The tendering activity as cornerstone of sustainability learning in CoPS activities

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INTRODUCTION

Complex Product Systems (CoPS) activities refers to high-value, engineering-intensive capital goods systems, networks and infrastructural components (Davies and Hobday, 2015). CoPS can be found in industries such as construction, aeronautic, railway, shipbuilding, telecommunications, defense, etc.. Sustainability issues gain importance in CoPS activities (Flyvbjerg et al., 2003) : scale of CoPS in terms of financial commitments that increase the relevance to evaluate them through sustainable methods (e.g. total cost ownership), development time and duration of the impacts related to, lifespan of the CoPS and duration of the impacts related to (in interaction with local issues), number and diversity of business and non-business actors involved in the project development phase, and number and diversity of stakeholders impacted during the lifespan of the CoPS (Crespin-Mazet and Flipo, 2009).

With an abductive perspective (Dubois and Gadde, 2002), our research emerges from a preliminary study on sustainability in CoPS activities where we highlighted that sustainability issues are playing an increasingly important role in the calls for tenders of public clients. Our preliminary empirical study lead on 20 calls for tenders from the rail industry showed that environmental issues and, more generally, sustainability issues could account for 10 to 20% of the award criteria. Following these rising issue, we draw preliminary interviews in the same sector which revealed that business developers and sales managers have difficulties to grasp sustainability issues, to assimilate and to translate them in their tendering activities and in their product/services offers. Our research is also focused on the problem of learning on sustainability in CoPS activities and more especially on the tendering activity as tool for project marketing to learn on sustainability.

LITERATURE REVIEW

The problem of learning in CoPS activities

If sustainability is important in CoPS activities (Flyvbjerg et al., 2003), it is difficult to learn and gain experience on sustainability in CoPS activities given some respective characteristics of sustainability and CoPS.
Concerning CoPS activities, specific inherent characteristics make learning difficult. Mandjak and Veres (1998) characterize CoPS as discontinuous, unique and complex. Discontinuity refers to the low frequency of purchase (decades in purchase are not uncommon). Uniqueness is related to technical content, the relational nature of its development, and the client's decision-making mode. Complexity refers to the scope of the project, multi-organizational buying center with many actors, wide circle of participants including non-market actors, sometimes multicultural approaches, need for financing engineering, long contract period and significant risk taking on the part of the buyer (complexity of the act of purchase is exacerbated in the context of public procurement). These three characteristics suggest that suppliers need to constantly adapt and innovate

(Crespin-Mazet et al., in press) which imply strong difficulties to learn to reuse interesting experiences.
And learning become even more difficult regarding sustainability. Maon (2009) points out the difficulty to make sense for managers of the concept of sustainability. He identifies four central challenges to be addressed by companies in order to anchor effectively the notion of sustainability at the heart of its strategy and daily activities. First, the 'challenge of intellection' states a cultural and contextual view of sustainability which highlight that individual and collective interpretative processes modify the own meaning to the concept of CSR and the specific nature of this notion for the organization. Second, the 'challenge of involvement' refers to the involvement and engagement with key stakeholders and the management of legitimate demands and expectations associated with their interests. Third, the implementation challenge is based on "*the mobilization of existing capacities within the organization as well as the development of particular skills*" (ibid, p.29) related to sustainability. Fourth, the challenge of inspiration corresponds to the emergence and recognition of responsible leaders, who can play a role of inspiration and drive for the company as a whole.

