CONTINGENT FACTORS AFFECTING LEARNING PROCESSES IN TEMPORARY ORGANISATIONS

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ABSTRACT

The purpose of this study is to understand how contingent factors such as social integration mechanisms, power relationships, and regimes of appropriability (taken from the Absorptive Capacity literature) impact the willingness and ability of temporary organisation members to engage in, and benefit from, learning. Individuals and firms face the challenge of maximizing opportunities to learn. In project-based industries where temporary organisations are typically found, projects are often short-lived and thus the time frame in which actors can learn is often limited and pressured. While much attention has been afforded to the knowledge held by firms and their knowledge dissemination practices, researchers note that less attention has been directed towards knowledge and learning at the level of the interfirm network. We see this study as offering a number of useful implications for managers. By examining two complex project networks we have identified a number of practical ways by which firms can facilitate organisational learning through their interactions with temporary organisation partners. Learning in temporary organisations can be significantly enhanced when temporary organisation members are cognisant of the incentives for investing in learning and innovation, the means by which they are connected within a temporary organisation and create shared meanings, and way in which ties are forged and expertise shared in the learning process they engage in.

Keywords: Temporary Organisations; Learning; Absorptive Capacity; Cognitive Consistency.

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INTRODUCTION: KNOWLEDGE AND LEARNING IN TEMPORARY ORGANISATIONS

Business networks and their constituent actors act as a key potential source of learning; whether via certain actors (e.g. suppliers or customers) or by learning through collaborations with other firms (Bångens & Araujo, 2002). The coverage of this topic, however, remains embryonic, fragmented, and is often limited to a single firm or dyadic perspective of learning processes in networks (Ford and Hakansson, 2006). In fact, these perspectives fail to capture important dynamics in the learning processes of many inter-firm collaborations, as they fail to recognise that in fact such collaborations often form what are termed 'temporary organisations'.

Temporary organizations are situations where individuals from different organizations collaborate on a task for a defined period of time (Bechky, 2006; Grabher, 2002). Temporary organizations are different to other forms of company collaboration (such as projects and joint ventures) as they have characteristics such as institutionalized termination and conflicting loyalties and tensions, as participants have 'home' organizations. Temporary organizations, unlike traditional hierarchical organizations, rely on co-operation within a network (Jones, Hesterly and Borgatti, 1997) rather than by easily identifiable "…lines of authority" (Bechky, 2006: 3). The individuals selected to complete the assignment are chosen on the basis of the nature of the task (Lundin and Soderholm, 1995). Hence temporary organizations are similar to what Lambe et al. (2000: 212) refer to as 'intermistic' relationships; short-term relationships defined as a ". . . close, collaborative, fast-developing, short-lived exchange relationship in which companies pool their skills and/or resources to address a transient, albeit important, business opportunity and/or threat" – a phenomenon that has received limited research attention.

This paper focuses specifically upon knowledge and learning in temporary organisations that are formed through interfirm collaborations. Individuals and firms in temporary organisations face the challenge of maximizing opportunities to learn. In project-based industries where temporary organisations are typically found (such as advertising, construction, consulting, and high-tech companies), projects are often short-lived and thus the time frame in which actors can learn is often limited and pressured (Grabher, 2002). While much attention has been afforded to the knowledge held by firms and their knowledge dissemination practices, researchers note that less attention has been directed towards knowledge and learning at the level of the interfirm network (Bygballe and Jahre, 2009; Lettl et al. , 2006). Interest in organizational learning at the level of the interfirm network, however, has been steadily increasing (Easterby-Smith, Crossan & Nicolini, 2000). Driving this shift is the recognition that ". . . organizations are collections of overlapping knowledge systems each of which may be embedded within a wider occupational community" (Araujo, 1998:331). Understanding the formation of knowledge therefore cannot simply focus on the learning of isolated actors, but rather such learning also depends on the capabilities and competencies of the wider network (Bangens & Araujo, 2002). Simply put, networking increases learning (Håkansson and Johanson, 2001), or rather, opportunities to learn.

One way to achieve this has been through the development of what is termed 'absorptive capacity'. This term was coined by Cohen and Levinthal (1989; 1990) to capture the notion that firms may have differing capabilities to innovate and to recognise the value of new knowledge, assimilate it, and apply it to creating business value. Lado and Wilson (1994) define organisational capabilities as the dynamic and non-finite mechanisms that enable the acquisition, development, and deployment of resources to achieve superior performance. (e.g. innovation and entrepreneurship, organizational culture, and organizational learning). Thus, the capabilities that underpin the organisational learning processes which characterise absorptive capacity (i.e. to innovate and recognise the value of

new knowledge, assimilate it, and apply it to creating business value) would lead to superior performance. While absorptive capacity is often theorised as a firm level construct, in this paper we apply the notion of absorptive capacity to the level of the interfirm network formed by the temporary organisation. Todorova and Durisin (2007) recognise several contingent factors that may enhance or inhibit this capability. Therefore, our study attempts to explain the following:

> *How are contingent factors able to influence the participants in a temporary organisation in terms of their willingness and ability to engage in learning processes?*

The case study context for the study is the project teams from two builds in the construction industry. The construction industry affords an interesting research context in which to understand learning processes in temporary organisations as it is characterised by; (i) low diffusion of new technologies and practices often due to adversarial relationships, where a focus on operational management issues rather than long-term benefits predominates (Anderson and Cook, 2004; Miozzo and Ivory, 2000); (ii) potential radical change of construction network relationships from project to project and loose network couplings, inhibiting the ability of members to form sustained cognitive structures that support learning (Dubois & Gadde, 2002; Teece, 1986); and (iii) short-lived site-specific project-based activity and uncertainty due to a lack of complete specification (Dubois & Gadde, 2002).

