

KNOWLEDGE APPLICATION IN THE SUPPLY NETWORK OF INFRASTRUCTURE PROGRAMME MANAGEMENT

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ABSTRACT

Cost and value management has focused upon collaboration and knowledge management in recent years to i) increase effectiveness and deliver value, ii) improve efficiency and reduce costs. Attention has been given to the project level. Less attention has been paid to programme management and the supply chain network. This paper examines knowledge sharing and application among a major client, consultants, main contractors and subcontractors in a programme supply network for a multi-billion dollar national infrastructure programme of megaprojects.

The interpretative methodology analyzes 20 interviews of 6 organizational members in a supply network supported by cognitive mapping. The findings show the supply side is failing to meet the increased demands of complex projects. A lack of investment, commitment and cultural leadership was found, hence the over-reliance on individuals and teams to take responsibility for knowledge sharing and application. The barriers to improvement include a lack of strategic front-end development on the client side, and scant programme management on the supply side. The conceptual outcome is a demand and supply side programme structuring and set of cultural norms that points to behavioural learned helplessness.

Keywords: Collaboration, Cost, Knowledge, Programme Management, Value

INTRODUCTION

Institutional policies and project organizations have tried to overcome the low levels of continuous improvement. Since the 2008 downturn, cost control has harnessed collaboration and to an extent knowledge management to drive efficiency. Primary attention has been given to the project level. Less attention has been paid to programme management and supply chains. This paper examines knowledge sharing and application among the consultants, main contractors and subcontractors in a £3bn (c. CDN\$6bn; US\$4.3bn) supply chain for a UK infrastructure client.

Research has shown low levels of investment and commitment to implementing of knowledge sharing and application. Responsibility has been left to individuals and teams without budgetary or management support. The research clearly shows that individual and team responsibility is both variable and insufficient (e.g. Kelly, et al. 2013). Projects have been found to have no organizational memory (Dubois and Gadde 2002), thus, firm-level support is needed. The paper mobilizes the concept of *learned helplessness* to depict the project outcome and explore the implications for the

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programme level within firms in their network. There are thus two original research contributions: i) knowledge application at the programme management level in the supply chain and network, ii) the extent of learned helplessness.

An interpretative methodology using action research is employed. Interview data was analyzed using cognitive mapping methods. The paper is structured to cover some key literature to inform the data collection (cf. Eisenhardt 1989). The client and six organizations in the supply cluster are analyzed. The aim is not to build theory, but to build further conceptual depth to existing theorization. The findings confirm low levels of commitment to knowledge management (e.g. Kelly, et al. 2013), due to a lack of investment and cultural leadership from the firms. It was found that there is an over-reliance upon individuals taking responsibility for knowledge sharing.

Organizations are unable to operate alone, integrating the dynamic resources across organizational boundaries (Dubois and Gadde 2002):

Nobody has seen a corporation!we mistake the phenomenon for its tangible representation. ...Our perceptions about organizations take over, and we become slaves instead of making them our servants. Inferior quality, disinterest in the customer, erroneous decisions and inertia are blamed on organization and system: "I'm sorry, I can't do anything about it." This has been called 'learnt helplessness'. (Gummesson 2002: 259)

LITERATURE REVIEW

A review of different knowledge management frameworks shows that combinations of tacit and explicit, formal and informal, soft systems supported by flexible hard systems are suitable to accommodate diverse human behaviour in complex operational contexts (e.g. Heisig 2002). Knowledge practitioners agree that the great challenge in developing effective and systematic knowledge sharing and application lies in the organizational and cultural dimensions. Organizational culture is the most important barrier and perhaps the most difficult one with which knowledge managers must deal (Davenport, et al. 1997). Cultural values shape patterns of interactions, hence influencing the willingness and behaviour for knowledge sharing (Gray and Densten 2005). A culture where knowledge sharing is the norm encourages people to collaborate and reward practices through praise, pay and promotion. Communication systems and IT platforms only support the culture for knowledge sharing and application (Bloom 2000). Culture is the organizational mental model for effective knowledge management (Blackman and Henderson 2003), inducing a shift from the transactional 'knowledge is power' to the more transformational mental model of "knowledge sharing is powerful" (cf. Dalkir 2005).

