Innovating ‘Assimilation Process’: The role of client leadership in fostering effective information flows in construction project supply chains

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Abstract

The effects of the cultural and structural fragmentation normally inherent in construction project teams, can be offset to a large extent, by effective communications. However for this to happen, it is first necessary to understand the detailed context that a particular project provides, before those communication channels can be optimised and the use of a supply chain model – in this case Lambert and Cooper (2000) – can provide the mechanism for developing this understanding. Issues of commercial motivation, information needs and specific requirements of effective communication channels can be analysed and understood from each participant’s perspective. This paper details the implementation of such an approach within a single case study of a distribution warehouse for an experienced major client engaging with six other key project participants. It utilises ethnographic interviews combined with thematic analysis and abstraction, and finds that the client’s role in managing informal information flows within the project supply chain, was critical to project success. Specifically, the client’s role was pivotal in cementing together positive working relationships across the first tier of the project team: this proactive activity that established the assimilation of all parties into a shared understanding is entitled ‘Assimilation Process’. It is argued that clients trigger innovative informal processes through ‘Assimilation process’.

Keywords: Information flow, governance, formality, informality, supply-chain process links
1. Introduction

The information fragmentation in construction project organisations is claimed to have drastic impact on project performance. Although this can be attributed to a number of contextual issues, the industry’s structure, culture and lack of interest in technological innovation are identified to be the root factors (NAO 2001). The loosely coupled nature of the construction project supply chains contributes to the fragmentation of its operations (Dubois and Gadde, 2002). It is argued that fostering appropriate information flows, through innovative technological uptake, process improvement and cultural transformation, have potential to reduce the impact of structural fragmentation on project performance. However the counter argument is, that structural fragmentation in itself, is a hindrance to implementing new initiatives or making any progressive changes.

Information flows in construction projects can be explored through a number of theoretical contexts including supply chains (Jharkharia & Shanker 2005), project organization and knowledge/learning management (Egbu and Botterill 2002). Whilst each of these theoretical contexts is intricately interconnected, each provides a distinct theoretical lens to explore issues that influence information flows. Due to the fact that ‘information integration’ and ‘supply chain integration’ are theoretically intertwined, both seeking to improve the flow of information in any production system, this paper adopts the supply chain context to study the information flows. The testimony of the links between the above two concepts are evident through the innovative use of Information and Communication Technology (ICT) progressing from ‘automation’ to ‘organization wide ICT integration’ to ‘supply chain wide ICT integration’.

The ICT enablement of supply chains is critical for a high degree of coordination within the supply chain as it facilitates frequent and automatic flow of information (Donk 2008). The effective flow of information, in both ICT and supply chain literature, is discussed using the term ‘Integration’. Tan (2001) suggests that a “well integrated supply chain involves coordinating the flow of material and information, between suppliers, manufactures and customers” (p, 44). The current phase of technological advancement (Power 2005) can assist in creating virtual supply chains, where information flows seamlessly and efficiently between the members of the chain. Therefore, considering ICT integration via supply chain context, provides a meaningful way to conceptualise information management.

In essence, effective information and communication flows, both upstream and downstream, is the major facilitator of integration of people and process in supply chains (Smart 2008). The aim of this paper is, to explore the links between construction project supply chain members in fostering information flows in project organisations, through supply chain context. The paper uses Lambert and Cooper’s (2000) supply chain conceptualisation, which allows visualising the members of a project team through network of connections, to explore information flows. The case study was based on a distribution centre project for a retail supermarket chain procured through construction only procurement. The scope of work involved building work (including complex mechanical and electrical operations) with associated civil infrastructure work (e.g. access roads, drainage, sewerage).
2. Literature Review

2.1 Lambert and Cooper’s model in the context of construction projects

Managing a supply chain is about maintaining effective flow of resources (including material, people and information) beyond the functional/corporate boundaries of firms. Shared business interests/goals/processes and effective information exchange between various business entities are essential to achieve this aim (Min & Zhou 2002). Mapping of a supply chain to visualise and identify any constraints on the information flows is a salient activity in administrating supply chains.

The supply chain model proposed by Lambert and Cooper (2000) used in this study, is due to its ability to depict numerous dimensions of supply chain operations, from an information integration perspective. Despite this model’s inadequacy to represent additional layers of complexity arising from the transient network structure/relationships inherent in the construction project supply chains (London 2008), its ability to map multiple dimensions, justifies its use in the context of this study.