This research is timely for a number of reasons. First, as noted, our understanding of learning processes in temporary organisations and the ways in which networking may increase learning is still under-developed. Second, from a practical standpoint, learning at the temporary organisation level presents a challenge in terms of developing sustained cognitive structures and sharing new understandings between individuals in the network. In addition, a better understanding of how construction industry temporary organisations function in terms of the relationships companies develop with each other, and how they learn from one another, would seem valuable. In their review of research on absorptive capacity, Volberda, Foss and Lyles (2010) found that most prior research on the topic had focused on the tangible outcomes of absorptive capacity, and had largely neglected both the organisational design and individual level antecedents, and how absorptive capacity might emerge from the actions and interactions of individual, organisational, and interorganisational antecedents. In particular they suggest that gaps exist in our understanding of the impact of individuals on the absorptive capacity process, and in how such capacities exist at different levels of analysis (2010:944-945). Our research goes some way to addressing these two research gaps in that it explores the impact of individual cognition and action on the absorptive capacity process of the wider network in which they are embedded.

The structure of the paper is a follows. First we begin by explaining the cognitive theoretical approach that will form the basis of our analysis. We then examine learning processes in temporary organisations from an absorptive capacity perspective, in particular its three key contingent factors (regimes of appropriability, social integration mechanisms, and power relations). We follow this with a discussion of the case study methodology and present our findings in relation to each of these three contingent factors for both case studies. Finally, we offer conclusions and discuss the managerial implications of our study.

COGNITIVE THEORY AND LEARNING PROCESSES IN TEMPORARY ORGANISATIONS

To support our investigation of the contingent factors that impact absorptive capacity in temporary organisations we focus upon a cognitive theoretical approach to understanding networks (Monge and Contractor 2003). Traditionally, cognitive theoretical approaches seek to understand the structures of cognitions in individuals. When applied to networks they

focus on the shared interpretations that people have for message content, such as network goals and stories (Monge and Contractor 2003). In particular, Cognitive Consistency Theory seeks to explain the mechanism by which individuals' fulfil their aspirations for consistency in their cognitions (Monge and Contractor 2003), and is seen as a prime motivation for changes in beliefs, attitudes, and/or behaviours if these are not psychologically consistent (Festinger, 1957). As an example, in personal friendship networks the theory would argue that individuals are more satisfied when their friends are friends with one another. This translates at the network level as the extent to which a drive for consistency is manifest in network membership, attitudes, and relations.

This drive for consistency will tend towards a state of balance, which is a homeostatic state in which further motivations to change recede (Simon, Snow and Read 2004). To achieve this balance, Simon et al. (2004) point out that it is a bidirectional relationship of change and adjustment between evidence (the object of judgement) and conclusions (the judgement of the object). Thus, actions may reform beliefs and attitudes, which may recursively alter further actions. We therefore find cognitive consistency may in fact be heavily reliant upon interactive and dynamic processes of information assessment, behavioural action, and the emergent 'reality' that is constructed from this interaction. This is a process of coherence-driven processing (Simon et al., 2004), that enables confidence in decision-making by reaching out to bring the various pieces of the cognitive field into consonance (Simon and Holyoak 2002). Managerial cognition is seen by Volberda, Foss and Lyles (2010) as an important aspect of absorptive capacity research, and they highlight prior research as supporting the link between managerial cognition and learning. It is managers' ability and motivation to absorb external knowledge, and to develop theories about the world around them, that will strongly influence the absorptive capacity of the firm in which they are embedded (Volberda et al., 2010:935). However, it is not simply the knowledge sharing and recognition aspects of individual cognition that is important in understanding absorptive capacity, for at the organisational level routines, histories, stories, documentation procedures and know-how are important in creating a shared understanding of such knowledge (Volberda, et al., 2010:935). Thus, absorptive capacity (as a learning process) involves the interplay of cognitions and actions.

CONTINGENT FACTORS AFFECTING LEARNING PROCESSES IN TEMPORARY ORGANISATIONS

Absorptive capacity - the capability of firms and networks to innovate and to recognise the value of new knowledge, assimilate it, and apply it to creating business value - has been seen as a major factor in organizational learning (Simon, Snow and Read, 2004). Our view is that absorptive capacity, while originally seen as a firm level construct, compliments the network approach because developing such learning capabilities often requires firms to become part of a value network, and in particular to form temporary organisations to achieve specific project goals. Todorova and Durisin (2007) proposed three contingency factors that may enhance or inhibit absorptive capacity: (i) regimes of appropriability; (ii) social integration mechanisms; (iii) and power relationships. We now briefly explain how these contingencies may facilitate learning processes in temporary organisations.

REGIMES OF APPROPRIABILITY

Regimes of appropriability are "…the institutional and industry dynamics that affect the firm's ability to protect the advantages of (and benefits from) new products or processes" (Zahra & George, 2002:196). Where appropriation concerns are high, network alliances are seen as less desirable and thus learning opportunities are reduced. Appropriation concerns in alliances between firms arise from the uncertainties associated with future specifications, cost

uncertainties, and problems in observing the contributions of network partners and occur in most alliances (Gulati & Singh, 1998). In addition, industry features such as the ability to protect intellectual property by patents, the value of first-mover advantage, and the ability to maintain the secrecy of an innovation, will impact network formation and governance (Teece, 1986).

As regimes of appropriability determine the incentives to invest in learning and innovation, they will thus influence the relationship between absorptive capacity and its antecedent knowledge sources (Cohen & Levinthal, 1990) and consequential performance outcomes (Zahra and George, 2002). Regimes of appropriability may exert either a negative or a positive influence (Todorova and Durisin, 2007) and would therefore inhibit or encourage the motivation of temporary organisation members to engage in learning activities within construction project networks by (dis)-incentivizing such acts. On the one hand, strong regimes of appropriability (e.g. were intellectual property rights are strong and where replication by competitors is difficult) will incentivise learning and innovation as the benefits of such innovation will accrue to the firms involved (Zahra and George, 2002). On the other hand, strong regimes of appropriability may also inhibit knowledge sharing and competitive spill over (Cohen and Levinthal, 1990) by limiting access to new knowledge. Knowledge and expertise sharing is one of the primary motivations to form temporary organisations, therefore we would posit that the benefits of weaker regimes of appropriability between temporary organisational members that allows them to engage in learning activities together would outweigh their fears of opportunism and loss of appropriation. Teece (1986) also recognises that tacit knowledge is difficult to imitate, and can lead to important competitive advantages such as flexibility, innovation and enhanced performance (Todorova and Durisin, 2007). Therefore, weaker regimes of appropriability may not dissuade engagement in learning activities in temporary organisations as they encourage temporary organisation members to develop tacit knowledge and greater transferability and adaptability of skills and knowledge.

