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Competitive Session

Learning practices for knowledge replication, adaptation and/or (re)creation

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Introduction

In spite of the exponential growth of organizational learning studies in the last two decades (c.f. Dierkes, Antal, Child and Nonaka, 2001; Grey and Antonacopoulou, 2003; Easterby-Smith and Lyles, 2005), still there are significant research gaps (Crossan, Mauer, and White, 2011). We know there is a relationship between learning and knowledge, albeit we do not know the constructs that influence knowledge or learning utilization; we want to understand organizational learning, but lack research on actual learning processes and knowledge (Easterby-Smith and Lyles, 2011: 15). While there is a large number of single-conceptual frameworks that help to explain the dynamics of learning processes, those frameworks might not be encompassing enough to capture the complexity of organising learning processes (Casey, 2005), contributing to both fragmenting our understanding and obscuring the comprehension of the overall phenomena (Salk and Simonin, 2011). Additionally, in the learning literature there is agreement about the key role of learning from experience and errors to cope with changing environments (Cyert and March, 1963; Easterby-Smith and Lyles, 2005; Carroll, Rudolph and Hatakenaka, 2005). Yet most of the learning literature underestimates the importance of the attributes of experience (knowledge) and, overestimates the attributes of individuals groups and organisations (March, 2010). The goal of this study is to develop a multilevel conceptual framework (Shapira, 2011) that integrates diverse learning processes that lead to different knowledge outcomes: knowledge transfer, translation and transformation. That is, the aim is to account for both attributes of knowledge and the role played by individuals, groups and organizations in learning processes. I argue that there are different learning processes for diverse knowledge outcomes, from transfer to transformation passing through translation; those diverse learning processes have different characteristics and dynamics.

This paper combines and integrates existing single conceptual-frameworks that together provide a set of tools addressing this research gap. It is argued that the integrated use of selected conceptual-frameworks that cross multiple levels of analysis from diverse perspectives is greater than

the sum of each one alone (Gioia and Pitre, 1990; Okhuysen and Bonardi, 2011). In developing the multilevel conceptual framework, and adhering to Kozlowski and Klein (2000), I define learning processes and the specific learning constructs used (*what*); explain how learning processes at different levels are linked—either contextually-shaped top-down or emergent bottom-up processes; elaborate on the diverse forms of emergence that are likely to be related to different learning processes (*how*); and, *where* top-down or bottom-up learning processes originate and culminate (pp. 1-5; 11-21).

In this paper learning is conceptualised as the socially constructed processes by which one absorbs as well as is absorbed into a practice (Nicolini, 2013: 80). While learning happens to individuals, it evolves at both group and organisational levels (Crossan et al., 1999). This means that learning is seen as particular—situated—social practice that depends on the conditions and modes of engagement in the activity, involving the reconstitution of cognitions identities and belonging (Lave and Wenger, 1991; Sandberg and Tsoukas, 2011). Knowledge is considered the outcome of learning (Argote and Miron-Spektor, 2011). Knowledge transfer refers to replicating prescribed and codified management ideas in a similar context of the initiator (Dixon, 2000; Szulanski, 2000; Alawi and Denford, 2011). Knowledge translation encompasses both replication and adaptation/edition of some components of a management idea in order to perform either a similar task in different context (Rovik, 2003; Lervik and Lunnan, 2004; Sturdy, 2004; Morris and Lancaster, 2005). Knowledge transformation involves the full (re)creation of all components of a management idea in order to perform a new task in a new context. This involves not only transformation of knowledge, but also actors and, to some extent, context-situations (Latour, 1986; Czarniawska and Sevon, 2005).

The next section elaborates on the morphology of the proposed framework. Three theoretical elements are detailed: knowledge boundaries, context framing modes, and learning mechanisms — also called bridges. Section 3 focuses on the physiology of learning paths. That is, processes that act as vehicles for circulating learning paths are detailed and qualified. Finally, in the conclusion section I discuss strengths and weaknesses of the proposed framework as well as contributions for theory.

