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KNOWLEDGE TRANSFER PROCESSES IN PFI/PPP: CRITICAL SUCCESS FACTORS

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Successful knowledge transfer is an important process which requires continuous improvement in today's knowledge-intensive economy. However, improving knowledge transfer processes represents a challenge for construction practitioners due to the complexity of knowledge acquisition, codification and sharing. Although knowledge transfer is context based, understanding the critical success factors can lead to improvements in the transfer process. This paper seeks to identify and evaluate the most significant critical factors for improving knowledge transfer processes in Public Private Partnerships/Private Finance Initiatives (PPP/PFI) projects. Drawing upon a questionnaire survey of 52 construction firms located in the UK, data is analysed using Severity Index (SI) and Coefficient of Variation (COV), to examine and identify these factors in PPP/PFI schemes. The findings suggest that a supportive leadership, participation/commitment from the relevant parties, and good communication between the relevant parties are crucial to improving knowledge transfer processes in PFI schemes. Practitioners, managers and researchers can use the findings to efficiently design performance measures for analysing and improving knowledge transfer processes.

Keywords: communication, critical success factors, knowledge transfer, performance measurement, PFI/PPP.

INTRODUCTION

In the rapidly changing knowledge-intensive business environment, an organization's knowledge is becoming a critical resource and determinant of business success (Bresman *et al.* 2010, Inkpen 2008). The implication for organizations is that it is increasingly necessary to resourcefully combine new and old knowledge to gain a competitive advantage over rivals or in the marketplace (Davenport and Prusak 1998, Nonaka and Takeuchi 1995). Davenport and Prusak (1998) argue that an effective management of the organization's knowledge is a major challenge faced by the organization. A crucial process considered essential to knowledge management is the transfer of knowledge between individuals and organizations (Cranefield and Yoong 2007). A successful knowledge transfer can result in an organization increasing its intellectual capital or resource (Easterby-Smith *et al.* 2008). However, the transfer and use of knowledge can be an intimidating task (Cranefield and Yoong 2007). Given the complex nature of knowledge and the myriad of processes and mechanisms

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involved in the knowledge transfer (Davenport and Prusak 1998, Nonaka and Takeuchi 1995), successful transfer is often not easy to achieve.

Improving knowledge transfer processes represents a major challenge for construction practitioners due to the complexity of knowledge acquisition and sharing and the challenging nature of construction projects with the large number and diversity of parties involved. A successful knowledge transfer will provide innovative ideas that can then be applied to successive projects. Within the UK PFI market, there are concerns over the level of and limited knowledge transfer between PFI projects and the performance measurement of their strategies (Liyanage *et al.* 2008, Robinson *et al.* 2005). Although a number of authors have proposed frameworks to enhance knowledge transfer in the construction industry (Liyanage *et al.* 2009, Carrillo *et al.* 2006), concerns over continuous improvement in the performance of the transfer processes have instigated the need to identify critical success factors for improving knowledge transfer in PFI/PPP projects.

The aim of this paper is to identify and evaluate critical success factors for improving knowledge transfer processes in the UK construction industry. The rest of the paper is organized as follows: A review of the relevant literature on knowledge transfer and performance measurement was undertaken to identify factors contributing to effective knowledge transfer and improving performance. This is followed by an outline of the research method adopted, a presentation and discussion of the results. Finally, conclusions and implications for practice and research are presented.

KNOWLEDGE TRANSFER PROCESS

Knowledge transfer can be described as a change process involving the movement of knowledge or skills from one specialized knowledge entity such as individuals, groups and organizations to another or from one place to another (Carlile and Reberich 2003, Szulanski 2000). A successful knowledge transfer implies that a transfer results in the receiving unit accumulating or assimilating new knowledge. To be of value to the individual or organization, the transferred knowledge should lead to changes in behaviour and the development of new ideas, processes and practices.

