ESADE

Integrating Knowledge in Organizations: A Lessons Learned Case Study

By

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SUMMARY

Purpose: The role of common knowledge in organizations (CKO) is emphasized in literature as an important topic; however, its formalization has been neglected. This dissertation presents a model of CKO that depicts its relationship with the capability of the organization within the context of theories of the firm.

Design/methodology/approach: Considering the un-operationalized status of knowledge in organizations and the several approaches to organizational capability, this work interviews text of the theories of knowing and the theories of the firm, following grounded theory coding methods, to frame a model to observe and assess CKO instances that participate in the productive practice.

The research empirical component of this dissertation follows case study strategy for data collection and grounded theory for data analysis. The case corresponds to a ten-year International Inter-university Cooperation Program that integrates knowledge into lessons learned. Data include program extensive program documentation, 3 sets of surveys, 16 filmed interviews, and 36 stories. Grounded theory follows Charmaz (2000) sensitizing concept approach to guide initial coding using the developed framework.

Findings: CKO is characterized by the (a) tension of integrating knowledge into the productive practice, (b) logic of instrumentalizing organizational tools (OT), and (c) processes by which knowers are recognized. CKO also operates as mediator between OT (directives, plans, structure, architecture and routines) and the efficiency of the organizational capability. CKO emerges, not as an organizational tool, but as the related processes that instrumentalize them, or by which knowers are recognized and shape the organizational interpretative system.

Research limitations/implications: Although methodology is qualitative and not subject to generalizations, study provides valuable insights about common knowledge in organizations and its relation with the organizational capability.

Practical implications: Dissertation offers efficiency oriented managerial criteria (emerged from the CKO conception) for applying organizational tools to integrated knowledge into the productive practice.

Originality/value: Dissertation proposes (a) an integrated organizational view of extant theories of knowing, (b) a model for observing knowing instances in organizations, (c) a scheme for framing theories of the firm, and (d) a model for understanding the role of common knowledge in organizations.

Keywords: Knowledge in organizations, Knowing, Practice, Common knowledge, Organizational capability, Theory of the firm, View of the firm.

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My sister in law, Gisela, for caring in difficult times.

DEDICATION

This dissertation is dedicated to my four children Nicole, Erika, Gaby and JJ.

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LIST OF ABBREVIATIONS

ACRONYM	MEANING
AKR	Abilities by which knowers are recognized
CC	Commonness criterion
CK	Common knowledge
CKO	Common knowledge in organizations
CL	Common language
EKIC	Efficiency of knowledge integration capability
IKF	Integrated Knowing Framework
IKPR	Initial knower recognition process
IKV	Individual Knowing View
IVLSR	Integrated View of Language, Shared Meanings, and Recognition of Knowers
ISO	Interpretative System of the Organization
KBV	Knowledge Based View
KIC	Knowledge integration capability
KIT	Knowledge integration tension
LoI	Logic of Instrumentalization
Mgmt.	Management
OC	Organizational capability
OKPR	Ongoing knower recognition process
OCF	Organizational Capability Framework
OT	Organizational tool
PMI	Project Management Institute
RK	Recognition of knowers
SM	Shared meanings

CHAPTER 1: INTRODUCTION

1.1 RESEARCH MOTIVATION

While working for IBM as a systems engineer, in the age of mainframes and midsized centralized computers, every year, during the almost 9 years that I worked there, we were tested on the issues of the commercial conduct guideline. In the following years, the same guideline text, with minor improvements, implied greater and deeper meanings as a result of the experience gained through business situations and by observing colleagues and managers' behaviors.

At age of 32, some IBM colleagues invited me to join them in a new venture, as a partner in charge of corporate sales. This was a small company that sold and serviced every computer product of that time. In eight years, the company grew from five partners to 130 employees, most of them recent graduates of electronics, telecommunications and systems engineering, who were assigned to one of nine different service areas.

As the company grew, the partners decided to adhere to and share with employees a principle borrowed from our time at IBM: solve the customer´s problem first, and then address the technical issues. At the partner level, we were convinced that this simple directive should align our efforts, and lead us to sustainable customer relations and, therefore, success.

Even though the company had an excellent financial performance during those years, we were not very successful in aligning the organization´s behavior to the general directive. Critical service situations required managers' interventions more frequently

than expected. After-incident reviews showed that, in most cases, the specialist in the service line focused on the computer problem and not on the people or the business process, or that someone in logistics considered that the service engineer´s request for resources was incompatible with the problem reported by the customer and decided to block the request.

We were a little frustrated; the directive that was supposedly shared by all – a piece of common knowledge for everyone in the organization – was not consistently guiding our actions.

Searching for understanding, I stated the question, in those days, as *Why is it that, even though we advise everyone in the organization to take action according to a broadly shared specific directive, we frequently confront misalignments to it?* Time went on without a satisfactory answer. Later, enriched by new entrepreneurial and academic adventures, I rephrased the question in more general terms: *What is the role of common knowledge in relation to the logic chosen by the firm to achieve its goals?*

In my personal search for an answer, I found books focused on the practice of managing knowledge in organizations, like *Common knowledge – How companies thrive by sharing what they know* (Dixon, 2000), which offer rich stories about successful and unsuccessful transferring know-how in organizations, a taxonomy of such transference, and knowledge management prescriptions for transferring knowledge. In this case, and as we will also notice later in organizational studies research works, authors adhere to the use of labels like common knowledge in organizations to refer to work related know-how; such reference is made with pragmatic arguments but without a frame of reference

(now I would say without "epistemological foundations"). This left me with good managerial advice, but still with no answer.

Then, during the doctoral courses at the EUDOKMA Program, I found that several organizational researchers, as part of their proposed logic for theories of the firm, had referred to the role of common knowledge in the conception of organizations.

Authors like Simon (1991b) identified goal-satisficing rational choosing heuristics; Kogut and Zander (1992) specified shared coding systems that encapsulate substantive knowledge to offer it as functional knowledge; while the work of Robert Grant (1996a; b) recognizes knowledge in organizations as co-owned (individuals and organization) and argues that such interdependence shapes goals and plans in organizations. Such theories or views of the firm identified the role of common knowledge as relevant, but did not offer explicit explanations about the relationship of such knowledge to the logic (organizational capability) behind the view of the firm.

Nurtured by such holistic views and theories, I thought I had a real business problem and a question related to the theories and views of the firm, a question to which I could apply scientific methods to frame possible answers. I was extremely motivated and felt that the quest's closure was near. Now I know that thinking about it was immensely easier than achieving it. It was the arena of philosophers, and, at that time, I was not so aware of the variety of postures about the idea of knowledge in management studies.

To start, I jumped on the fast train and tried to conceptualize and frame common knowledge. My information systems background led me to draw up an understanding and observational framework for common knowledge, which I presented as *Comparison of*

approaches toward formalizing context in the 2006 ICICKM Conference, published in 2007 in the EJKM journal, and later (2011) included as part of a book called *Leading issues in knowledge management research.* This work portrays a contextual framework proposing a data-information-knowledge continuum (Davenport & Prusak, 1998; Bell, 1999; Tsoukas & Vladimirou, 2001) to formalize common knowledge in organizations.

Armed with such a framework, I tested it as an observational guideline for a case study in a Lottery organization. A year later, I found that, even though the contextual framework systematically guided the observation of common knowledge instances, it did not offer an explanation of the relationship of such instances to the organizational capability (for which I did not yet have an articulated framework).

The contextual framework did not clearly set the criteria by which observable instances are either knowing or knowledge (Gourlay, 2006; Tsoukas, 2003), an assessment that was frequently required to decide which instances to observe.

I assimilated the experience as a process in which I learned to use case study methodology (Yin, 2003a; b) and the rigor of observation, writing and publishing, while recognizing that I had advanced in one important piece of the puzzle: identifying the criteria by which common knowledge is common in organizations: its organizational context.

After evaluating that experience, I had a clearer idea of the required dimensions of the framework for observing, understanding and explaining common knowledge in organizations.

First, I was asked to explore extant individual level knowledge and knowing theories (Polanyi, 1958; Bruner, 1990; Weick, 1995) in a way that ends up offering a framework for identifying observable instances of knowledge and knowing in organizational contexts.

It was a defiant and enriching work, given that extant references to knowledge theories in organizational studies mainly invoke either their central ideas, for example, that personal knowledge is tacit or founded on tacit knowledge (Polanyi, 1966), which offered limited observational handles to the organizational researcher (Gourlay, 2004; 2006); or explore the development of new understandings of knowledge in organizations (Gourlay, 2006; Baumard, 1999).

Second, the theories or views of the firm, in which knowledge plays a role (Simon, 1991a; Cyert & March, 1992; Nelson & Winter, 1982; Spender, 1992; Kogut & Zander, 1992; Grant, 1996a) needed to be framed in such way that the body of knowledge that participates in the logic behind the view of the firm (organizational capability) is made explicit.

Finally, we need the criteria by which knowledge in organizations is framed as common knowledge (already dealt within my previously published work). With such clarity of requirements, I put myself to work again on the theoretical component of this quest.

Since, extant literature did not offer such holistic framing of theories of knowledge and theories of the firm, in the beginning, I was tempted, for time's sake, to follow a

surgical approach and extract the required epistemological foundations and the inventory of knowledge instances from those theories.

However, while I was reviewing those theories, I found myself following the grounded-theory approach (Charmaz, 2006; Strauss & Corbin, 1998), in the sense that (a) I had articulated questions to be asked to the text of the knowledge theories (questions like "What is the role of language and meanings in the use, creation and sharing of knowledge?") and to the text of the firm´s theories (questions like "What knowledge sustains the organizational capabilities in this theory?"); and (b) that I was comparing and contrasting in search of topics for framing possible answers.

"What scientific method should be followed to frame such theories?" I asked myself. There was no easy answer, especially for the scientific consequences and scope that the answers implied.

To frame the question, I considered that this was not an endeavor oriented towards the development of a new theory of knowledge - there are plenty of them (Polanyi, 1958; Weick, 1995; Bruner, 1990, Gourlay, 2006, Baumard, 1999) - but an endeavor trying to frame extant theories for ulterior purposes.

Then, on one hand, following the traditional literature review approach and declaring adherence, following certain plausible criteria, to an understanding of knowledge, sounded methodologically acceptable. On the other hand, I thought that, as organizational researchers, we lack of a single scientifically accepted definition and operationalization of knowledge (Alvesson & Kärreman, 2001; Kakihara & Sorensen, 2002), and that the

concept of knowledge was a key issue in a dissertation that tries to frame common knowledge in organizations.

I kept thinking for a while. Then, I recalled certain class discussions with professor Gourlay (2006), in Denmark, where he commented on his work on *tacit knowing*, in which he exhausted its conceptualization in empirical studies following a procedure that mirrors grounded-theory studies. Finally, I made up my mind when I also recalled the work of Cook and Brown (1999) questioning knowledge management research works that do not clearly specify their epistemological foundations.

In short, the literature review and the emerging observational frameworks of this research will follow Charmaz (2006) and Strauss & Corbin's (1998) grounded-theory approach. In doing so, it reviews the extant text of theories of knowledge and theories or views of the firm following a careful line by line analysis, to compare and contrast them in search of topics that frame (a) individual knowing and knowledge, and (b) knowledge domains within organizational contexts. If successful, this could be considered a specific research contribution on its own merits.

Twelve months later, such frameworks were ready for empirical testing. The framing of the theories or views of the firm revealed different organizational capabilities among them, and, as a consequence, different roles and instances of common knowledge. Given the previous Lottery case study experience, and after holding in depth discussions of the approach with colleagues [for which I am very grateful (see Acknowledgments)], I decided to let the document with the outline frameworks rest for a while (three months), and then put it to test in my business endeavors.

For six months, construction workers were observed and invited to explain their doings in work related activities every working day, to validate the individual knowledge framework. Business process designers and software developers were observed and interviewed for another six months, in regard to how they integrate their work related doings into the deliveries of the automation project. All of it was done to validate the organizational capability framework. It took a while, which helped to add preciseness and to gain confidence in the frameworks.

At that point, I made the decision of following Grant´s (1996a) knowledge based view of the firm for the empirical observation of organizational capability (Charmaz, 2006), mainly for three reasons. First, it was clear that the organizational context of my original businessman question referred to an organization that integrates specialists' knowledge into services (or products) supported by common knowledge, which is the main approach proposed by Grant (1996a) in his view of the firm. Second, Grant´s knowledge based view of the firm holds greater explanatory power (Deutsch, 1997), since it more closely describes the role of knowledge in regard to the organizational capability of a firm, with not much space for theory changes. And, third, Grant´s (1996a; b) is an exploitation view of extant knowledge of organizations (effectiveness) and of new knowledge (flexibility); which means that it may explain better how organizations incorporate knowledge to the productive practice.

This choice of Grant's (1996a) KBV of the firm helped to refine the research question as: *How is common knowledge in organizations related to the knowledge integration capability?*

These theoretical findings brought the great explanatory powers and rich details of the re-reading of extant individual knowledge theories (Polanyi, 1958; Weick, 1995; Bruner, 1990) to light. Details such as (a) the understanding of knowing as the instrumentalization of physical or mental objects or behaviors, (b) the continuum between ability-based knowing and symbol-based knowing characterized by the gradients of the symbolic content of the tool in use, and its implications for making what we know either explicit or not; or (c) the characterization of the knowing tensions around the logic of contriving, that is, the criteria through which we assimilate physical and mental tools and qualify their usage as knowing.

Finally, the empirical findings here are based on a case study (Yin, 2003a; b) that portrays a ten-year International Inter-university Cooperation Program – designed to dote the beneficiary university with its essential organizational capabilities (researchers, research culture and research facilities), and in which specialists' knowledge was integrated during the externalization of the Program's lessons learned. The process of framing the participating body of knowledge for this case, following grounded-theory (Strauss & Corbin, 1998), was extensive but straight forward since the knowledge areas (12) for the management of programs had already been formalized by the Project Management Institute (PMI, 2009).

Yes, there is an answer for the original businessman' question (*Why is it, that even though we advise everyone in the organization to take action considering the broadly shared specific directive; we frequently confront misalignments to it?)* and for the refined question of the researcher (*How is common knowledge in organizations related to the knowledge integration capability?*); and it is an answer that is plausible, rich in content,

and framed to fit into Grant´s (1995a) invitation to advance in his proposed KBV of the firm.

A businessman could always jump to the conclusions chapter and look at the single-page 5x3 matrix (Table 51) that is proposed as the common knowledge framework in organizations. In it, he will find, in familiar terms, 42 entries about the role that common knowledge holds in tools like (1) directives, (2) plans, (3) routines, (4) organizational structure, and (5) architecture of capability when integrating knowledge into productive outcomes. And for the specific issue regarding the directives, a businessman will find, in section 6.4.2, a set of twelve questions, emerged from the common knowledge framework, which invites to re-think about managing knowledge in organizations.

Additionally, a researcher will mostly find tools that are proposed to fill relevant gaps in certain lines of strategy research and knowledge management research. Among these tools are: (a) the framing and contrasting of extant individual level knowledge theories, (b) the framing and contrasting of extant theories of the firm with their knowledge domains, (c) the framing of common knowledge in extant theories of the firm, and (d) the framing of empirical findings about common knowledge in the context of the knowledge integration capability in organizations.

Surely, at this point the reader may have become acquainted with the more general conclusion of this quest: the role of common knowledge in organizations depends on the theory that the business leader or researcher holds about organizations. The specifics of this and other conclusions are presented in such a way as to invite thinking about *how*

common knowledge supports the subjacent business logic of organizations and shapes the way of seeing organizations.

Here, at this point, a narrative style that abuses the pronoun "I" is ended. This was a deliberate approach, not only intended to reveal research justifications, motivations, and contributions, but oriented to sharing the tension of the personal duality – the organizational researcher and the entrepreneur – and in sharing it, looking for a way to mitigate, in the reader, the tension of contriving the proposed extensive and detailed open and axial coded findings as the plausible and useful tools they are intended to be.

1.2 DISSERTATION STRUCTURE

This dissertation is structured in six chapters. The first two chapters describe quest motivation and review the literature that contextualizes such quest. The third chapter describes research objectives, methodologies and the case being studied. Chapters 4 and 5 frame individual level theories and theories/views of the firm. Finally, chapter 6 presents theoretical and empirical findings, conclusions, contributions and limitations. The next four sections summarize chapters' content and their linkage logic.

1.2.1 Research Motivation and Literature Review

As it has been noticed, this first chapter tries to share research motivation which is captured in the quest of the businessman for an answer to: "Why is it that, even though we advise everyone in the organization to take action according to a broadly shared specific directive, we frequently confront misalignments to it?"

The chapter also contextualizes the quest in terms of common knowledge in organizations (CKO) in relation to knowledge theories and organizational capabilities within theories of the firm.

Second chapter reviews literature regarding (a) knowledge and common knowledge in views of the firm, (b) its conception and role within their organizational capabilities, and (c) identifies research gaps in those two themes.

Among those identified research gaps is the conclusion that since extant individual level knowledge theories has not been operationalized yet (Alvesson & Kärreman, 2001; Kakihara & Sorensen, 2002), then, as an extension, we do not count with a tool to frame common knowledge within views of the firm. The alternative of developing and isolated frame of reference for common knowledge returns to defining its epistemology.

With similar framing limitations, organizational capabilities are identified as embedded in the explanations of knowledge-based view (KBV) of the firm (Grant, 1996; Spender, 1996; Kogut and Zander, 1992), in which their labeling is usually upfront (e.g. knowledge integration capability or organizing principles); but the complex patterns of coordination between people and between people and resources designed for value creation are not that evident in such firm views.

1.2.2 Research Objectives, Methods and Case Study Description

The third chapter describes theoretical and empirical objectives, and research methodologies.

The dissertation´s general research objective is to understand and explain the role of common knowledge in organizations within the integrating capability of the KBV of the firm.

Such objective emerges in the context of Grant´s (1996a) understanding of the firm as a knowledge integrator (p. 116), that is, as an organization that primary and routinely applies existing knowledge resident in individuals during its operations; and that the key is to minimize specialist knowledge transfer is through common knowledge.

