

THE INNOVATION JOURNEY IN CONSTRUCTION – THE COMPLEMENTARITY OF FORMAL AND INFORMAL DYNAMICS

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Abstract

The construction sector is often identified as less innovative than other industries due to its project-based character and the lack of long-term relationships. This problem is suggested to originate from the disconnection between the temporary project environment and the permanent organization of firms. The paper addresses this disconnection through the following research question: *How can construction firms capitalize on new ideas and solutions across local and global company levels and their temporary and permanent networks in generating innovation?* While IMP studies highlight the key role of interaction and high-involvement relationships in innovation processes, few studies provide an in-depth analysis of how these innovation processes transcend different organizational levels: i.e. from project level to firm level and vice-versa. The community-of-practice literature focuses on the individual and group dynamics and hence provides complementary insights to innovation in networks. The paper draws on a critical case which we use to develop IMP theory, specifically contributing to innovation in networks. The results highlight that innovation in construction requires a connecting mechanism between top-down (global firm level) and bottom-up (local firm and project level) processes for idea development to turn into company-wide knowledge and practices. In this regard, communities of practice can play a key role in functioning as “vessels” for ideas and knowledge in both directions. However, formal hierarchical structures and business networks are then required for new solutions to turn into widespread innovation

INTRODUCTION

The construction sector is often described as lacking innovativeness and long-term relationship development (Bygballe et al., 2010; Harty, 2008). While projects are innovative arenas for new ideas due to their one-off and interactive nature, these innovative project solutions are seldom turned into widespread innovations (Winch, 2014; Dubois and Gadde, 2002a; Brady and Davies, 2004). This generates a waste of resources (Crespin-Mazet et al., 2015; Havenvik et al., 2016). Therefore, creating better connections between their local-project level and their global-firm level (Pemsel and Widén, 2011) constitutes a key issue for construction firms. Our research tackles this issue by focusing on ‘internal networks’ in construction (Ballantyne, 1997; 2000) and addresses the following research question: *How can construction firms activate their internal networks to turn local, project-based ideas into solutions widely adopted at the global level?*

We mobilize the complementary research streams of IMP literature (interactive learning mechanisms and role of networks in creating and diffusing innovation) and the community-of-practice (COP) literature to review how innovation processes transcend different organisational levels within an existing firm (Bygballe and Ingemansson, 2014). The COP literature shares the view that learning and innovation are situated with IMP scholars, i.e. dependent on the specific context in which they take place (Lave and Wenger, 1991). It considers *communities* as a way of initiating and spreading learning and innovation both within and across the firm’s boundaries. In this view, innovation involves the enactment of practices and determination of meaning by the various actors involved in this process. Several authors demonstrated the relevance of this social theory of learning for construction (e.g. Dubois and Gadde, 2002a; Bresnen et al, 2003; Sergeeva, 2017). Based on an in-depth case study in the French construction industry, our research reveals how an original idea that originated at the local firm level was progressively embraced and developed by a local *community of practice* (COP) and then further diffused and enriched by various other local COPs to become a company-wide offering enacted by top management.

LITERATURE REVIEW

The interactive nature of innovation - The IMP perspective considers innovation as interactive and collective processes where knowledge is created through new combinations of existing knowledge (Håkansson and Waluszewski, 2007). Through interaction, actors make various resource adaptations that favour the adaptation of their innovative solutions to their context of use (e.g. Ingemansson, 2010; Linné, 2012); this process also highlights the benefits that users can derive from their implementation (Harrison and Waluszewski, 2008). In this context, innovation and knowledge development are highly related to existing interfaces and relationships and depend on the context in which they arise. This literature also highlights that the materialization of a new idea in a widespread product, requires that it fits into systems of already existing solutions (Håkansson and Waluszewski, 2007; Harty and Araujo, 2009), more specifically into a developing setting, a producing setting and a using setting. Innovation is seen as the result of interaction processes in which new *resource combinations* are confronted, combined and eventually found beneficial from the standpoint of several different actors (Håkansson and Waluszewski, 2007; Ingemansson and Waluszewski, 2009).