> ***Proposition 1: Weaker regimes of appropriability will enhance the extent to which temporary organisation members engage in learning activities by creating incentives which enhance transferability and adaptability of skills and knowledge within the temporary organisation.***

SOCIAL INTEGRATION MECHANISMS

Social integration mechanisms facilitate connectedness and shared meanings between actors (Merali, 2000), determining how knowledge is employed within temporary organisations. Thus, learning processes in temporary organisations are facilitated by social integration mechanisms that draw actors together and serve as sources of network cohesion. However, the ability to identify and absorb new external knowledge can be hampered by the embedded knowledge, well-established capabilities, and traditional managerial cognitions of firms (Todorova & Durisin, 2007). Thus, learning in temporary organisations may be inhibited because traditional ways of working and thinking are firmly embedded and therefore blind participants to the opportunities present.

Learning processes in temporary organisation contexts will therefore rely on the use of social integration mechanisms to both introduce new knowledge (which may challenge existing knowledge) and to help integrate this knowledge into existing knowledge schema. Where the use of such social integration mechanisms allows the developing of shared cognitions between temporary organisation members it will have a positive influence on learning, as they allow the temporary organisation to develop greater cognitive consistency.

Proposition 2: The use of social integration mechanisms will positively enhance the learning activities of temporary organisation members by facilitating the continuity of project intentions and actions, and by assisting in developing shared cognitions between members.

POWER RELATIONS

Power relations are said to influence cognitive processes and learning and so should be considered as a contingent factor of absorptive capacity (Todorova & Durisin, 2007). At the network level, learning processes may be influenced by the allocation of resources (both inside an organisation, and between organisations and external markets and stakeholders), and thus power relationships help to explain why only some of the available new knowledge is used by the firm or network, and why some organisations are better able to exploit external knowledge from their network partnerships.

Power relations may also affect learning processes through their influence on the development of social capital within the temporary organisation. Social capital, defined as the social context (i. e. social ties, trusting relations, and value systems: Tsai and Ghoshal, 1998) which facilitate the actions of individuals within a social context, establishes paths for knowledge transfer as well as reciprocal learning (cf. Thibaut and Kelley, 1959). Therefore, power relationships will influence exposure to and the exploitation of new knowledge (Todorova & Durisin, 2007), ultimately influencing the extent to which learning takes place and social capital is developed.

Proposition 3: Power relationships in the temporary organisation will influence the learning activities of members by altering exposure to and exploitation of resources (e. g. new knowledge) and by directing the establishment of social capital within the temporary organisation.

Figure 1 highlights the three contingent factors that enable or constrain learning in temporary organisations. We now explain the methodology which underpins our data selection and collection, and our findings in relation to the propositions offered.

Figure 1 here.

METHODOLOGY

CASE STUDY SELECTION AND CONTEXT

We base our study of learning processes in temporary organisations through the exploration of two exemplary case studies of temporary organisations formed for the delivery of large scale construction projects. Sampling of these construction projects was theoretical (Yin, 1994) based on the opportunities they provided to observe learning processes in a temporary organisation. These cases were chosen for three main reasons. First, because of the scope and significance of the projects; in both cases they were substantial new-build projects (as opposed to the renovation, repair, or extension of existing buildings). Second, both included levels of innovation that challenged existing practices and technologies requiring new and innovative solutions to both construction processes and operational outcomes. Third, the nature of the contractual arrangement between the client and the build team was an important factor, as both were two-stage tenders. In a two-stage tender process, the technical proposals are separated from the fixed price which reduces the risk to the contractor. It also allows the contactor to engage with the design team at an earlier stage in the design process, and therefore provides learning opportunities that would normally not take place in a one-stage tender process.

Case study one, *OfficeProject*, was a project creating office space and conference and training facilities. The second case, *PowerProject*, related to the construction of a combined heat and power plant (CHP) for a large-scale institutional user. In Table 1 we summarise the key features of each case. The management teams were of approximately equal size on each project, and details are provided in Table 2.

TABLE 1
CASE SUMMARIES

	Case 1 *OfficeProject*	**Case 2 *PowerProject***
Value	£8. 5 million	£8 million
Purpose	Office accommodation and conference/training facilities	Combined heat and power generation
Supplier	A leading construction, development and services group in the UK. The group employs 11,400 people worldwide and has annual revenue of £2.1 bn.	A leading construction and regeneration group in the UK. The group employs over 8,500 people and has annual revenue of over £2,548 m.
Customer	Training and Education Provider	Large-scale site with district heating system to approximately 30 buildings.
Level of Risk	Medium, new variant of energy efficient construction technology previously used by this client in other buildings.	High, if successful this will be the first working CHP plant utilising this form of energy production technology in the UK.
Planning time frame	9 months in planning, this data was collected over the 24 month construction period.	3 years in planning, this data was collected over the 24 month construction period.

TABLE 2
RESPONDENT DEMOGRAPHICS

	Client Team (e.g. Project Director, Project Administrator	**Client Team Representatives** (e.g. Project Managers and their Quantity Surveyor)	**Design Team** (e.g. Architect, Mechanical and Electrical Engineers, Structural Engineers)	**Other Specialists** (e.g. Clerk of Works, Landscape Specialists, Acoustic Specialists)	**Contractor Team** (e.g. Project Managers, and their Quantity Surveyor)
OfficeProject*	3	3	4	5	3
PowerProject	3	1	5	5	4

* Some team members participated on both projects.

While the role of the client and other members in the wider network (e. g. sub-contractors and external stakeholders such as planning authorities) are no doubt important, we chose to focus our data collection and observations on the managerial and specialist designer temporary organisation members only (i.e. those on what is known in the construction industry as the design team). This provided a useful boundary in terms of learning processes as these are the temporary organisation members who met on a regular and frequent basis, both formally and informally, and who dealt directly with the practical issues and problems that arose in relation to the project design and construction.