![Diagram of Lambert and Cooper's model](image)

**Figure 1**: An illustration of Lambert and Cooper’s (2000) model in the context of construction project

Figure 1, modified after Lambert and Cooper (2000) proposes a ‘root and branch’ model using a number of dimensions to aid the description, analysis and management of the supply chains. Conceptually it allows all members to be linked, from client to final supplier, in layers or tiers. It enables members to visualise and link various functions/aspects/operations within a firm and across firms. This assists in determining the different informational needs of supply chain members and how
they should flow across the members. There are two explicit categories of links connecting the firms in the supply chain: (1) Contractual—legal—links and (2) Process—business/operational—links. The contractual links provide the legal basis for the connections between each member and their formal obligations to other members, including the provision of information flows. The process links are based on how the supply chain network connections are managed from an operational perspective. That is how firms should manage or monitor other members in the chain. The nature of the process links may or may not be influenced by the contractual links.

Figure 1 illustrates how the four types of Business Process Links (BPLs) can be used to reflect the supply chain relationships from a focal firm’s point of view. The BPLs are classified based upon the degree of managerial interventions/relationships required to sustain effective supply chain operations. This model identifies a focus organization in a supply chain (in Figure 1 it is the principal contractor) to simulate how that organization can/should manage supply chain relationships with other organizations in the project. Lambert and Cooper (2000) indicated that a complete management of all processes across all tiers of the supply chain, from a focus organization’s point of view, would be impractical. Therefore, firms need to design their interventions/relationships based on the needs of information and communication flows. The four business process links are discussed below in the context of construction project supply chains.

- Managed process links—links that the focal firm finds important to integrate and manage. This is to integrate the flow of resources, including people, money, plants and information. In the context of a construction project, depending on the governance approach, each firm will have a different extent of flow of resources between the members. As an example, from a principal contractor’s (PC) point of view, it is unlikely that people, materials and plants need to flow between the PC and their upstream members (e.g. project managers and consultants). However, integration of information between upstream members as well as downstream members (e.g. sub contractors and suppliers) is fundamental for project success. Based on the operational arrangements, PC’s and sub contractors may have flows of people, materials and other forms of resources between them.

- Monitored process links—links that are not as crucial to the focal firm. However, it remains important to the focal firm that these process links are integrated and managed appropriately between the other supply chain member firms. Monitoring the process links can be a formal requirement established through the governing mechanisms or it could be an informal activity. As an example, from a principal contractor’s (PC) point of view, it is likely that the PC would like to keep trace on the resource flows between their sub contractors and their trading partners (e.g. labour sub contractors, material suppliers, etc). Although at times it may be outside their contractual obligations, to ensure smooth project operations, they may choose to monitor this informally.

- Not-managed process links—links that the focal firm is not actively involved with, nor are they critical enough to use resources for monitoring. However, the focal firm trusts other supply chain members to manage the BPL appropriately in ways that do not undermine the focal firm’s goals. At times, firms may choose to opt out of monitored process links with some of the links to crucial firms and expect the trading partners will do the necessary management. As an example, from a
principal contractor’s (PC) point of view, the links between manufacturers of the air conditioning systems and the mechanical installation subcontractors, can be classified as a not-managed process link.

- Non-member process links—supply chains could be influenced by actions occurring in other connected supply chains. For example, a subcontractor to the focal firm could also be a subcontractor to one of their competitors, which could have implications on the focal firm’s project. As an example, a link between a competitor principal contractor and a mechanical installation sub-contractor who works with a principal contractor (PC), can be classed as a non-member process link. The competitor principal contractor may benefit from conscious or unconscious divulging of intellectual property developed by the PC, by the mechanical sub-contractor.

Identifying the type of process links between the firms could assist in establishing the extent of information flows between firms or vice versa. Mapping the process links can aid in identifying any weak links and information fragmentations across the supply chain.

2.2 Information flow via formalisation vs. informalisation

From a construction management perspective, Briscoe et al. (2004) suggest that supply chain integration is about information flow and systems alignment for collaboration. Information flows are an essential component for collaboration between supply chain members. Also, integration of supply chains needs to occur at both strategic and operational levels. Often project arrangements stress the importance of formal configurations of ‘control oriented’ mechanisms for ‘engineering’ information flows for collaboration between team members (Martinsuo and Ahola 2010). This approach may hinder genuine collaboration as it underplays the role of social dynamics and informalities on the development of relationships between team members (Bresnen and Marshall 2002).