The importance of internal networks for innovation - Internal networks are defined by Ballantyne (1997: 361) as: “*open organisational systems within host organisations whose members are connected to each other by choice, and through complementary patterns of cyclical activity, for the legitimate purpose of creating and circulating knowledge to the host organisation*”. In this perspective, internal networks mostly emerge informally through

“*spontaneous community behavior of employees*”. Several scholars have emphasized the importance of such internal relationships and networks for innovation as they develop the firm’s collaboration capabilities (Blomqvist and Levy, 2006), particularly in geographically-spread firms (Colombo et al., 2011). They involve different levels of relationships both within the firm (individuals, units, teams, and projects) and outside the firm (e.g. external networks with customers and suppliers). While this literature review highlights the importance of internal networks for innovation, it provides little detailed insights on the social dynamic supporting bottom-up innovation processes across the firm’s various organizational levels i.e. across its local, corporate and global structures. We therefore turn to the community of practice literature - COP - (Wenger, 1998) to enrich our understanding of the internal social dynamics and practices supporting innovation processes identified in the construction firm analyzed in our case study.

A Communities-of-Practice (COP) view - COPs are defined as autonomous, self-emerging and ‘*tightly knit*’ groups (Brown and Duguid, 1998) whose members share the same practices and values. Their members learn by engaging in frequent, social, face-to-face interactions and by working side-by-side (Wenger, 1998) with the objective to develop the competences in a given practice. After having emerged to study learning among individuals, the notion of COPs has been applied to professional contexts to explain learning and knowledge sharing at work (Lave and Wenger, 1991; Brown and Duguid, 1991). It proved adapted to reflect learning and innovation dynamics within firms (Sarazin Cohendet and Simon, 2017).

Learning through communities relies on two complementary processes (Wenger, 1998):

- *Participation process*. A COP has an identity defined by a shared domain of interest (mutual engagement). Membership to a COP implies a commitment to the practice and a shared competence that distinguishes members from other people. In pursuing their shared interest, members commit to engage in joint activities (joint enterprise), to help each other and share information. They are mutually engaged to sharing, questioning and negotiating the meaning of their individual experiences. Thanks to participation, members constantly update ideas, sustain a common purpose, and create a sense of *shared identity*. A member becomes central in the community and consolidates its identity thanks to its recognized expertise. This legitimacy enables her to create boundary relations with external networks (i.e. actors that transcend their community boundaries and develop relationships with external actors). They then become and act as “*boundary actors*” or “*brokers*”.
- *Reification process*. As practitioners, members of a COP ‘freeze’ their practice-based knowledge in a shared repertoire of resources consisting of various elements such as a common vocabulary, a set of tools, methods, objects, products, artifacts or ways of addressing recurring problems. Its various elements form ‘*boundary objects*’ that can facilitate *brokering practices* when COP members exchange with other communities, external actors and networks (Wenger, 1998, 2002). The links between COPs (brokering) can be established through different *boundary relations* (types of connections) including boundary practices, boundary objects, brokering and boundary encounters. Brokering knowledge means more than moving knowledge; it also means transforming knowledge.

Hence, through the sharing of common practices and experiences, COPs support the capture, diffusion and transfer of knowledge and learning between individual actors (Bresnen et al., 2003; Winch 2014). These informal structures seem particularly adapted to the sharing of tacit knowledge (context, social elements) embedded in the daily practices and routines of projects staff in construction. The concepts of network and communities seem complementary to tackle our research problem. While the concept of internal network places emphasis on the relationships, bonds and personal interactions among colleagues involved in innovation; the

concept of community places emphasis on the development of a *shared identity* around a topic and a collective intention. Hence, a community involves a network of relationships and networks exist because members are committed to a joint enterprise.

Table 1. Key elements forming the conceptual framework that inform both the analysis of our case study and the discussion of its main theoretical insights.

Organizational level of actors involved in the innovation process	<ul style="list-style-type: none"> - Local level: the innovation is developed or adopted by actors belonging to one region or geographical unit - Multi-local: the innovation is developed or adopted by actors belonging to more than one geographical unit (2 minimum) but does not spread to the entire organization - Corporate level: the innovation is developed or adopted by actors belonging to the firm's HQ - Global level: the innovation reaches widespread use within the firm, adopted by a variety of actors in the entire organization and is formally embedded in the firm's global practices
Boundary objects	<ul style="list-style-type: none"> - Various resources used by COP members to organize their interconnections and relationships such as: "Artifacts, documents, terms, concepts and other forms of reification" (Wenger, 1998, p. 105) - Resources maybe transformed in the interconnection process
Boundary actors or brokers	<ul style="list-style-type: none"> - Individuals able to make connections across COPs or external actors, who enable coordination and open new possibilities for meaning - Individuals who introduce elements of one practice into another (brokering)
Boundary encounters	<ul style="list-style-type: none"> - One-on-one conversations between individual members of different communities - Immersion: when members of a COP visit members of another COP (visit of a practice) - Delegation: meeting involving several participants from each COP