The Morphology of Learning Processes: Boundaries, Frames and Bridges

In this stage, I outline the endogenous constructs that are used to develop the multilevel framework (Kozlowski and Klein, 2000). A set of single-conceptual frameworks were selected because they seem to account for key aspects of learning processes. They were group into three categories: boundaries, frames and bridges. *Boundaries* refer to a set of knowledge-related limits operating at individual, structural-organisational and societal-environmental levels that can either support or constrain the extent to which knowledge can be transferred, translated or transformed. Two conceptual frameworks have been selected, Carlile (2004)’s knowledge boundaries and Collins (2010)’s types of knowledge.

Carlile (2004)'s concepts were selected because they are multi-epistemological and consider diverse forms of knowledge, as well as because they are considered a leading concept in the organisational learning literature (Easterby-Smith and Lyles, 2011). Collins (2010)' concepts detail novel forms of tacit knowledge that can be associated to learning processes.

Carlile (2004: 558-9) indicated three knowledge boundaries that are closely related to different knowledge outcomes. Syntactic boundary, following information-processing views, approaches knowledge as objective, assumes stable context and common lexicon, making 'transfer' of knowledge unproblematic. Semantic boundary adheres to interpretive views and recognises that diverse interpretations based on different world-views, shape the construction of shared meanings. Thus, knowledge brokers, actors and context play a significant role during knowledge translation. Pragmatic or political boundary refers to the conflicts of interest that might be associated to the practical application of knowledge by highly inter-dependent actors. In this case, negotiation and transformation of both common-knowledge and domain-specific knowledge seems to be necessary.

Similarly, Collins (2010) suggested three types of tacit knowledge that can be approached as other set of knowledge boundaries. Relational tacit knowledge refers when it cannot be explicated due to social relations arising out of the nature of social life. Somatic-tacit knowledge when humans cannot perform a set of actions due to their material (body and brain) limitations rather than lack of knowledge that can be written. Finally, collective tacit knowledge can be acquired by an individual only by being embedded in a society. It is argued that codified knowledge seems to be sufficient to transfer knowledge; relational and/or somatic tacit knowledge seems to be necessary to translate knowledge and; collective relational and/ or somatic tacit knowledge seems to be necessary to transform knowledge.

Frames constitute underlying cognitive/psychological/sociological schemas for interpreting, making sense, and/or building meaning about the world (Antonacoupoulos & Chiva, 2007) by enabling the (re)construction of situated awareness (Endsley, 2006) about context, problem-issue and their relationships. Knowledge brokers (c.f. Currie and White, 2012) play an important role framing situations. In this study I use Carlsen, Clegg, Bjorkeng, Pitsis and Antonacopoulou (2011) conceptual framework that encompasses motivational, diagnostical and propositional frame modes. It assists to recognize context-situation, make sense of specific problems, practices and build alliances through engagement and enrolment in order to address the implementation of an idea accordingly. Motivational frame refers to the mobilisation and enrolment of competing actors, with potential conflicting priorities, in order to frame perceptions by aligning people into acknowledging common purpose (Carlsen et al., 2011: 15-16). Diagnostical frame involves the recognition of past traditions that constraint new ideas and, the redefinition of schemas and assumptions in order to open new possibilities by (re) framing

decisions, interests and the reasons these interests are rationalised with (pp. 18-20). Propositional frame is related to the materialisation of actions through using objects, spaces and senses to build connectivity and transparency for co-creation. This also involves selection of resources and setting criteria of what is judged as valuable or not (p. 22-24). Carlsen et al. (2011)'s framework was chosen because it encompasses a range of critical aspects to support the framing process. Nevertheless, it is acknowledged that there are other functional-equivalent frameworks.

Bridges represent the learning and knowledge mechanisms used for crossing boundaries. Learning and knowledge mechanisms need to be customized to cope both knowledge and non-knowledge boundaries; and be aligned to both frames and the prevalent context-situation. The bridges selected in this study, include Argyris & Schon (1996)'s learning modes (single- and double- loop as well as deutero-learning) and Crossan et al. (1999)'s learning processes model. Argyris and Schon, (1996) framework was selected because it is considered a watershed in the organisational learning literature (Easterby-Smith and Lyles, 2011). Likewise, Crossan et al. (1999)'s framework was the most cited AMR article and received the 2009 AMR decade award. Argyris and Schon (1996)'s concepts focus on the cognitive aspects of learning while Crossan et al. (1999) linked social and psychological processes to different levels of analysis for supporting specific learning processes: intuiting and interpreting supports individual level learning; integrating supports group learning and institutionalizing supports organizational level learning.