DATA COLLECTION

The data collected for this study consists primarily of 45 in-depth semi-structured interviews and two focus groups conducted with design team members of two UK construction projects over a period of twenty four months. In addition, 14 design team progress meetings were attended (eight for *OfficeProject* and six for *PowerProject*). In each meeting official progress documents were collected and field notes were made. Together with the interview data these meeting observations allowed for a deeper understanding of the data and provided evidence of validity through triangulation. The interviews were conducted at the offices of the respondents and at the construction sites with respondents. The interviews

lasted on average 90 minutes and the focus groups lasted two hours or more; all were digitally recorded. The data were transcribed and coded using AtlasTI v6 software, following the coding procedure outlined by Strauss and Corbin (1998). The theme of the discussions focused on new knowledge exposure and the acquisition, interpretation, dissemination and utilisation of knowledge within the temporary organisation, following the work of Cohen and Levinthal (1990) and Todorova and Durisin (2007). A coding scheme was constructed based on these key aspects of learning in organizations. Open coding was used to identify data relating to learning processes within the two teams. The data were then examined for co-occurrence of learning related activities with aspects of absorptive capacity development.

In addition, during the course of the project we frequently drew on the expertise of a senior executive in the construction industry (who was not a member of either project team and was thus impartial) to help understand the issues arising from the data and our interpretations of them. This industry expert held a management board level position in a major UK construction company and had over thirty years' experience in the industry. Thus the observations of the researchers, together with the triangulation of data and the steps outlined below regarding validity and reliability, help give the analysis and conclusions greater legitimacy.

FINDINGS

CASE ONE (OFFICEPROJECT)

The *OfficeProject* remit was to create office space and conference and training facilities. Construction work began on-site in July 2008, after a planning stage lasting approximately nine months. The project design team involved eighteen members from nine different organisations.

OFFICEPROJECT REGIMES OF APPROPRIABILITY

One key environmental factor which encouraged the client to undertake the *OfficeProject* project was significant growth in their core business area. This necessitated an expansion of their facilities for both office staff and business activities. This lessened their concerns regarding the need for, and the specifications of, the building and the relative risk regarding cost. It thus altered their cognitions in relation to the project costs and benefits. The client was known to many of the design team members, including the main contractor, who had worked for this client previously. Therefore concerns regarding the contributions of these network partners was low. Most design team members commented in the interviews on the esteem associated with undertaking work for this client. The opportunity to further develop already established relationships and to be involved with a client who provided the possibility of further projects was also a key factor in motivating the organisations involved to bid for the job, particularly in the current challenging economic environment.

In terms of innovation, while this build was a fairly typical construction in most respects technically, it did involve the use of some specialist materials and build techniques that increased the building's energy efficiency. Enhancing their tacit knowledge and expertise in such sustainability technologies was seen as desirable by the construction companies involved. Finding opportunities to be exposed to such new knowledge was important in developing capabilities that could lead to a sustainable competitive advantage, as the contractor pointed out: *"When we work on tenders we're always looking at the best options to do something…. so we're constantly learning and we're constantly trying to find that edge that can make us stand out from our competition. We attend lots of seminars, lots of people come to us, to educate us. [the firm] is a very good trainer as an organisation, so there's lot of internal training."* However, it is the combination of this training with the practical experience that being part of the 'right' temporary organisation can bring in terms of

capability development, particularly in relation to addressing uncertainties, that guides decisions related to regimes of appropriability.

OFFICEPROJECT SOCIAL INTEGRATION MECHANISMS

One of the common actions used to help frame information observed in the project meetings was the use of technical drawings and diagrams to build a consensus of meaning between different technical disciplines. The training of engineers includes the ability to use technical drawings and to translate those into 3D mental models, thus they are able to envision the results of their actions. In meetings they often shared drawings and made impromptu sketches. Architects would draw sketches to illustrate their ideas, and the engineers would translate technical drawings into detailed solutions to specific problems. Technical drawings in particular were shared and discussed via email in order to ensure that the interpretation (or framing) of the information was understood correctly by those concerned and to provide an agreed blueprint for construction and an audit trail of design alterations. Individuals, however, differed in their approach to the envisioning of this information. Often, this was because their professional training created embedded knowledge, well-established capabilities, and traditional managerial cognitions which could hamper new ways of looking at information. For example, while the engineers tended to visualise technical drawings as 3D elevated models and could imagine how the finished structure would look, the architect talked about this as a potential weakness, commenting that in the technical visualisation of drawings there tends to be a lack of the more specific finishing details. He also stated that the engineers could not visualise the actual experience of being in the building. He recognised that to achieve cognitive consistency and a common framing of the information being shared, compromise was often needed. The architect commented: *"It is a balance of an emotive thing as well as a substance thing. I try and inspire people, but people join half way through and so I do what I do and try and listen and compromise if I have to, particularly if there are cost issues. "*

In addition to envisioning, face-to-face contact was also a vital part of their communication practices. It allowed the interpretation and framing of information by individuals to be compared to that of the others on the team and therefore made this process of developing a consensus of meaning less risky. This was one of the primary motivations for holding monthly face-to-face progress meetings, in order for individuals to enact their understanding through interaction. Both formal and informal settings for enacting were seen as important. While the more formal progress meetings gave everyone the opportunity to verify their own understandings with those of others, the informal site meetings were devoted to more practical and often very specific problem solving. The architect in particular welcomed involvement with the contractor and sub-contractors on site, and described how the different mind sets of the contractor (practical) and himself (artistic) could come together in a focused way through such interactions: *"It feels family friendly, like a conductor and an orchestra…. You would think we would not get on as he is trying to save money and I am trying to spend it …. But on this project we get on and all work together. It is one of the best working teams I have been on in a long time. "* The time and effort devoted to establishing a common aim through communication practices such as enacting and envisioning (in particular recognising and addressing the issue of framing information and understanding as an explicit part of the design process) would appear to have helped facilitate learning processes on *OfficeProject*.

OFFICEPROJECT POWER RELATIONS

Respondents recognised that there can be problems regarding ". . . *defending your expertise*" on projects. The structural engineer on *OfficeProject* stated that: ". . . *you can only*

go so far as a team, but on site, and at a greater level of detail, decisions may be made by individuals." This was echoed by the mechanical and electrical engineer who observed that one of the most common problems in the temporary organisations he had been a part of was: "… one which seems to come up is - I wouldn't say it's defending but it's almost defending your expertise because a lot of people - yes, everyone's got an expertise but they'll always try and sway it from their point of view and it's more a global one and it always comes in as an item." Thus personal integrity, both given and received, was a cogent feature in relations between team members.