The mechanisms for transferring any type of knowledge, from an individual or organization or place to another, include learning, training programme, communication, observation, dissemination, implementation, translating, technology transfer conferences/seminars, project reviews, video conferencing, communities of practice, face-to-face meetings, discussion forum etc. Significantly, the performance of these mechanisms is context based (Szulanski 1996). As the transfer process begins in one context and moves into another context (Oliver 2009), performance of the processes are influenced by several factors (Harada 2003, Szulanski 1996).

One way of improving the transfer process is by identifying and understanding the critical factors influence it. Critical success factors can be defined as "those few key areas of activity in which favourable results are absolutely necessary for a manager to reach his/her goals" (Rockart 1982: 4). Critical success factors have been used as a management measure in several fields including construction management research (Li *et al.* 2005)

KNOWLEDGE TRANSFER CHALLENGES IN PFI/PPP PROJECTS

Introduced in 1992 by the UK government, the PFI initiative represented an alternative way of delivering better public services and facilities. A characteristic of PFI/PPP model is the transfer of liability of design, build, finance and the operation of a public facility or service from the public sector client to the private sector for a period of 25-30 years. The PFI/PPP model involves the setting up of a Special Purpose Vehicle (SPV) to work in partnership with the public sector client to deliver a service or facility to the public. The long term service delivery nature of PFI/PPP projects demand contractors, as service providers, think like the project owners while the public client has the responsibility of developing, executing and delivering the service improvement. Unlike traditional procurement, PFI/PPP procurement involves the continuous participation of client and service providers at all levels and across a wide range of disciplines and external technical advisors (Carrillo *et al.* 2008). Thus the success of the PFI/PPP project depends to a great extent on the effective communication of experience, expertise and skills of all stakeholders involved in the project. This is more so as PFI/PPP is a relatively new procurement process and practitioners are continuously learning from the experience.

Within the extant literature, a large number of articles, research findings and debates on various aspects of PFI/PPP initiatives' achievements and shortcomings have been published (National Audit Office 2009, Carrillo *et al.* 2008, Li and Akintoye 2003). Although PFI/PPPs are often associated with providing an environment that is favourable to innovation and improving practices, several government reports have highlighted the inefficiencies of the PFI/PPP scheme (National Audit Office 2009, Commission for Architecture and the Built Environment 2008). HM Treasury (2008) highlighted the significance of communication and information sharing for better performance of PFI projects. Although knowledge transfer problems do exist in all construction projects, for PFI/PPP projects, the problems are further drawn-out by the complexity of procuring and delivering PFI/PPP projects (Robinson and Scott 2009, Carrillo *et al.* 2008). Carrillo *et al.* (2006) pointed out that a major concern was the number of stakeholders involved in projects, the complexity of PFI/PPP structure and the several stages involved in procuring a PFI/PPP project. They highlighted the challenge of successfully transferring knowledge and experience to other relevant stakeholders in order to facilitate innovation. They suggested as a solution, the introduction of appropriate mechanisms and processes for capturing and transferring the knowledge and expertise from one context to another.

Furthermore, due to the long term service delivery and the continuous improvement implications for the PFI/PPP project, mistakes made as a result of a lack of current expertise, skills and experience can be critical in an increasingly complex and evolving environment. Compared with other construction projects, payment for PFI/PPP projects depend crucially on performance monitoring to ensure that service delivery is in accordance with the output specification (Robinson and Scott 2009). However, the effectiveness of performance monitoring and output specification depends on an effective knowledge transfer among the key stakeholders.

Improving knowledge transfer in PFI/PPP

Due to the relationship between the complexity of organizational structures, number of stakeholders and the challenges of PFI/PPP projects, the knowledge transfer process can be improved by identifying and understanding the critical success factors

as knowledge is transferred from one context to another. This paper proposes to address and evaluate the critical success factors from the perspective of the European Foundation for Quality Management (EFQM). The EFQM excellence model provides a flexible framework for measuring performance. Therefore, this study investigates its suitability to assess the success of knowledge transfers.

The EFQM is a quality management model that has been adopted as performance measurement framework (Bassioni *et al.* 2004). The EFQM model identifies links between required actions (enabler criteria) and strategic goals (results criteria). The enabler criteria consist of: Leadership, People, Policy and strategy, Process, Partnership and resources. The results criteria consist of: People, Society, Customer, Key performance results.