This objective sets the attention in the two previously identified research gaps: (a) framing knowledge within firm´s views and (b) framing organizational capabilities to unveil their supporting knowledge domains. This chapter argues and describes how grounded theory will be applied to frame extant theories of knowledge and views of the firm to fulfill such research gaps.

Then, given the exploratory orientation of this quest, it was chosen that the empirical part of this dissertation follows (1) a qualitative approach using case study methodology (Yin, 2003a; 2003b) for the design, and (2) grounded theory (Strauss & Corbin, 1998; Charmaz, 2000; 2006) for data analysis protocols, all this, in order to answer the research question:

> *How is common knowledge in organizations related to the knowledge integration capability?*

Finally, this chapter also portrays the case, which corresponds to a ten-year International Inter-university Cooperation Program that integrates knowledge during the

externalization of the Program's lessons learned. Data collected include extensive program documentation, surveys and 16 filmed interviews with Scholarship holders, Local Project team members, Flemish Project team members, Local Program administrators, Flemish Program Administrators and Non-participant Local Professor.

1.2.3 Framing Knowledge Theories and Theories of the Firm

Chapters 4 and 5 6 follow grounded-theory methods (Charmaz, 2006; Strauss & Corbin, 1998), to develop (A) an Individual Knowing Framework, (B) an Integrated view of language, shared meanings, and recognition of knowers, (D) an Organizational Capability Framework within KBVs of the firm, that is used to reveal views´ knowledge domains. Note: references denoted here as A, B and D) follow codification used in Table 1.

The interception of the (B) Integrated view of language, shared meanings and recognition of knowers within the context of individual knowing theories, the (D) Organizational capability framework, and the transversal application of the (C) Commonness criterion ease the construction of a conceptual model that served as a departing point to observe the (F) empirical instances of common knowledge in the outcomes of the productive practice in organizations; and from there try to understand and explain the relationships among common knowledge types with the organizational capability in the context of KBVs of the firm in general, and with Grant's (1996a; 1996b) knowledge integration capability in particular.

1.2.4 Findings, Conclusions, Contributions and Limitations

Chapter 6, the final chapter, is about the theoretical and empirical findings and conclusions. It shows the analysis of 36 lessons learned which are grouped by type of activity (Program Opening issues, Program and Component management, Sub-Component Management, and Scholarship issues and Program Closing issues) and theme in 12 knowledge area, following PMI's (Project Management Institute) practice.

Strauss and Corbin (1998) grounded theory approach was followed to develop categories of the interviewees' data, considering as departing point (Charmaz, 2000, 2006) the developed frameworks (Individual knowing framework, the Organizational capability framework, and the transversal application of the commonness criterion), see Tabe 1. Chapter 6 also offers conclusions, theoretical contributions, practical implication, future research and limitations of the research.

In this dissertation I have to recognize and apologize for an unbalanced distribution of content (pages) among chapters. Chapters 3 and 4, dedicated to conceptual frameworks, demanded a sequence of preciseness and details that for most I tried to place some of the content in appendices, they kept losing their clarity and richness.

Finally, to ease the recognition of this dissertation structure and the connecting logic among chapters a graphical representation is presented in Table 1. Such structuring could be also understood as general framework for exploring empirical instances of common knowledge in organizations (CKO) in the context of knowledge-based Views (KBV) of the firm.

General Framework for Exploring Empirical Instances of Common Knowledge in Organizations (CKO) in the Context of Knowledge-based Views (KBV) of the Firm

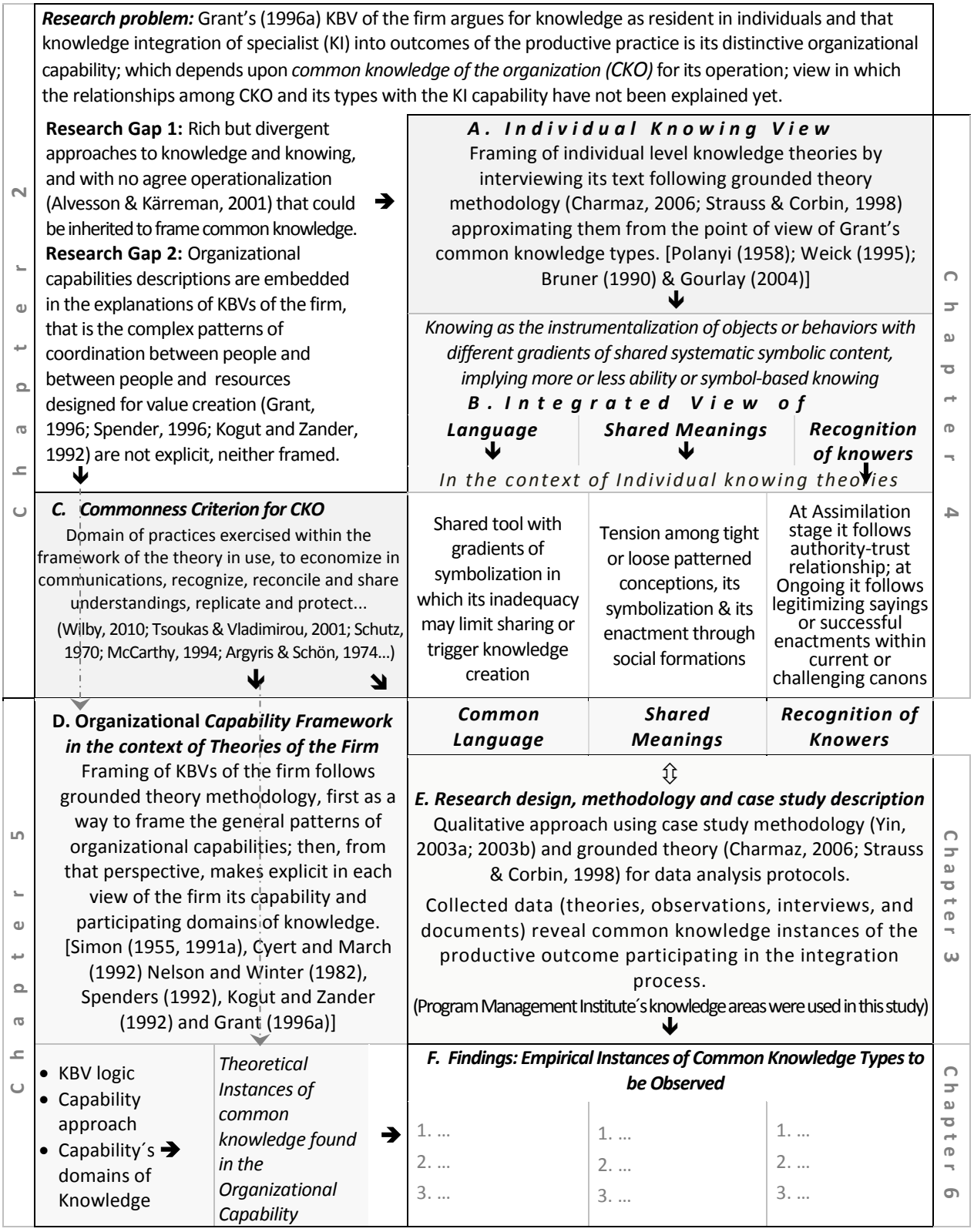

Table 1. General Framework for Exploring Empirical Instances of CKO in the Context of KVBs of the Firm

CHAPTER 2: KNOWLEDGE, VIEWS OF THE FIRM AND COMMON KNOWLEDGE

2.1 RESEARCH CONTEXT

Now you are invited to get familiar with the context of this search, which holds as its main research question: *How is common knowledge in organizations related to the knowledge integration capability?*

Since this research attends the quest from a comprehensive perspective it is convenient to star by segmenting the participating concepts into (a) the more general issues like knowledge-based views of the firm, and (b) the more specific issues like knowledge and common knowledge.

The general research context involves a critical visit to the knowledge-based views of the firm, the role of organizational capabilities within them, and the role of knowledge within those capabilities. The more specific research context goes from characterizing knowledge and common knowledge as such in organizations, and within the knowledge-based views of the firm.

2.1.1 From Resources to Knowledge in Views of the Firm

When Robert Grant (1996a) published his article *Toward a Knowledge-Based Theory of the Firm*, he sketched a view of the firm that basically emphasizes the firm as an institution in which knowledge-based capabilities are the main driver for value creation, emphasizing that such knowledge resides in the members of the firm.

Grant´s (1996a) view, when recognizes knowledge in organizations as residing within the individual, is a portray of the firm that depart from other views that conceived knowledge residency in objects of the organization (Cyert and March, 1992, Nelson and Winter (1982, Kogut & Zander, 1992); that is, a view that raises epistemological discussions about the residence of knowledge in organizations (Tsoukas, 2009; Gourlay, 2006, Foss 2003a), an in consequence about the approaches for managing knowledge in organizations.

However, before getting into specifics, it is useful to review: *How is that organizational researchers came to appreciate an understanding of the firm in terms of knowledge?*

The general context of value creation in organizations is best described by the way organizations are viewed in abstract terms. Penrose (1959) conceived the firm as an administrative entity with a collection of productive resources. In his view, *material resources and human resources p*rovide the firm a variety of services according to the firm´s ideas on how to apply them. In this view of the firm, called resource-based view (RBV), resources could be classified as physical, human or organizational according to Barney (1991); or tangible or intangible according to other authors like Mathews (2003).

RBV is a strategic notion of the firm which conceives it as an entity that possesses scarce, durable, and valuable resources, through which the firm envisions and implements its value creation mechanisms (Barney, 1991); that is, an understanding that sets in *resources possession* the evaluations of strengths and weaknesses that eventually help to shape the strategy of the firm.

In this view of the firm, resources and capabilities explain the profit and value of the organization (Penrose, 1980), and they explain differences in performance within an industry (Hoopes et al., 2003). These differences in performance were revealed to happen when well succeeded organizations possess valuable resources that others do not have (Wernerfelt, 1984).

In RBV, organizations are heterogeneous entities characterized by their particular and unique resource bases (Barney, 1991; Nelson & Winter, 1982) and in this sense the type, magnitude, and nature of resources and capabilities are important determinants of their capacity to generate profit (Amit & Schoemaker, 1993).

In RVB, resource accumulation is considered to be a manifestation of innovative and entrepreneur activities; and profits can only emerge from these activities if resource accumulation costs are inferior to the rents that those resources might actually produce (Peteraf, 1993). This implies that the choice of the resources is the main mechanism influencing the generation of the economic rent (Makadok, 2001); thus, *the organization should back with knowledge these superior capabilities to choose resources at the resource markets* (Barney, 1986a, 1986b). These capabilities will traduce in better expectations of the future value of resources, than those presented by other participants in the resource market (Makadok, 2001).

Thus, the mechanism for economic rent creation acts before the acquisition of resources; and firms that hold superior capabilities to identify winning resources will be able to acquire them and benefit from them, even they are not acquired (Makadok, 2001).

It should not past without noticing that in this RBV logic there is an instance of the value creation capability guided by knowledge-based activities, and it is in this relevant sense that RBV could be considered a theoretical predecessor of views of the firm that are based on capabilities that apply knowledge to create value.

Then, these knowledge-based activities fit in the understanding of the firm as an entity in which the source of tangible resources lies outside the firm; and that the manner of exploiting factors of production is mainly originated within the firm. It is in this context that authors like Spender (1996), Grant (1996a, 1996b) and Zack (1999) proposed that, this unique manner – knowledge-based value creation capability – is in the core of the knowledge-based views (KBV) of the firm.

Elaborating the KBV view, Grant (1996a, p. 112), following Demsetz (1991), argue that firms exist as institutions for producing goods and services because they can create conditions under which individuals can integrate their knowledge and that markets are unable to assume this role because of the immobility of tacit knowledge in organizations and the risk of appropriation of explicit knowledge by the potential buyer.

Then, this is the point in which RBV and KBV set apart. While RBV argues mainly for the possession of resources types (material and human) and characteristics (nature and magnitude) for explaining firm performance, that is a Ricardian view for rent creation; KBV argues mainly for the enactment of capabilities for explaining firm performance, that is a Schumpeterian view of rent creation (Teece et al., 1997).

However, by accepting this breaking point between RBV and KBV we are also asked to consider a fundamental epistemology change in the approach follow to create value in

organizations; that is, we are confronting a shift from the epistemology of possession of resources (knowledge about resources) to, both, the epistemology of possession of knowledge and its practice (knowledge in action). A relevant change that is well expressed by Cook and Brown (1999) in:

> *Organizations not only create knowledge, they also – and usually primarily – create goods and services. In doing so, they need to be increasingly innovative. And this requires, we believe, attention not only to what they possess, but also to how they practice. This calls for a broadening of focus from one epistemology to two, including the generative potential of interplay between them (p.71).*

In summary, seeing now organizations as entities that create value supported in knowledge-based capabilities shift the explanations of the theories of the firm about performance from resource possession to knowledge possession and practice; and such change asks for the characterization of its main construct (knowledge) and its enactment (knowing) in organizations.

2.1.2 Organizational Capabilities and Views of the Firm

Let's start reviewing such characterization of knowledge and knowing with a better understanding of organizational capability, by paraphrasing Zack´s (1999) contextualization of capability: "What a firm knows is a resource …What a firm knows how to do, is a capability". And in that context, Simon´s idea of organizational processes, back there in 1947, fits also as capability: heuristics accumulated over experiences. However, what should not go unnoticed among those understandings is the difference of emphasis between the disposition to act ("do") and the past actions ("experience").

Descriptions of organizational capabilities come from many authors from different string of research – organizational studies, strategy, organizational learning, and knowledge management. Their summarized descriptions could be split in three groups: (1) those research works in which the focus is set in the capability itself, (2) those works that embed the capability description within a broader organizational study, and (3) those works that presents the capability within a view or theory of the firm.

The first group of capabilities tends to hold a qualifying label and explicit definitions:

> *(a) Core competences* (Prahalad & Hammel, 1990): Specific factor that is central to the way the organization works, which can be re-used in different products and markets, contributes to customers' good experience and is difficult to imitate by competition.
>
> *(b) Absorptive capacity* (Cohen & Levinthal, 1990; Van den Bosch et al., 2005): Ability of organizations to recognize external knowledge, assimilate it, and apply it commercially.
>
> *(c) Capability as a network of routines* (Grant (1991, p. 122): Complex patterns of coordination, between people and between people and resources, design for competitive advantage and profitability.
>
> *(d) Dynamic capability* (Teece et al., 1997): Organizational ability to build and reconfigure competences to tackle changing environments.

The second group of capabilities corresponds to research proposals that tell us about the way organizations create knowledge (Nonaka, 1994) or the way they combine they routine activities with their innovative activities (Duncan, 1976). Even though their authors do not call them capabilities, they achieved to characterize them as such, as is the case of:

(e) SECI model capability (Nonaka, 1994): Ability of an organization of translating the tacit knowledge of the members, by means of dialogues and collective reflection, to explicit knowledge of the organization, manifested in the form of documents, procedures, plans.

(f) Ambidextrous capability (Duncan, 1976; Tushman & O´Reilly, 1996): Ability of an organization to manage the tension of an asymmetric structure and culture that deals simultaneously with tight predictable units focused on economies of scale, scope and with loose risk taking units oriented to flexibility and customer closeness.

The final group of capabilities is recognized as part of a view or theory of the firm in which knowledge is its key driver. Some of these theories were published under parallel lines of research like organizational learning, (OL) (Argyris & Schön, 1978), or published in organizational studies, even before the labels KBV or OL were coined.

Most of these capabilities were not explicitly labeled with a specific name, nor concisely described, but hinted in the extensive narrative of the theory (Simon, 1947; 1991a; Nelson & Winter, 1982; Cyert & March, 1992), or left for the inference of the reader (Spender, (1989; 1992); or combined with the description of the view or theory (Kogut & Zander, 1992; Grant, (1996a; 1996bs):

(1) Heuristic-based capability (Simon, 1947; 1991a): Ability of the organization to satisfy its goals through heuristic-oriented rational competences guided by choosing rules.

(2) SOP-based capability (Cyert & March, 1992): Ability of an organization to satisfy its goals through adaptively rational uncertainty-avoiding standard operating procedures.

(3) Routine-based capability (Nelson & Winter, 1982): Repetitive patterns of activity oriented to fulfill firm´s targets, and that adapts to changes by replacing failing routines with existing satisficing recombined subroutines.

(4) Industry recipe-based capability (Spender, 1989; 1992): Ability of an organization of either (a) reactively apply classical managerial knowledge by accepting certain institutional assumptions for action; or (b) proactively apply creative entrepreneurial and collaborative industry recipe-based knowledge by assessing and influencing institutional assumptions for action.

(5) Replication and Combinative capabilities (Kogut & Zander, 1992): Ability of an organization to (a) replicate activities by means of a shared language to eases knowledge transferability and exploitation of complex knowledge embodiments, and (b) recombine functional knowledge through a common coding scheme that encapsulated substantial knowledge.

(6) Integrating capability (Grant, 1996a; 1996b): Ability of the organization to efficiently integrate the knowledge of specialists into productive outcomes by minimizing knowledge transfer through the use of common knowledge.

In general, these three different groups of conceptualizations of organizational capabilities exhibit two, non-necessarily exclusive, approaches to organizational capabilities: (a) *the exploitation of existing routines* (also referred here as "application") (Simon, 1947; 1991a; Cyert & March, 1992; Grant, 1996a; 1996b), and (b) *the exploration of new alternatives* (also referred here as "creation" or "generation") (March, 1991, Duncan, 1976); which are presented as complementary (Kogut & Zander, 1992), or

as alternatives (Spender, 1992), or as combined; but not in an integrated way (Raisch et al., 2009), see Tabe 2.

Another issue that is relevant to establish is that such descriptions of organizational capabilities neglected the framing of knowledge and knowing instances that support the capability, that is, given the provided conceptualizations of capability there is still a pending theoretical work to enable the observation of specific knowledge instances linked to organizational capabilities; an issue to which this quest will have to attend. Summing up:

> O*rganizational capabilities are the complex patterns of coordination, between people and between people and resources for the purpose of creating value.*

These capabilities which are either described explicitly in focused organizational studies, or hinted in the narrative of the theory of the firm, or left for the inference of the reader to propose (a) *the exploitation of existing routines* and/or (b) *the exploration of new alternatives*, within a scope that left the capability unframed in respect to their knowledge or knowing instances.