Single conceptual frameworks compounding boundaries frames and bridges are multilayered like onions, but then its components do not operate independently. In Carlile's (2004) knowledge boundaries framework, for example, overcoming semantic knowledge boundaries involves passing through syntactic knowledge boundaries; overcoming pragmatic knowledge boundaries involves passing through both semantic and syntactic boundaries. The ways single conceptual frameworks are structured bring important implications for understanding how learning processes emerge and their interrelationships.

Table 1 categorizes selected single-conceptual frameworks. Depending on the nature of boundaries, problem-situations are likely to be framed in different ways and, the adequate learning and knowledge mechanisms can be selected and subsequently applied. It is argued that those categorisations are the domain in which a wide range of learning processes emerges and, eventually form patterns in order to transfer, translate and/or transform knowledge. This suggests the boundary frames bridges relationship is highly interdependent. How interdependent those relationships are is the focus of the following section.

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The physiology of Learning Processes: Relationships between boundaries, frames and bridges

In this stage, the focus is on the relationships between selected single-conceptual-frameworks cutting across boundaries frames and bridges (how), the properties of the linkages between constructs (where) and why they are interrelated in some ways and not interrelated in other ways (Kozlowski and Klein, 2000). I argue that three interconnected processes are likely to occur for knowledge transfer, translation and transformation. The first process is the recognition of individual organizational and contextual boundaries. The second involves the (re)framing of issues to develop awareness of both the situation and the connections between boundaries and context-situation, in order to influence other stakeholders about what the problem is and how to tackle it. The third encompasses the use of a set of knowledge and learning mechanisms (bridges) that support knowledge transfer, translation and/or transformation (see Figure 2). Those processes do not necessarily occur in this order, as it is a dynamic process that may unfold in diverse forms.

Relationships between single-conceptual frameworks are heterogeneous. Considering the dynamic multilayered and, to some extent, uncertain social nature of learning processes, it is possible to suggest relationships range from closely related to mostly decoupled. Carlile (2004)'s Knowledge boundaries, for example, seems to be closely connected to the types of knowledge proposed by Collins (2010). Syntactic boundary can be easily overcome due to the codified nature of knowledge embedded in this type of knowledge. Semantic boundaries seem to require relational tacit knowledge to be addressed and, pragmatic boundaries are likely to need the development of collective tacit knowledge in order to be realised.

INSERT FIGURE 1 HERE

Likewise, it is possible to suggest a close relationship between learning modes (Argyris and Schon, 1978), knowledge boundaries (Carlile, 2004) and types of tacit knowledge (Collins, 2010). Single-loop learning mode seems to be enough to deal with syntactic knowledge boundaries that are made up mostly of explicit knowledge. Double-loop learning seems to be adequate to overcome semantic knowledge boundaries made up of, mostly, relational tacit knowledge and; deutero learning seems to be likely to address pragmatic knowledge boundaries made up mostly of collective, somatic and relational tacit knowledge.

Differently, the character of the relationship of other single-conceptual frameworks seems to be dynamic. In some cases interrelationships can be loosely-coupled (Orton and Weick, 1990); therefore, one does not necessarily shape another, while in other cases, one can directly influence another. Framing modes (Carlsen et al., 2011), in some situations, are likely to be little related to the type of knowledge boundary and tacit knowledge. For example, motivational frames in some specific cases

might be enough to address pragmatic knowledge boundaries involving somatic tacit knowledge, such as voluntarily learning to surf. Similarly, it is possible to think of a situation in which semantic knowledge boundaries encompassing relational tacit knowledge demand the deployment of mostly propositional frame in order to be addressed. The situation where access to key information to perform a task can be possible only by addressing power and political issues embedded in propositional frames, illustrates this point.

Hence, the heterogeneous character of the relationships between single-conceptual frameworks assist to explain the wide spectrum of modes in which boundaries, frames and bridges can be interconnected. The connection of particular boundary frames and bridges conceptual-frameworks can be characterized as sets of learning processes that are better represented as an archetypical learning process. As a way of illustration, two archetypical learning processes are detailed.

