software. Content analysis attempts to find similar cognitions under a same concept or about its meaning rather than the actual content of the segment. Although this software is helpful in data reduction it cannot used for data display. Hence cognitive mapping was used for displaying data which are analysed using Decision Explorer software. It was used to structure, analyse and make sense of accounts of problems and managing large amounts of qualitative data from documents.

4. Research Findings

4.1 Knowledge transfer process and mechanisms

Four key stages were identified in knowledge transfer process and those stages were studied in three cases in detail. It is obvious that, contracting organisations do not have a strategically established process for knowledge transferring. All the stages of knowledge transfer process are done, but only when it is needed. Therefore, knowledge transfer process carried out in these organisations is incidental.

Initiation stage - As the initiation stage, in organisations decisions regarding knowledge transferring are taken by the top management, through meetings and from annual management evaluation and annual performance evaluation. Further, it is identified that organisations have established paths to take such decisions. At this stage, organisations take decisions related to knowledge transfer such as, identifications of necessity of acquiring new knowledge, from what sources knowledge should be acquired, to what recipients knowledge should be transferred, what kind of mechanisms should be used and likewise. Those decisions will lead to the implementation stage of the knowledge transfer process.

Implementation stage - This stage is carried out in three steps namely; acquisition, information distribution and make meaning.

Acquisition – Post project analysis is used as a source of knowledge which is used as lessons learnt from every completed project. Therefore, by referring previously completed post project analysis success stories and mistakes can be identified. But, sometimes by means of applying new knowledge also success stories and mistakes can be identified and that helps to acquire the right knowledge about that method. Further, project reports of on-going projects are also valuable sources of knowledge. Project reports of completed projects are some sort of lessons learnt practice for a month. Another way of lessons learnt practice is work studies. It is a significant source that uses to acquire knowledge by tendering department. Therefore, post project analysis, project reports, success stories, mistakes and work studies are very important sources in knowledge acquisition. Experience of long-term senior staff is also a valuable source of knowledge. Therefore, interaction between new and experienced employees helps to acquire knowledge from experienced staff. Empirical findings stated that weekly presentation on a special topic which related to the field is common in organisations. Various new technologies can be adapted to change the existing working pattern. Therefore, that adapted change is some sort of knowledge source. After adapting various systems with the time, those systems integrated in to the culture as standards and procedures. Therefore, adaptive changes, standards and procedures are important sources in knowledge acquisition in any organisation. In addition to that head office is one of the most important sources of knowledge as the knowledge base of the organisation.

Skill development through conferences, Continuous Professional Development (CPD), trainings, workshops and seminars are significant methods, to get new updates of knowledge in the industry. Exhibitions are also great opportunities to share knowledge with others. Technical reports and publications are also popular methods. Through internet browsing also people use to refer various publications and magazines. Generally, new employees are recruited through the head office human resources department. Although it helps to acquire knowledge from a different perspective, they recruit new employees only if a new vacancy is created. Interaction with the external environment is a good way to acquire knowledge. Therefore, external links of an organisation is important. There are three major divisions in this external environment as project stakeholders, competitors and specialists. Under project stakeholders, contractor can acquire knowledge from client, engineer, sub-contractors and suppliers. All these parties have to work together at the project. Therefore, knowledge is shared to achieve required standard of the project. Acquire knowledge of other competitors is very important to survive in the industry. It is learned that joint venture is a significantly used mechanism to interact with other competitors. In addition, contractors have to consult specialists in the industry whenever they do not have required knowledge inside the

organisation. Therefore, specialist's knowledge is acquired to get some advices regarding issues arising from the project. Sometimes they outsource their projects whenever they decide it is the best to that circumstance than recruiting new staff. Therefore, knowledge can be acquired through observations also.

Information distribution - Normally, the knowledge gain through training is implicit and it is hard to transfer to others. Therefore, in contracting organisations, every member who participates in trainings has to prepare a report on training and present it through presentation. Task forces and job rotation are not much popular methods for distribution of implicit knowledge. Most valuable implicit knowledge is stored with the experts. Although that knowledge is hard to transfer, discussions with the experts help to distribute the knowledge of the experts among others. The most significant explicit knowledge distribution mechanism is technological means such as internal networks, electronic mails, telephones and facsimiles. From all the non-technological means of knowledge distribution, face-to-face communication is the best mechanism in contracting organisations as knowledge will pass only to the required persons. Most probably it is done through informal discussions. Sitting arrangement also supports the face-to-face communication too. On the job training is important to distribute knowledge as well as to integrate new employees to the organisational culture. Meetings also support for distribution of knowledge among staff members as well as to the workers. Therefore, meetings are also very effective means of knowledge distribution as it relates to face-to-face communication also. But the difference is in meetings communication is done in a formal way. Important and necessary information is distributed within the organisation through hand-outs or publications. But empirical findings does not strongly support to that mechanism. Therefore, it is not much popular method.