Summary of Approaches to Organizational Capabilities

Capability			*Approach*	*Research Context*
Prahalad & Hammel (1990)	Core competences	Reapply core knowledge	Exploitation	Focus set in capability
Cohen & Levinthal (1990)	Absorptive capacity	Absorb external knowledge and apply it	Exploitation	
Grant (1991)	Network of routines	Coordinate interaction between knowledge with resources	Exploitation	
Teece et al. (1997)	Dynamic capability	Recombine extant knowledge and apply it	Exploitation	
Nonaka (1994)	SECI model capability	Translate personal tacit knowledge into explicit organizational knowledge	Exploitation	Capability within a broader study
Duncan, 1976; Tushman & O´Reilly (1996)	Ambidextrous capability	Cope with the tension among applying and creating knowledge in the same organization	Exploitation & *Exploration*	
Simon (1947; 1991a)	Heuristic-based	*Apply* heuristics to satisfy goals	Exploitation	Capability within firm´s view
Cyert & March (1992)	SOP-based	*Apply* standard operating procedures to satisfy goals	Exploitation	
Nelson & Winter (1982)	Routine-based	*Apply* routines to satisfy targets and recombine sub-routines to attend changes	Exploitation	
Spender (1989; 1992)	Industry recipe-based	(a) *Apply* managerial knowledge to attend given institutional goal conditioning	Exploitation	
		(b) Co-*create* industry recipe knowledge to influence institutional goal conditioning	*Exploration*	
Kogut & Zander (1992)	Replication and Combinative	(a) *Apply* shared organizational language to ease knowledge transfer	Exploration	
		(b) *Create* functional knowledge by encapsulating substantial knowledge through shared coding systems	*Exploitation*	
Grant (1996a; 1996b)	Knowledge Integration	*Apply* (integrate) specialists knowledge into productive outcomes by minimizing knowledge transfer through common knowledge	Exploitation	

Table 2. Summary of Approaches to Organizational Capabilities

2.1.3 Knowledge in Capabilities within Views of the Firm

Research regarding knowledge-based organizational capabilities shares principally the same motivation: management of the implications of the transferability of knowledge in organizations; implications that are best exemplified in the desirable replication that guides organizations' grow and effectiveness; and the unwanted imitation by competition that drains organizations' advantages (Winter, 1987).

Managing such implications asks for reviewing the research status of the two epistemological issues previously identified: (*1) knowledge understandings and its residency,* and *(2)* recognizing knowledge domains of organizational capabilities.

That is, if we are asked to build and manage organizational capabilities that, at will, replicate effectively and deter unwanted imitation, it would be better to understand the "who", "what", and "how" of them.

The first issue, besides discussing knowledge residency, has to do with the need to hold clarity about the difference and relationships between knowledge and knowing. The second issue has to do expliciting organizational capabilities domains of knowledge.

Both of these subjects are attended in detail in Chapter 4 (*Framing Individual level Knowing*) and in Chapter 5 (*Body of Knowledge of Organizational Capabilities)*; however, we will advance here with the mainstream of ideas to characterize the topics while controlling the risk of being repetitive.

2.1.4 Knowledge Understandings and Residency within Views of the Firm

Depending of the view of the firm, knowledge holds residence within the individual (Simon, 1947; 1991a; Grant, 1996a), or in the objects of the organization, either in abstract objects like routines (Nelson & Winter, 1982), or in physical objects like productive infrastructure (Spender, 1992), or in social or cultural objects like language (Kogut & Zander, 1992; Grant, 1996a; 1996b).

Knowledge Conceptions and Residency within Knowledge-based Theories of the Firm

Simon (1947; 1991a)	Satisficing heuristics and bounded rationality	Individuals
Nelson & Winter (1982)	Organizational routines	Abstract objects
	Tacit knowledge and bounded rationality	Organization
Cyert & March (1992)	Standard operating procedures	Documents/ Organization
Spender (1989; 1992)	Industry recipe	Social and cultural process
	Knowledge-embedded productive infrastructure	Physical objects
Kogut & Zander (1992)	Organizing principles	Organization
	Common language and shared coding system	Social and social objects
Grant (1996a; 1996b)	Common language, shared meanings	Cultural and social tools
	Recognition of knowers	Social process

Table 3. Summary of Knowledge Conceptions and Residency in Theories of the Firm.

The lack of single scientifically accepted definition and operationalization of knowledge (Alvesson & Kärreman, 2001; Kakihara & Sorensen, 2002) has moved

organizational researchers in their endeavors to adhere in practical terms to a variety of knowledge understandings and residency (see Tabe3).

All this in the context of the two main trends in the study of knowledge in organizations (Bou et al., 2004a; b); one with emphasis in typifying knowledge and its exploitation in the organization endeavors, like the (a) data-information-knowledge continuum (Davenport and Prusak 1998; Bell 1999), (b) the tacit-explicit dichotomy (Nonaka, 1994), (c) the know what – know-how dichotomy (Davenport and Prusak 1998), or the (d) declarative-procedural-causal structural content (Zack, 1999). The other trend focused in learning and action, in which knowing and practicing happens at the same time (Orr, 1993) within and considering a specific situation (Lave and Wenger, 1991), in which actions are part of our ongoing sense-making (Weick, 1995).

One key issue within the diversity of knowledge understandings is the risk of the reifying organizations as knowers; a concern presented by Grant (1996a) when arguing in favor of knowledge as residing in individuals, expressed as:

> *Taking the organization as the unit of analysis not only runs the risk of reification, but, by defining rules, procedures, conventions, and norms as knowledge fails to direct attention to the mechanisms through which this 'organizational knowledge' is created through the interactions of individuals, and offers little guidance as to how managers can influence these processes (p. 113).*

Concerns about the risk of reification of organizations as knowing entities are not new. For example we can recall the words of Herbert Simon when he was invited to the Conference of Organizational Learning in 1991 in honor of James March (a proponent

that organizations learn) when presenting his paper on Bounded Rationality and Organizational Learning:

> *However, we must be careful about reifying the organization and talking about it as "knowing" something or "learning" something. It is usually important to specify where in the organization particular knowledge is stored, or who has learned it.* (Simon, 1991a, p. 126).

Simon's warning is helpful for characterizing the state of development of the KBV of the firm. Let's start by assessing his statements. First, people of the organization learn; implying the exercising of an ability that achieves to acquire certain knowledge. Second, knowledge has a residing place in the organization, implying that knowledge is a conceivable object – tangible, intangible, concrete, abstract, logically or socially constructed – that is, the possibility of embedding it into objects of the organization.

Then, Grant´s (1996a) warning and Simon´s (1991a) call ask, in broader terms, that any theory of the firm that follows the dual residency posture should be ask to make reference to (a) theories about individual level knowing, and (b) theories about knowledge-embedded objects.

However, what is actually posited in most theories of the firm is that organizations not only store knowledge in these objects but also learn or know while neglecting the epistemology requirements; and conceiving in this way knowing objects as the object of observation and measuring in the organization. Let's briefly approach these theories of the firm to recognize these "knowers".

Most theories of the firm (Cyert & March, 1992; Nelson & Winter, 1982; Kogut & Zander, 1992; Spender, 1992) have conceived either organizational cognitive collective

constructions as a knowing entity, and used these abstractions as unit of analysis; as is the case of the knowledge residing in Cyert and March's standard operating procedures, or Nelson and Winter's routines; or proposed the alternative of social constructions, as is the case of Spenders' industry recipes, or Kogut and Zander's organizing principles. Thereby, in these views, organizations "learn" by encoding inferences from history into routines that guide behavior (Levitt & March, 1988); or into organization's industry recipes that hold knowledge that modulates rationality (Spender, 1989); or social knowledge as source of the combinative capability that creates value (Kogut & Zander, 1992).

In these views, in one side we have the posture of theories of the firm that advocates for knowledge residing at individual level (Grant, 1996a, Simon, 1947) which do not count with an operationalized knowledge theory yet; and in the other side there are theories of the firm (Cyert & March, 1992; Nelson & Winter, 1982; Kogut & Zander, 1992; Spender, 1992) that argue for individual and organizational residency that propose approaches in which human knowing activity is assimilated into knowing organizational objects that eventually could be operationalized and measured.

These last group of theories usually, when describing the body of knowledge that participate in the organizational capability, merge human native faculties that participate in the process of knowing – e.g. heuristic faculties – with the instrumentalized object of the knowing process – e.g. procedures, routines, recipes. However, no clear epistemology is provided to support such relationship.

The rich but diverse understandings about the central construct of the knowledge-based views of the firm eventually leads to different type of observations of what

constitute knowledge, and therefore to different managerial conclusions. Moreover, if we ponder that views of the firm does not always hold specific epistemological foundations, or such specifics refer to theories of knowledge (Polanyi, 1958; Weick, 1995; Bruner, 1990) tangentially or misread them (Gourlay, 2004; 2006, Foss, 2003a; 2003b), or mix incompatible epistemologies (Miller, 2008).

Then, if we consider: (a) the absence of a unified accepted conception of knowledge (even though they are plenty of theories available), (b) the two main knowledge management research trends (the application of a variety of knowledge types and the situated practice), (c) the incomplete integration of such epistemologies when they are invoked in views of the firm, (d) the risk of reification when departing from individual as knowledge holders, and (e) the possible divergent management implications of such variety of conceptualization; we could say that there is a relevant research call for re-reading extant theories of knowledge in search of their framing to offer a well founded approach to knowledge and knowing in the context of the capabilities of views of the firm.

Given such warnings and call, I advance here a departing research posture about knowledge and knowing, not a radical one, but one that will demark our initial research steps: *to avoid the risk of reification, the act of knowing is recognized to happen at individual level.*

In regards to the knowledge-knowing dichotomy, Cook and Brown (1999) proposed bridging the two epistemologies and theories that regard about "possessing" different types of knowledge and those theories that focus on "practice and action" (knowing). In

such view, non-translatable four types of knowledge (individual explicit and tacit, and collective explicit and tacit knowledge), understood as tools, are at the service of knowing, in an interplay that generates new knowledge and new ways of knowing. That is, knowledge, abstract and static, holds residency in the individual and such possession does not demand its usage; while knowing, concrete and dynamic, is related to the work individuals do with such tools.

While Cook and Brown (1999) approach for bridging knowledge and knowing epistemologies is a compelling step forward the unification of knowledge management research endeavors (Merali, 2000; Okhuysen and Eisenhardt, 2002), however its taxonomy has been questioned for not reflecting Polanyi´s (1958) epistemological work (Orlikowski, 2002).

2.1.5 Recognizing the implicated domains of knowledge at capability level

With the to-be-emerged KBV of the firm integrating orientation to understand knowing and knowledge, we could attend the issue of recognizing knowledge domains of the organizational capabilities; to do so, we should star by recalling the ample number (14) of approaches that describe organizational capabilities (see Section 1.2.2), and in that sense we need to adhere to a productive selection criterion that helps to set the boundaries of the quest.

The proposed criterion is oriented to choose organizational capabilities that are hold within views or theories of the firm that incorporate knowledge as they main driver,

including those that were stated even before the label KBV was coined by Grant and Spender (1996).

This criterion leaves out of consideration well known approaches like (a) Nonaka's (1994) SECI model, which concentrates in the knowledge life cycle in organizations, but without offering a complete view of the firm, and (b) Cohen and Levinthal´s (1990) absorptive capacity, which analyses the implications for an organization that is able to incorporate outside knowledge to innovate, but such following an approach that does not make explicit a theory of the firm.

Similar arguments apply to core competences (Prahalad & Hammel, 1990), capability as a network of routines (Grant (1991), dynamic capability (Teece et al., 1997), and ambidextrous capability (Duncan, 1976; Tushman & O´Reilly, 1996).

The eight selected capabilities, the ones listed in Table 2, already classified into exploitation and exploration approaches, could be framed additionally to attend the knowledge possession and practice dichotomy; which in organizational terms, I argue to be understood as the dichotomy between the knowledge participating in the organizational design stage, and the knowledge participating in the organizational execution stage. In such view the research endeavor invites to read (Strauss & Corbin, 1998) theories of the firm in search knowledge domains considering the two dimensions: (a) exploitation-exploration and (b) design-execution. Such framed reading of capabilities allows for comparable revealing knowledge domains among them.

2.1.6 Common Knowledge

Before getting into the discussion of common knowledge in organizations (CKO), is a useful approach to recognize the status of the central idea of common knowledge in philosophy and cognitive psychology.

Initially, this concept was reviewed from the perspective of philosophical studies by Lewis (1969) and described summarily as "there is common knowledge of *p* in a group of agents *G* when all the agents in *G* know *p*, they all know that they know p, they all know that they all know that they know *p*, and so on ad infinitum". Later in 1976, Lewis´ understanding of common knowledge was mathematically formulated by Aumann (1976), who set the focus of his efforts in modeling the infinitum issue.

In philosophical studies, in a work about meaning, Schiffer (1972) enrich the discussion of common knowledge by incorporating the idea that mutual knowledge can happen within finite situations, that is:

If:

Actor *1* knows about an Object or Event *p*, and

Actor *2* knows about an Object or Event *p*, and

Actor *1* knows that Actor 2 knows about *p*, and

Actor *2* knows that Actor 1 knows about *p*

…

Them, even though there may be infinite number of iterations, Schiffer (1972) poses that for mutual knowledge to come into existence actors are aware of the situation they are attending to, which brings about for the participating actors, in their quality

of normal individuals, possibilities of generating shared inferences from the particular situation; which eventually will end up with the knowing interactions.

However, Wilby (2010), in a revealing work in philosophical studies and cognitive psychology, considered that Schiffer´s (1972) approach was elegant but improvable, and proposed (a) to notice that the common generating property that eventually limits the infinite regression of embedded mental states within the conception of mutual knowledge is "a visibly ´normal´ open-eyed, conscious person" (p. 35); and (b) to invoke Campbell´s work in cognitive psychology (2005) about the distinction between *reductive analyses and relational analysis* in the context of *joint attention*.

In *reductive analysis* it is possible to identify, within the psychological states of an actor, which states matter, that *without implying that there is joint attention* with another actor about the object under consideration; and that in *relational analysis*, the ascribed relevant psychological states of the actor offer evidence that *there is someone jointly attending* (Campbell, 2005). That is, in relational analysis, the object of attention and the other actor also attending the object become part of the experience.

With such conceptions, Wilby (2010) proposes to recognize that *Actor 1 and Actor 2 know about p in terms of a relational joint attention*, and not as any *unrelated normal persons* knowing about *p*, as posited by Schiffer (1972); an understanding that helps to calibrate the interactions about their mutual knowledge; this because the needed interactions to reach common knowledge follows a single generating property: *the jointly understood social situation.* In few words:

Common knowledge is not only what actors share about a particular situation, but about what actors, who know about the other; jointly know about a particular situation.

The idea that actors "are in direct, unmediated cognitive contact with each other to the extent that they literally share the mental state of mutual knowledge" (Wilby, 2010, p. 93) does not only helps to identify its domain of knowledge, but also leads to frame the commonness criterion by which that shared cognitive state happens.

Wilby (2010) does not explicitly talks about commonness criterion, but he provides a cue for identifying it when he posits that situations, subject of mutual knowledge, could be seen as a problem (the General´s problem), in which the generating property helps to calibrate the interactions toward a share understanding of the problem (p. 98): that is:

Commonness criterion corresponds to the reference that drives joint actions toward a jointly understood situation.

We will invoke these three proxies – *common knowledge, commonness criterion and domains of knowledge* – later to support the search for a better understanding of common knowledge in organizations.

2.1.7 Common Knowledge in Organizations

In philosophy, organizational studies and communications literature the relevance of common knowledge, referred frequently with other names, is invoked in the context of the professional practice and work in organizations; as is the case of:

Common cognitive schemas and frameworks that facilitate coordination (Weick, 1979).

Shared success or failure stories about how work is accomplished (Orr, 1990).

Knowledge that the communicating parties share in common and know they share (Cramton, 2001; Krauss & Fussell, 1990).

Common cognitive schemas and common social norms of the communities that guide behaviors of practitioners (Brown & Duguid, 1991).

Stories as vehicles for molding, integrating and reconciling different individual experiences and understandings (Brown & Duguid, 1991).

Mutual cognitions to coordinate social actions (Leudar, (1992).

Metaphors and analogies as tools that bridge knowledge gaps in organizations (Orr, 1990; Nonaka and Takeuchi, 1995).

Network of intersubjectively shared meanings supported through the use and development of a common language brought into existence when people act in organizations (Weick, 1995).

Language codes as tools used by specialists to economize communications in organizations (Arrow, 1974; Grant, 1996).

Common ground integral to the coordination of actions (Clark, 1996).

When people in organizations become practitioners, not only by modeling themselves, but also by the recognition of their colleagues; that is, the becoming and recognizing of practitioners share some common grounds (Duguid, 2001).

In a more integrating approach, extant organizational research also states CKO as relevant in the value creation capability process, like in:

Industry recipe: Common cognitive and social schema that facilitate coordination among and within organizations (Spender, 1989).

Common knowledge of work activity and product ease operations of the organization (Demsetz, 1991).

Common coding system exposes functional knowledge for its internal replication and also protects substantial knowledge from competition (Kogut & Zander, 1992).

Principle of redundancy: mechanism that allows a loose coupling among members of a group in an organization (Nonaka, 1994).

Genres: Historical usage-based meanings of typified physical and social artifacts and activities that contextualize ongoing work within groups (Cook & Brown, 1999).

Such understandings of common knowledge in organizations could be categorized into:

(1) Knowledge Types (types within a domain of knowledge pending of identifications):

(a) Common language (i.e. language code, coding system, metaphors, analogies, stories).

(b) Shared meanings (i.e. shared understandings; shared cognitive schemas; molding, integration and reconciliation of experiences/understandings; industry recipes; common grounds; genres).

(c) Know-who (i.e. becoming and recognizing practitioners).

(2) Practice (commonness criteria candidates):

(a) Improving and economizing of communication.

(c) Loosely-couple mechanisms for coordinating actions.

(d) Replication and protection of key knowledge.