Knowledge transfer (see dotted arrow 1 in Figure 2), encompasses the recognition of syntactic knowledge boundary that is usually associated with codified forms of knowledge. Political time and space boundaries are usually low since knowledge is transferred between similar contexts (Dixon, 2000) and, clear cause-effect relations are likely to prevail (Snowden and Boone, 2007). Thus agreement about what and how to do it is highly likely to develop over time. Motivational frame seems to suffice for assisting individuals to interpret the situation and think about how to respond. Single-loop learning combined with intuiting and interpreting constitute the conceptual bridges that seem to be able to cope this situation. The implementation of ISO9000 at a Steelworks illustrates well this situation. ISO9000 can be considered a codified management concept since it contains a comprehensive set of directions, procedures and templates that describe how to organize work environment along ISO9000 principles (Lazaric et al., 2003). In this case (Guzman and Trivelato, 2008), Steel-Co, a mass-production facility, implemented ISO9000 standards previously developed at its Headquarters. Very few adaptations were needed. Additionally, this facility was operated in a stable environment since customers, competition and government regulations were fairly stable. Thus, it is possible to suggest the most relevant boundaries were syntactic and prevailing knowledge was clearly codified. Framing mode adopted in this situation was motivational since both the external (competitive) and the internal environment were stable and unproblematic. Workers knew what would be the impact of the implementation of ISO9000 since the same management concept was already implemented in other units of the group and outcomes for workers were well known and neutral. Bridges used were (i) single-loop learning, as it suits well simple application of standard operating ISO9000 procedures; and (ii) the institutionalizing/integration/interpreting learning process, as it fits the top-down application of codified-oriented ISO9000 management concept. This means that knowledge transfer entails a specific

set of learning processes that, for example, are likely to be different from learning processes needed for knowledge transformation.

Knowledge transformation (see dotted arrow 3 in Figure 2) requires overcoming syntactic semantic and pragmatic boundaries that are usually associated to relational, somatic and collective forms of tacit knowledge. Political time and space boundaries, in this situation, are very relevant. This is because no clear cause-effect relations are likely to emerge since context is likely to be dynamic complex and thus containing both foreseen and unforeseen uncertainty (Snowden and Boone, 2007; Loch, DeMeyer, and Pich, 2006). Therefore, it is unlikely general agreement among main stakeholders might develop organically. This situation demands the simultaneous application of motivational diagnostical and propositional frames in order to gain awareness of the particular situation (Endsley, 2006), its connection with specific issues and development of alternative solutions. Deutero learning blended with intuiting, interpreting, integrating and institutionalizing learning processes constitute the conceptual bridges that seem to be necessary to cope with this complex situation. Orr (1996)'s study of photocopy machine technicians helps to illustrate this learning archetype. He describes a situation in which the prevailing knowledge boundaries (mostly pragmatic and somatic tacit knowledge) seem to be crucial for the technician performing his primary task:

> -*Ethnographer*: And where is it misadjusted? Where is the adjustment?
> -*Technician*: …it's a D-shaft in back…it's got a plastic bearing that drives it.
> -*Ethnographer*: Uh-huh.
> -*Technician*: OK, and the flat on the D-shaft…wear out that flat on the…the pulley, the gear, and gradually enlarges it" (p. 118-9).

In this situation, after the technician feels the free play of the shaft, he wiggles it in order to demonstrate the issue to the researcher. The existing free play is a pragmatic issue and the technician uses somatic tacit knowledge (feeling the shaft) in order to verify it. This means that in framing terms, the technician is developing a diagnosis of the situation. In term of bridges, the technician seems to apply deutero-learning. Because this was not an entirely new problem (other cases were reported by colleagues) some single-loop procedures were applied, such as checking key machine points as written in the operating manual. Additionally, in order to determine the exact nature of the situated problem, double-loop learning seemed to be necessary. In terms of learning processes, we can infer the technician followed the intuiting/interpreting/integrating learning processes that are suitable to deal with tacit-oriented knowledge. Even these illustrations help to explain the operation of each learning

archetype; still it is necessary to explain the functioning of the whole framework. This is done in the next section.

Discussion

Turning our attention to the dynamics of the entire framework, it is possible to devise diverse forms of application. Because of space reasons, two alternative scenarios are elaborated and at the last part of this section, a closer examination of the relationships between the single-conceptual models that constitute the proposed framework is provided.