Learning in business networks

Research on learning and appropriation in the field of industrial marketing refers to knowledge development (Smirnova et al., 2018) and to knowledge integration capabilities (Martín-de Castro, 2015; Salunke et al., 2019) in the fields of business networks and relationships.
First, the issue of who is learning entails to deal with deferent analytical levels from individual to collective (group, organizational, dyad and network) learning. Storbacka and Nenonen (2015) recommend to shift the unit of analysis towards a network level. It results to the conclusion that "*the objective of the firm is not to learn 'about the market'. Instead, actors wanting to influence the becoming of markets need to focus on learning 'with the market'*" (Storbacka and Nenonen, 2015, p. 80).
Second, the issue of how the firm can acquire, develop and integrate knowledge has occupied many researchers. Knowledge management and/or customer knowledge management (Martín-de Castro, 2015) insist on the essential role of external resources and business networks to develop the 'stock' of knowledge of the firm. In this way, relational learning become an essential dynamic capability to manage (Smirnova et al., 2018) through collaboration with partners. Relational learning refers to distinctive organizational capabilities based on joint activities and routines (ibid). The firm and its external partners "*share information, which is then jointly interpreted and integrated into a shared relationship-domain-specific memory that changes the range or likelihood of potential relationship-domain-specific behavior*" (Selnes & Sallis, 2003, p. 80, in Smirnova et al., 2018). Peters et al. (2017) point out modality of learning through business network when highlighting causal mechanisms that drive contagion of learning in networks : contagion by cohesion (i.e. the presences and closeness of direct contact with others in the network), and contagion by structural equivalence (i.e. where influence is related to the structural patterns of relationships in the network). Customer knowledge management also refers to network methods such as open innovation which allows to acquire new knowledge through inside-out or outside-in processes (Martín-de Castro, 2015). And more specifically on the question of learning tools, sales person are engaged in activities in which they learn so that reading and writing blogs can be considered as a sales learning and training tools (Rollins et al., 2014). Beside the question of how to acquire and develop knowledge, the learning process and methods get wider through the concept of absorptive capacity (Martín-de Castro, 2015).

Thus, four dynamic capabilities should be developed by the organizations, that is to say : identification and acquisition, assimilation, transformation and exploitation of new knowledge for commercial purposes. The process of learning gain a dynamic and iterative dimension thanks to Storbacka and Nenonen (2015) who develop the market-learning cylcle framework. Seven steps (trigger, analyzing, modeling, testing, applying, reflecting, consolidating) drive the market-learning process and are divided in three phases (origination, mobilization and stabilization).
Third, literature underlines different outcomes of learning activities in business networks. At a firm-level perspective, learning activities produce outcomes on innovation capabilities, value creation and competitive advantage (Ferreras-Méndez et al., 2015; Martín-de Castro, 2015; Salunke et al., 2019; Winkelbach and Walter, 2015). Networking capacity and collaboration are powered by relational learning (Smirnova et al., 2018) ; synergy effects of collaboration where learning activities took place improve practices of current collaborations (supporting the flow of ideas, decreasing uncertainty, influencing and activating a partner's capabilities) and draw new collaborations and open to value creation and competitive advantage. At a market-level perspective, learning activities led to modifications of network properties (Storbacka and Nenonen, 2015) as networks structures, market practices and cognitive market learning. Managers differently understanding relationships, interactions and interdependencies in the network can change network pictures (Ford and Redwood, 2005; Ramos et al., 2012).

Learning as a mediated activity

Activity theory was overexposed in the field of pedagogy, and if contributions are scarce in management, they are conceivable in many fields as in business marketing (Makkonen et al., 2012; Storbacka and Nenonen, 2015). Consistent with the IMP tradition (Hakansson, 1982; Ford et al., 2011), activity theory takes a holistic view of action and sees knowledge as a dynamics emanating not from individuals themselves but from interactions.

Three periods of activity theory

Vygotsky (1987) as founder of the Cultural-Historical Activity Theory elaborated the first period of activity theory. When studying the child development and its ontogenesis, he focused on the primary sociability which develop very early in the life of an infant: in itself, human is not a complete being since he necessarily has extensions in others. Vygotsky created the idea of mediation. Learning always comes from social interactions mediated through language and culture. He highlighted the essential role of signs and different semiotic systems as tools of organization and control of individual behavior (signs are essential supports of voluntary attention, logical memory, verbal and conceptual thinking, complex emotions). And thus he also highlighted the essential role of asymmetric interactions, through adults carrying messages and culture. He therefore created the triangular model of "a complex mediated act" which is commonly expressed as the triad of subject, object, and mediating artefact. While the first period is principally focused on individual development, Leontiev (1978) extended the activity theory to collective learning distinguishing individual actions and collective activity, defining three levels of structure activities : activity, actions and operations. Engeström (1987) led the third period of activity theory when he studied collective action in an organizational context. He underlined three specific elements for the analyze of activity at work : community, rules, labor division. With the concept of expansive learning, Engeström (2001) underlines that presupposition of activity theory, especially on asymmetric interactions, have to be adapted in organizational context: "*People and*

organizations are all the time learning something that is not stable, not even defined or understood ahead of time. […] There is no competent teacher" (p.137).