One way to examine the power relations in this temporary organisation was to note its cohesion and range. Researchers have inferred the association between networks and knowledge transfer by observing the link between network structure and network performance (Reagans & McEvily, 2003). In particular, they focus on the role of cohesion (the extent to which a relationship is surrounded by strong third-party connections) and range (the extent to which network connections span institutional, organisational, or social boundaries) as facilitators of knowledge assimilation and transfer in networks.

The importance of cohesion in particular was evident in our discussions with the team members. One of the design team members (the mechanical and electrical engineer) described the early phase of the project, where the main design team members (i.e. the architect, structural and mechanical/electrical engineer) each have a fairly direct contact with the client and his appointed Project Manager. Once the design is developed to a certain level of detail, the contractor (who will build the design) comes on board, as do other project team members (e.g. building compliance officials). At this stage the temporary organisation has the membership it needs to become fully operational (i.e. the build begins), and has a greater range as it now incorporates a wider spectrum of temporary organisational partners and expertise.

This then changes the power structures of the team. The contractor describes this change as a tripartite structure, with the client and user group (those who will inhabit and use the building) as one side of the temporary organisation, themselves and their sub-contractor supply chain on the other side of the temporary organisation, and the client team (i.e. the architect, structural and mechanical/electrical engineer, etc.) in between. This then places increased importance on the Project Administrator and Project Manager, who act as cohesive agents between the two sides of the temporary organisation. Although there are some direct linkages between the client team and the contractor, by and large temporary organisation cohesion is facilitated by the Project Administrator and the Project Manager who forge ties between the members. Thus, they are instrumental in translating client wishes into construction activities. The relative complexity and greater range found in their individual network configurations may provide ways to challenge established practices, but also places them as key integrators in bringing cohesion to the temporary organisation overall. Without them, learning might be inhibited because of the limited cohesion between the client, the contractor, and the design team. Their network position infers power (cf. Burt, 1992), and highlights network position itself as a mechanism for learning. Researchers such as Burt (1992) have argued that network linkages enable and constrain the flexibility, autonomy, and consequently the effectiveness of organizational members. In fact, the role of the project manager and the project administrator would be to forge ties that connect knowledge from the client in terms of value sought with the actions and capabilities of the design team and the contractor in terms of what is needed to make that value a reality. Without them, both the client and the other temporary organisation members might not be able to identify and appreciate how to translate knowledge into value.

The relative isolation of one of the client representatives from the design team (the risk and sustainability manager for the client company) may have also inhibited learning. One design team member, reflecting on the progress of the project, suggested that more involvement of this individual in the project could have been useful. Because of this lack of involvement, decisions were made by the Project Administrator and the relevant design specialists to remove features related to energy efficiency from the intended design. Once this manager became aware of this decision, and because he considered these features to be key to the sustainability of the design, he approached the clients' Project Board directly who then revised the budget to allow for these design features to be included. This was not without some hard feelings on the part of the project team, who had not felt consulted about the problem prior to the manager approaching the Project Board. In describing his involvement with the project, the risk and sustainability manager described an extremely simplified and starkly hierarchical structure. In fact, their temporary organisation description highlighted their role as a boundary spanner between the client and the project team, but did not describe these constituents in any detail. In his own words, *"I seem to flit between the two.",* thus picturing the temporary organisation as three highly aggregated constituents (the client, himself, and the project team) but without the richness of ties that characterised network relationships with the project manager and administrator. It is possible that a greater sense of inclusion and participation with the project team might have enhanced the boundary spanning role of this manager in more positive ways.

CASE TWO (POWERPROJECT)

The *PowerProject* remit was to build a combined heat and power (CHP) plant for a large-scale institutional user which would eventually allow the client to provide up to 90% of its own electricity needs. On-site construction began in July 2008, having previously been in the planning stage for approximately three years. The project design team involved eighteen members from eleven different organisations.

POWERPROJECT REGIMES OF APPROPRIABILITY

The primary reason that the various design and construction team members wanted to be involved in the project was because it offered them the opportunity to collaborate in using innovative building methods and technologies, and in innovative team working processes. These processes allowed earlier involvement of the main contractor in the design process. Thus many participants felt that the project gave them a competitive edge over other supply chain competitors in terms of product and process innovation and key learning opportunities.

To begin with, appropriation concerns such as uncertainties associated with future specifications and cost uncertainties were strong. Considerable time was expended assessing the relative costs and feasibility of what was a new technology in the UK, hence the long lead time in the planning stage prior to commencing construction (nearly three years). However, changes in the relative costs of fuel (i.e. large price increases), the expansion of the business (and therefore an increased need), and the desire to be a "*low carbon emission leader*" led to approval for the *PowerProject* by the client. Thus regimes of appropriability changed the cognitions of the project initiators and made the project a more attractive investment for the client and the temporary organisation members.

At the same time, this delay in starting construction meant that all aspects of the design process were now under intense time pressure. This presented a problem on *PowerProject* because the innovative (and still emergent) power generation technology being used presented decision-makers with many uncertainties as the project progressed through each stage of design and development. This lack of detail presented many challenges to the design team, and directly contradicted their traditional construction industry practices. Thus,

adaptability of skills and knowledge within the temporary organisation was of even greater importance to overcome such time constraints and design vagaries.

POWERPROJECT SOCIAL INTEGRATION MECHANISMS

Unlike the *OfficeProject* build, the *PowerProject* construction operated as two distinct phases. In the first phase, the building (often referred to by the design team as the shell or the shed) was constructed. In the second phase, the power generation equipment was installed (referred to as the fit-out). This provided a number of issues for those managers co-ordinating the project, particularly in relation to enactment as a social integration mechanism. The Project Manager, who brings together all the areas of expertise in a co-ordinated manner, achieves this through regular face-to-face (monthly) design team meetings and a system of signing off at each stage of the design and construction process. Due to this need to meet face-to-face, design team temporary organisation partners were often located in the same geographical area (often in the same city, and sometimes in neighbouring buildings). On this particular project the shell construction design team members tended to be clustered in three reasonably close locations; one cluster was at the client site (the site of the build), another cluster was approximately 5 miles away, and a third cluster was approximately 70 miles away. Thus monthly progress meetings and interim site meetings for building the shell were generally well attended. Co-location helped to make enactment (through attendance) at these meetings possible.