The first scenario is to use this middle-range framework for assisting to apply other general knowledge and learning related frameworks. Nonaka and Takeuchi (1995)'s model is used to illustrate this, as well as to show how the proposed framework is more encompassing than Nonaka and Takeichi's model. Their well known SECI model approaches knowledge-creation as a spiral process, involving the interaction of individuals groups and organization, through four processes: (socialization, externalization, combination and internatization) that perform in an enabling context called *ba*. Key enabling conditions for managing the knowledge creation-process are: knowledge vision, autonomy, fluctuation and creative chaos, redundancy, requisite variety and love care trust and commitment. Moreover, Nonaka and Takeuchi (1995) distinguish four types of knowledge assets ('inputs and outputs of the knowledge-creating process'). They are experiential (tacit knowledge created though common experience), conceptual (explicit knowledge articulated through images symbols and language), systemic (systemized and packaged explicit knowledge) and routine (tacit knowledge routinized and embedded in action and practices) (Nonaka, Toyama and Byosiere, 2001: 501-2). Because of disagreements about view that tacit knowledge can be 'converted' (through externalization) into explicit knowledge (c.f. Collins, 2010; Tsoukas, 2011), externalization, in this study, is redefined as particular learning process in which knowledge is articulated/shared/translated though metaphors, creative dialogue and embedded into product concepts, and/or designs. Notable, Nonaka and Takeuichi's typology of knowledge assets can be associated to the proposed typology of knowledge (knowledge boundary-2): experiential knowledge can be linked to relational and collective tacit knowledge; systemic knowledge is close to codified knowledge; routine knowledge can be associated to somatic and relational tacit knowledge and, conceptual knowledge is related to somatic and collective tacit knowledge.

Re-interpreting Nonaka and Takeuchi's model with the proposed lenses, it is possible to argue that they emphasize bridges at the expense of boundaries and frames. This helps to explain the difficulty to operationalise it (c.f. Jackson, 2005). Nonaka and Takeuichi's model's has many

assumptions embedded in the model and considers types of knowledge (knowledge assets), context (ba) and some cognitive aspects of learning.

Nevertheless, some gaps related to learning processes remain. Three of them are highlighted. First, there is a gap in their model regarding knowledge boundary-1 (syntactic, semantic and pragmatic) associated to different learning processes. Nevertheless, it is necessary to acknowledge Nonaka and Takeuichi recognize diverse types of knowledge. Nonaka and Takeuichi‘s knowledge assets types look like close to our knowledge boundary-2 typology. Second, Nonaka and Takeuchi’s model do not pay enough attention to ‘framing’ required for most learning processes. They focus on context (ba) that is defined it as a physical virtual or mental space (e.g. shared experiences, ideas, ideals) in which knowledge is shared, created, and utilized (Nonaka et al., 2001: 499). This indicates that Nonaka and Takeichi’s model while being precise about specific context for particular knowledge conversion type, they overlook the diverse necessary frames for varied learning processes. Third, while Nonaka and Takeuichi focus their attention in *bridges*, they overlook knowledge *boundaries* and *framing* modes. Combination, for example, seems to follow learning archetype 1 for transferring knowledge. Because knowledge involved is mostly codified-oriented, single-loop learning (Argyis and Schon, 1996) and Crossan et al. (1999)’s feedforward learning sequence (institutionalizing/integrating/intuiting/interpreting) seems to be in line with Nonaka and Takeuichi’s definition of combination. Nonetheless, they leave a gap regarding type of knowledge boundary-1 it is necessary to overcome and adequate frame. Similarly, socialization and internalization seem to fall into our learning archetype 3 (knowledge transformation). Nonaka and Takeuichi’s socialization and internalization processes implicitly seems to account for the application of Argyris and Schon (1996)’s deutero-learning and Crossan et al. (1999)’s feedback learning sequence (intuiting/interpreting /integrating/ institutionalizing). Nevertheless it falls short to point out the adequate framing for knowledge transformation, and overlooks the type of knowledge boundary (Carlile ‘s syntactic semantic and pragmatic knowledge boundaries).