(e) Recognition, reconciling and sharing of understandings

In this characterization the terms "loosely coupled" as a characteristic of the coordination of actions rescues the ideas posited by Nonaka (1994, p. 26) in: "each part has the potential of becoming the leader of the entire system when there exists redundancy of information", and also by Thompson (1967) in that *pooled interdependence* is a kind of coordination driven by shared directives.

At this point, CKO sounds a little bit clearer; its commonness criterion, in a broad sense, is argued to be linked to activities related to communicating, coordinating, sharing and protecting knowledge in organizations;

That is, organizational studies description of the commonness criterion corresponds, with a more specific approach, to what has been reference in philosophy and cognitive psychology studies: *it is what drives joint actions toward a jointly understood situation.*

*A*nd, in regards to the CKO domain we have advanced in typifying some general knowledge types that fit within common language, shared meanings and recognition of knowers categories.

However, such commonness criteria and common knowledge domains need further clarification. The next section pays attention to that.

2.1.8 Domains of Knowledge and Commonness Criterion

While common knowledge in organizations, following Wilby´s (2010) social finite situation, is described as *what members of the organization, who know about the others; jointly know about the organization.* Here, the reference domain to which this knowing is common – organization - has been temporally admitted without adequate specification. Now, I argue that such finite situation is better described with the idea of *organizational context*.

Such reference to "context" may sound also too general; however, further examination will reveal that it holds the required boundary specificity to help in the identification of common knowledge domains.

Context characteristics have been discussed in detail in the knowledge management literature, as in Akman & Surav (1996) - *Steps toward Formalizing Context*; in Brézillon (2002) - *Modeling and Using Context - Past, Present and Future* in Strang et al. (2004) - *A Context Modeling Survey*, and in Akman & Surav (1997) – *The use of situation theory in context modeling*.

These publications were critically analyzed by Loyola (2011) in *Comparison of Approaches toward Formalizing Context,* in a search for a proxy that bounds common knowledge.

In Loyola (2011) the ideas of Tsoukas and Vladimirou (2001) on organizational knowledge are called to our attention. In there, they defined knowledge as the: "*Individual capability to draw distinctions, within a domain of action, based on the appreciation of context or theory, or both*"; and supported in Wenger (1988), they posit that to know how to act within a domain of actions is to make competent use of the distinctions constituting that domain.

In Wenger (1988), the label "domain of actions" corresponds to a generalization that refers to the actions within the community of a specific scientific or professional *practice*. Then, within this specific domain – practice in organizations – is where the standard of knowledge is measured through theory and/or context.

Also, social construction of reality (Schutz, 1970) is brought to our attention by Tsoukas and Vladimirou (2001) to argue in favor of context equipped as theory in the phrase:

> *"we routinely bring to situations of interaction a tacit awareness of the normative expectations relevant to them and an intuitive appreciation of the consequences that might follow from breaking them" (McCarthy, 1994).*

Normative expectations and consequences imply shared tacit propositions and conditions. It is in this ethno methodological sense that context guides the appreciation of our capacity to exercise judgment (Tsoukas & Vladimirou, 2001).

When talking about the theory in use, it is useful to recall Kogut and Zander´s (1992) coverage of the debate between Dreyfus and Dreyfus's (1988) doubts about the possibility of identifying the theory that allows for the codification of background knowledge, and Argyris and Schoen´s (1978) organizational behavioral studies with a

more certain posture about the possibility of developing models of actions that explains interpersonal behavior.

Here, following Argyris and Schoen (1978), we take the posture that the *theory in use*, from our theoretical research work, is equivalent to the *espoused theory*, which is either explicitly declared in the views of the firm in the form of organizational capability – *complex patterns of coordination, between people and between people and resources for the purpose of creating value* – or because it's organizational capability could be revealed from the views of the firm.

Then, considering (a) Wilby's (2010) social finite situation as the boundary that defines the domain within mutual knowledge happens, (b) that at organizational level CKO´s knowledge domains was described to be bounded by its organizational context, (c) the arguments that characterized context as the theory in use (Argyris & Schön, 1974), and to the (d) emerged drives expressed in the different descriptions of common knowledge in organizational studies (Brown & Duguid, 1991; Arrow, 1974; Weick, 1979; 1995; Polanyi, 1966; Leudar, 1992; Clark, 1996; Cramton, 2001; Krauss & Fussell, 1990), it could be said that:

> *CKO´s domain corresponds to the practices that are bounded by the theory in use by the members of the organization.*

Then, since commonness criterion corresponds to the reference that drives joint actions toward a jointly understood situation, CKO and its commonness criterion could be described as:

Domain of practices exercised within the framework of the theory in use by the members of the organization, to economize in communications, recognize, reconcile and share understandings, replicate and protect key knowledge, and ease coordination of actions.

Note: Domain of practices exercised within the framework of the theory in use by the members of the organization (Tsoukas and Vladimirou, 2001; Schutz, 1970; McCarthy, 1994; Argyris & Schön, 1974), to economize in communications (Arrow, 1974; Grant, 1996), recognize, reconcile and share goals (Brown & Duguid, 1991), replicate and protect key knowledge (Kogut & Zander, 1992), and ease coordination of actions (Nonaka, 1994; Thompson, 1967, Demsetz, 1991, Spender, 1989).

2.1.9 Common Knowledge in Theories of the Firm

In theories of the firm, with greater or lesser emphasis, CKO hold a declare role in the subjacent logic of the theories.

Understood from a broad perspective, in some of the theories the role assigned is not explicit, as are the cases of Simon (1991b) and Cyert and March (1992); in others, like in Nelson and Winter (1982), Spender (1996) and Kogut and Zander (1992), common knowledge is proposed as the context that helps to modulate the interpretations and coordination system; or as in Grant (1996a & 1996b), who proposes that common knowledge explicitly plays a role in the efficiency of the knowledge integration capability.

In the first chapter, I shared the managerial motivations of this research work – an organization that integrates knowledge through shared directives – and the scientific justification – greater explanatory power of the theory – for following Grant´s (1996a) knowledge-based view of firm as the reference within which understand the role of common knowledge. Now it is the time to describe how Grant explains CKO, and what is still pending in such approach.

Common knowledge is described by Grant (1996a) in general terms as composed by three types: (a) common language, (b) shared meanings, and (c) recognition of knowers. This taxonomy is similar to what emerged from our previous literature review of theories.

Even thou Grant (1996a) did not follow an structured literature review to argue for these emerging common knowledge types, but presented them at front, it is reasonable to think that he made such review and did not presented it in his research paper.

Grant´s descriptions of common language include literacy, numeracy, rules, directives, English, computer software, statistics, other languages and specialized organizational knowledge.

Shared meaning, according to Grant (1996a), is a common knowledge type that holds the tacit to explicit conversion process challenge where losing happens; and to confront this challenge, he lists approaches like the development of shared understanding between individuals by indwelling in the others practice (Polanyi, 1966), or the recognition that when people acts in organizations bring common schemas of organizational structures and events into existence (Weick, 1979) or the role of metaphors and analogies (Nonaka & Takeuchi, 1995), and stories (Brown & Duguid, 1991, 2001) as “vehicles for molding,

integrating and reconciling different individual experiences and understandings" (Grant, 1996a, p. 116).

The last common knowledge type referenced by Grant (1996a) is the recognition of individual knowledge domains which according to him facilitates non-explicit coordination of activities by knowing everyone knowledge repertories; that is, the interdependences for organizing for a task are known by the participants (Thompson, 1967).

Grant´s description and framing of CKO are enlightening, but still broad; in it he declares a relationship with the efficiency of knowledge integration capability (ability of the organization to efficiently integrate the knowledge of specialists into productive outcomes by minimizing knowledge transfer through the use of common knowledge). This is an idea that holds grounds; however, such relationships in case of CKO types are not explained; and to my best of knowledge, empirical research in this issue has also been neglected.

In brief, in general theories of the firm seems to approach common knowledge, when they do, from the perspective of interpretative systems or types (language, meanings and know-who). Apparently, in these theories, there is not a focus in the issue of practice for the role of common knowledge. This is a matter worthy of paying attention.

2.2 KNOWLEDGE IN ORGANIZATIONS – EMPIRICAL RESEARCH STATUS

Extant relevant research works related to frameworks that posit explanations about knowledge and knowing in organizations are here critically reviewed to recognize their empirical status and to expose the role of common knowledge in such views.

Given that there is not a specific approach to common knowledge in extant empirical research works a useful criterion for selecting findings about common knowledge is collectiveness. A criterion that is used to map findings labeled as collective, group, social, shared, community or contextual knowledge.

Among those works are Wenger´s (1989) Community of Practice, Baumard´s (1999) Cunning intelligence, Carlile´s (2004) Boundary Framework, Vladimirou and Tsoukas´ (2001) Organizational Knowledge, Cook and Brown´s (1999) Knowledge-Practice framework, and Bou, Sauquet and Bonet´s (2004a; 2004b) Bundles of Knowledge approach.

2.2.1 Wenger´s Community of Practice (CoP)

Lave & Wenger (1991) and later Wenger (1998) observed communities, such as midwives, insurance claims processors, and apprentice tailors, interacting in their practices. Such observations were realized from the perspective of a learning theory that proposes that context and social interactions within it influence how people share knowledge and learn (situated learning theory).

Situated learning theory is related to (a) Brown et al. (1989), who presented a situated learning model that extends the traditional classroom approach to consider apprentice reflection and coaching,; (b) to the ethnography work of Orr (1990) on photocopier technicians, in which sharing knowledge is mainly achieve through telling stories; (c) to Brown and Duguid (1991), who, based on Orr's empirical data, views learning, not as a master-apprentice relationship, but as a *peers that share and create knowledge by mutually engaging in joint practices while sharing a common repertoire*, to Greeno

(1997), who emphasized the idea of learners participation focused on the practice, in contrast to personal interaction with the other.

Wenger's (1998) approach to communities of practice (CoP) emerged from an ethnographic study regarding a group of insurance claims processors at their work. His findings argue for an evolutionary apprentice-to-expert community, in which new members, in their condition of novices, are assimilated at the periphery, and advance to the center of the community, to become experts; not by the information of manuals, but by the community mechanisms for sharing tacit knowledge; in such evolution older members move away from the center to the periphery, an eventually leave the community.

However, such description of CoP may direct over consideration to its members says Wenger (1998). He asks to pay attention toward the analytic components that characterized the (a) community, as a creation capable of learning trough (a1) mutual engagement around (a2) joint enterprising while sharing a (a3) common repertoire; and toward four interrelated aspects that shape (b) practice, as the symbiotic interrelation of (b1) meaning, (b2) community, (b3) learning, and (b4) identity.

Bozarth (2008) argues that the fact that Wenger (1998) text is difficult to read and filled with abstractions, and that may the reason why no researcher yet have follow his framework for the analysis of other CoPs.

Attending such research gap, Bozarth (2008), by means of an instrumental case related to a network of trainers, operationalized, tested, confirmed a generic adequacy of

the framework, and suggests refinements to the analytic components of the CoP framework.

Bozarth´s (2008) refined CoP framework confirms the support to the shift in focus from managing a community of practice, to "nurturing and understanding the significant internal dynamics of learning, meaning, and identity" (Bozarth, 2008, p. 2).

Then, even though that organizations hold a high interest in encouraging CoPs to gain from meaning making, the emergence of identities, and the sharing of knowledge (Wenger 2004), Bozarth (2008) confirms Wenger´s (1998) view that CoPs cannot effectively be setup by an organization, neither its membership, nor participation could be ordered, since they are emergent, self-managed, and motivated by the members' commitment for better work practices.

That is, CoP´s view offers rich descriptions for the understanding of common knowledge, as are the cases of: (a) community´s analytic components like (a1) mutual engagement, (a2) joint enterprising, and (a3) common repertoire; and (b) the practice´s aspects like (b1) shared meanings from the practice aspect; however the way it is framed becomes problematic for the knowledge-based views of the firm that proposes knowledge as the mechanism of value creation (Spender, 1996) when Wenger (1998) and Bozarth (2008) propose CoP as non-manageable; especially if we are considering efficient forms of integrating knowledge into the outcomes of the productive practice (Grant, 1996).

2.2.2 Baumard's Cunning Intelligence

Baumard (1999) argues for discernible behaviors exhibited related to the well-known dimensions in knowledge categorization: tacit-implicit and individual-collective.

To evaluate his observations, instead of referring to the traditional Greek concepts related to knowledge, like episteme (principles and reasons of all categories), techne (knowledge on how to do something), phronesis (practical wisdom), empeiría (accumulation of particular memories) or aletheia (sensation or feeling when truth is revealed), Baumard referred to the not very well diffused Greek concept of metis.

Metis, a concept rescued as conjectural intelligence and cunning by Détienne and Vernant (1978), which Baumard (1999, p. 65) explains as "certain type of intelligence that is committed to practice, confronted with obstacles that must be dominated by cunning to obtain success in the most diverse areas of action"

Then, with the concept of "metis" as the building block of his epistemology and an emphasis that acts of behavior reveal knowledge instances, Baumard (1999) offers a guideline for observing human behavior, as follow:

(a) Tacit individual behaviors are related to lose attention, automatic behavior, suppressed conflicts, mixed feelings, and succeeding in chaos, among others.

(b) Explicit individual behaviors may be explicit avoidance, attempting to articulate a situation, conflict seeking, showing awareness of a situation, focus on problem solving, and commitment to self-analysis.

(c) Explicit collective behaviors may be related to collective involvement, collective evasion, deliberate sharing of knowledge, formation of task force, and working on collective sensemaking.

(d) Tacit collective behaviors include practice in communities, achieving task without explanations, networks of tacit understanding, sought of collective orientation, uncomfortable atmosphere, and knowledge sharing emergent attitude.

Baumard (1999) achieved to discuss this behavior observational framework in four different organizational settings. There, he found not only evidence of instances of knowledge sharing and transformation, but some general principles for managers when they confront strategic issues.

In a more broad reading, Baumard's (1999) framework mainly intents to provide an account of the role of tacit knowledge in the everyday functioning, observed in individual and collective behaviors, through the lenses of the epistemology of commitment to the intelligent and cunning practice to achieve success. The identified explicit and tacit collective behaviors describe practices in which common knowledge holds a role, but such CK instances are not completely categorized given the strategic thinking approach.

This is a different enriching view of personal and collective knowing; it presents a theoretical and empirical exercise in which certain types of knowing are operationalized in observable human behaviors. Interestingly, this approach attends Gourlay´s (2004) suggestion of understanding knowing through observable behaviors.

However, Baumard (1999) is a focused approach to knowing, which, for the purposes of this research, it has the pending tasks of giving an account for the role of symbol-based systems and the production of other kind of knowledge besides the strategic kind.

2.2.3 Carlile´s Boundary Object Framework

Shannon and Weaver (1949), in their seminal work on information theory, describe the three levels of communication complexity. First, they relate the available repertoire of distinct symbols and their syntax - rules between symbols - to the syntactic or technical level of communication. Then, they identify the process by which symbols actually get meaning as the semantic level; and finally, they consider the desired effect of a particular message on a message destination as the effectiveness or pragmatic level. Even though Shannon and Weaver avoid much elaboration on the semantic and pragmatic level of communication, these three levels – syntactic, semantic and pragmatic – have been referenced by several authors as an approach to understand and map the data-information-knowledge continuum (Carlile, 2004; Boisot and Canals 2004).

Complementarily, the idea of boundary objects, a term coined by Star (1989), in sociologist of science, makes reference to artifacts (physical or mental) that allow members of different practices to share common grounds (Arias and Fischer, 2000). Boundary object supports the distinguishing of differences but also provides common points of reference (Harvey and Chrisman, 1998).

Boundary objects hold several characteristics that help to explore the interactions between knowledge and people, like (Star, 1989):

(a) *Modularity:* (e.g., a plan, in which its sequencing, timing, costing, risk managing, says something specific to each stakeholder),

(b) *Abstraction* (e.g., an organizational structure diagram that reveals general dependencies among members),

(c) *Accommodation* (e.g., organizational directives that hold different implications depending of the role), and

(d) *Standardization* (e.g., organizational routines as guideline for working behavior).

It is within these two approaches (the syntactic, semantic and pragmatic framework and the boundary object approach to artifacts) that Carlile's (2004) argues for an "integrative framework for managing knowledge across boundaries when innovation is desired". His work, an empirical research, presents the case study of an automobile clay model, considered as boundary object, to explain the dynamics of the exploration for new knowledge.

Carlile (2004) argues that in order to achieve novelty different capabilities are needed at different boundaries of communication. The transferring capability invites to consider as necessary (thou not sufficient as we see later) the development of a common lexicon to deal with the syntactic issues; the translation capability takes care of semantic issues and asks for the development of shared meanings, and the transformation capability ask for the sharing of common interest at the pragmatic level.

In short, Carlile´s (2004) framework argues for understanding of the knowledge creation process as the interactions among:

(a) Organizational artifacts evaluated in terms of their boundary object´s characteristics,

(b) Knowing human abilities (transferring, translation and transformation), and

(c) Forms of common knowledge (language, meanings and interest).

Interactions in which either (a) members of the organization may or may not hold the demanded knowing abilities to operate within or in transcended boundaries, or (b) artifacts, as conceived, hold or does not hold the characteristics for the required knowledge transferring, translation or transformation.

The specifics of Carlile ´s (2004) findings of the automobile clay model case study reveal, by examining the two previous mentioned interactions, that in innovative environments:

(a) Common lexicon is necessary but not sufficient to share and asses the differences and dependencies of specific domains of knowledge,

(b) Sharing meanings is not simply an issue of translating but a "political process of negotiating and defining common interest" (p. 559), and

(c) Willingness of an organizational member to act in new ways is not only adversely linked to the cost of learning the new knowledge, but also affected by the cost of transforming current common and specific knowledge.

Carlile's knowledge creation framework follows the information system approach to knowledge. In it, common knowledge has been related to common lexicon, shared meaning, and common interest; however their commonness criteria are not explicit. Also, three knowing abilities (transferring, translating and transforming) have been referenced in regard to the "boundary object" characteristics. This is a compelling conception that is useful as an academic abstraction, but also it is an approach that leaves as pending the easier practitioner understanding.