RESEARCH METHOD

A questionnaire survey was deemed the most suitable way of obtaining the views of a large number of clients and construction practitioners on specific PFI issues. For example, Li *et al.* (2005) used a similar approach to investigate critical success factors of PFI/PPP projects. The questionnaire content was informed by literature reviews, and interviews which identified success factors for knowledge transfer from other sectors and industries. A total of forty-three factors were identified. These factors were then grouped under the five EFQM enabler categories as shown in Tables 1-5. The respondents were then asked to express their level of agreement with a statement on a five point Likert scale where 1 is Strongly Disagree; 2 is Disagree; 3 is Neutral, 4 is Agree and 5 is Strongly Agree.

Between April and July 2009, over 250 questionnaires were posted to potential respondents using a database of education sector, transport and NHS PFI projects. The respondents included PFI/PPP directors, bid managers, partners, associates, and procurement managers. The survey process followed Dillman's (2000) Total Design Method. The sample survey consisted of a self-reported questionnaire which was completed by a senior manager of a construction related company or firm. A total of 53 usable responses were obtained. This represents a response rate of about 20%. This rate is higher than rates achieved by comparable survey study reported in the construction and project management journals (Akintoye *et al.* 2000).

Analysis and ranking of critical success factors

To overcome these shortcomings of the direct questioning approach, the Severity index (SI) and Coefficient of variation (COV) (Elhag *et al.* 2005) were selected and used to rank the critical success factors according to their significance in affecting the transfer processes. The Severity index calculation is used to rank the critical success factors. It is illustrated by the equation below:

$$SI = \left(\sum_{i=1}^5 w_i \times f_i \right) \times \frac{100\%}{n} \quad (1), \quad COV = \frac{S}{\bar{X}} \times 100\% \quad (2)$$

where i represents the ratings 1–5, f is the frequency of responses, n the total number of responses and w the weight for each rating

where COV stands for coefficient of variation, S is the standard deviation and \bar{X} is the weighted mean of sample.

The COV is used to convey the standard deviation as a percentage of the mean, and it is useful in comparing relative variability of different responses (Elhag *et al.* 2005)

Table 1: Ranking of leadership enablers

Factors	COV	SI (%)	Category Ranking	Overall Ranking
Supportive leadership	18.3	87	1	1
Organizational culture – supportive and a positive culture towards knowledge sharing, awareness, willingness to embrace new ideas and technology, etc	22.1	84	2	4

Table 2: Ranking of policy and strategy enabler

Factors	COV	SI (%)	Category Ranking	Overall Ranking
Clearly articulated goals and strategies / Good Planning	20.3	78	1	12

Table 3: Ranking of people enablers

Factors	COV	SI (%)	Category Ranking	Overall Ranking
Individual's attitude towards innovation or knowledge transfer	15.3	83	1	6
Willing to solve problems together	23.2	78	2	11
Individual capabilities and competencies	16.5	71	3	21
Roles of Innovation Champion (i.e. those individual or organization play key roles in innovation diffusion)	32.7	69	4	24
Organizational capabilities	28.6	65	5	31
Training and development	27.5	62	6	36
Reward mechanisms	36.2	53	7	41
Health and Safety procedures	35.0	52	8	42

RESULTS

Overall, the analysis of the survey response data produced SI and COV values for the forty-three critical factors ranging from 46% to 87%, and 14% to 45% respectively, as showed in Tables 1-5.

The overall ranked results irrespective of the EFQM enabling criteria indicated that the ten most critical factors gained SIs ranging between 80% and 87%. This indicates that respondents perceived these ten factors as highly critical and influential to the knowledge transfer process in PFI/PPP projects. The top five critical success factors, in order of significance, are (i) Supportive leadership; (ii) Participation/commitment from the relevant parties; (iii) Openness; (iv) Organizational culture – supportive and positive culture towards knowledge sharing, awareness, willingness to embrace new ideas and technology and (v) Trust.