The **second scenario** is using the proposed framework as a theoretical platform where diverse single learning- and knowledge-related concepts/models can be added, deleted, combined, amended and/or reinterpreted. For example, Zollo and Winter (2002)’s model can be added to the proposed framework as an additional bridge, since it includes key learning mechanism that complement both learning modes and learning processes at each one of the proposed learning archetypes. Knowledge codification mechanisms are an important bridge for knowledge transfer; knowledge articulation mechanisms support knowledge translation and; knowledge accumulation assists knowledge transformation.

Similarly, Carroll et al. (2005)'s four-stage model of organisational learning, can be amplified by integrating its main stages into the proposed framework. Accordingly, their control stage (fixing known problems and complying with rules) suits archetype learning process 1. Their open stage (acknowledgement of doubt and motivation to learn) seems to combine with learning archetype 2. Likewise, their deep learning stage (skilful inquiry and systematic mental models) would enhance learning archetype 3.

Finally, we consider the relationships between the single-conceptual frameworks that constitute the proposed framework. The heterogeneous character of the relationships between single-conceptual frameworks, together with the onion-like structure of most single-conceptual framework, helps to explain the increasing social complexity that seems to be associated to the deployment of different learning processes (Antonacoupoulous and Chiva, 2007). Comparing learning processes (1) and (3), it is possible to note that the level of cognitive and structural complexity required to deploy learning process (1) is lower than the one required to deploy learning process (3). Cognitive complexity (Boisot and Child, 1999) refers to the extent to which knowledge is abstract and codified, while structural complexity (Remington and Pollack, 2007) stem from the (large) number of interconnected tasks/activities possessing uncertain interdependencies.

In order to untangle the maze of interrelationships between different single-conceptual frameworks performing at different levels, in the following sub-sections and adhering to Kozlowski and Klein (2000), the focus shifts to two crucial aspects that need to be further characterized: (i) how different phenomena at different levels are connected and **;** (ii) what type of emergence is likely to evolve in organising learning processes?.

(i) How different phenomena at different levels are connected

Connections between diverse phenomena at diverse levels represented by a set of concepts (see Figure 2) are likely to be either top-down or bottom-up (Kozlowski and Klein, 2000). Top-down processes describe the influence of higher-level contextual factors over lower levels, and bottom-up processes describe the way in which lower-level properties emerge to form collective phenomena (p. 14-5). Because emergent phenomena are based on patterns of interaction, collective phenomena may emerge in different ways under different contextual constraints and patterns of interaction (p. 58-9). In the case of the presented framework, while recognizing contextual forces play a role in learning processes, I argue that learning processes possess more a bottom-up than a top-down nature. The main reason being that bottom-up processes describe the way low-level properties emerge to form collective phenomena (Goldstein, 2011; Kozlowski and Klein, 2000), and learning— added with its associated practices—is mostly collective phenomena. Additionally, collective phenomena associated to learning processes constituted by low-level practices, as above possess complex adaptive system characteristics

and are prone to emergence. Thus, it is necessary to briefly explore the emergent nature of learning processes.

(ii) What type of emergence is likely to evolve in organising learning processes?

Emergence encompasses both self-organising and structuring processes that focuses on how pre-existing order in a system is *complexified* during its transformation into a novel emergent order (Goldstein, 2011). Self-organisation, according to Maguire et al. (1996) requires tolerance to deviations, search for new relationships, reflective thinking and action, and proactive boundary redefinition for embracing new configurations. Structuring processes, for example, include linking people to projects/teams; shaping behaviour by setting timelines and/or diffusing ideological themes (Stacey, 2001). Thus, emergent learning processes transcend initial practices and do not necessarily involve an external constructor because novel order can stem from the interaction of elements that are already ordered to some extent.

Bottom-up emergent learning processes, as emergence, can be of two types, composition and compilation (Kozlowski and Klein, 2000). Composition is based on assumptions of isomorphism, and describes the convergence of identical phenomena that emerge upstream across levels, such as in the case of shared (convergent) mental models. Compilation, based on discontinuity, describes phenomena within a common domain that develops different characteristics as they emerge across levels but produce a higher level property that is functional equivalent to its constituent elements, such as in the case of patterns emerged from knowledge spirals.