Dawson (2000) cites the need for firms to capture knowledge for organizational benefit. Bredillet (2004) links individuals' knowledge to the firm via organizational competency. Yet awareness of the need for support to facilitate knowledge sharing, socialization and transfer for application is variable (e.g. Kivrak. et al. 2008). The absence of an enabling culture leads to a passivity or one where barriers are raised, essentially feeding the concept of behavioural *learned helplessness* that becomes structured into systematized to raise further barriers (cf. Abramson, et al. 1978).

The "stickiness" of knowledge demands that cultural and process barriers are addressed (e.g. Szulanski 2000). Gray (2001) argues that communities of practice provide a key means to encourage knowledge flow and address stickiness. It is

generally agreed that inducing motivation for effective knowledge management is a cultural and leadership challenge (Davenport and Prusak, 1998). Organizations that have brought to the surface the deep-seated and complex assumptions start to build leadership and communities of practice around knowledge sharing and application in their organization and across supply chains and the wider network (Foss 2009). Schlumberger, the world's largest oilfield services company, is not alone to claim to have made efficiency savings (est. US\$75m) through its knowledge management initiative, *InTouch*, that connected technology centres and fieldworkers (Rao 2014). Where the culture, systems and leadership for knowledge sharing are inappropriate, responsibility is left to individuals or team relationships without the support and capabilities at the programme management level (e.g. Brady and Davies 2004; Fong and Chu 2006) which stimulate service innovation (Storey and Kahn 2010).

METHODOLOGY AND METHODS

An interpretative methodology is used, which is appropriate for a topic embracing explicit and tacit aspects of knowledge sharing and application and the associated behaviours. The research is more specifically conducted through engaged methods, which combines two elements. First is an action research element via a 2-year Knowledge Transfer Partnership, supported through UK government funding via Innovate UK. A single client infrastructure programme provides the prime locus. The client is under close scrutiny for cost accountability and the supply cluster operates in a multi-organizational environment of new provision, renewal and maintenance comprising complex overlapping and interlocking project and operational systems. Second is direct engagement with the infrastructure institutions. This was helped by the action research with the client. The two elements led to soliciting qualitative data for analysis, supported by cognitive mapping as a further tool of analysis. Cognitive mapping is a visual technique to show perceptions, patterns and causal relations between the issues (Ackerman and Eden 1994). Action research facilitated feedback to reflect further on the analysis. The data was solicited from 6 supply chain case companies, comprising 2 consultants, 2 contractors and 2 subcontractors (Table 1; cf. Eisenhardt, 1989). 20 semi-structured interviews were conducted. Defensiveness in the supply chain led to uneven access across the organizations and all functional departments – a symptom of barriers to knowledge management.

FINDINGS AND DISCUSSION

There's a lot of ad hoc stuff around lessons learned is a statement from one main contractors summing up the main issues reported. The approach extensively relied upon individual initiative, which was inconsistent and unsystematic. The suppliers had an extremely defensive culture in the challenging context of infrastructure provision, client actions and market drivers. There was evidence of egalitarian conduct internally yet hierarchy was invoked by adversarial behaviour and accountability criterion. There was extensive reliance on transactional risk and cost control at the expense of transformational practices, underpinned by low firm investment to develop capabilities in programme management.

GloCo	Consultant	Division for an Infrastructure Sector	Director of the Division; Systems Practice Manager
WayCo	Consultant and Specialist Subcontracting	-	Managing Director; Access Service Manager
BudCo	Construction, Engineering and Asset Management	Construction and Engineering	Head of Sector Operations; Director of Business Development; Director of Bid Management; Compliance and Operations Manager; Project Director; Supply Chain Manager; Materials Manager
RhoCo	Specialist Engineering & Electronics	Engineering Subcontractor and Contractor	Director of the Division; Head of Business Development; Project Director; Project Manager ; Bid Manager; Head of Commercial; Business Improvement Manager
ElecCo	Specialist Engineering & Electronics	Engineering Subcontractor and Contractor	Head of Business Development
Entco	Institutional Provider and Contractor	-	Head of Stakeholder Management

Knowledge management did not occur in real time. Project reports, when conducted, were completed at handover with no programme capabilities to spread and embed lessons learned. Competitive pricing and a lack of contingency budgets inhibited transfer during projects. Finance and Commercial Directors applied transactional management to project and functional budgets, failing to understand the transformational transition needed for complex projects.

Table 1: Schedule of case study contractors and personnel

Drilling down, there was low engagement with IT platforms for knowledge sharing within the suppliers and the client intranet. The client held 6-monthly conferences that served the purpose of “socializing ideas”, yet lacked operational follow through.