Interpretation - Organisations on receiving information are obliged to give meaning to the information. Hence, this aspect was used in the investigation of how contracting organisations make meaning of information received at the organisational and individual level. To make meaning of knowledge discussions are significantly used as the primary mechanism. Individuals make consultation amongst themselves as a way of making meaning of new information. Both at organisation and projects it was learnt critical reflection only occurred at individual level where they use their past experience and reflect the new knowledge and rarely documented. Although past experience is used for the analysis under critical reflection, just the individual minds take a rational decision under rational analysis. However, learnt that an individual never documents such reflections although it was admitted that an individual in reflection would consider: a previous task and reflect what facilitated the successful completion of the task; the problems encountered; and how the

solution was achieved. Process check is commonly used as a practical way of make meaning of new knowledge but not documented for future references. Strategy formulation is known to be a good mechanism for make meaning of new knowledge.

Ramp-up stage - At the ramp-up stage, organisations used to identify the issues in new knowledge and improve their work through that new knowledge. Organisations do not willing to take risks by applying new knowledge without testing. They adopt knowledge, if only that knowledge improves their performance.

Resistance to change of humans is a major issue when a new knowledge is going to apply. Team work is the only way helps to resolve this problem. Dealing with human behaviours and attitudes is very difficult especially in application of new knowledge. When a knowledge or technology is new to our country it is very difficult to apply, because organisations face so many problems when they apply new technologies into projects as that knowledge is new to Sri Lanka in case of availability of technology and experts. Further, when knowledge is acquired through internet, there are so many problems. Most of the times, internet gives knowledge regarding something which is applied in a different country. The knowledge which is related to Sri Lanka is very rear. As a solution to these issues, organisations have to solve those matters by consulting specialists, sometimes studying similar projects in other countries like wise. The main purpose of applying new knowledge in to the current system is improving the current performance of the organisation. Implementation of test project is a common practice to evaluate new knowledge. Through empirical findings it is learnt that only the parts of the new system that can improve the performance is adapted to the current system. Further it is found that performance evaluation of employees help to identify the improvement of them after gone for trainings and skill developments. Therefore, as employee performance supports to performance of the organisation, management can decide whether they have earned value for their cost incurred on trainings. After identifying issues that knowledge should be stored in knowledge base, which leads to the final stage

Integration stage - After new knowledge is applied it should be integrated to the organisations. Integration is the repository of organisational knowledge. Literature has it that knowledge can also be stored explicitly and implicitly. Implicit integration is not used in organisations much. Post project analysis is a common practice that uses to store knowledge for future use. Through this all new knowledge, success stories, mistakes and likewise all the lessons learnt throughout the project is documented and transferred for future use. Work studies also another way of integrating knowledge applied to the project and also it is known as a lessons learnt practice. Reporting is also a common

way, because post project analysis stored as reports and publishes within the organisation. In terms of employees, most common knowledge integration practice is performance evaluation. It is learnt that results of performance evaluation helps to improve future performance by taking necessary actions. In terms of project, monthly there is a project review meeting to review the progress, lesson learnt, performance and all kind of new knowledge used for project. The results will be used to plan the works for following month. It was emphasised that sometimes new knowledge is integrated through systems adapted to the organisation. Therefore, using this system all the knowledge related to cost can be stored and transferred to future projects easily.