The lead contractor for the power generation equipment fit-out was, however, located several hundred miles from the project itself. His specialist expertise in this particular power generation technology made it necessary to employ him. Nevertheless, the project administrator for the first phase of the project (building the shell) was concerned about the lack of availability and the distanced communication with the key fit-out contractor. He talked in one interview about the importance of face-to-face communication, even though there are detailed plans and drawings: "*It helps link understandings between people, and the lack of it is one reason why the project is so late*". He termed it a "*lack of intimate design review process*" and felt that it made them vulnerable. Thus, the tools used to facilitate envisioning cannot be used as substitutes for enacting.

In order to counter this vulnerability, there was a wide and ongoing consultation between the two teams (the shell and the fit-out teams) in order to know how to design the shell for the later activities of fitting it out with the power generation equipment. There were, however, some problems in getting the fit-out team to understand how to communicate and work with the shell design team. For example, the design team constructing the shell would know from the plans that they needed to provide an outlet hole in an external wall at a certain point. However, because the fit-out design team were still researching suppliers for the power generation technology, they were unable to specify in precise terms how big the hole had to be. The lack of these social integration mechanisms, both envisioning and enacting, between the shell and the fit-out teams meant that uncertainty became a common feature of the design process. In design team meetings we observed the ingenuity and dedication of the shell design team members in finding ways to build flexibility into these design gaps so that the problem could be resolved at a later date when the exact equipment specifications were known by the fit-out team. We also observed that there could be frustration by those designing and building the shell as they may have had to contend with questions left unanswered (lack of enactment) and details missing by the fit-out team who at times did not seem to understand the implications of this lack of information (a lack of envisioning). This frustration could be compounded by the geographical distance between the two teams, which prevented the attendance of the main fit-out contractor at the monthly progress meetings of

the shell design team: an example of the real problems that a *lack* of social integration mechanisms can precipitate.

POWERPROJECT POWER RELATIONS

At certain times there were considerable strains on relationships that required resolution. The geographical distance between the shell team and the equipment fit-out team created issues. There were pressures from outside the temporary organisation as well. As this power plant was to be close to residential buildings, the local authorities insisted on stringent sound restrictions. The building had to emit no more sound than that measured on the site at 2 am on the day the measurement was taken. If this restriction could not be met, then the plant would not be allowed to operate. Given the unknowns of the technology being employed, and the sometimes lack of detailed design information from the fit-out team, this posed a considerable challenge to the shell design team. What might have been simply a large scale garden shed now had to act more like a sound booth. This constraint caused the shell design team to – in their own words – "*over engineer*" the solution. Working with the contractor they had to create new ways to guarantee sound emission levels, even in the face of so many unknowns. They thus needed to both respect the expertise (and authority) of the local planning department and meet their requirements, and to find ways to defend their own expertise to the planners. One way in which they did this was to conduct sound tests on a model of the build to demonstrate to the planners that the requirements could be met. As one of the engineers commented: *"so … testing on that smaller scale gave enough confidence that actually it was going to be okay."*

While this requirement did place design constraints on the build, the respondents commented on the positive side of this kind of cooperation in the temporary organisation, and how it built respect for each member's expertise. A member of the contractor team discussed how emotionally he felt more engaged with the project as part of the two-stage tender process where his input was sought at an earlier stage of project development. They and their subcontractors were treated as an integral part of the design process, as opposed to a more traditional one stage tender process where they would only become involved after the majority of the design work had been completed. This was not without its problems as the tensions felt in the early stages of the project because of mis-matched expectations caused some friction on the team. However, as the respondent explained, having worked through such tensions and established more co-operative working practices than might ordinarily have been seen on such projects, the resulting integration and closer relationships dramatically improved the situation and now the working relationships were seen as happy.

DISCUSSION

Based on the findings presented, we next consider the three contingent factors of absorptive capacity; specifically identifying how and where these influence learning processes in temporary organisations.

REGIMES OF APPROPRIABILITY

We identified two mechanisms that acted as facilitators for learning processes in temporary organisations in relation to regimes of appropriability; altered cognitions and addressing uncertainties. These mechanisms could support learning processes and enhance value for the project participants through the development of greater adaptability and transferability of skills.

ALTERED COGNITIONS

While the exposure to innovative technologies was more limited on *OfficeProject* than on *PowerProject*, the use of more innovative design and team working processes (e. g. two-stage tendering) did allow those in the temporary organisation to develop working practices which they felt were valuable in current and future projects. For *OfficeProject* in particular the tight timeframe for completion of the build meant that design time for each aspect of the build had to be reduced, thus requiring increased co-ordination and co-operation between the design team members. Greater face-to-face contact and use of informal communication was how many of the temporary organisation members said they coped with the need to share understanding and engage in coherence-driven cognitive processing under such time pressure. Thus, weaker regimes of appropriability allowed these temporary organisation members to combine their current knowledge and expertise (i.e. antecedent knowledge sources) with practical experience that then challenged their traditional working practices and allowed them to develop greater capabilities for co-ordination and co-operation, leading to altered cognitions (i.e. consequential performance outcomes).

Although time constraints were also a factor on *PowerProject*, the primary motive for participating was the opportunity to engage in a project that used novel energy generation technologies (i.e. recognising the value of acquiring new knowledge). This novelty prompted several members of the design team to visit a similar project that was being attempted several hundred miles away, prior to the start of construction on the *PowerProject*. Although not yet functional (the other project was already one year behind schedule), the external building had been erected and some energy production equipment had been installed. Having reviewed the problems being faced by this project, the design team members on *PowerProject* then immediately sat down in a local café and totally redesigned the layout of the proposed building and internal equipment. This experience had a powerful and potent effect on the rest of the build process on *PowerProject*, as the act of physically seeing for themselves the problems facing the other project helped them to recognise potential issues and problems. Perhaps more importantly, it gave them increased confidence that they could rise to such challenges and successfully complete their project. It altered their thinking about how the project should proceed, and thus enhanced the adaptability of their skills. This experience had a significant positive influence on the extent to which temporary organisation members engaged in learning activities and improved their performance outcomes by alerting them to prior problems and mistakes on a similar project.