METHOD

The research process corresponds to an 'abductive' approach as it involved systematic combining (Dubois and Gadde, 2002b) through a continuous combining of empirical insights with existing theory from different fields. The conceptual framework mixing IMP and COP insights was developed simultaneously with the assessment of the empirical findings and, as such, was both a result of the case study and a way to analyze it.

Case selection and analysis - Our research is based on one deep single case, viewed as a critical case (Koenig, 2005). We selected the case for its insights regarding the complementary dynamics of its internal networks and COPs in innovation processes across the firm's various organizational levels (local, multi-local, corporate, global). We used the retrospective and analytical case study strategy (Yin, 2003) to organize the data collection and analysis, with respect to the complexity and the richness of the data analyzed. We first elaborated the chronology of the case by identifying main actors, resources and activities involved in each phase of the development of the innovation, and synthesizing the interpretation that actors gave to events and behaviors, leading to the development of a thick description of the story (Balogun and Johnson, 2004). We then analyzed the case based on our conceptual framework (table 1).

CASE STUDY

Stage 1 - A first-of-a-kind partnering project: a local 'innovation' gets lost

In early 2000, a British investor requests Spie batignolles to apply partnering to the renovation of a luxury hotel - a method considered as extremely innovative in France at the time. The local team of Spie batignolles (the south-eastern unit) accepts to take over the challenge and to learn

to apply this method on this First of the Kind project. At the end, they acknowledge the positive outcomes of this innovative experience for all the parties: the project is delivered at required performance level (cost, quality, delays, margin) – an achievement that could not have been obtained under a traditional contracting mode. The success is reported internally but the local unit does not build on this experience to modify its practices on other projects.

Analytical points - All local project-led learning was lost, thus pointing to the well-known difficulties in generating bottom-up innovation processes (Winch, 2014). The lack of formalization of project innovative practices (reification processes), as well as the autonomy of each local business unit (limited internal events supporting internal network development), limited opportunities for further internal diffusion and exploitation.

Stage 2 - When partnering comes back through the firm's headquarters

After their merger with AMEC, the corporate Sales VP of Spie batignolles hears about the benefits of partnering from their new British partner (costs savings, reduced delays and margin). As this approach echoes his experience, he decides to adapt it to the French market. After having drafted the operational guidelines of this method (called Concertance) and a partnering contract with corporate managers (Strategy and Innovation & legal managers), they ask regional units to promote it towards their customers. However, this was far from sufficient to ensure their adoption due to the drastic change of practice that this method involved. Many local teams, used to arm's length negotiations expressed some doubts on the relevance of sharing costs with customers (especially with public customers) and thus continued to do 'business as usual' resulting in failure of adoption. *"The problem is that we have people who think up there at headquarters but that really have no clue about what commercial reality is about. It is purely non-saleable"* (a salesman).

Analytical points - This second episode highlights the failure of the top-down approach where the innovation developed by the firm's corporate level fail at being implemented on projects. In this initial framing, Concertance simply did not fit into the context of use of local units. This lack of meaning generated their lack of active participation and engagement into practices of adoption of the innovation (to the exception in the south-east region).

Stage 3 - Emergence of a local COP around the innovation (Concertance)

In the South-East region its local manager first envisioned the interest of this approach as it echoed their recent experience on the luxury hotel project and seemed adapted to their foreign customers in the French Alps. After the failure of their first attempts at selling Concertance, he concludes with his team that Concertance requires more precise targeting. During several meetings, 9 colleagues review 20 projects and share their experience with Concertance (2 salesmen refused to cooperate). Through this process, they develop a more precise understanding of the market adapted to this approach. This learning started paying off and the team signed its first Concertance contracts on two complex projects. Based on this experience, they saw its benefits for several parties including the customer (increased satisfaction) and project partners (less conflicts), while internal teams expressed an internal satisfaction to work in a collaborative mode. Based on these results, 7 colleagues from another unit in the same region joined the collective reflection (10 new projects reviewed).