So’derlund (2010) argues that the temporary and fragmented nature of project organizations, often with a large number of new team members who enter the project at different points in time, poses significant challenges with establishing the interdependencies; therefore, effecting on managing process links. Depending on governance-based control may not secure true cooperation and information sharing among team members (Bresnen and Marshall 2002). In highly risky environments where uncertain transactions occur, formal ‘market and hierarchy’ based controls are not sufficient. Informal and collaborative forms of integration – including trust (Dainty et al 2001) and decentralized cooperation– are needed.

Overcoming the issues of conflict due to differing goals, resource scarcity, and interdependence of tasks, the project team should employ a project leader with strong brokering skills. These leaders can co-develop a clear project charter and use boundary objects for joint problem solving. They also should take to the role of making aware and constantly reminding about members the ‘big picture’ through open and balanced communication (Ruuska and Teigland 2009).
3. Research methodology

This research is underpinned by the ‘constructivist’ paradigm to accommodate the multiple realities of the world (Creswell and Clerk 2007), as construed by the different supply chain members. The constructivist paradigm enables analysis of diverse perspectives and experiences of the members of the project team arising from varying realities or multiple world views held by them. A single case study approach (Yin 2009) was employed to identify the boundaries of the project organisation. Data was collected using interviews contextualised in ethnographic principles (Spradley 1978). Seven individuals in key positions (client, project manager, principal contractor, architect, engineer, quantity surveyor and subcontractor) from the firm’s part of the project were interviewed. Following this stage, the interview data underwent a thematic analysis process to abstract the general themes displayed in the data. Abstractions were made linking the teams to arrive at the findings. The following section presents the abstracted themes arrived at via qualitative analysis process.

4. Results

4.1 Background to the case study

Case Study project is construction of a warehouse-distribution centre, procured through construction only method, for a large commercial retail chain entity in Australia. This project is part of a larger project encompassing the construction of a number (more than ten) distribution centres across Australia. The majority of the design team members in this project were and are involved in the construction of other warehouse-distribution centres. The contractor was selected through a competitive tendering process.

Client dictated the use of an online collaboration platform for document management and communication processes during both design and construction stages. The client incurred the cost associated with that initiative. All consultants and the principal contractor were mandated to use the platform while subcontractors were excluded from use. Most information transfer, including drawings, specifications and Request for Information (RFI), was conducted through the online platform. Each firm printed the relevant documents on a needs basis. Therefore, engagement with the online collaboration platform was limited to document transfer, including drawings and RFIs. Most information between the principal contractor and sub contractors was on paper, except for dealing with shop drawings. All parties also used email and telephone for communication.

The formal communications as dictated by the contractual links made (a) the project manager as the formal hub of information control between the consultants and the principal contractor (and their construction team) and (b) the principal contractor as the formal hub of information control between the construction team and the Project Manager (and the consultant team). However, the client emphasised the importance of fortnightly face-to-face site meetings and non contractual/non-formal communication between selected members of construction and consultant teams.
4.2 Ideologies and personalities shaping the project environment

The client representative (CR) for this project, also the representative to all other warehouse expansion projects, showed significant leadership in managing the project environment. CR had extensive delegated authority from the retail chain’s CEO, providing CR with significant power position. CR used his power position to custom design governance mechanisms and communication protocols to suit each project in the expansion program. CR’s pragmatic approach to problem solving and the desire to foster a collaborative project environment made him directly involved in the administration of the project organisation, to some extent, by passing the Project Manager. Client representative indicated that lack of certainty is the root cause for most problems arising in project organisation. Therefore CR focused on minimising uncertainty arising from their organisation. (A quote from the CR to reinforce this point).

Client Representative: I guess [supermarket retail chain client] is a little bit different from other clients given that it is actively involved, tries to be as decisive as it can, because one of the worst things that you can have on the project is uncertainty . . . You have to create certainty. And my job is to create this certainty as well as stem the crap that comes out of (Client Board) sort of—[We use] information management to create [some level of information flow] certainty.

However, both client and sub contractor did not believe that depending entirely on the computer based information management systems, is the answer for effective information management. They see face-to-face communication as a critical component of information management.

Client Representative: You can’t [replace face to face meetings with ICT tools], you can’t. Because again you are creating a new project in its own right, a new team, and new set of relationships every time. You are dealing with guys who are very intelligent and very clever and very clinical right down to the other end, with the shovel. Now I walk out there and I go right up to the guys shovelling concrete and asked him how he is going. So you can’t, you can’t lose that. This is information management, that’s all that is. This is not going to build the building, the guy at the other end is going to build it. This is information management to create certainty.