Hence, actors in both projects were compelled to alter their cognitions concerning how the project would be successfully completed based on their exposure to innovative working practices, flexible building techniques, and new energy sustainability technologies. This exposure to new practices, techniques, and technologies (i.e. a sign of weaker regimes of appropriability), allowed altered cognitions which acted as an incentive to greater transferability and adaptability of skills and knowledge in the temporary organisation, as posited in our first proposition.

ADDRESSING UNCERTAINTIES

The innovative nature of *OfficeProject* resulted in uncertainties concerning the completion of some design and build tasks (e. g. sound insulation proved a challenge, as traditional methods would have interfered with the innovative heating and temperature control system used in the building), ultimately forcing the project team members to challenge their thinking and traditional working practices. However, facing such problems and challenges when regimes of appropriability are weak and allow better coordination and cooperation was seen as a benefit to learning by the contractor: *"Oh yes, [problems are an important part of learning]. We like a problem. And if you crack a problem, you get a real lift off it, you know, that's a real high because … the bits that go well, go well don't they? You*

don't have to worry about them." As already noted, on PowerProject the act of visiting a similar project helped them focus their attention on specific areas of uncertainty that were proving to be difficult. Because this took place early in the design process, and prior to the start of construction, the subsequent effect was to reduce uncertainty on the *PowerProject* and to encourage the client to approve the project go-ahead. As a consequence of these challenges, project team members benefited from having to adapt to circumstances; offering them the possibility of leveraging or transferring this 'new' learning in future projects.

As stated in our first proposition, we can see from these situational factors that there were strong incentives and motivation in each case for the two projects to take place and for those involved to be fully engaged with the learning processes in their respective temporary organisations. Nevertheless, there were significant challenges to these learning processes and therefore the incentives provided by weak regimes of appropriability proved to be a necessary, but not sufficient, condition for temporary organisation formation and learning.

SOCIAL INTEGRATION MECHANISMS

We identified two mechanisms that acted as facilitators for learning processes in temporary organisations in relation to the social integration mechanisms employed. Firstly, the communication practices of envisioning and enacting, which influenced cohesion and learning. Secondly, the way in which convergence and divergence of understandings affected the continuity of intentions and actions through forming interpretive schemes.

COMMUNICATION PRACTICES OF ENACTING AND ENVISIONING

The availability of communication opportunities to enact and envision were seen as an important factor in allowing the temporary organisation to engage in learning processes in both projects studied. Substantial informal, as well as formal, communication took place between the temporary organisation members. This enactment allowed not only faster progress on the builds, but also helped to integrate diverse understandings and solve problems. Where enactment was lacking, as seen between the two aspects of the *PowerProject*, cohesion suffered and uncertainty became a normal feature of project interactions.

In the design team meetings envisioning and the framing of understanding through the use of technical drawings, progress reports, and gant charts were important tools to convey tacit understanding and to gain cognitive consistency. Often, immediately following a formal design team progress meeting, individuals would go onsite and discuss issues that had arisen in the meeting, thus transferring enacting from a formal to an informal setting. By situating their enacting on the building site itself and engaging with the activities of the actual build, they were able to overcome many of the limitations or miss-understandings that might have arisen in the meeting where envisioning with communication tools such as drawings were used. As previously noted, even technical drawings are interpreted differently by different team members, and the most powerful and effective unifying communication tool was often the building itself. Thus, both enacting and envisioning can be situational and context dependent.

FORMING INTERPRETIVE SCHEMES

As we have seen, even where face-to-face meetings were attended (enacting), interpretive issues arose (envisioning). Thus, we have a paradox. Even if individuals disagree about their interpretive pictures (or communication content), they may still converge around a framework that is broad enough to encompass those differences (Fiol, 1994). Thus convergence need not be complete in order to facilitate understanding and guide action. Giddens (1984) would describe this as the interpretive scheme, and would see its role as

helping individuals to share in a common stock of knowledge without the need to assume that those individuals have common meanings and values which are somehow – at the level of the organization – identical and replicable across space and time (Boland, 1996). Thus a shared sense of team goals may help ensure that project outcomes are as intended.

Facilitating continuity of intentions and actions on projects that span organisational and professional boundaries means that the development of these interpretive schemes is important. These interpretive schemes allow for sufficient flexibility in understanding between the members of a temporary organisation which helps to ensure a continuity of intention and action. On both projects, relationship building through informal events (as well as formal meetings) was used to develop interpretive schemes. We have already recognised the importance of the site visit to another similar project by the PowerProject team and how this unified the project members. On *OfficeProject* the contractor organised a charity project where the design team members spent a day building a nature walk for a local school. This team-building day helped to build stronger personal relationships and a greater sense of common purpose on the *OfficeProject* build. On both projects informal relationships were encouraged and developed between the respective team members, many of whom had worked together on other projects in the past. These social relationships acted as powerful facilitators for the continuity of intentions and actions on the project. We therefore see, as posited in our second proposition, that social integration mechanisms such as enacting, envisioning, and forming interpretive schemes help maintain a continuity of project intentions and actions, and assist in developing shared cognitions between temporary organisational members.

POWER RELATIONSHIPS

We identified two mechanisms that acted as facilitators for learning processes in temporary organisations in relation to power relationships. These were respecting and defending expertise, and forging ties. These mechanisms help provide the benefits of building social capital within the temporary organisation, and establishing network characteristics such as cohesion and range.

RESPECTING AND DEFENDING EXPERTISE

Several respondents raised the issue of defending both personal and professional expertise and how this reflected power relations within the team. In relation to professional expertise, the team elicited and respected different points of view, as each team member had the role of providing specific expertise in their area. There were occasions in progress meetings when sense making tools such as drawings, and sometimes site visits, were used in order to make clear the implications of actions and decisions from a multitude of perspectives. This could, however, lead to competing perspectives that needed to be reconciled and accommodated. For example, *OfficeProject* required the acoustics engineer and the structural engineer to collaborate to plan how the large open presentation space could function, given that the sound insulation - normally placed on the ceiling - would compromise its thermal insulation.