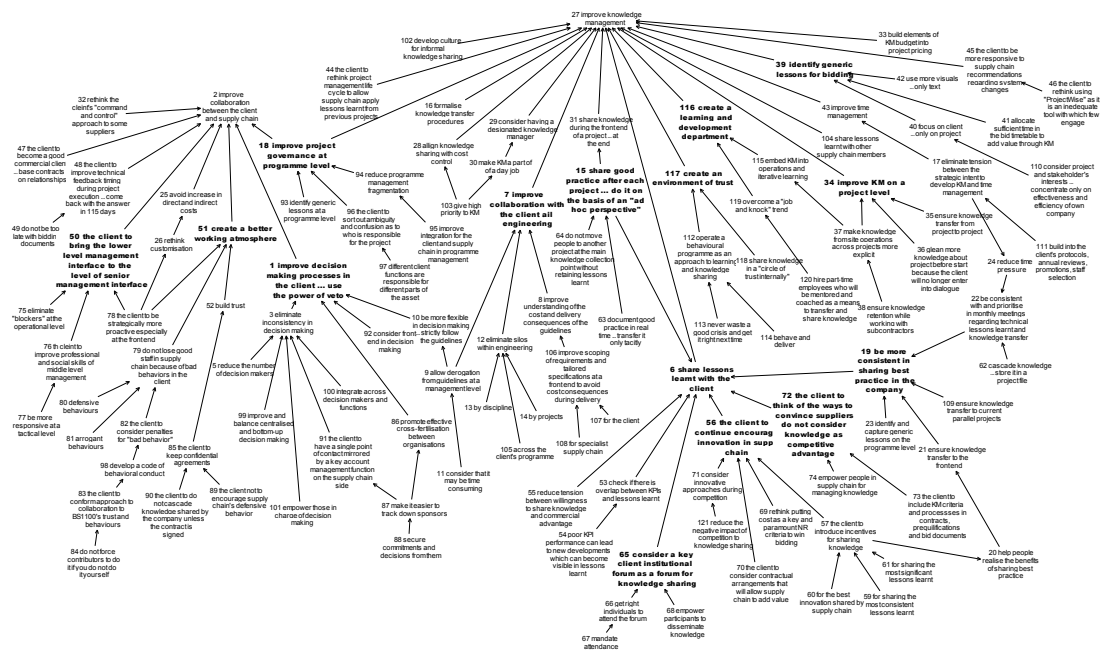


Figure 1: Cognitive map of interviews with client supply chain

The supply chain interviews were analyzed and the linkages and interdependencies between the issues are depicted in a cognitive map (Figure 1 above), highlighting the shared thinking across organizing organizational boundaries and the desire to see improvement. The commonly raised strategic issues are shown in rank order in Table 2 below with numbered cross-referencing to Figure 1.

Rank	Key Strategic Objectives	Reference on the map (Fig. 1)
1.	Share lessons learnt with the client	6
2.	Improve project governance at programme level	18
3.	Improve collaboration with the client engineering	7
4.	Improve knowledge management on a project level	34
5.	The client to continue encouraging innovation in supply chain	56
6.	Create an environment of trust	117
7.	Create a learning and development department	116
8.	Identify generic lessons for bidding	39
9.	Be more consistent in sharing best practice in the company	19
10.	Consider a key client institutional forum as a forum for knowledge sharing	65
11.	Improve decision making processes in the client rather than use the power of veto	1
12.	The client to think of the ways to convince suppliers do not consider knowledge as competitive advantage	72
13.	Share good practice after each project rather than do it on the basis of an "ad hoc perspective"	15
14.	Create a better working atmosphere	51
15.	The client to bring the lower level management interface to the level of senior management interface	50

Table 2: Key Strategic Options in Descending Order

A reported tendency was that the client proceeded to delivery prior to completing the scoping, defining and specifying of each project. The main contractors described this as a major disincentive to engage with effective knowledge management due to the subsequent constant change. The client and entire supply chain use threshold criteria qualifying suppliers, rather than additional dynamic criteria to include knowledge

management to assess improvement rates. HR policies in the supply chain lacked knowledge sharing and application criteria in staff selection, induction, training, annual reviews and promotion. These factors created a gap between the rhetoric about what the firms claimed to be doing and what happens on the ground.