I hypothesise some learning processes are likely to be constituted by discontinuous compilation and others by isomorphic composition. I argue that compilation is likely to emerge in situations in which polymorphic actions are deployed by heterogeneous pluralistic individuals having competing goals and intentions, such as in learning archetype 3. Conversely, composition is likely to emerge in situations where mimeomorphic actions are deployed by individuals with shared goals and intentions, and similar skills and capabilities, such as in learning archetype 1.

Two sets of reasons assist to explain compilation and composition patterns in emergent learning processes. The first is connected to human nature. In situations where heterogeneous actors with multiple and competing goals, cognitions, identities, capabilities, skills and intentions, not only are self-determined self-willed and selfish, but also interact during learning processes resulting in non-uniform nonlinear individual responses, compilation patterns are likely to emerge. In the situation where actors are more homogeneous—that is, have shared goals, similar intentions capabilities and skills—their interactions are likely to support the emergence of composition such as learning processes.

The second refers to the nature of actions, understood as behaviours plus intentions, unfolded during the deployment of learning processes. Using Collins and Kush (1998) distinction between

polymorphic and mimeomorphic actions, it is possible to connect types of actions with likely emergent patterns of learning processes. Polimorphic actions involve actions that are always done in different ways because there are too many context-dependent possibilities. Because polimorphic actions demand the understanding of the society where they are embedded, they cannot be neither articulated, codified nor automated (e.g. dancing in a social setting). Mimeomorphic actions are always done in the same way and can be articulated and automated (e.g. keying a number on a telephone pad).

Conclusions

The goal of this paper was to present a multilevel conceptual framework to examine the morphology and physiology of diverse learning processes that lead to different knowledge outcomes. The strength of the framework seems to reside on the conceptual blending of key learning-related models that supports their integration into an overarching multilevel framework. Because of the open and modular character of the framework**,** it can be used as a conceptual scaffold in order to enhance the explanatory properties of the framework as well as enable further theory development by (i) assisting the development of new insights; (ii) adapting the framework to diverse but compatible research questions; (iii) enabling the empirical test of diverse configurations of the framework; (iv) facilitating the inclusion or exclusion of entire dimensions for particular situations and; (v) by combining similar single-conceptual models, enables the co-existence of multi epistemological stances.

Besides, it contributes to the adaptive learning and, translation of management ideas literatures. On the one hand, adaptive learning studies (Tyre and von Hippel, 1997; Sole and Edmondson, 2002; Handley, Clark, Fincham and Sturdy, 2007; Kakavelakis and Edwards, 2011) focus on the behavioural, cognitive and, social aspects related to understanding in unique local-specific learning situations. While this literature have made important advances in understanding the situated nature of learning processes, still most of those studies have not differentiated among diverse learning processes that conduct to variegated knowledge outcomes. On the other hand, it also contributes to the management idea translation literature (c.f Czarniawska and Sevon, 2005; Heusinkveld, Sturdy and Werr 2011; Morris and Lancaster 2005; Sturdy, 2004; Rovik, 2003). This approach, in general, has explained how management ideas are edited and adapted to particular context-situations. Nevertheless, it has either overlooked the actual learning processes, or have assumed universal learning processes for differentiated knowledge outcomes, or both.

The weaknesses of the framework can be seen as opportunities for further research. First, while power and politics are crucial in any learning process (c.f. Coopley and Burgoyne, 2000; Bunderson and Reagans, 2011; Lawrence, Mauws, Dyck, and Kleysen, 2005; Clegg, Courpason, and Phillips, 2006), this dimension has not been explicitly incorporated to the framework. The second one is related

to the small attention paid to institutional aspects shaping learning processes (c.f. Sahlin-Anderson and Engwall, 2002; Perkmann and Spicer, 2008; Sahlin and Wedlin, 2008). The third one is connected to the non-use of a practice-based approach to examine learning practices associated to learning processes (c.f. Schatzki, 2001; Gherardi, 2006; Antonacopoulou, 2008; Nicolini, 2013). All those three aspects constitute important theoretical avenues waiting for further studies.