Analytical points - This is how an internal COP took shape. The sharing of their experiences on Concertance (*participation process*) enriched their selling practice (better understanding and qualification of local customers). The local COP went through a *process of translation* of the approach. The innovative idea only started making sense when the teams actively engaged into its adaptation to their context of use. The first products of the COP consisted of a customer segmentation with a grid to qualify customers and projects directing their market practices.

These *products of reification* served as a basis to train new salespeople and enabled to sign the first Concertance contracts.

Stage 4 - Concertance spreads to several local COPs (multi-local level)

During corporate events (sales conventions, trainings), several of local COP members shared their success on Concertance with colleagues from other regions. Two groups from the North and the West showed their interest in learning more from them. After several telephone discussions, emails, documents exchange and informal meetings, the colleagues of these 3 units (20 people) organized a two-day seminar to share their reflection and practical tools (power point presentations and Concertance brochures). As a result, the western and northern COPs decided to segment their customer portfolio and started modifying and enriching the tools developed in the south-eastern COP (suggesting for example to involve the project manager earlier in the sales process). The corporate sales manager at HQ was informed.

Analytical points - This stage illustrates various forms of *boundary relations* enabling the members of the local south-eastern COP to cross the organizational boundaries of their geographical unit and to transfer their knowledge to other geographical units (North and West). This episode is characterized by several types of *boundary encounters* starting from *one-on-one conversations* between salespeople and *immersion* when local team members from the North visited their colleagues from the south, and to complete *delegations* during the 3-day seminar (20 people). These encounters were facilitated by the tools (*reification work*) designed by the first COP (segmentation and customer qualification grid) which acted as *boundary objects* in the firm's *internal network*. These boundary relations favored the creation of two new local COPs (in North and West) emerging thanks to the active engagement of an increasing number of local project teams in adapting Concertance to their local context.

Stage 5 - Concertance® becomes institutionalized

Several project managers and construction supervisors joined the Concertance communities and enriched its method with new execution tools and interaction methods with customers (how to practice open book, organization and decision-making processes). The lack of training of "Project Managers" and the lack of precise definition and scope of their function was highlighted and having spent, several months on defining the new function and a training program they asked corporate management to enact their common work. The sales teams requested 'official Concertance® brochures and sales presentations'. As a result, top management appointed Jacques from the corporate marketing team to the task. Due to long experience, Jacques benefitted from high internal legitimacy and was well positioned to coordinate exchanges between local COP members. He gathered all resources developed by each COP (common repertoire) and created a formal reference guide and data base that could then be used throughout the company (top down approach). Thus, local-based and informal knowledge progressively became both formal and global. Based on this work and the recognition of its value both internally (motivation, improved sales and margin) and externally (increased customer satisfaction), top management decided to brand this innovative method. Today, the Concertance® brand is well-established and its method stabilized. It is part of the company's offering development project portfolio and promoted through the corporate web site.

Analytical points – So far, the exchanges and learning on Concertance® had mostly been carried out at the local level between various COPs (constellation of COP level). This stage marks the first involvement of top management with their official and formal support, reflecting the development of the innovative method (Concertance®) at the global firm level. The case highlights the key role played by Jacques in this bottom-up process including centralizing the exchanges of the various community members in the different regions (*boundary encounters*)

and reifying varied practices in a unified form. Due to enabling coordination and homogenization of local practices Jacques became a *boundary actor (broker)* between the various local COPs. Moreover, he stimulated *boundary practices* by bringing the various practices of local COPs together and identified a common base framing the corporate innovation. Once this local knowledge reified, Jacques could build on its corporate legitimacy and disseminate this knowledge to all geographical units for a more systematic use. This stage thus marks the embeddedness of the innovative method into the firm's global practices.

DISCUSSION

The case reflects how a new idea develops through interaction processes stretching various levels of the firm and involving informal communities, internal networks as well as formal, corporate resources.

By highlighting the failure to establish an innovation from a local bottom-up approach, stage 1 of the case confirms existing literature stating that new ideas hardly find their way outside of individual construction projects (Miozzo and Dewick, 2004; Brady and Davies, 2004). The opposite top-down approach depicted in stage 2 generates a similar failure: the corporate idea does not raise enough 'meaning' to local staff members as they do not see how it can be adapted to their local contexts of use (Waluszewski, 2011).