A further 28 factors gained a SI between 60% and 79%, indicating a high level of importance to the process (See Tables 1-5). Only five of the listed factors gained a SI between 46% and 60%, indicating a relatively lower level of influence on the knowledge transfer process. These relatively less critical factors were: a) Ensure reliability of the source; b) Hiring external consultants (experts in the relevant area), c) Reward mechanisms, d) Health and Safety procedures and e) Low cost.

The COV values from 14% to 45% indicated a good agreement level between respondents. The COV for the top ten critical factors ranged from 14% to 24%, a very low score, indicating a strong support from the respondents.

Table 4: Ranking of partnership and resources enabler

Factors	COV	SI (%)	Category Ranking	Overall Ranking
Participation/commitment from the relevant parties	18.5	86	1	2
Trust	23.2	84	2	5
Good communication between the relevant parties	20.9	80	3	10
Multidisciplinary team work	14.5	75	4	14
Willingness to learn from others	21.7	74	5	15
Experience	19.3	71	6	22
Win-win	32.3	71	6	22
The support from the other companies/partners	26.4	68	8	25
Compromise	34.6	67	9	27
Direct relationships or networking	25.7	66	10	28
Environmental Influences (Political, Economical, Social, Institutional etc.	32.1	63	11	32
User-friendly technology	27.8	63	12	33
Cost and budget availability	39.3	63	13	34
Ensure reliability of the source	29.4	60	14	39
Hiring external consultants (experts in the relevant area)	41.1	57	15	40
Low cost	46.6	46	16	43

DISCUSSION

Results from the statistical analysis showed that the top five critical success factors can be found within three EFQM enabler categories (Tables 1-5). As shown in Table 1 (Leadership enabler category), the Supportive leadership and Organizational culture factors were ranked first (87%) and fourth (64%) respectively. In Table 4 (Partnership and Resources enabler), the Participation/commitment from the relevant parties and Trust were ranked second (86%) and fifth (84%) respectively. In Table 5 (Process enabler category), openness of the transfer process was ranked third (85%). A more detailed discussion of the statistical analysis and main findings regarding each of the top two critical success factors is presented below.

Supportive leadership

Supportive leadership is ranked as the most important critical success factor in the leadership enabler category as well as the overall survey analysis (Table 1). The supportive leadership factor reinforces and validates the view that for an effective knowledge transfer process, it is critical to have support from the leadership of the organization or project. With a COV of 18.3%, this indicates that a high proportion of respondents agreed with this perception. This finding suggest that it is more significant for PFI/PPPs since there are several stakeholders involved in the project with different responsibilities and objectives, which might lead not having any leadership. As such PFI/PPP is a relative new procurement method and all the stakeholders are still learning about it. The findings indicate the importance of the partnership and resource as an enabler in PFI/PFI knowledge transfers. The findings suggest that there is a need for strong leadership to stimulate and encourage collaboration within the project. It is necessary for the leaders to be actively involved in the improvement activities by establishing clear ownership of the processes. Thus leadership styles are critical for improving knowledge transfer processes (Singh 2008, Yang 2007).

Participation/commitment from the relevant parties

Participation or commitment from the relevant parties is ranked first in the partnership and resources enabler category but as the second most important critical success factor

Table 5: Ranking of process enabler

Factors	COV	SI (%)	Category Ranking	Overall Ranking
Openness	14.8	85	1	3
Understanding Client's needs	22.0	83	2	7
Willing to challenge	22.0	83	2	7
Innovative	14.6	81	4	9
Transparency	31.6	77	5	13
Supply Chain Management	27.8	74	6	16
Quality of the product/project	18.8	73	7	17
Use of effective management practices (feasibility studies, change control mechanisms, cost benefit analysis, etc.	25.9	71	8	18
Performance monitoring, measurement and management	28.8	71	8	18
Feedback mechanisms	27.4	71	8	18
Organizational management	23.8	68	11	26
Good price on product/project provided	22.9	66	12	29
Enforcement on the innovation diffusion or knowledge transfer Organizational	28.6	65	13	30
Work programme (time)	24.4	62	14	35
Organization Structure (i.e. well-balanced structure)	29.4	62	15	36
Negotiation	29.9	61	16	38