The role of artefacts

According to Vygotsky and his mediated act model, every activity involved a subject (individual or collective) and is mediated by signs and artefacts / tools / instruments and oriented towards an object (goal). Rabardel (1995) defines the concept of artefact as "*anything having undergone a transformation, of human origin (...), susceptible of a use, elaborated to register in activities finalized*" (p. 59). Artefacts can be language, rituals, processes, models, computers, a budget, or every tools. Artefacts are culturally elaborated and through social relationships, as time goes. Artefacts participate to the construction of the objectives of the subjects who use it, because it carries implicit goals and a cultural heritage, which were put there by its designers and which refer to its context of use. Activity theory give to internalization of artefacts an important role where, just as kids who learn to count on his fingers, artefacts help individual and collectives to go beyond their initial limits. Expansive learning refers to "*the entire activity system in which the learners are engaged"* (Engeström, 2001, p. 139) where the relationship between a subject (which may be a collective) and an object (interpreted through the finalized collective action) is done through two processes : mobilizing tools (signs, rules, models, …) to act on an object and inscribing this object in a working community (with its rules and division of labor). Artefacts play also a key role in the coordination of collective activities.

The role of contradictions

Engeström (1987) also highlighted the role of internal contradictions as driver for changes and learning. In this perspective, the chosen unit of analysis must therefore be at least two systems of activity, or more than two, interacting and oriented towards the same object. As Engeström (2001, p. 137) stated : *" when an activity system adopts a new element from the outside (for example, a new technology or a new object), it often leads to an aggravated secondary contradiction where some old element (for example, the rules or the division of labor) collides with the new one. Such contradictions generate disturbances and conflicts, but also innovative attempts to change the activity systems."* Series of contradictions also open new possibilities of action and activity systems. It raises the importance of the articulation between this new tools and the pre-existing system of tools in which it is inserted (in the interpretative sense, not in the technical sense).

Research gap and research questions

Activity theory highlights the question of artefact as cornerstone of learning activities and the role of contradictions as driver for changes and learning. Industrial and project marketing gave little importance to artefacts as intermediary. Researchers in this field study interactions and business relationships but mediation through artefacts and to a larger extant activity theory are poorly developed (Finch and Geiger, 2011; Hoholm and Araujo, 2011) as a tool to understand learning activity in business relationships contexts. As cornerstone of the CoPS activities and project development, we choose to study the key role played by tender documents to learn on sustainability. We therefore ask how tendering documents can be considered as creators of learning spaces in the context of CoPS activities ?

METHOD

The study is carried out through a single case-study strategy (Dubois and Gadde, 2002; Siggelkow, 2007; Yin, 2009). We choose the case of ITC, a European railway equipment

manufacturer facing to new and varied sustainability demands from their clients. In a sector not long ago dominated by two European companies and one American, ITC is today facing to the competition of a Chinese giant with the colossal internal market. On the one hand, sustainability is linked to quality and in this context becoming a key success factor beside price competition, that's why ITC is just structuring its CSR strategy. On the other hand, sustainability emerges in tenders and opens up a new field of exchange with customers.

Through a three-year research-action (David, 2008) aiming at understanding ITC's clients sustainability demand especially in four urban rail projects chosen for the variety of this sustainability demand, we extracts data from five steering committee (Girin, 1990) with a duration between 2 and 3 hours each. The steering committee was composed by researchers and managers at ITC (the sales director for public clients, a business developer, a tender leader and the sustainability director). We conducted interviews with the marketing and sales director. We furthermore used the documents related to the four calls for tender of the urban rail projects selected and the logbook we carried during these three years.

The purpose of the analysis is the tendering activity specifically on the sustainability criteria.