2.2.4 Tsoukas´ Organizational Knowledge

Fusing predominantly Polanyi´s (1958) view of knowledge – "All knowing is personal knowing" and combine it with the Wittgensteinian claim that all knowledge, in a fundamental way, depends on historically evolved collective understandings and experiences, Tsoukas and Vladimirou's (2001) proposed and tested, in a case study related to a call centre of a leading mobile phone operator in Greece, an understanding of organizational knowledge.

Starting with Bell´s (1999) conception of (a) data as an ordered sequence of given items and events, (b) information as a context-based arrangement of items and their relationships, and (c) knowledge as the judgment of the significance of events and items which comes from a particular context and/or theory, Tsoukas and Vladimirou's (2001) rescued that judgement could be based on context, and not only on theory.

Social construction of reality (Schutz 1970, Berger and Luckmann 1967) is also brought to our attention to argue in favor of context equipped as theory: "we routinely

bring to situations of interaction a tacit awareness of the normative expectations relevant to them and an intuitive appreciation of the consequences that might follow from breaking them" (McCarthy 1994, p. 65); in such acceptation normative expectations and consequences imply shared tacit propositions. It is in this ethnomethodological sense that context supports the capacity to exercise judgement (Tsoukas and Vladimirou, 2001).

The research case study presents how personnel at the customer care department were exposed in their work to many discrete items (names, addresses and phone numbers) and business rules (if <problem> then <check this or that>) in which their invocation required certain level of judgment; departing from such exposition and by means of experience, operators discovered from customers´ verbal hints that they were dealing with an unhappy or perplexed customer and acted according to the circumstances, adapting the business rules to the context of their conversations. In summary, the case study reveals different levels of human involvement and abilities (Tsoukas and Vladimirou 2001): (a) discriminating: identifying phone numbers, (b) inferring: selecting applicable business rules, and (c) judging and acting: deciding how to act in a particular context.

The case study supported Tsoukas and Vladimirou (2001) proposition that to know how to act within a domain of actions is to make competent use of the distinctions constituting that domain. Domain of actions is a generalization that refers in terms of organizations to the community of a specific scientific or professional practice. Within this specific domain – practice – is where the standard of knowledge is measured through theory and/or context.

Building upon recognizing organizations as three things - historical social communities, real settings where individuals take action and sets of abstract rules - Tsoukas and Vladimirou (2001, p. 983) also proposed a definition of organizational knowledge, as follow:

> *Organizational knowledge is the capability that members of an organization have developed to exercise judgment and act in particular concrete contexts, by enacting sets of generalizations (propositional statements) based on the appreciation of theory or historical evolved collective understandings regarding experiences in their practice - which is based on the appreciation of context - or both.*

Tsoukas (2009) extended this definition of organizational knowledge to posit a dialogical description of how new knowledge is created in organizations. In such description, besides ratifying the individual ability to draw distinctions in relation to the practice at hand, he proposes an evolutionary appreciation of new experiences in terms of the extant distinctions.

Tsoukas argues for the productive relational and engaging practitioner dialog around the reflective articulation of such new distinctions, an interaction in which the responsibility assumed about the joint new conceptualization and the emerged relationships among participants triggers the creation of new knowledge in organizations.

Here, we are ready to pledge to Tsoukas and Vladimirou´s (2001) criterion by which personal knowledge is considered organizational. However, lexicon and scope ask for precision. First, since here we argue for knowledge holding residence in the individual, we insist, to avoid the misunderstanding of the organization as a knowing entity, and in that sense the terms “knowledge in organizations” avoids confusions. Second, the scope

to which Tsoukas and Vladimirou refer is the practice in play; however, the scope pledged in this dissertation is related to the theory in use at firm level.

Their epistemological arguments mainly follow Dewey´s (1934) re-order approach to create a new vision, McCarthy´s (1994) normative approach to social construction of reality, Bell´s (1999) data-information-knowledge continuum and their associated human abilities (discriminating, inferring, judging and acting), and Wenger´s (1998) joint and engaged participation from the communities of practice.

Then, in summary, Tsoukas and Vladimirou (2001) and Tsoukas (2009) is an approach to knowledge in organizations that argue for the judgment of distinctions as the central personal ability to make distinctions within a practice at work, in which responsible joint action creates new knowledge.

I found Tsoukas and Vladimirou´s (2001) view of knowledge in organizations as a plausible one, and share it partially; as it was evident in section 2.1.6 when organizational context was invoked as the criterion for bounding common knowledge in organizations.

However, I also found that Tsoukas and Vladimirou´s (2001) narrated approach while providing plausible line of thoughts, but with no punctuated or taxonomic themes distinguishing knowledge from practice, invites for detail epistemological work that may complete a framework oriented to unproblematic empiric observations of knowledge and knowing instances in organizations.

2.2.5 Knowledge-Practice Framework and Bundles of Knowledge

Cook and Brown (1999), questioning Nonaka´s (1994) SECI knowledge types conversion model, proposed the dichotomy knowledge-practice as a framework that in which the same SECI four knowledge types – outlined within the individual-collective and explicit-tacit two-by-two matrix-based taxonomy – operate as distinct non-convertible tools at the service of practice through interactions that enrich each other – knowledge and practice.

Cook and Brown (1999) summarily identified common knowledge types as:

(a) Explicit shared stories, metaphors or phrases about successes or failures at work and about know-how that provide useful meanings within groups. For future reference this understanding is labeled here as *shared work-related transcendent narratives*.

(b) Useful and continually practice-based negotiated tacit shared meanings that a group attaches to its symbolic, physical and social artifacts and to its activities. This type of knowledge was labeled as *genres* by Cook and Brown (1999), but given the scope of this work, *organizational genres* sound as a more suitable and memorable label.

In a complementary line of empirical research, the works of Bou, Sauquet and Bonet (2004a; 2004b) regarding job placement and consulting practice, follow critically Cook and Brown´s model for observing instances of knowledge and practice (knowing).

Bou, Sauquet and Bonet (2004a; 2004b) found that such framework while being a good initial reference for observing knowledge types, it holds certain shortcomings. In their research they experienced:

(a) Variation of the predominance of certain knowledge types depending on the proficiency of the knower in the specific practice, all this within the extremes defined by the novice status in one side and the recognized expert in the other.

(b) The limited description of practice, that Cook and Brown´s knowledge-practice framework provides, does not explain that similar observable acts may imply different meaningful actions, as is the case of the cannon follower (novice) versus the cannon re-framer (expert).

Such findings led Bou, Sauquet and Bonet (2004a; 2004b) to propose the idea of bundles of knowledge as a proxy that:

(a) It extends the knowledge types that participate in practice, to include knowledge types like: structure, implicit contextual norms and know-who. In other words, the recognition of organizational context as a knowledge type that shape practice. They argue that contextual variables influence, both, the types of knowledge use by the knower, and the knowing aspects while practicing.

(b) It describes that knowledge types participate in different combinations and proportions depending of the apprentice-expertise gradient. That is, they propose a dynamic framework that depicts an evolution the goes from the more explicit (individual and collective) to the more tacit (individual and

collective) in terms of the level of experience hold (novice-expert) and organizational contextual factors like structure (formal, hierarchical ladder, division of labor), directives (implicit mostly), and social knowledge (know-who).

In summary, bundles of knowledge (Bou, Sauquet & Bonet, 2004a; 2004b) propose a dynamic extension to Cook and Brown (1999]) static knowledge-practice framework, in two dimensions.

First, the knowledge-practice dichotomy is shaped by the organizational context; that is, organizational structure and know-who induce certain knowledge usage and practices. Second, the usage of certain knowledge types is dependent of the level of expertise hold; and in practice novice tend to apply them as given, and experts tend to reframe them.

In terms of this research, the collective types (explicit *shared work-related transcendent narratives* and tacit *organizational genres*) proposed by Cook and Brown (1999) as common knowledge instances are extended by Bou, Sauquet and Bonet (2004a; 2004b) to consider *organizational context* (structure, implicit directives and social knowledge), not as a "mere container" but as an actor that modulates the bundles of knowledge in play when practicing.

2.2.6 CKO: Empirical Research Summary

The previous review regarding empirical findings about common knowledge in organizations reveal, with different level of granularity and scope, the agreement about

two concepts that describe CKO types: common language and shared meanings (Wenger, 1989; Baumard, 1999; Carlile, 2004; Cook & Brown, 1999; Bou et al., 2004a; b).

In addition, there is evidence about a third more active conceptualization of common knowledge which emerges with lesser clarity but providing illustrative facets of what may be pending for discovery. Here, I dare to link them, when possible, to some of the ideas emerged in the previous theoretical review (see Table 4):

Loose coordination of actions: Wenger (1989) and Bozarth (2008) argue for a community learning-oriented component characterized by mutual engagement around joint enterprising.

Evaluation criteria: Baumard (1999) describes it as dynamic and evolving, shaped by the successful practice.

Theory in use: Tsoukas and Vladimirou (2001) invokes the role of organizational context as the shared theory that assesses the practice of judgments and acts as the knowledge in organizations; and

However, special attention deserves the approach followed by bundles of knowledge. Bou, Sauquet and Bonet (2004a; b) argue for an active role of the organizational context, characterized mainly by the organizational structure and social knowledge (know-who).

Approaches to Knowledge in Organizations and Participating Common Knowledge Types

Community of Practice
Wenger (1989)
Bozarth (2008)
	Argues for an evolutionary apprentice-to-expert community driving by community mechanisms for sharing tacit knowledge	• Community´s analytic components
		  • Mutual engagement
		  • Joint enterprising
		  • Common repertoire
		• Practice´s aspects
		  • Shared meanings

Cunning Intelligence Baumard (1999)	Provide an account of knowledge through the lenses of the epistemology of commitment to the intelligent and cunning practice to achieve success.	• Explicit: collective involvement and evasion, deliberate sharing of knowledge, formation of task force, and working on collective sense making. • Tacit: achieving task without explanations, networks of tacit understandings, sought of collective orientation, uncomfortable atmosphere, and knowledge sharing emergent attitude.
Boundary Object Framework Carlile (2004)	Understand the knowledge creation process as the interactions among: • Organizational artifacts as boundary objects (modularity, abstraction, accommodation and standardization). • Knowing abilities (transferring, translation and transformation).	• Common language • Shared meanings • Shared interests
Organizational Knowledge Tsoukas and Vladimirou (2001)	An approach to knowledge in organizations that argues for context operating as the criterion by which knowledge of members is assessed.	• Organizational context understood as historically evolved collective understandings regarding experiences in their practice.
Knowledge & Practice Framework Cook & Brown (1999)	An approach that proposes a static understanding of knowledge types, framed within the individual-collective and explicit-tacit 2x2 matrix-based taxonomy, which operate as distinct non-convertible tools for the practice in organizations.	• Shared work-related transcendent narratives. • Evolutionary shared meanings (genres) attach to symbolic, physical and social artifacts and activities.
Bundles of Knowledge Bou, Sauquet & Bonet (2004a; 2004b)	A dynamic extension of Cook & Brown (1999) in which the knowledge-practice dichotomy: • Is shaped by organizational context structure and know-who) • Usage of certain knowledge types (explicit-tacit / individual-collective types) is dependent of the level of expertise hold. • In practice novice tend to apply knowledge as given, and experts tend to reframe it.	• Shared work-related transcendent narratives. • Evolutionary shared meanings (genres) attach to symbolic, physical and social artifacts and activities. • *Organizational context (a) modulates proportions and combinations of the bundles of knowledge in play, and (b) the identification of the abilities that shape successful practice within the novice-expert gradient (knowledge follower – knowledge reframer).*

Table 4. Approaches to Knowledge in Organizations and Participating Common Knowledge Type

They propose an understanding of organizational context that (a) participates in modulating proportions and combinations of the bundles of knowledge in play (explicit-tacit / individual-collective types), and (b) the identification of the abilities that shape successful practice within the novice-expert gradient (cannon follower – cannon re-framer). That is a CKO understanding that did not emerged in the theoretical review of common knowledge, which deserves attention.

In brief, empirical research, thou not specifically oriented to common knowledge, but understood from the categories belonging to social, collective or organizational knowledge, approach CKO from three different perspectives: (a) pure practice (Wenger, 1989; Bozarth,2008), or (b) a mix of knowledge types and practice, with emphasis in taxonomy (Cook & Brown, 1999), or (c) a mix of bundles of knowledge and practice, with emphasis in practice (Bou, Sauquet & Bonet,2004a; 2004b).

2.3 COMPARING OCK THEORETICAL AND EMPIRICAL RESEARCH STATUS

Theoretical approaches, from philosophy, cognitive psychology, communications and organizational studies, to common knowledge propose to understand it as the domain of practices exercised within the framework of the theory in use by the members of the organization to economize in communications, recognize, reconcile and share goals, replicate and protect key knowledge, and loosely coordinate actions.

That is an understanding of CK that emphasizes (a) practice, (b) knowing performance evaluation criteria, (c) common repertoire as efficient communication systems, (d) an instrumental view of shared meanings for goals agreement, (e) dual

purpose (productive and defensive) instrumentation and (f) loose approach for the coordination of joint actions.

However, views and theories of the firm seems to conceived CKO from the perspective of either (a) interpretative and coordination systems, or (b) knowledge types (language, shared meanings, know-who).

Extant empirical research about common knowledge in organizations reveal certain level of agreement on two common knowledge types – shared symbolic systems and shared meanings – and in its evolutionary condition and active modulation role. These findings emphasize (a) practice, (b) common symbolic repertoire, (c) shared meanings, (d) joint action, (e) knowledge type composition, and (f) *ability type relevance*.

Empirical findings (Bou, Sauquet & Bonet, 2004a; 2004b) also reveal the limited description of practice that the knowledge-knowing framework (Cook and Brown, 1999) provides. In addition, even though, they propose extensions to the framework to fit findings (evolutionary composition of knowledge types and organizational context as knowledge and knowing modulator) there is still pending some integrating epistemological discussion of practice (knowing) since its taxonomy has been questioned for not reflecting Polanyi´s (1958) epistemological work (Orlikowski, 2002).

Advancing in discussion of OCK research status, the comparison of the theoretical and empirical approaches reveals similarities, with different levels of specificity, in constructs related to shared symbolization, share meanings, and joint action.

However, while theories of the firm focus in knowledge instrumentalization and performance criteria within a more integrative understanding of common knowledge in

goal-defined organizations, but still appreciating more knowledge types than practice; empirical studies focus more in composition and interaction of bundles of knowledge with practice and its participating *abilities,* within a more circumscribed organizational scope.

I argue that some epistemological work could bring more clarity to role of common knowledge in organizations, especially if we considered them from the perspective of views of the firm. Then, the understanding of CKO confronts:

(a) The rich but divergent approaches to knowledge and knowing.

(b) The understanding of the commonness criteria in organizations (already attended in Section 2.1.8), and through it

(c) The specification of the instances of common knowledge participating in KBVs of the firm.

From a broad perspective, such gaps suggest for at least three frames of reference: an integrated view of knowing, an organizational capability framework, and the framing of common knowledge in the context of KBVs of the firm. Such work will allow exploring and explaining knowledge-based capabilities and CKO in the various conceptions of KBV of the firm.

In the specifics of this work, those frameworks will provide an understanding of the role of common knowledge in organizations in the context of Grant´s (1996a) knowledge integration capability (KIC). This work aims to fill such research gaps.

CHAPTER 3: RESEARCH OBJECTIVES AND METHODS

3.1 PHILOSOPHICAL ASSUMPTIONS AND GENERAL INQUIRY STRATEGIES

Here, I follow Creswell (2003) to guide the three research issues that a scientific study should consider. The first one corresponds to the philosophical assumptions of the knowledge claims, the second are the inquiry strategies, and the last one are the methods for data collection and analysis.

This quest follows a constructivist philosophical approach, in which the most important issue of the quest is to understand relationships between common knowledge resident in the members of an organization with the integration of specialized knowledge into the productive practice. This philosophical approach, expressed in terms of Crotty (1998) when discussing constructivism, invites us to understand the problem of common knowledge as implied in the social interactions of the members of the organization, including their shared environment, in relation with the productive outcomes of the organization.

Complementarily, Schutz (1973) posits that to understand human behavior we should account for human intentions, and to understand intentions we should take in consideration the contexts in which they make sense. In organizations, those contexts correspond to the physical environment, directives, organizational structures, plans, routines, processes, or any other artifacts enacted by men. Context, in this sense, it is understood more specifically, since it holds an important role in the conception of the organizational capability.

In addition, common knowledge in organizations needs to be understood from the perspective of the knowers: the members of the organization. The exploration of their world from a social perspective situates our quest in the position of the organizational member that tries to interpret departing from his (organizational) context (Creswell, 2003, p. 8).

Then, *while proposing a constructive philosophical assumption for our knowledge claims, we also pledge to a qualitative research methodology*, which is well adjusted to this philosophic focus. Among the five alternatives *for research strategy* presented by Creswell (2003), that go from ethnographies, grounded theory, case study, phenomenological research, to narrative research, *this dissertation follows the case study and grounded theory approaches.*

3.2 THEORETICAL INQUIRY STRATEGIES

As it was mentioned in chapter one, the scientifically conceptualization and operationalization of knowledge has not arrived yet to a conclusive definition (Alvesson & Kärreman, 2001; Kakihara & Sorensen, 2002), and it had lead organizational researchers to adhere in practical terms to variations of knowledge types (tacit-explicit, individual-organizational); and not always specifying its epistemological foundations (Cook & Brown, 1999). Among such postures is Grant´s KBV of the firm that proposes an organizational capability that recognizes, as assumption, that knowledge holds residency in the members of the organization (Grant 1996a, p. 120).

The works of Tsoukas (2003) and Gourlay (2006) set the status of this problem in context, when they recall that if knowledge is mostly tacit or supported in tacit knowledge (Polanyi, 1966), then there is an implicit call to frame extant theories of knowing that allows to discuss about (Tsoukas, 2003) or observe behaviors related to (Gourlay, 2006) knowing instances given than knowledge articulation is not always possible.

Tsoukas (2003), following Wittgenstein (1958) and Shooter & Katz (1996), argues that the "[I]neffability of tacit knowledge does not mean that we cannot discuss the skilled performances in which we are involved" and that "[n]ew knowledge comes about not when the tacit becomes explicit, but when our skilled performance – our praxis - is punctuated in new ways through social interaction".