In stage 3, the case shows that it is only when the idea is taken up informally by few local staff members that the transformation of the idea into an innovation takes off. These individuals share their vision and experiences about this innovation (participation) and progressively engage in processes of translation, adaptation, testing and reification of the idea. They form a local community of practice -COP- which uses and reifies its project-based learning to improve their performance on other projects. For example, thanks to its qualification grid, the sales team could more easily identify customers opened to partnering and could be more accurate in their sales targeting. Thanks to this adaptation, the innovation moved from a one-shot invention/idea developed locally to the internal network of the local sales team (first diffusion of the innovation within one region).

Stage 4 is characterized by the growth of the staff members taking the Concertance innovation on-board. This diffusion first rests on the firm's *internal networks* facilitated by corporate internal events (initially sales networks) where by the innovation acquires internal renown and interest in the group. This in turn favors the emergence of new local COPs (individuals willing to use and adapt the approach to their own context). The innovation process then relies on several forms of brokering and boundary relations across local COPs which enable the local project-based knowledge to cross the natural boundaries existing between the firm's geographical units: boundary encounters but also sharing of boundary objects (products of reification) or boundary practices when members from different COPs try to bring their practices together. Here, the idea diffuses from one local COP to several local COPs and is further enriched. The innovation dynamic thus lies in a constellation of communities of practice taking care of specific aspects of the competence that the organization needs (Wenger, 1998). However, this natural internal diffusion remains limited to the scope of local COP members, and lacks homogeneity across the tools, methods and practices labelled as Concertance in the various regions. The innovation reaches a stage where it needs more corporate resources and formalization (to brand the approach, generate corporate brochures, develop corporate training programs and new job descriptions) and also more "control" over what can be labelled as Concertance. This is where the informal structures (communities and internal networks) remain insufficient to stabilize and diffuse the innovation at a more global scale.

Stage 5 is thus characterized by the progressive scaling up of the innovation at the global firm level through the coordination of the works of the various local COPs by a broker from HQ. The latter bridges the structural boundaries existing between the local, corporate (HQ) and global levels of the construction contractor by formalizing the established practices of local COPs and redefining it. The broker activates formal top-down process to disseminate the stabilized works of the local COPs to the rest of the organization. This brokering role requires a high level of internal legitimacy to be effective. Instead of being rejected by local units (as was the case initially), the innovative material has been developed, tested, enriched and successfully used by an increasing number of internal champions (i.e. COP members) which serves as a business case to convince actors and individuals at several levels of the benefits of the innovation (Håkansson and Waluszewski 2007). This shows that the institutionalization of the idea requires connection with top management (global level) to be legitimized as a corporate innovation.

CONCLUSION

In this paper, we have explored the much-debated issue of the construction industry's divide between the local, corporate and company-wide levels of the firm that hinder innovation. Our case enables to draw 2 preliminary theoretical findings.

Firstly, it confirms the role of informal interaction among firm's individuals in innovation processes. Based on our case study, we can identify the complementary roles of Communities of Practice and Internal Networks in these informal exchange processes. While COPs seem good vehicles to federate small groups of motivated individuals to develop, test, adapt and document the benefits of an innovative idea for the firm; internal networks are required to support the informal diffusion and spreading of the COPs' experiences and products of reification and to generate internal recognition of the idea. By enabling to identify other internal "champions" for the innovation through boundary relationships, these internal networks thus encourage the growth of community dynamics internally (growth of existing COPs and/or emergence of other local COPs). They support the internal evolution from a COP to a constellation of COPs. Due to their characteristics – i.e. autonomy, practitioner-orientation, informality, capacity to cross boundaries -, constellation of communities seem good vehicles for stewarding internal knowledge transfer within the firm across its various organizational levels.

Secondly, the case shows that while these internal informal dynamics (COPs or internal networks) support the early phases of innovation development in construction, they remain insufficient to bring innovation to a global scale. At a certain stage, the idea developed by informal structures is mature enough and sufficiently equipped with knowledge from all local COPs to be turned into a "product" (i.e. successful internal business cases have been documented). This process requires the formal engagement of corporate resources as well the stabilization of the practices developed (largest common denominator of COPs' practices). The engagement of corporate levels is required to legitimize the work carried out by informal structures as a corporate innovation and disseminate it in the entire global company (top-down process).

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