overall (Table 4). This finding suggests that in PFI/PPP projects, commitment from the parties is required for a successful knowledge transfer. A reason is that commitment affects the motivation and willingness of individuals or groups to invest time energy and effort in improving the knowledge. Due to the complexity of PFI/PPP procurement system, it is critical for individuals or groups to actively participate and communicate with other members of their organization in order to improve the transfer processes. Similarly it is critical that they have a high willingness to share knowledge within the PFI/PPP environment to make it a success. The findings also reveal the importance of the partnership and resource as an enabler in PFI/PFI knowledge transfers.

Openness/transparency

Openness is ranked as the most important success factor in the process enabler category but third most important critical factor, overall (Table 5). This finding implies that openness and transparency of the process is a key factor in improving the amount of information and knowledge that is shared or transferred between partners in the PFI/PPP projects (Inkpen 2000). Within the complexity of the PFI/PPP project, openness of the processes allows the parties to easily adapt to new processes. The openness of the relationship is also associated with the degree of trust between the collaborating partners.

Least ranked factors

The findings also indicate that the five least ranked critical factors are located in two categories, namely the partnership and resources enabler and the people enabler categories. These are a) Ensure reliability of the source, b) Hiring external consultants c) Low cost, for the partnership and resources enabler category. For the people enabler category, these are a) Health and Safety procedures and e) Reward mechanisms. For example, the reason why respondents viewed hiring external consultants (experts in the relevant area) as not a critical factor in the knowledge transfer process may be that consultants are seen as advisors rather than knowledge

transformers. Also in the case of the reward mechanism, most organizations do not link reward mechanisms to successful knowledge transfers.

Overview

Overall, the three important criteria for improving the knowledge transfer process in PFI/PPP based on the EFQM model are: (a) the leadership, (b) the partnership and resources, and c) process criteria. This implies that stakeholders in PFI/PPP projects should pay more attention to their leadership qualities, processes and their participation and strong support for the transfer of knowledge and experience. Furthermore, the stakeholders have to commit themselves and resources to improving the transfer processes.

CONCLUSIONS

Many factors contribute to a successful knowledge transfer. This paper set out to identify and assess the most critical success factors that could influence improvements in knowledge transfer process in PFI projects. The EFQM excellence model was used to group the factors into the five enabling categories of the model: leadership, people, policy and strategy, partnership and resources and process. Drawing upon a questionnaire survey of professionals and managers involved in PFI/PPP projects in the UK, data was collected and statistically analysed to rank the relative significance of these factors. The SI values of the data were then used to rank the relative significance of the factors that influence knowledge transfer in PFI/PPP projects. The results indicated that the top ten critical success factors had an SI value between 80% and 87%. The next twenty-eight factors ranged between 60% and 79%. The remaining five least ranked factors had SI values between 46% and 60%. Coefficient of variation (COV) values of the data were then used to evaluate the agreement exists between the respondents in ranking the critical factors. It was found that there was a strong agreement between the respondents.

The results also indicate that the five EFQM enabler categories critically influence the knowledge transfer process to various degrees. The top five critical success factors were located in the leadership, partnership and resources, and the process enabling categories. The five most critical success factors for improving knowledge transfer processes in PFI/PPP projects were (i) supportive leadership, (ii) participation and commitment from the relevant parties, (iii) openness/transparency, (iv) organizational culture, and (v) trust. This outcome is consistent with the complexity of the organizational structure and the large number of stakeholders involved in procuring PFI/PPP projects. The results indicate that all the evaluated critical success factors play important roles in improving knowledge transfer processes as indicated by the SI values. While some may be considered more critical than others, importantly, the selection of the critical success factor depends on the context of the practitioners. This study provides professionals and managers wishing to improve their knowledge transfer process an evaluated list of critical success factors to consider.

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