FORGING TIES

Individuals may seek to enhance their power within a network by forging ties with two or more unconnected others, thus creating indirect ties between the people with whom they are linked (Burt, 1992). We observed that network position allowed actors (e. g. the Project Administrator in particular) to act as knowledge brokers in both temporary organisations. Consequently they were able to broker the relationship between otherwise unconnected temporary organisation members. This made them particularly valuable in terms

of their ability to facilitate knowledge transfer and bring cohesion to the temporary organisation through their more extensive network horizon. The network horizon of an individual is determined by how much information they have about the network structure (Diederik, Koppius and Vervest, 2008). Diederik et al. argue that those with higher network horizons occupy a stronger bridging position in the network. They are therefore better placed to forge the ties that facilitate the exploitation of knowledge in the network.

Forging such ties was a key element in achieving the homeostatic state of balance referred to by Simon et al. (2004). It was often these ties that allowed a bidirectional relationship of change and adjustment between evidence and conclusions between project team members, and facilitated coherence-driven processing. Achieving this involved both relationship scripts (which filter new information to determine its relevance to existing knowledge) and relationship enactment (where relationship schema are linked to action). As important links between temporary organisation members, these individuals had real influence over relationship script filtering processes and how these were then enacted. These processes help to embody social capital and to link individual and collective learning (Merali, 2000). We therefore see, as stated in our third proposition, that power relationships influenced learning by altering the exposure to and exploitation of resources and by directing the development of social capital within temporary organisation relationships. We summarize in Table 3 our three propositions, the related aspects of learning, and the associated learning benefits.

TABLE 3
CONTINGENT FACTORS OF LEARNING PROCESSES IN TEMPORARY ORGANISATIONS: SUMMARY OF FINDINGS

Contingent factors	Mechanisms facilitating Learning Processes	Learning Benefits
P1: Weaker regimes of appropriability *will enhance the extent to which temporary organisation members engage in learning activities by creating incentives which enhance transferability and adaptability of skills and knowledge within the temporary organisation.*	• **Altered cognitions** Exposure to innovative project, technologies and/or team-working/processes. • **Addressing uncertainties** Challenging thinking and require new rather than traditional methods of working.	- Adaptability and transferability of skills and knowledge.

P2: The use of social integration mechanisms *will positively enhance the learning activities of temporary organisation members by facilitating the continuity of project intentions and actions, and by assisting in developing shared cognitions between members.*	• **<u>Communication practices of enacting and envisioning</u>** Framing problems, solution finding, conveying information. • **<u>Forming interpretive schemes</u>** Addressing convergence and divergence of understanding between temporary organisation members.	- Developing shared cognitions. - Continuity of intentions and actions.
P3: Power relationships *in the temporary organisation will influence the learning activities of members by altering exposure to and exploitation of resources (e. g. new knowledge) and by directing the establishment of social capital within the temporary organisation.*	• **<u>Respecting and defending expertise</u>** Establishing credibility in the temporary organisation. • **<u>Forging ties between actors in the temporary organisation</u>** Actors act as knowledge brokers by providing a bridge between unconnected actors.	- Developing social capital within the temporary organisation. - Exposure and exploitation of resources through network cohesion and the range of the network horizon.

CONCLUSIONS AND IMPLICATIONS

The purpose of this study was to understand how contingent factors such as social integration mechanisms, power relationships, and regimes of appropriability are able to influence the participants in a temporary organisation in terms of their willingness and ability to engage in learning processes. Our contribution increases our understanding of how these contingent factors operate, and how in a temporary organisation context learning may be both understood and facilitated.

Our findings emphasise the importance of weaker regimes of appropriability that provide powerful motivations for members to support learning in temporary organisations. As environmental factors change so too do the relative cost and benefit assessments of coordination and cooperation in temporary organisations. Thus learning in temporary organisations may be facilitated, enhanced, discouraged and/or disrupted by factors both inside and outside the temporary organisation and the immediate control of its members. In particular, the mechanisms of altered cognitions and addressing uncertainties act as contingent factors in helping temporary organisations to enhance the adaptability and transferability of skills and knowledge.

We saw evidence of the importance of social integration mechanisms such as the communication practices of envisioning and enacting. These mechanisms allowed the temporary organisation to develop a shared language through mediums such as technical drawings and industry standards, and to enact understanding in face-to-face meetings, which helped to facilitate learning through developing shared cognitions. However, the forming of interpretive schemes through the establishment of a shared framing of knowledge and information by temporary organisation partners is also critical in learning processes to help ensure a continuity of intentions and actions.

Lastly, power relationships were seen to influence both exposure to, and exploitation of, new knowledge. The extent to which actors can defend their expertise, respect the expertise of others, and forge ties with other actors within a temporary organisation has implications for the degree to which learning can take place. Learning is also contingent on

the extent to which they actively pursue the building of social capital and are able to facilitate exposure to and exploitation of resources through network cohesion and range with their temporary organisation partners.

The findings of the study provide a number of useful directions for future research that merit investigation. Firstly, research in other (contrasting) industries should shed further light on the regimes of appropriability, social integration mechanisms, and power dependencies that are more industry specific. The extension of our understanding of learning processes in temporary organisations by the application of alternative network related theories to those utilised in this study (e. g. contagion, homophily), as well as drawing upon other literatures (e. g. collaborative learning) would also be welcome.

The limitations of our study reside primarily in its reliance on inductive methodology, and therefore its limited ability to generalise to other construction industry relationships and to other industries. However, as an exploration and illustration of how temporary organisation partners learn, the issues raised should be of interest to researchers in the area of knowledge transfer, learning, and innovation. The data collected and presented in this paper should be of value in guiding further empirical research in these areas.

We see this study as offering a number of useful implications for managers. By examining two complex project temporary organisations we have identified a number of practical ways by which firms can facilitate organisational learning through their interactions with temporary organisation partners. Learning in temporary organisations can be significantly enhanced when members are cognisant of the incentives for investing in learning and innovation (regimes of appropriability), the means by which they are connected within a temporary organisation and create shared meanings (social integration mechanisms), and the learning process they engage in (power relationships).

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FIGURE 1: CONTINGENT FACTORS IN LEARNING PROCESSES