Gourlay (2004), based on Dewey and Bentley (1949), proposes to understand explicit and tacit knowledge within a behavioral framework, in which tacit knowing corresponds to signaling and explicit knowledge corresponds to designation of symbols and symbols itself.

Both, Tsoukas (2003) and Gourlay (2006), achieve to contextualize the kind of issues to be attended when exploring knowledge, a superset of common knowledge, within organizational studies.

Finally, Grant (1996a, p. 113) insists that understanding the residence of knowledge at organizational level offers little guidance on how management can influence individual's knowledge creation and application, and advocates for knowledge to be understood at individual level, emphasizing the role of language, shared meanings, and recognition of knowers.

Then, following Tsoukas (2003), Gourlay (2006) and Grant (1996) arguments, and the theoretical and empirical status of common knowledge in organizations (see section 2.3) in which it was argued for epistemological work to bring more clarity about the role of shared symbolization, share meanings, joint action, knowledge instrumentalization, and its performance criteria, and knowing participating abilities.

Then, summarizing, in this quest, given the following arguments:

(a) The lack of operationalization of individual level knowledge theories (Alvesson & Kärreman, 2001; Kakihara & Sorensen, 2002).

(b) The warnings shared by Gourlay (2004; 2006), Foss (2003a; 2003b) and Miller (2008) about the miss-read or mixed incompatible epistemologies that organizational studies hold.

(c) The limited description of practice (Cook and Brown, 1999) that the knowledge-practice framework provides (Bou, Sauquet and Bonet, 2004a; 2004b), and

(d) The knowledge-practice framework´s taxonomy has been questioned (Orlikowski, 2002) for not reflecting Polanyi´s (1958) epistemological work.

This research work will follow a methodologically re-reading of knowledge theories, invoking grounded theory (Strauss & Corbin, 1998; Charmaz, 2000; 2006) to interpret the texts that describe the individual knowing theories, and the knowledge oriented views/theories of the firm to achieve and well-founded emergent and holistic understanding of individual knowing in the context of views of the firm.

This is not an open re-reading, but a focused one. Knowledge-based views of the firm, as is noticeable in Table 2, recur to a variety of conceptions of knowledge and knowing to support their organizational logic; however at higher level of abstraction those instances invites for conceiving knowledge within human limitations (Simon, 1947; 1991a), and abilities to contrive order and patterns (Nelson & Winter, 1982; Cyert & March, 1992), and to share their meanings them through socially and culturally enacted tools or systems, like a common language (Spender, 1989; 1992; Kogut & Zander, 1992; Grant, 1996a; 1996b) or modes for recognizing knowers (Grant, 1996a; 1996b).

3.2.1 Framing Individual Level Knowing Theories

The proposed re-reading will try to underline, following an integrating approach, those characteristics of knowledge that organizational views geared. Given firm´s theories orientation to knowledge to the issues of common language, shared meanings,, and to social and cultural enactments I choose to draw on Polanyi's (1958, 1966) tacit knowledge approach, Weick's (1995) enactment of sense-making and Bruner's (1990) meaning readiness approaches as the main objects of study.

The data to be interpreted, using grounded theory, are the relevant research texts that describe individual level knowledge theories used as foundations of theories of the firm in which knowledge, in any form or residency plays a key role.

This section describes the general inquiry strategy followed to examine knowing theories. For reasons of clarity, methodological details of such inquiry are presented in the same chapter in which the work is done.

Chapter 4 of this study holds a section named "Framing Individual Level Knowing – A Note on Method" which describes in detail how the open coding and axial coding methods of grounded theory were applied (Strauss & Corbin, 1998; Charmaz, 2000; 2006). In it, conceptual ordering approach was followed to unveil categories within the individual level knowledge theories.

The coding design hold two stages (see Table 11 for a diagram of the coding design). In the first stage the research question (1) *Which are the participating constructs that are related to common knowledge types in the context of the knowledge integration capability as reference by Grant's (1996a; 1996b) KBV of the firm?* led to the "Framing Scheme for Individual Level Knowledge Views" (see Table 12).

In the second stage, the research question (2) *Which are the explanations that individual level knowledge theories offer for the constructs related to common knowledge type?* achieved to reveal comparative frames for each individual level knowledge theory. Polanyi´s personal knowing theory (1958 & 1966) is framed in Tables 17, 18 and 27; Weick´s social sensemaking theory is framed in Tables 23, 24 and 28, and in Figure 1; and Bruner´s enculturated meaning theory (1990) is framed in Tables 25, 26 and 29, and in Figure 2.

Finally, following (Strauss & Corbin, 1998) notion of theorizing – the emerging of a schema that describes the relations among categories – three frameworks arise from the set of framed individual level knowledge theories:

(a) Individual Knowing View (see Table 30).

(b) Integrated Knowing Framework: Personal, Cultural and World States Layers (see Table 31).

(c) Integrated View of Language, Shared Meanings, and Recognition of Knowers (see Table 32).

3.2.2 Framing Organizational Capabilities

The second inquiry strategy attends the research gap related to interpreting the theories of the KBV of the firm to make explicit is organizational capability and the body of knowledge participating in it. Chapter 5 of this study holds a section named "Framing Capabilities – A Note on Method" which describes how the open coding and axial coding methods of grounded theory (Strauss & Corbin, 1998; Charmaz, 2000, 2006) were applied in this inquiry.

The coding design holds two stages. In this first stage, each of the six theories of the firm was open and axial coded as a whole asking the questions (a) "*How does an organization function within this theory of the firm?*" and (b) "*What does it make this theory the same as, or different from, the previous one that I coded*?" (Strauss & Corbin, 1998, p. 120).

The emerged categories revealed an (1) Organizational Capability Framework to portray the capabilities approach of KBVs of the firm (see Table 33) which summarily holds two dimensions which correspond to (a) the dichotomy exploration-exploitation; and to (b) the activities related to organizational design and execution.

In the second stage, the emerged Organizational Capability Framework is used to query each theory at a time, applying the open and axial coding method. Such inquiry resulted in framing the body of knowledge of the following capabilities:

(a) Exploitation capability of Simon's (1947; 1991b) administrative behavior theory (Table 35, Figure 4).

(b) Exploitation capability of Cyert and March's (1992) behavioral theory of the firm (Table 36, Figure 5).

(c) Exploitation and exploration capability of Nelson and Winters's (1982) evolutionary view of firm (Table 37, Figure 6).

(d) Exploitation and exploration capability of Spender's (1992, 1989) theory of postindustrial organizations (Table 38, Figures 7 and 8).

(e) Exploration capability of Kogut and Zander´s (1992) theory of replication and combinative capabilities (Table 39).

(f) Exploration capability of Grant's (1996a, 1996b) KBV the firm (Table 40, Figure 9).

Additionally, two summarized comparisons of organizational capabilities are presented in Tables 41, 42 and 43.

Finally, following (Strauss & Corbin, 1998) notion of theorizing – the emerging of a schema that describes the relations among categories – arises an observational model labeled as Framework of Common Knowledge Types in Views/Theories of the Firm (see Tables 44 and 45 in Chapter 5).

This model is composed by the interception of the (a) Integrated View of Language, Shared Meanings, and Recognition of Knowers (Table 32 in Chapter 4) and the (b) Organizational Capability Framework (see Table 33 in Chapter 5).

The Framework of Common Knowledge Types in Views/Theories of the Firm plays three roles.

First, it allows identifying from the body of knowledge of the organizational capabilities of the theories of the firm the theoretical types of instances that correspond to CKOs.

Second, it plays the role of a theoretical "sensitizing concept" (Charmaz, 2000) that serves as departing reference for the observation of the empirical instances of CKO in relation with the organizational capability in KBV of the firm.

Third, it operates as an initial reference for the coding ((Strauss & Corbin, 1998; Charmaz, 2000, 2006) of the empirical instances of CKO) in general for any of the six theories of the firm, and in particular with the knowledge integration capability of Grant's (1996a; 1996b) KBV of the firm.

3.3 EMPIRICAL INQUIRY STRATEGIES

In reference to the empirical part of this quest, we follow case study research strategy for the research design, and grounded theory for data analysis.

3.3.1 Case Study Research Strategy

Our understanding of case study pledges to Creswell's approach (2003) which states:

> *"(T)he researcher explores in depth a program, an event, an activity, a process, or one of more individuals. The case(s) are bounded by time and activity, and researchers collect detailed information using a variety of data collection procedures over a sustained period of time" (p. 15).*

The justification for this research strategy follows Yin (1994), who presents a matrix that helps to decide what research strategy to use, in which case study approach is appropriate when the form of the research question is of the "what" and "how" type, no control or manipulation is to be exerted over the behavior of members of the organization and participants, and a contemporary focus predominates in the research.

Giving that the research questions deal with contemporary issues in knowledge management of the type "How" and that no influence is planned over the participant's behavior, case study research strategy is considered to be plausible.

Among the research methods referred by Creswell (2003, p. 17) that could be use in case study – the quantitative (predetermined, instrument based questions, performance data, attitude data, observational data, and census data, and statistical analysis), the qualitative (emerging methods, open-ended questions, interview data, observation data, document data, audiovisual data, text and image analysis), and mixed methods (both predetermined and emerging methods, both open and closed ended questions, multiple forms of data drawing on all possibilities, and statistical and text analysis) – this study choose to use qualitative research methods characterized by surveys with a mix of closed and open ended questions, follow by interview data, and complemented with related documents.

The reasons presented to support the selection of these methods are found in the need of using exploratory inquiries with the purpose of developing themes for the data for an issue that has not been explored before (Creswell, 2003, p. 18, 22).

In our quest, to my best of knowledge, common knowledge and its types has not been explore before in the context of the knowledge integration organizational capability. Then, an in-depth and rich single-case design is used to conduct the exploratory research, and grounded theory was invoked to discover explanations about the relationship between common knowledge types and the integration capability.

Yin (2003a) presents a guide that helps to decide what types of research design to use for case study. Type 1 design, that Yin (2003a) names "holistic single-case designs" holds five rationales that justify a single case study (critical case, unique case, representative case, revelatory case, and longitudinal case). Considering our research questions – How are common knowledge and their types in organizations related to the knowledge integration capability? – we found that a holistic case, which is focused on a single unit of analysis – integrated specialized knowledge in the outcomes of the productive practice through common knowledge hold by members of the organization – could be justified to be representative when the lessons learned from the case are informative about the average person in organizations (Yin 2003a).

In this study, the case corresponds to a ten-year International Inter-university Cooperation Program that integrates the knowledge of PhDs, master in science and engineers during the externalization of the Program's lessons learned; a representative

case that clearly asks for the integration of knowledge of specialist into a productive outcome (program's lessons learned) after collaborating for a long period.

3.3.2 Grounded Theory Research Strategy

The case study design will be followed by a grounded theory strategy "in which the researcher attempts to derive a general, abstract theory of a process, action, or interaction grounded in the views of participants in a study." (Creswell, 2003, p. 14).

The justification of such inquiry strategy is twofold. First, this research is looking for making explicit relations among categorized instances of human behavior grounded in the views of the participants of the University Program (Creswell, 2003). Second, the focus of attention of this interpretation considers sensitizing concepts as departing point for the analysis (Charmaz, 2000, p. 515) like common knowledge types identified in the literature review and in the theoretical findings.

Grounded methods like the conceptual ordering approach can help to unveil instances of how common knowledge types are related to the integration of knowledge into the lessons learned of the program (Strauss & Corbin, 1998, pp. 19-20).

In addition, this research asks for a method that presents such ordered concepts in a "logical, systematic, and explanatory scheme" (Strauss & Corbin, 1998, p. 21); that is a theorizing method from grounded theory is a useful tool for such endeavor.

This research work asks for a method that allows to see the relations of common knowledge with the organizational capability from different perspectives, all this in

search of a systematic set of interrelated statements that depicts a theoretical framework (Strauss & Corbin, 1998, p. 22).

3.4 CASE STUDY DESIGN AND GROUNDED THEORY DESIGN

This research used the case study methodology (Yin, 2003a) as a design framework and the grounded theory methodology ((Charmaz, 2006; Strauss & Corbin, 1998) to analyze data about the role of common knowledge in the integration of knowledge in the outcomes of the productive practice.

3.4.1 Research Problem

Grant (1996a, p. 112) argues that firms exist as institutions for producing goods and services because they can create conditions under which individuals can integrate their specialist knowledge. Research about the role of knowledge in the value creation capability (Schendel, 1996) and in firm strategy (Prahalad & Hamel, 1990; Prusak, 1996; Grant, 1996a; Zack, 1999; Foss, 2005) proposed knowledge as a factor linked to sustainable advantage and organizational performance. Grant's (1996a) view of value creation capability, focused on knowledge application, is described as the capability of integrating the specialist knowledge into goods and services (p. 120), which is, into the outcomes of the productive practice of the organization.

Grant (1996a) proposes to understand the firm as a knowledge integrator (p. 116), that is, as an organization that primary and routinely applies existing knowledge resident

in individuals during its operations; and asserted that the key is to minimize specialist knowledge transfer; and that this depends upon the existence of common knowledge.

Even though Grant (1996a) described common knowledge and its types (common language, shared meanings, and recognition of individual knowledge domains); he did not describe the specifics of the positive relationships among common knowledge and the knowledge integration capability.

Summing up, there is a relevant view of firm, Grant's (1996a) knowledge-based theory of the firm, that argues for the integration of knowledge into the outcomes of the productive practice as its distinctive capability; which depends upon the existence of common knowledge and its types for their operation; in which the specifics of the relationships among common knowledge, as a whole and its types in particular, with the knowledge integration capability are not explained; and that to the best of my knowledge, an integrated explanation of such relationships has not been proposed.

3.4.2 Research Questions

Main research question attend to the need to understand and explain the relation between common knowledge and the integration capability, and take the form of:

(a) How is common knowledge in organizations related to the knowledge integration capability?

Secondary research questions are:

(b) How is common language in organizations related to the knowledge integration capability?

(c) How are shared meanings in organizations related to the knowledge integration capability?

(d) How is the recognition of individuals as knowers in organizations related to the knowledge integration capability?

3.4.3 Research Design

Research design follows a straightforward design:

(1) Choose relevant participants and categorize them according to their role in the program (PhD scholarship holders, project team members, and program team member).

(2) Develop, and run three different surveys, one for each role in the program (two of these surveys were written in Spanish and English to attend language needs of the participants).

(3) Ask survey respondents for an interview.

(4) Develop an interview protocol (Kvale, 1996) for each participant; by means of researching his/her activity in the Program and the answers offered in the survey.

(5) Film the interviews.

(6) Transcribe (and translate) interviews.

(7) Ask interviewee to validate transcribed interviews, 8) interpret surveys, interviewed data and program documents using grounded theory methods-

(9) Write findings-

In this study, surveys followed two objectives, as a selection mechanism to identify collaboration aptitude, and as an interview profiling mechanism. The general guideline for the interview invites to recall stories related to the Program or Project (Component) that are linked to the answers and comments of the Lessons Learned Survey.

The guidelines for the interviews asked specific questions that were developed for each interviewee based on the answers and comments of the Lessons Learned Survey. Those questions are exposed at the beginning of each interview protocol. (See Appendix 7: Interview Protocols).

3.4.4 Contextual Setting: Inter University Cooperation Program

The Escuela Superior Politécnica del Litoral (ESPOL) is a public university with a trajectory of 50 years and of great academic prestige in Ecuador. ESPOL embarked on cooperation processes with Belgian universities in the field of aquaculture in the early 1990's. This experience motivated ESPOL to participate in the Institutional University Cooperation Programme (IUC-VLIR) organized by the Vlaamse Interuniversitaire Raad – VLIR (Flemish University Council). In 1999 the VLIR-ESPOL Cooperation Programme initiated its activities with a 4 year time frame and a funding of $3.2 million.

The Program had as its main objective the development of sustainable research with two basic premises: To solve problem in vital areas for Ecuador and to transfer these results to the productive sector. Initially, the program's development was made up of six components (see Table 5).

Inter University Cooperation Program - First phase components and objectives

Component		Promoter	Objectives reached
1	Strengthening of ESPOL's research capacity	José Luis Santos, Ph.D.	Strengthening of CICYT
			Formation of interdisciplinary groups at PhD level working on applied research
			Increase in the number of scientific publications
2	New technologies for Education on Engineering and Environmental Sciences	Enrique Peláez, Ph.D.	Creation of a Center for Innovation of Education
			Design of courses using technologies
3	Mussa Agro-Biotechnology for sustainable development	Rodolfo Maribona, Ph.D.	Development of Biotechnology to combat Black Sigatoka in an environmentally sound manner
			Practical training of senior level staff
4	Environmental Management Systems in Agriculture and Aquaculture	Ma. del Pilar Cornejo, Ph.D.	Development of environmental quality indexes
			Use of geographic information systems as a management tool of coastal resources
5	New Management Techniques for Sustainable Aquaculture	Jorge Calderón, Ph.D.	Development of management techniques to increase the density of desirable benthic organisms in shrimp ponds
			Improvement in post-larvae management
6	Studies for the development of the Coastal Zone in Ecuador	Marco Velarde, M.Sc.	Development of new materials, and building standards techniques for Ecuador taking into consideration the effects of the El Niño Event
			Plan for the establishment of an interactive museum
			Redirection of the Tourism program

Table 5. Inter University Cooperation Program, first phase components and objectives.

Once the Program concluded in 2002 and due to the results obtained, ESPOL was granted funding for a second phase of the project, with a budget of $4.5 million and a period of 6 years.

This second phase of the Programme started in April 2003 and concluded in March 2009. The 8 components addressed in this second phase were:

1 Strengthening of ESPOL's research capacity

2 Education innovation through the use of Technology

3 Tools for the, environmentally friendly, production of bananas in Ecuador

4 Environmental management system in Agriculture and Aquaculture

5 Management Techniques towards Sustainable Aquaculture

6 Research program on Materials

7 Program for the Development of Entrepreneurs

8 Development of the Education and Research Capacity on Software Engineering, Telecommunications, and Robotics

The ten years of activities carried out within the VLIR - ESPOL Programme have represented a change in the institutional paradigm which supports ambitious projects such as the Parque del Conocimiento (Knowledge Park) which ESPOL is setting forth as part of its institutional development (see www.youtube.com/watch?v=z9yXAsS8h1o).