4.2 Development of the framework

Knowledge transfer has been identified as a core factor and the mode by which organisations can acquire competitive advantage. Through that, they can continuously enhance their vision and achieve goals set through the organisational strategies. For an effective knowledge transfer process, organisations need to have a knowledge management vision. Subsequently, strategic knowledge goals are also needed. Integration among knowledge vision, knowledge strategies and knowledge transfer is essential, because for the effectiveness of the organisation, knowledge management should be taken as a key asset. Thus, established knowledge has to be made operational. It can be achieved through a knowledge transfer process. Employees and finance is one of the most valuable knowledge resources, while employee is one of the most important resources, as construction industry is labour intensive. Therefore, qualifications and skills of employees and budget amount give more information about the current status of any contracting organisation. Therefore, in the transformation process of inputs in to products and services, those above resources makes major effect. Therefore, organisations should established policies, procedures, rules, norms and cultures to control those resources. In addition to that to get the maximum benefits from employees organisational reward system is essential. For the knowledge transfer system to be useful to an organisation, it has to be in a form that can easily be understood to every employee. To enhance this to strategically level, organisations should establish suitable atmosphere, which facilitates knowledge transfer in the organisation. That suitability can be differed due to many reasons such as; external and internal information; procedure, processes and norms; budgets; employees; time constraints; organisational databases; and most importantly decisions taken at the initiation stage. Finally, this discussion can be simply drafted as a model for a sustainable business process of a typical contracting organisation (See Figure 1).
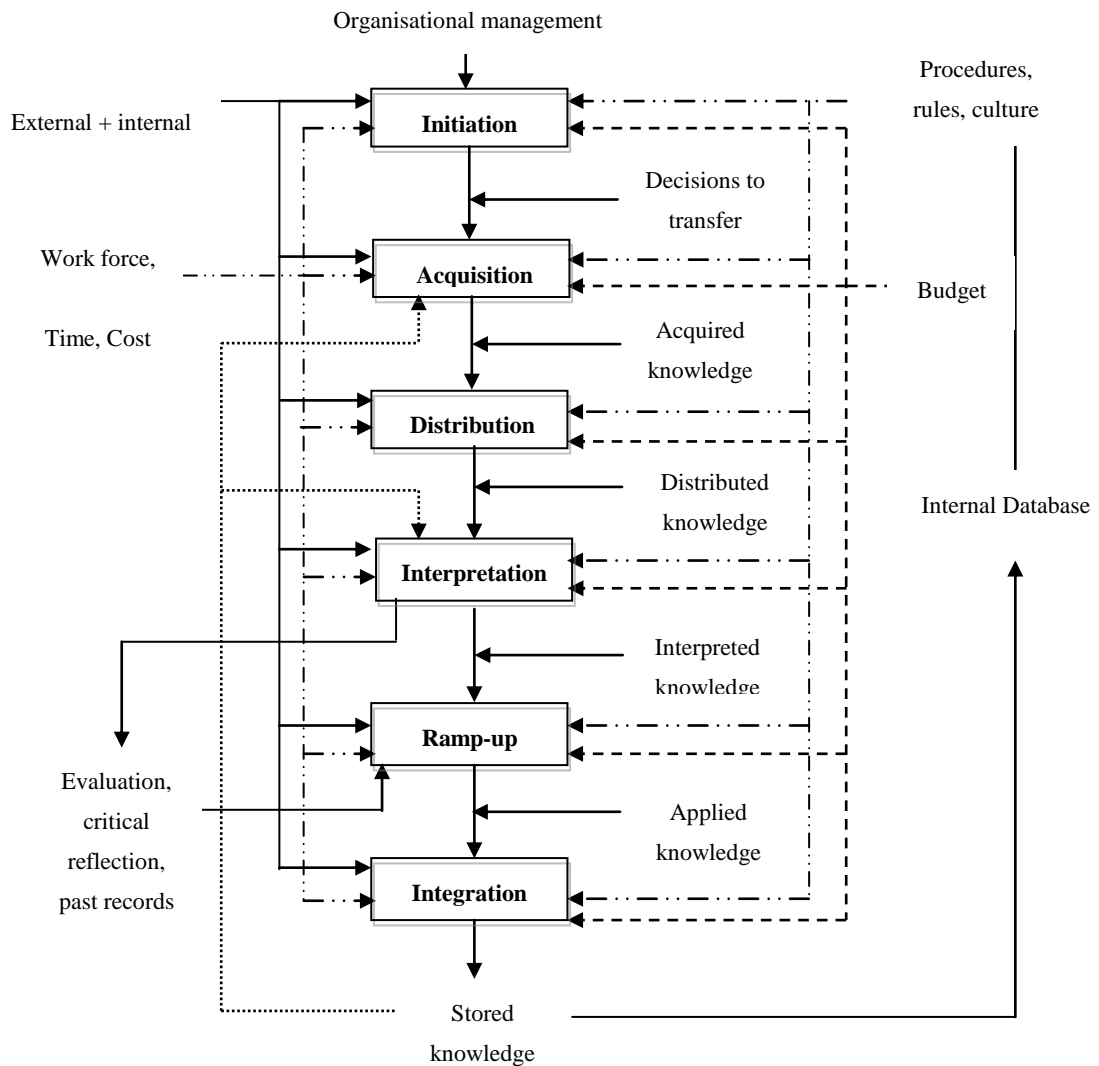
Organisational management

External + internal

Procedures,
rules, culture

Initiation

Decisions to
transfer

Work force,

Acquisition

Budget

Time, Cost

Acquired
knowledge

Distribution

Distributed
knowledge

Internal Database

Interpretation

Interpreted
knowledge

Evaluation,
critical
reflection,
past records

Ramp-up

Applied
knowledge

Integration

Stored
knowledge

Figure 1 – Knowledge Transfer Process Model

5. Conclusions

It is learnt that, the knowledge transfer process of contracting organisations in Sri Lanka can be regarded as incidental, un-structured and informal. It is not identical but differs from one organisation to another, with organisations showing in various magnitudes: different sources and patterns of initiating, implementing, ramping-up and integrating knowledge. The typical knowledge, organisations used to transfer is day-to-day knowledge that is found in the business undertaking of the organisation hence making the knowledge situational. There is limited codification of knowledge thus knowledge remains, unstructured and informal. Further, organisations are more concerned with short-term goals hence time for critical reflections is not given due significance. The mode of business being practiced in contracting organisations does not create an incentive for the contractor to

establish an effective knowledge transfer system at strategic level. The ability to generalise the study is limited to the case study sample population, and, cannot be generalised to a wider population or universe. As the unit of analysis of the research was contracting organisations in Sri Lanka, the research findings can be generalised to the Sri Lankan contracting organisations with confidence.

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