The consultants tended to be better than other firms, yet this is largely the result of employing “knowledge workers” and “reflective practitioners” rather than strategic and tactical commitment from the firms’ senior management. Main contractors displayed some effective knowledge management practices. These were largely focused upon cost savings and efficiency gains for the firm to improve profitability. They were not directly about adding value to serve or save costs for the client. While indirect benefits may accrue at times, this is fortuitous rather than through designed service improvement. The focus was self-interested and inward facing.

The respondents identified a series of barriers to effective knowledge sharing and application: i) insufficient time is allowed for early contractor involvement and for bidding to apply lessons learned; ii) untimely and confused client decision-making during execution due to poor programme and front-end management of the projects; iii) client confusion between collaboration and intervention to manage projects which reduces the room for flexible responses among suppliers. However, there were as many internal barriers as external. Finance Departments were serving agendas of survival and profit declaration by keeping costs and investment to a minimum. This is part of the cash flow management practice regarding return on capital employed to declare dividends at the expense of the long-term interests of the firm, their clients and in this case making a portion of the profits from taxpayers. Senior management lived in the tension between supporting the willingness of operational personnel and project teams to be transformational, yet following the lead of financial management and commercial directors. There was evidence that the resultant restructuring aligned behaviour around survival and competitiveness at the personal level.

At the individual level, there appeared to be scant appreciation of the difference between generic solutions and tailored solutions to context and the role of knowledge to initially identify the generic and later apply knowledge to tailor to context. There was reliance upon the assumed notion of ‘project uniqueness’ as if this is justifiably self-explanatory – taken for granted thinking in the culture. The consultants as specialist providers and the specialist subcontractors as solution suppliers were more aware than the main contractors, although it is the latter that are responsible for knowledgably configuring integrated solutions and service innovation.

Knowledge management is more difficult for contractors due to site dislocation, exacerbated by a temporary workforce that infrequently receives robust induction. In most industries the knowledge management process is a 6-stage process:

Identify → Capture → Process → Store → Disseminate → Apply

For projects it depends upon double processing to sift on site and tease out the generic at programme management level followed by the problem of identifying applications on new projects, which usually involves tailoring and customizing. This is 9-stage process, which is more costly with low levels of repeatability:

Identify → Capture → Process on site → Process in the firm → Store → Disseminate → Identify → Adapt → Apply

This is a considerable barrier to developing knowledge sharing and applying lessons learned. This is why investment within programme management is necessary.

Overall, programme management and the strategic project front-end were driven on the client side by external and organizational factors in ways that constrained knowledge management in the supply chain. The client had developed some fora for strategic sharing, which needed to be cascaded down the supply chain for implementation. Knowledge application at the programme management level in the supply chain and network was highly constrained, resulting in internal transactional policies, especially low investment, and process barriers. The derived cultural norms resulted in a sense of learned helplessness, which can be described as a nuanced position between adverse and collaborative behaviour.

CONCLUSION

There are a number of patterns emerging from the research, summarized as follows: 1) there were commonly held perceptions about the importance of knowledge sharing in collaborative relationships of trust and robust governance; 2) lessons in practice were assimilated and transferred on an ad hoc basis, relying upon individuals and small groups taking responsible action; 3) there was a lack of investment in management capabilities, and programme management; 4) there was a management perception that IT platforms provided solutions yet had very low levels of engagement at the operational level; 5) where firms were more systematic knowledge sharing was self-interested rather than enhancing the service and value for the client and other stakeholders; 6) the culture was transactional and very defensive with a focus on risk around time and cost control; 7) departmental functions, especially finance, HR and procurement failed to perceive the significant potential role they could play in facilitating knowledge sharing; 8) senior management failed to show commitment and leadership to knowledge sharing and application.

While there was evidence of willingness to be transformational bottom-up, there were considerable barriers to facilitating knowledge sharing and application. This emanated from the top. Investment and leadership was absent, especially at the level of programme management on the client side and within the supply chain. The pattern of findings aligns with the condition of “learned helplessness”. This abnormal condition (Abramson et al, 1978) becomes pathological in the organizational setting (Gummesson, 2002) where individuals and teams end up saying in effect, “*I’m sorry, I can’t do anything about it*”. Learned helplessness provides an original contribution, as does the use of cognitive mapping to shed new light on knowledge management in construction. Supply side programme management is an area needing further development in construction theorization and practice as an agenda for future action.

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