3.4.5 Contextual Setting: Project Management Practice and Lessons Learned

Project and program management has evolved from basic initiatives in the U.S. defense industry in the late 1950s into a capability that is broadly known across most sectors. Early project management schemes were constituted by directives that define policies, procedures and formats. These initiatives were followed by the development and diffusion of tools and techniques for scheduling and estimating costs (Morris, 1998).

In the natural flow of collaboration, several initiatives followed. The International Project Management Association (IPMA) was founded in Europe in 1967 (Kousholt, 2007) as a federation of several national project management associations. Later in 1969, the Project Management Institute (PMI), a US based Project Management Institute not-for-profit professional association, was formed dedicated mainly to the advance of the project management knowledge (Harrison & Lock, 2004), and in 1972 the APM, a UK based Association for Project Management came into existence.

By 1976, PMI, embarked on programs to test whether people met their standards of project management professionalism, and this was followed by APM. This testing sets the knowledge areas that the project manager has to demonstrate their competence. PMI and APM developed their own reference for the related body of knowledge (BoK) which has been updated several times to reflect the learned practices of their members.

PMI has developed several standards that collect the best practices of their profession which are widely deploy in organizations. Among those practices are: (a) The Standard for Program Management, 2nd. Edition and (b) Project Management Body of Knowledge, 4th. Edition.

Lessons learned, considered in this study as the outcome of the productive practice, adhere to the concepts defined in these two proposed PMI standards, from which applicable terms are summarized as follow:

Project: “a temporary endeavor undertaken to create a unique product or service”.

Program: “a group of related projects managed in a coordinated way to obtain benefits and control not available from managing them individually”.

Process: “Interrelated group of actions and activities undertaken to develop a previously specified products, services or outcome”. These standards group the process in two categories: a) Project or Program Management Process and b) Product Oriented Process. Here, we only care for the first ones.

Project or Program Management Process: processes are designed to either *initiate, plan, execute, control or close* a project or program. These 5 design orientations should not be understood only as phases or stages but as a way of categorizing the process in terms of the type of activity involved (initiate, plan …). The standards include 42 processes for Project Management and a total of 59 (42 plus 17) processes for Program Management. These processes interact among them following the Shewhart - Deming continuous improvement quality cycle: “Plan – Do – Check – Act”; in these iterations among processes the outcome of one part of this cycle becomes the input to other process or processes.

Knowledge Area: Domain of knowledge, mostly business management knowledge with some specialization in microeconomics, identified as required and useful for the success of project and program management endeavors. The two standards describe their processes by grouping then in 9 knowledge areas for projects (the management of scope, cost, time, risk, quality, procurement, human resources, communications and integration) and a total of 12 knowledge areas for programs (the same 9 project knowledge areas plus three program-specific

knowledge areas: financial management, stakeholder management and governance). PMI's program and project knowledge areas and their related processes are summarily described in the Appendix 1.

Now, we can say more precisely that *lessons learned* is an outcome of the *Close project or phase process* which is categorized within the *Integration knowledge area* of the PMI practice (see Appendix 1). Lessons learned are also used as incomes when developing other related new project chapters in the organization.

It is also perceptible that if we are to follow these standards that there are three perspectives from which we could analyzed lessons learned: a) Type of Activity (Initiate, Plan, Execute, Control or Close a project or program), b) Type of Process Interaction (Plan, Do, Check, Act) and c) Knowledge Areas (12 business management and microeconomics knowledge domains).

In the context of the lessons learned (the productive outcome of a knowledge integration process), it is relevant to identify categories that eased the discovery of events or situations that relevantly affect (positively or negatively) the success of the projects or programs. Type of Process Interaction (Plan, Do, Check, Act) is a too general approach to characterized individual knowledge contributions and too distance to be applicable (talk about) during the interview process.

On the contrary, the 12 instances included in the program and project Knowledge Areas relate to more tractable and specific concepts (Scope, Cost, Time, Risk, Quality, Procurement, Human Resources, Communications and Integration) in the sense that they are better candidates to talk about what was applied in the program or project. This

argument is also applicable for the case of the Type of Activity (Initiate, Plan, Execute, Control or Close a project or program), in the sense that defines a dimension for grouping lessons learned. Here, we propose to map: *Initiate* with the narratives related to Opening stories, *Plan* with the Program & Component stories, *Execute* with the Sub–Component stories and Scholarship Holders stories, and finally *Control* with the Closing stories.

So, based on the argument of usefulness and organizing, this work pledged to the PMI's Knowledge Area and Type of Activity as the categories that guide the survey design and interview protocol to collect data that makes explicit the integrated knowledge in the lessons learned of the VLIR – ESPOL international cooperation program. Such grouping eases the identification of situations of joint attention (Wilby, 2010).

3.4.6 Case Description

The international inter university VLIR - ESPOL cooperation program between ESPOL from Ecuador and 5 Belgians universities ended, after 10 years of execution, in March 2009.

The externalization of lessons learned in the VLIR – ESPOL program was promoted in February 2008 by Virginia Lasio (VLIR - ESPOL Local Promoter) in her efforts to put in practice, for the Program, the discussions they were holding about knowledge management at ESPAE (ESPOL's Business School). Sergio Flores (VLIR - ESPOL Local Coordinator) and Magda Vincx (VLIR - ESPOL Flemish Coordinator) bought the idea and scheduled a presentation for their once-a-month meeting in which was approved and funded by the CICYT (ESPOL's Scientific and Technological

Research Center), the ESPAE Graduate School of Management and the VLIR – ESPOL Program.

Lessons learned was an initiative that collected stories from people that were involved in the program and intended to be useful for the impact analysis of the Belgian and Ecuadorian outlined program policies and their outcomes, as well as a point of reference for the continuous development of the scientific and academic capacity of ESPOL.

At the time the initiative started, July 2008, the recorded list of program's participants included 119 participants, of which 23 PhD scholarship holders, 45 Local Project team members, 18 Flemish Project team members, 19 Local Program administrators, and 14 Flemish Program administrators. Records showed that 116 of them hold e-mail accounts belonged to universities domains.

3.4.7 Data Collection

By September 1, 2008, three different surveys, one for each role – PhD scholarship holders, project team members, and program team member – have been developed, pilot tested and sent by e-mail to 119 people by the sponsors of the initiative using the e-mail account lessons_vlir@espol.edu.ec. See Appendices 2 for the surveys and their introductory message.

Getting the surveys answered was not an easy task; mail and phone follows up discover that many participants were too busy or had other priorities. In four cases, e-mail

accounts were no longer in use, however new e-mail accounts were used to resend the survey.

By the end of September, not all the ones that were expected had responded, but having answers (34) from stakeholders of all components (8) of the Program was sufficient to keep going. We had to recall ourselves that this was not a quantitative research.

To take advantage of Sergio Flores's (VLIR - ESPOL Local Coordinator trip) to Belgium during the last week of September, four interview protocols (Kvale, 1996) were developed: Magda Vincx (VLIR - ESPOL Flemish Coordinator) , Dominique Van Der Straeten (PhD Promoter), Martin Valcke (PhD Promoter) and Rony Swennen (VLIR Promoter). Sergio succeeded filming 3 of the 4 planned interviews. See Apendix 3 for interview protocols.

During October and November, surveys were analyzed and 16 interview protocols were prepared in total. December 2008 and the first week of January 2009 were interview filming time. During the second week of January 2009, we got a unique opportunity to interview Serge Hoste (Flemish Promoter) and made a second interview to Magda given that they were visiting ESPOL.

Interviews were focused (Yin, 2003a), that is the questions in the protocol were directed, based on answers of the survey, to explore lessons learned in those categories of knowledge related their studies, project or program, depending on their role. Also, interviews were active (Holstein and Gubrium, 1995); that is, based on the answers

offered to the initial questions set in the interview protocol, clarification or extending questions were posited to externalize the lesson learned being shared.

Additionally, documents related to the program were available through a web site dedicated to store the program progress reports (www.vlir.espol.edu.ec/paginas/galeria.htm), these documents were consulted to clarified and validate surveys and interview data.

Appendix 8 contains extracted transcripts of the interviews structured as stories, which capture, as a whole, the key ideas behind each lesson learned. Those transcripts were validated by each interviewee and by them as a group. In that group validation, it was clear that the product, as a whole, holds internal tensions that indeed capture their diverse knowing.

3.4.8 Data Analysis

The remainder of the story, I mean methodology, can be summarized as a period for transcription, analysis and reflection with the filmed interviews covering 36 lessons learned.

The next paragraphs give account of the conceptual ordering approach followed to unveil instances of how common knowledge types are related to the integration of knowledge into the program lessons learned. (Strauss & Corbin, 1998, pp. 19-21).

The focus of attention of this interpretation is characterized by the definition of the problem, the stated research questions, and definition and application of the corresponding coding methods of grounded theory (Strauss & Corbin, 1998, pp. 39-48) while considering sensitizing concepts as departing point for analysis (Charmaz, 2000, p. 515).

Answering the stated research questions follows the sequence described by Strauss and Corbin (1998): “the purpose of axial coding is to begin the process of reassembling data that has been fracture during open coding” (p. 124). That is, first, the interviews will be fracture using open coding in terms of the research questions; and then, by assessing the founded categories, the relationships and the dimensions, a paradigm will emerge (p. 127).

This coding “sharpens our use of sensitizing concepts – that is, those background ideas that inform the research problem. Sensitizing concepts offer ways of seeing, organizing, and understanding experience; they are embedded in our disciplinary emphases and perspectival proclivities” (Charmaz, 2000, p. 515).

In this sense, this study will pledge to the framework of common knowledge types in Views/Theories of the Firm (see Tables 44 and 45 in Chapter 5) as sensitizing concept that is both, embedded in our disciplinary way of seeing, and as warning of our biases.

Then, lessons learned, contextually saw, in the ten-year VLIR–ESPOL International Cooperation Program are tabulated in Tables 6, 7, 8. 9 and 10, labeled with a title that reflects the main content of the interview. Lessons, grouped by type of activity (Program Opening issues, Program and Component management, Sub-Component Management, and Scholarship issues and Program Closing issues) and theme in 12 knowledge area, following PMI’s (Project Management Institute) practice were examined following Strauss and Corbin (1998) open coding approach to unveil themes (instances of knowledge) from the collected data.

List of Lessons Learned grouped by Type of Activity and Themed by Knowledge Area (Part 1 of 5)

Knowledge Areas → / Type of Program Activity ↓	Lesson Learned	Scope (S)	Time (T)	Risk (R)	Cost (C)	Quality (Q)	Procure-ment (P)	HHRR (H)	Comm. Mgmt. (Cm)	Integration (I)	Financial Mgmt. (F)	Stakeholder Mgmt. (Sh)	Governance (G)
A. Opening Stories	1. A Flemish Historical and Critical view of the Program								Sharing the meaning of research culture and integrating the organization around it, it holds debates, it is progressive, leadership-dependable at start, and incentive-dependable for sustainability				Previously known organizational designs do not necessarily fit the new initiative and takes time to adjust successfully
	2. An Outsider's Reservations and Expectations	Scope leaves out practices of non-participant colleagues							Diffusing may only mean going from none to a more known but still closed program			Prioritizing practices implies leaving out members (knowledge & criteria)	
	3. The Beginnings 1: Building Trusty networks								Gaining trust on delivery precedes economic & HHRR issues			Network building asks for persistent message & adaptability to context	
	4. The Beginnings 2: Identifying Stakeholder´s Expectations											It helps to understand limits of stakeholder's expectations	
	5. From Exploiting to extending the Trusty network								Trust helps tuning one's background with other's expectations			Trust opens listening possibilities for other members	
	6. A Look to the Institutional Culture											It pays – economic benefits, prestige and higher standards - to pledge to the normative values of the research culture	
	7. "Sharing" an approach to governance and management			Member's weakness mgmt. reduces risk		Member's weakness mgmt. improves quality		Member's weakness inventory allows for proactive intervention	Trust-based work related criticism is a way of collaborating	Managed communal support "fund' is a way for integration	Managed communal "fund' as a way of balancing budgets	Sharing as a way of incorporating new members	Sharing as a way of growing
	8. Peer Review - A way of living … the culture								Peer criticism as a way of executing				

Table 6. List of Lessons Learned grouped by Type of Activity and Themed by Knowledge Area (Part 1 of 5).

List of Lessons Learned grouped by Type of Activity and Themed by Knowledge Area (Part 2 of 5)

Knowledge Areas → / Type of Program Activity ↓	Lesson Learned	Scope (S)	Time (T)	Risk (R)	Cost (C)	Quality (Q)	Procure-ment (P)	HHRR (H)	Comm. Mgmt. (Cm)	Integ ration (I)	Financial Mgmt. (F)	Stakeholder Mgmt. (Sh)	Governance (G)
B. Program and Component Stories	9. Let's replicate management - Let's refine policies	There should be alignment between scholarship holder research background and PhD program research required skills.						Project planning and control demand skills, money, tech. and time	Potential benefits of project's products demand diffusion and knowledge sharing to ease transition to the ongoing stage				There should be alignment among specialist's skilful execution, power requirements, and vision stated.
	10. Do you travel and eat well in the ESPOL-VLIR Program?							Assessing stakeholders' possibilities of meeting requirements may be necessary before calling for participation				Perception of membership openness may depend on stakeholder's limitations to meet requirements	
	11. Difficulties on sharing what you do not know or Have							There should be alignment between scholarship holders and the future demand of HHRR	Diffusing program news demands competences that are not part of the core ones				
	12. Research scope: It's not always crystal clear, on occasion it has a white spot	Knowledge to frame scope may be hidden, which collaboration could efforts release it											
	13. Research planning – Tension between norms and creativity	Not everyone still has learn the meaning of research plan											Administrative plans follows strict formats, research plans asks for flexible scopes
	14. More and better	Ambitious goal (Research Center) demands an aligned scope breakdown (+PhDs, +masters, ↑specialist, own PhD program, ↑mgmt. skills)											Management of research demands specialized skills, planning and a governance structure, and not only good teams
	15. Variations and differences: Weaknesses , therefore Threats	Either, not knowing, or own weakness awareness may distort scope meaning (Research Council)							Diffusion may be aligned to a distorted scope through "coherent" means.				

Table 7. List of Lessons Learned grouped by Type of Activity and Themed by Knowledge Area (Part 2 of 5).

List of Lessons Learned grouped by Type of Activity and Themed by Knowledge Area (Part 3 of 5)

Knowledge Areas → / Type of Program Activity ↓	Lesson Learned	Scope (S)	Time (T)	Risk (R)	Cost (C)	Quality (Q)	Procurement (P)	HHRR (H)	Comm. Mgmt. (Cm)	Integration (I)	Financial Mgmt. (F)	Stakeholder Mgmt. (Sh)	Governance (G)
C. Sub – Component Stories	16. We learned to do Research ... and also to Manage – Part 1												
	17. Snapshots of costs, RRHH and stakeholders at Sub-Component Level	Personal involvement in the procurement process may distract specialist from their goals	Personal involvement in the procurement process may give the false impression of positively affecting execution		The multiple dimensions of cost planning *(underestimates of equipment, personnel, custom taxes & language training)* may be unknown to the specialists and distract them from goals		The multiple dimensions of procurement (administrative tasks, estimates, imports, exports), may be unknown to the specialists and distract them from goals	The multiple dimensions of HHRR planning (personnel requirements, task load, task prioritizing) may be unknown to specialists and distract them from goals		Procurement activities may be centralized for efficiency reasons		The multiple dimensions of stakeholder interests may be unknown to specialists and distract them from goals	
	18. We learned to do Research ... and also to Manage – Part 2												
	19. A very Sad procurement story												
	20. We should have been more Ambitious							English language proficiency affects research and program pace					
	21. Do we need to keep the Research assistants?							HHRR planning may be unknown to specialists and bring long time consequences					
	22. We learned to do Research ... and also to Manage – An alternative					Without pledged quality standards, delivering satisfactory outcomes ask for non-replicable extraordinary efforts				We should have tried management standards from the beginning to avoid routine inefficiencies			

Table 8. List of Lessons Learned grouped by Type of Activity and Themed by Knowledge Area (Part 3 of 5).

List of Lessons Learned grouped by Type of Activity and Themed by Knowledge Area (Part 4 of 5)

Knowledge Areas → / Type of Activity ↓	Lesson Learned	Scope (S)	Time (T)	Risk (R)	Cost (C)	Quality (Q)	Procure-ment (P)	HHRR (H)	Comm. Mgmt. (Cm)	Integration (I)	Financial Mgmt. (F)	Stakeholder Mgmt. (Sh)	Governance (G)
D. Scholarship Holders Stories	23. Frozen for the Commitment: Tension among Scope, Cost &Time	Initial scholarship programs' goals may be adjusted with the particular experience	Study programs may last longer due to living cost and scope adjustments		Level of students' commitment to living cost estimates may change over time				Long term student´s living cost estimates should include discussions of institutional expectations and students' life changes				
	24. More Tension in the Scholarship holder Commitment				Managers´ expectations to students' living cost commitments may be linked to own experience								
	25. Sandwich Studies: A "Glocal" approach	Students' goals should include learning with global standards while willing to beat local restrains	Overcoming local research limitations ask for students' anticipation and planning mentality						Profile of scholarship holders should include being adaptable, collaborative and foresighted	Goals of scholarship holders studies should include integration with their local and abroad practice communities			
	26. Sandwich Studies: A "Community of Practice" approach	Students' goals should include integrating to local CoPs to learn about collaborating opportunities with their abroad research	Long and disjoint students´ abroad stays hold the risk of goal disconnection										
	27. Sandwich Studies: A "Flexible Control" approach	Program should be open to adjust time and budget to research work requirements by coordinating it with the supporting network											
	28. Please Send More PhD students, as long as ...							English language proficiency affects PhD mentoring, studies pace, abroad integration and social life (See Lesson 20)					
	29. English Proficiency optimizes not only Lab Interactions but also Social Life												
	30. English Language - More planning is Required												
	31. The Number One Rate-defining Factor	Students´ English language proficiency affects the accomplishing of goals, plans, budgets, risk level, quality of outcomes, interaction between stakeholders, and the integration process											
	32. Get Together and Learn to Discuss							Institutionalizing discussing own & others works helps to build a research culture					
	33. We need X PhDs, ¿Do we send $X/(1-f_1-f_2-f_3)$ scholarship holders to study?	Estimation of the number PhDs scholarship holders in relation to the PhDs required, in the long term, it should consider the "human nature" story (students failures, non-returning and school changing)											

Table 9. List of Lessons Learned grouped by Type of Activity and Themed by Knowledge Area (Part 4 of 5).