The client indicated that it is important to acknowledge that, in a construct only procurement, the dynamics and communication between the firms change when the contracting team becomes part of the project. This change of dynamics in the project organisation shows the cultural divide between the client/consultant team and construction team. This arises of the lack of trust between both teams on the intention of the other.

Client Representative: The builder wants to get as many extensions as he can to limit his risk of being clobbered for damages. The client wants no extensions as it puts some skin in the game for the builder—that’s fine, that process goes on, it’s just a side process.

Client believed in developing collaboration between project team members through shared understanding to achieve common goals. However, in projects governed by construct-only procurement, connections between most firms are treated as isolated contracts. This does not give
each firm the overall picture of the project from the inception. This occurs due to the nature of project operations, which takes place in stages. Therefore, client believes that in a construct only setup, establishing common goals for a project complementing the goals of individual firms, is important. Even more important is communicating strategies that may enable such alignment of goals to all the project team members. Subsequently, firms in a project need to be informed about how their firm will fit into the overall project and with other firms.

Client Representative: So what we do is we have what we call Day I meetings where we invite everyone involved with the project and we lay the project out to them. Key subcontractors, the builders, all the people. And it has two purposes. One is to explain the project to everyone that is going to work on it—you know, if you are going to work on something you need to know why you are doing it. So we tell on why we are doing it. We're not just building a building, this is why we are doing it, this is what it looks like, and here is the things to watch.

Common goals are not purely about completing the project within time cost and quality, but could also be to foster a fairness-based project environment to ensure that individual firms in the project are not unfairly financially hurt.

Client Representative: Sure, we have a contract, and there is a commercial arrangement but, you know, provided everyone works together and everyone makes a little book of money and everyone is happy and we get our building and it is not a disaster. You end up with a success... And then the other thing that we engender in this day 1 meeting is that it is a two way street. It is a "we" team, right? It is "us", "US" doing the job. It is not just you and you doing it for me, it is I'm helping you and you are helping me... this all sounds very wankie but this is what we do.

4.3 Beyond the contractual links: Fostering informal information flows

Most of the project team members believed that communicating outside the formal or contractual lines of communication, in order to develop collaboration, could open up disputes. Project Manager believes that although they espouse a friendly and informal relationship-based approach to project management, contractual obligation can only be enforced via formal mechanisms. However, CR believed that some form of informal communication between the project team members is critical for effective project operations. The formal contractual arrangement did not provide the means to foster the kind of communication client espoused, as the principal contractor employed large number of team members, as sub contractors. Tensions between these two beliefs were suppressed by the client's power position. That is, the client representative was bestowed with the power to engender informal links between the team members, bypassing the formal lines of communication stipulated in the contracts.

Project Manager: Obviously, it is relationship based, but when we need to we do look at the contracts and see that they are fulfilling the contractual obligations to the client if that supplier is not obliging by doing those tasks we can ask once, asked twice, but we do have a contract we can
use to say to them that they have to perform this, this, and this within this time, and within this cost.

Client Representative: We get relationships going between the fire consultant and the fire subcontractor and the services manager of the builder. So we deliberately do those introductions. The fire consultant and the fire subcontractor, and they walk through the plans and the consultant will explain his design, what is this, what is that. The engineer will do the same with the structural steel guy and concreter, and so it goes on, electrical, and then you get these little relationships going. And then the other thing that we engender in this Day 1 meeting it is a two-way street.

The client engendered collaboration by introducing initiatives away from the formal mechanisms to exploit ‘project drawings’ and the ‘construction program’ as boundary objects.

CR: [I tell the project team that] we have to continue with the process outlined in the contract. I say as part of you working with me—we have to be transparent on your target program. The contractual tool we use, but at the same time we are all driving hard at the target program. We understand that the target program is not contractual but it is the target.

The fostering of ‘informal relationship and communication’ between non-contractual parties, a client lead innovative approach, cannot be explained via the supply chain process links described by Lambert and Cooper (2000). The idea of ‘Assimilation Process’ allows carefully designed informal communication in a project complementing the formal mechanisms. The CR, once the assimilation was fostered between key members, did not explicitly monitor the links between them. However CR expected the project manager to use the existing Managed Process Links to identify any contradicting outcomes arising from the assimilation process with the formal expectations (e.g. cost over runs).

Figure 2 maps the ‘supply chain process links’ from the client’s position. Although the client has contractual links with the project manager, architect, engineer, quantity surveyor, and principal contractor, the client only managed the process link with the project manager. However, the client monitored the link between the other firms e.g. project manager and architect, architect and principal contractor etc. However, the ‘Assimilation process’ (AP) fostered by clients created direct communication between the consultants and subcontractors in the areas of mechanical, electrical and fire, and also the principal with the architect, fostering a collaborative work environment to solve problems as and when they arose.