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Boundaries	Frames	Bridges
Knowledge boundaries (Carlile, 2004) • Syntactic • Semantic • Pragmatic	Framing modes (Carlsen et al., 2011). • Motivational • Diagnostical Propositional	Learning modes (Argyris & Schon, 1978) • Single-loop • Double-loop • Deutero
Types of tacit knowledge (Collins, 2010). • Relational • Somatic • Collective		Learning processes (Crossan et.al., 1999) • Individual • Group • Organisational
Non-knowledge boundaries (Easterby-Smith et.al., 2010) • Political • Space • Time		

Table 1: Boundaries Frames and Bridges

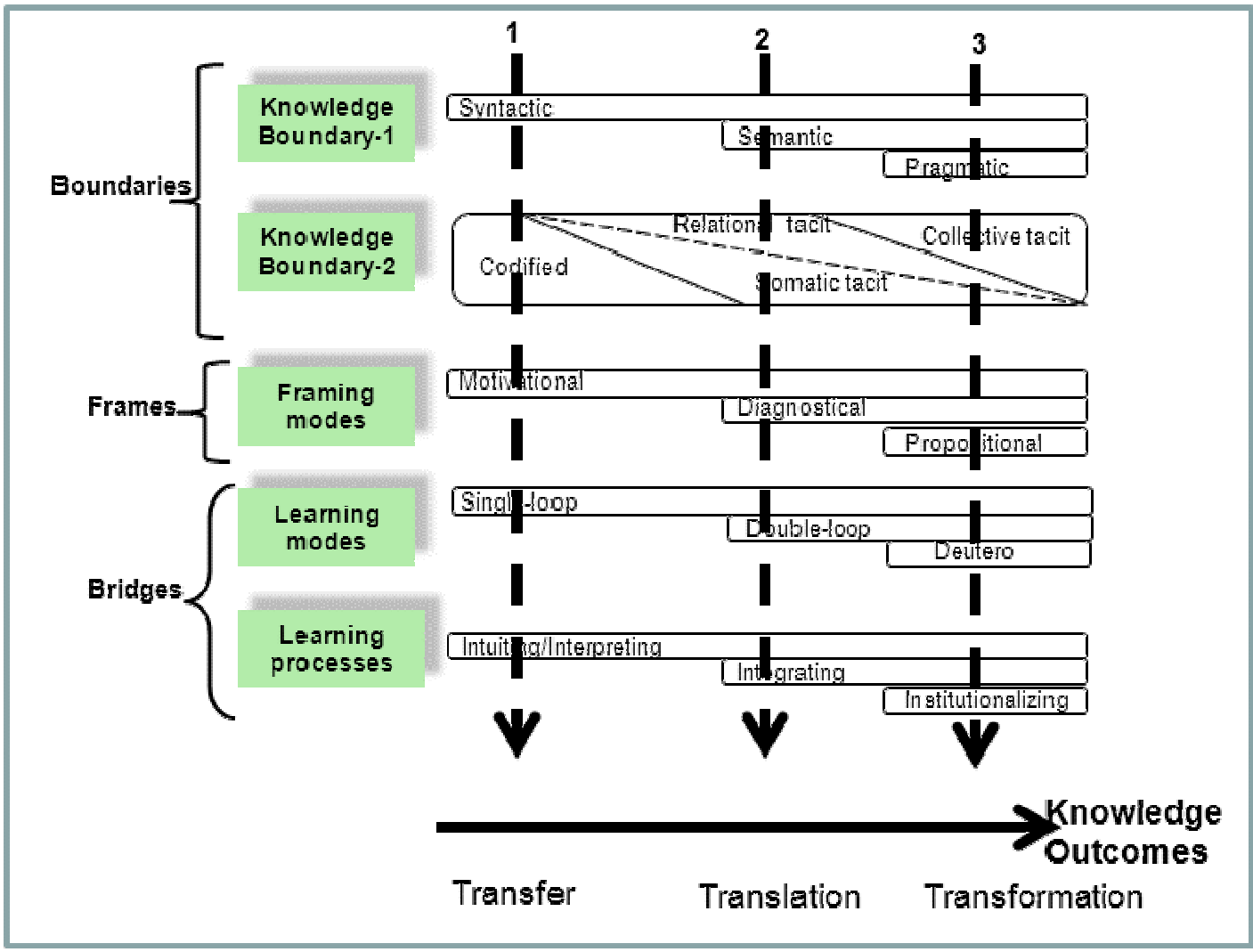

Figure 1: Learning processes crossing boundaries frames and bridges