Our first analysis grid comes from Maon (2009) who identifies challenges for managers to make sense of sustainability concept and its particular complexity for the operational implementation. This grid allows to show the difficulties of project marketing activities when understanding the sustainability demand of their clients. We here differentiate the situation at the beginning and at the end of the research. We also use a second analysis grid, the activity theory (Engeström, 2001) and focus on the role of tender documents as artefacts allowing a process of leaning on sustainability and on the role of contradictions with other activity systems.

RESULTS

Table 1 shows the compilation of our results illustrated through some verbatim.

Construct		Results
Sustainability challenges (Maon, 2009) / Situation at the beginning of our research	Intellection	- Law quality and quantity of relationships between the CSR department and the sales teams. The commercial teams didn't develop its own meaning of CSR and its implications. - No sustainability training program for business developers and sales persons in charge of tendering. Weak identification of sustainability of their clients.
	Involvement	- No relationship with stakeholders of projects developed by the company as they consider it to be the client's role
	Implementation	- Annual reshuffle of the organizational chart that upsets the understanding of sustainability in rail projects (given their complexity) - Lack of shared methodologies on sustainability implementation in projects
	Inspiration	- Lack of recognition of ITC' sustainability director by sales people, lack of consideration for the first cases of tenders 'with sustainability criteria'...
Activity theory	Technical tendering artefacts	- Call for tender documents : consultation rules (weighting of sustainability criteria), technical specifications and "sustainability spec.", administrative specifications - Response of call for tenders : environmental impact studies (eg, LCA), energy consumption tables, noise control board, material recyclability tables, …
	Epistemic tendering artefacts	- Sustainability chart relating the intellection of CSR in urban rail projects
	Educational tendering artefacts	- Method documents on sustainability in some call for tenders[1]
	Interaction with other systems	- Interaction between business development processes and tendering processes - Interaction between tendering processes and project management processes - Interaction between tendering processes and different expert teams (e.g. air conditioning, environmental management, eco-design, …)

[1] Verbatim from a tender leader, Steering committee n°5 : "*The call for tender of [city A] requested the life cycle cost, there was a calculation note attached in the consultation rules.*"

		- Interaction between tendering processes and management processes
	Contradictions and tensions on the object of activity	- Lack of standard and method on sustainability issues, which is not accepted in public market rules[2,3] - Sustainability is considered as packaging (same arguments presented in a "sustainability language") - Additional cost of offers with sustainability requirements [4]
	Contradictions and tensions on the rules	- Friction points to integrate sustainability in public procurement regulation, which requires great subtleties and a capacity to 'manipulate' the regulation. - Low level of detail on the sustainability award criteria in tender documents (content, weight) which reduces supplier's visibility and makes the procurement process less transparent. - The tacit rules of interaction must be circumvented so that clients could formulate sustainability requirements [5]
	Contradictions on the artefacts	- Tensions on the normalization of sustainability issues used in tendering process[6] - Some clients open to variants on sustainability only for advertising purposes [7]
	Contradictions and tensions on community and networks	- Lack of lobbying from ITC in the supply network (internal and external to ITC[8]) - Lack of and too late lobbying on sustainability in the demand network - The necessary political will concerning sustainability issues is called into question by electoral mandates issues - Interest of the prime contracting to repeat past tendering requirements, so clamping down on innovation and sustainability
Sustainability challenges (Maon, 2009) / Situation at the end of our research	Intellection	- Better knowledge of vocabulary and concepts, clients' demand, and ITC's tendering strategies on sustainability. - The analysis and response to requirements help qualify sustainable development issues for ITC
	Involvement	- Moving from a technical to a strategic vision of sustainability changing the tendering activity (lobbying towards the buying center and demand network including stakeholders).
	Implementation	- Evolution of skills, ability to manage sustainability networks, development of sustainability tendering strategies, development of tools, …
	Inspiration	- Innovative rail projects lead salespeople to develop new expertise because they anticipate a diffusion of these innovations

Table 1 : Empirical results

[2] Verbatim from the marketing and sales director : "*Because we do not know how to answer. Everyone answers anything. [...] Result, we answered less well than we could say: we said that the train was recyclable at 85% while it is 92% ... but 2 months ago we said 99%!*"