The Project Manager’s only contractual link was with the client. However the Project Manager, managing the project on behalf of the client, required development of ‘Managed Process Links’ with the consultants (e.g. architect, engineer, quantity surveyor, principal contractor) and the client. The rest of the supply chain links from the Project Manager’s point of view was characterised as ‘non-managed links’. PM’s attitude favouring formal approach to management, did not allow them to foster assimilation process between non-contractual parties. However, PM’s position was complementary to client’s position, as the PM ensured that the supply chain members fulfilled their formal obligations as part of their contracts and did not exploit any situation arising out of the assimilation process.
The Principal Contractor had contractual links with the client and their sub-contractors. The Principal Contractor was the formal conduit for information flow between the consultants and the subcontractor via the Project Manager. The Principal Contractor, as the leader of the construction team, monitored links between the subcontractors and client team. However, in this project the Principal Contractor also developed assimilation processes with the consultants that were fostered by the client. This enabled reducing the time taken to clarify the required information to construct the building.

![Supply chain map with 'Process links' mapped from client's focus](image)

Figure 2: Supply chain map with 'Process links' mapped from client's focus

The reflections on the project progress from the interviewees indicated that this project was somewhat different to the other projects they had been involved with in the past. They acknowledge the positive attitude of the client and the role of the CR’s leadership in contributing to this environment.

**Principal Contractor:** [This project is] very collaborative. It's certainly what (clients name) and (clients representative) have emphasised from day one. And on day one all of the parties sat around the meeting table here onsite and (the clients representative) said 'we are all a team, we [are] working as one, to achieve the same goal'. So he was very much driving that "we are a team" philosophy. He doesn't want to see any animosity, he doesn't want to see people squabbling, he wants us to get the job finished. And if people are working together, you know if people ask a question and the question is being responded to up on time, it helps the process. So everyone has a part to play, so let's help each other out. So that was the driving force behind (clients name).

In summary, results indicate the four process links, namely ‘Managed Process Links’, ‘Monitored Process Links’, ‘Not Managed Process Links’ and ‘Non Member Process Links’ are inadequate to capture the actual flows of information between the supply chain members in this project. Moreover, an innovative process termed ‘Assimilation Process” was identified, that appeared critical to the effective operations. This link is purely related to information management between parties who are not contractually linked. The two node organisations associated through the assimilation processes are neither contractually linked nor fit into the process link proposed by Lambert and Copper (2000). Carefully designed Assimilation Processes made the flow of information between construction and consultant teams more effective, creating a harmonious project environment.
5. Discussion and conclusions

Managing the flow of information is one of the most critical facets of construction project supply chains. The findings of this study suggest that the clients, by prudently flexing their power position, can design formal and informal governance mechanisms that can foster effective information flows between supply chain members. Findings indicate that face-to-face interaction is essential to complement information technologies in managing information flows. The face-to-face communication is conducive for building relationships between supply chain members. These findings corroborate with Pant, Sethia and Bhandarib (2003) who noted that ICT has an important role in improving information flows, but that it is not as simple as installing ICT hardware and software.

It was evident that the client’s understanding of the contextual challenges in managing temporary and fragmented project organisations as described by So¨derlund (2010), enables client’s and their representatives, to devise appropriate strategies to manage the project pragmatically. The client’s approach to creating certainty wherever possible, by using formal ‘market and hierarchy’ and informal mechanisms to manage highly risky environment and uncertain transactions, is discussed in the literature (Bresnen and Marshall 2002).

The client taking the project leadership role with strong brokering skills can enable them to co-develop a clear project charter and use boundary objects for joint problem solving. The construction program and construction drawing can be used as boundary objects to foster relationships and collaboration between members. Clients assume the role of constantly reminding the project team members about the common goals and the strategies that are in place to achieve them. These findings strike accord with Ruuska and Teigland (2009). Although triggering ‘Assimilation Process’ appears to be a simple process, innovation based on informal communication, it needs to be carefully orchestrated at appropriate junctures to suit each project context.

Essentially, findings indicate that clients assuming a leadership role with a fine appreciation of the project environment, can engender innovative initiatives that can improve the project outcomes. Specifically, they can design governance by mixing both formal and informal mechanisms to complement each other, in creating a project environment conducive for effective information flows.

6. References