[3] Verbatim from the marketing and sales director : "*How are the criteria evaluated at the tendering stage? By who? How is it verified during the production phase? [...] Can we win thanks to fuzzy elements? If yes, it's scandalous! Or is there something that becomes an objective element, treated by independent organizations, where the rules are the same for everyone?*"

[4] Verbatim from a tender leader, Steering committee n°5 : "*As on [city B], they asked me for a calculation of … a carbon footprint. I can not do that at the offer stage. We can promise them to do it if we win*."

[5] Verbatim from the sales director for public clients, Steering committee n°5 : "*That's why, so that sustainability passes in the calls for tenders, it does not have to come from us… while being the ones who give the rule to play on sustainability*".

[6] Verbatim from the marketing and sales director : "*We need a classification: class A, B, C. We do not ask you how you use your fridge. It is class A, full stop ! There must be criteria to say that it is class A ... Well we must know how to do the same to differentiate rolling stock. [...] So far, there is no element of measurement. [...] How can one standardize the criteria that still remain today in an big vagueness and which leave to the competition a too strong room for maneuver?*"

[7] Verbatim from a tender leader, Steering committee n°2 : "*there is clearly hypocrisy within public procurement, which on the one hand opens up very wide variants, for example that can boost energy recovery solutions, etc. And on the other hand, the buyers who take the basic solution, silly and nasty. Under cover of an opening and an advertisement, finally he has his idea in mind and he will take the cheapest ... Without environmental impact.*"

[8] Verbatim from the marketing and sales director : "*These are major topics and we must convince the profession to work with common rules, verifiable, controllable, upstream (when we declare objectives) and downstream (when we realize, we can check).*"

ANALYSIS AND DISCUSSION

Our empirical data show the beginning of a learning process on sustainability, highlighting the role of tendering in the context of CoPS activities.

Following the activity theory (Engeström, 2001) and its mediated conception of learning, we analyzed tendering documents as artefacts opening the internalization of a learning process on sustainability. We understand that tendering documents allow asymmetric interactions. They boost on the one hand internal interactions between the learners (business developer, sales team) and "those who hold the knowledge" (specialists at ITC: sustainable development director, ecodesign experts, energy experts, etc.). Meeting the sustainability criteria and clauses serve learning by getting to the heart of the company's core business. The formulation of the answers to these criteria requires choices (syntax, tools, performance measure, etc.) and has strategic (commitments) and operational (production, etc.) implications. We can therefore clearly consider tender documents as internalized artefacts (see the hand of the child to learn how to count). On the other hand, they also boost interaction between ITC as supplier and its clients. Beside the pressure on costs, sustainability allows to interact on other subjects with the clients and to learn more on their needs. Tendering documents create a ‘zone of proximal development’, a space of interactions and learning in CoPS activities.

Furthermore, sustainability as the expression of a new form of request encourage learning because interactions take place to solve contradictions. Internal and external contradictions cannot persist and must be resolved to reach an agreement. We notice here that there are many more technical artefacts than epistemic or educational artefacts, which is symptomatic of CoPS (cf. technical complexity) and also provides an indication of an initial approach to sustainability that could be qualified as limited from ITC. We also notice the weight of the legal contradictions concerning sustainability criteria, which will require the construction of a large network of actors (buyer networks, sustainability networks, institutions in charge of regulation, etc.) to solve these contradictions.

The initiation of a learning process on sustainability already partially contributes to the four challenges "anchoring" CSR at the heart of ITC’ strategy and daily practices defined by Maon (2009).

In conclusion, our research highlights the central role of tender documents for a better use of co-created knowledge and co-learning through the orchestration of network between customers and suppliers. We show the first phases of the 'sustainability-learning process' (Storbacka and Nenonen, 2015) but we understand that these phases are not 'linear'. The cycle seems generally effective, but the steps (origination, mobilization, stabilization) take place simultaneously, where contradictions on sustainability in tendering activities cohabit with the progressive anchoring of the sustainability in daily tendering practices.

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