List of Lessons Learned grouped by Type of Activity and Themed by Knowledge Area (Part 5 of 5)

Knowledge Areas →	Lesson Learned	Scope (S)	Time (T)	Risk (R)	Cost (C)	Quality (Q)	Procure-ment (P)	HHRR (H)	Comm. Mgmt. (Cm)	Integration (I)	Financial Mgmt. (F)	Stakeholder Mgmt. (Sh)	Governance (G)
Type of Activity ↓													
E. Closing Stories	34. Multidisciplinary Projects to Solve National Problems	Goals program should be aligned and integrated to attend society problems											
	35. Research Council – A more Deductive Approach	Priorities for selecting and funding projects should consider those that have the best possibilities				Goals achievement should be externally retrofitted and validated by best practices					Goals program should be aligned and integrated to attend society problems (See Scope cell in Lesson 34)		
	36. Sustaining Dreams and Opportunities								There is an overall persistent program message that transcends the specific deliveries but it is modulated by them; a message that may trigger future institutional behaviors		An option for economic self-sustainability is the exploitation of intellectual property rights, which ask for policies that define knowledge ownership		

Table 10. List of Lessons Learned grouped by Type of Activity and Themed by Knowledge Area (Part 5 of 5).

3.4.9 Evaluation Criteria

The case study quality, according to Yin (2003a), is revealed, first, by the capacity of making it so explicit than it helps to operationalize it. Second, the quality of the study need to satisfied four conditions: 1) construct validity, 2) internal validity, 3) external validity, and 4) reliability. Attending to these five criteria allows starting to build a preliminary theory about the theme of study.

Construct validity (Yin, 2003a, p. 34) is related to the operational measures that care for the concepts being studied. This was attended by collecting data through multiple sources, asking the interviewee to validate the transcripts, and maintaining a chain of evidence.

Internal validity is related to establishing the correct causal relationship among conditions in explanatory studies (Yin, 2003a, p. 34). This was addressed by incorporating in the interview protocol the approach of asking the interviewee to tell about lessons learn in the form of stories (e.g. Would you recall stories related to this Program or Project that are linked to your answers and comments of the Lessons Learned Survey?).

Elliot (2005) recalls that internal validity is improved by the use of narratives because (a) interviewees are given the power to offer more concrete and specific details about the themes conversed, and (b) they use their own language and framework to describe experiences (Smith, 1996), resulting in more accurate or valid evidence (Cox, 2003).

Complementarily, Chase (1995a) argues that by assigning the responsibility of the narrative to the interviewee, researchers can get a better understanding of the experience. Then, here internal validity is designed in the data collection process, by letting the participants expose their meanings by structuring a narrative with their vocabulary.

Of course, data analysis requires the researcher interpretation; however, such interpretation is bounded by the context provided by the story and by the backtracking references evidenced in the *List of Lessons Learned grouped by Type of Activity and Themed by Knowledge Area* (Tables 6 – 10) and in the tables title *Empirical Instances of Common Knowledge Types founded in the Lessons Learned* (Tables 46 – 48).

External validity relates to the identification of situations in which the findings can be generalized (Yin, 2003a, p. 34). This was addressed by the selection of a representative case: the integration of specialized knowledge into lessons learned.

Lessons learned is a productive outcome of a business process broadly executed in organizations when closing projects and programs. For such process, associations of practitioners had documented best practices and described formally their pertaining domains of knowledge.

This is a representative case for which its replication – the process of integrating specialist knowledge into lessons learned - and its logic - data recollection and data analysis - is formally explicit, and by which generalizations may be possible.

Of course, replicating the logic in cases other than the integration of knowledge into lessons learned has to consider that the productive outcome under analysis asks for

the existence or the formalization of the domains of knowledge participating in the integration process, which now days is frequently available given that most business process, products or services are guided by public standards that expose in their rationalities the criteria (body of knowledge) that guides them or pledge to.

Finally, reliability has to do with the replication of the operations of a study (Yin, 2003a, p. 34). This was attended by providing a clear and extensive description of the research process, including surveys, interview protocols, transcripts and extensive coded tracking references.

CHAPTER 4: FRAMING INDIVIDUAL LEVEL KNOWING

4.1 FRAMING INDIVUAL KNOWING – A NOTE ON METHOD

Beforehand, I recognize myself as a holder of certain motivations that drives my search into the individual level knowledge theories toward instances, in those texts, that may constitute, later, a participating construct of an organizational capability.

I also recognize that I hold an intellectual call that remembers me that I have certain duties as a researcher that I should follow to assure that this endeavor toward the truth is executed with universal intent.

Both stances lead the application of grounded theory coding methods (Strauss & Corbin, 1998; Charmaz, 1993) when reading and framing individual level knowledge views or theories in search conceptual ordering (Strauss & Corbin, 1998, p. 19).

The data to be interpreted using grounded theory are the documents that contain the text that describe: (a) common knowledge and its types in the context of the knowledge integration capability in the KBV of the firm, and (b) individual level knowledge theories that are used as foundations for the theories or views of the firm in which knowledge, in any form or residency, play a key role.

The next paragraphs give account of the conceptual ordering approach followed to unveil categories within the individual level knowledge theories (Strauss & Corbin, 1998, pp.19-21). The focus of attention of this interpretation is characterized by the sequence (a) the definition of the problem, (b) the stating of the research questions, and (c) the application of coding methods of grounded theory (pp. 39-48), see Table 11.

Since the final understanding is directed toward an integrated approach of what individual level knowledge views posit, the search is driven by the three common knowledge types related to the integration capability (Grant, 1996a). In this way the emphasis is set on specifics, and about the role of language, shared meanings, and recognition of knowledge domains in individuals. However, also this emphasis needs to attend to the main activities related to knowledge - application, creation, and sharing - foreseen already in the preliminary review of organizational capabilities' approaches.

Conceptual Ordering of Individual Level Knowledge Theories

Holding as reference Grant's KBV of the Firm

Questions	Method
1. "Which are the participating constructs that are related to common knowledge types in the context of the knowledge integration capability as referenced by Grant's (1996a; 1996b) KBV of the firm?"	**Open Coding** Applied to Grant (1996a; 1996b) to reveal common knowledge related *categories*. **Axial Coding** Applied to Grant (1996a; 1996b) using *open coding unveiled categories* to make explicit a *paradigm*.
2. "Which are the explanations that individual level knowledge theories offer for the constructs related to common knowledge types?	**Open coding** Applied to each individual level knowledge theory using the unveiled *paradigm reframed as questions* to reveal *categories* of each element of the paradigm. **Axial coding** Apply to individual knowledge theories using open coding unveiled *categories* to make explicit *comparative frameworks* of individual knowledge theories

Table 11. Note on method: Conceptual Ordering of Individual Level Knowledge Theories.

The research questions attend to the need to identify (a) the constructs that are related to common knowledge types as is express in Grant's (1996a; 1996b) KBV of the firm, and (b) given those constructs, we them will ask individual level knowledge theories about those constructs.

Research questions take the form of: (1) "Which are the participating constructs that are related to common knowledge types in the context of the knowledge integration capability as reference by Grant's (1996a; 1996b) KBV of the firm?" and (2) "Which are the explanations that individual level knowledge theories offer for the constructs related to common knowledge types?

Answering the research questions follows the sequence stated by Strauss and Corbin (1998): "the purpose of axial coding is to begin the process of reassembling data that has been fracture during open coding" (p. 124). That is, first, Grant (1996a; 1996b) will be fracture using open coding in terms of the first question; and then, by assessing the founded categories, relationships and dimensions, a paradigm will emerge (Strauss and Corbin, 1998, p. 127).

The emerged paradigm – the answer of the first question – will be applied, reformulated as questions, to each text of the individual level knowledge theories, to start the second coding process; if successful, the final product of this quest will achieve comparative frames for each individual level knowledge theory.

4.2 GRANT'S KBV OF THE FIRM: KNOWLEDGE CONSTRUCTS

Applying Open coding to Grant's (1996a; 1996b) revealed the following thirteen categories: (a) knowledge/knowing, (b) common knowledge, (c) specialized knowledge (d) knowing abilities, (e) knowing triggers, (f) language (including common language as subcategory), (g) meaning, (h) knowing process/principles, (i) recognizing knowers, (j) creating knowledge, (k) applying knowledge, (l) sharing knowledge (including knowledge transferring as subcategory), and (m) organizational capability.

Also, the following relationships were identified: (1) language-meaning, (2) meaning-knowledge, (3) language-knower, (4) meaning-knower, (5) knowledge-knower, (6) knowing process-creating knowledge, (7) knowing process-applying knowledge, (8) knowing process-sharing knowledge, (9) knowing process-recognizing knowers, and relationships between every previous mentioned category with knowledge/knowing, common knowledge, specialized knowledge, and organizational capability; except for the subcategory "common language" which points only to 'language".

Several things were interesting at this open coding stage:

First, in Grant (1996a; 1996b) relationships points to language and not to common language, as we can read in "The higher the level and sophistication of common knowledge among the team, whether in the form of language, shared meaning, or mutual recognition of knowledge domains, the more efficient is integration likely to be." (p. 117). Indeed, common language concept is as broad as language can cover: "A single tongue is but one aspect of commonality of language. If language is defined to embody all forms of symbolic communication then literacy, numeracy, and

familiarity with the same computer software are all aspects of common language which enhance the efficiency and intensity of communication." (p. 116). Besides, there is no reference to the concept of specialized language. Then, in Grant (1996a) the category to frame is language, since it holds in this case the same properties as common language.

Second, categories (j) creating knowledge, (k) applying knowledge, and (h) sharing knowledge fits into a dimension label (1) *knowledge activities,* this reduces the set of categories and helps in the drafting of a paradigm.

Third, categories (a) knowledge, (b) common knowledge and (c) specialized knowledge hold the same set of relationships with the other categories, implying that the essential property is the same, and that the difference is in regard to the covered domain; them these categories at this stance ask for the interpretation of what is understood for knowledge before inquiring for subsets. Them, at this level the categories knowledge, common knowledge and specialized knowledge are equated, and leave for later is sub setting.

Fourth, category (m) organizational capability is a broad concept in this context, linkable to any category, and does not belong to this unit of analysis – individual level knowing. Then, the category was dropped.

Finally, the category (i) recognizing knowers point to (h) knowing process/principles, and most of the relationships of other categories points to (h). That leads us to sub categorized (i) into (h). Even though this is neater, the original drives of this search

alert us to keep in mind (i) (recognizing knowers) in explicit form in the final framing.

Then, re-examination of the text using axial coding to validate the depurated set of categories [(a) knowledge/knowing, (d) knowing abilities, (e) knowing triggers, (f) language, (g) meaning, (h) knowing process/principles (including recognizing knowers)], and the dimension (1) knowing activities (creating, applying and sharing) was in order. This is the short version of the story, re-examination of text happens for every depuration of categories.

Re-examination of text achieved to clean up some relationships, and reposing of intermediate findings provided opportunities for higher levels of abstraction.

The result is a paradigm that reveals a scheme for inquiring individual level knowing theories in the context Grant's (1996a; 1996b) common knowledge; or better said, inquiring the concepts of knowing and knowledge, since the emerged paradigm equated common knowledge to knowing/knowledge (see Table 11).

This framework holds two dimensions, the first structured around the (a) individual knowledge category in which subcategories like (d) knowing abilities, (e) knowing drives (re-labeled from knowing triggers), (h) knowing process/principles, and (f and g) participating knowing constructs (by combining language and meaning in a subcategory). The other dimension corresponds to the already emerge knowing activities category.

Finally, to answer the second question – "Which are the explanations that individual level knowledge theories offer for the constructs related to common knowledge levels types?" – if we are to follow open coding method (Strauss & Corbin, 1998) which asks that the frame of reference or theories that guide the inquiry should be reframed into questions, lead us to reframe subcategories and relationships into the following six questions:

(a) "What does it trigger the application, creation and sharing of knowledge?", (b) "Which are the personal abilities that drive the application, creation and sharing of knowledge?", (c) "Which is the role of language in the application, creation and sharing of knowledge?", (d) "Which is the role of meanings in the application creation and sharing of knowledge?", (e) "What does drive the recognition of the quality of knower during the application, creation and sharing of knowledge?", and (f) "Which are the principles, logic or processes that guide the application, creation and sharing of knowledge?".

In summary, the framework for the reading of views or theories of individual level knowledge is structured in three levels. First, a top level category related to individual knowing/knowledge; a second level with four subcategories: [a] drives of knowing behavior, [b] personal knowing abilities, [c] participating knowing constructs (constituted by the relationships language-knowledge and meaning-knowledge), [d] knowing principles or process (including a third level category: recognizing knowers); and third, the dimension labeled "knowledge activities" with the categories creating, applying and sharing knowledge (Table 12).

This scheme, even thou it departed from Grant´s (1996a) requirement to frame common knowledge, has emerged as a more general method to frame theories of knowledge from the perspective of organizational studies, and this happens because Grant´s view of the firm inherits in the common knowledge construct the logic that organizations follow when they look for creating value based in knowledge. Thus, the inquiry executed by the use of such framework will ask to the theories of knowledge for explanations that theories of the firm in general need to attend when conceiving knowledge-based organizations.

We have to recognize that the particular questions, not the dimensions, of the scheme are lean toward Grant´s understanding of knowledge – it residency in individuals. This is a view that guides the asking about language, meanings and the recognition of the knower. However, to avoid the intentional narrowing of findings, here the questions are assumed as a sensitizing concept (Charmaz, 1998) that illuminates the search, but does limit it. And, since the scheme dimensions that guide the inquiry hold a broader scope that the questions, we already count with an explicit reference to be considered, including the now illustrated understanding of the issues emerged as pending in the literature review.

Framing Scheme for Individual Level Knowledge Views

		Individual level knowledge/knowing			
		[a] Drives of knowing behavior	**[b] Knowing abilities**	**[c] Participating knowing constructs**	**[d] Knowing principles or processes**
Knowing activities	**Applying Knowledge**	[a] What does it trigger the application, creation and sharing of knowledge?	[b] Which are the personal abilities that drive the application, creation and sharing of knowledge?	[c1] Which is the role of language in the application, creation and sharing of knowledge? [c2] Which is the role of meanings in the application creation and sharing of knowledge?	[d1] Which are the principles, logic and processes that guide the application, creation and sharing of knowledge? [d2] What does it drive the recognition of the quality of knower during the application, creation and sharing of knowledge?
	Creating Knowledge				
	Sharing Knowledge				

Table 12. Framing Scheme for Individual Level Knowledge Views.

4.3 VISITING INDIVIDUAL LEVEL KNOWLEDGE VIEWS

The individual level knowledge views initially considered for framing are supposed to be those that are the keystone of the views of the firm that propose that knowledge holds a central role in the organizational capability of theory of the firm. Following this criterion, we found Polanyi's (1958, 1966) tacit knowledge approach, Weick's (1995) sensemaking approach and Bruner's (1990) meaning readiness approach. Additionally, relaxing a bit the criterion, brief analytical comments are made about Gourlay's (2004) "semiotic tacit knowing" which offers a refreshing picture of the subject.

Before getting into the fine coding details, let us make a quick visit to these individual level knowledge views.

Polanyi´s (1966) central idea is that our personal knowledge is tacit or founded in tacit knowledge. Polanyi's (1958, 1966) personal knowledge view is the main and most referenced approach to individual knowledge approach in organizational studies (Gourlay, 2004). However, these studies – like the Nonaka and Takeuchi's (1995) SECI model, in which tacit knowledge is translated to explicit knowledge – have "very little in common" with Polanyi's theory (Tsoukas, 2003) and have referenced the central idea of personal knowing at the distance.

Gourlay (2006), Hildreth and Kimble (2002), and Tsoukas (2003) reveal a pattern of worries about Polanyi's misleading interpretations in two fronts: (a) emphasis in epistemological confusions, specially about the conception of truth in knowing; and (b) omission of certain features of tacit knowing that constrains its conversion to explicit knowledge. However, as revealing as their analyses are, they do not offer an integrated interpretation of Polanyi's personal knowledge theory, and rather tend to contrive alternative ones.

Nonaka and Krogh (2009) responded to these questionings, with three lines of arguments in mind. First, they invoke Polanyi's specific descriptions of the tacit knowing process to assimilate it as a continuum, to support its conversion to explicit knowledge. They accompanied this argument with supportive current literature. Second, they recognized that current challenges have changed, and proposed an agenda to attend to the relationships among social practices, leadership, and organizing with knowing. Third, they recognized,

in the endnotes, that Polanyi was inspirational, but is not a restriction (Nonaka & Krogh, 2009, p. 648).

Polanyi's (1958, 1966) knowledge view is not narrated to offer manageable handles for the organizational researcher, its operationalization is not a one stop reading; and to my best of knowledge, it has not been interpreted yet as to offer a guide for the empirical observation of the knowing phenomenon . Polanyi's personal knowledge view begs for it is framing.

Weick's (1995) sensemaking and related works (Weick, 1993, 1988; Weick, Sutcliffe & Obstfeldis, 2005) proposes to conceived reality as an ongoing project, among many others, in which we plausibly assemble a prospective story that is retrospectively clarified through selecting distinctive cues from past experiences; based not only on perceptual similarities, but also in emotional ones; by conversing with ourselves and with other real or imaginary interested parties, about the living experience, and how our role in it defines us; and by executing constraining or habilitating acts that redefined the situation (Weick, 1995; Weick, Sutcliffe & Obstfeldis, 2005).

Analysis invoking Weick's (1995) sensemaking approach has been used (a) to understand micro processes that provoke significant changes over time (Ocasio, 2001); (b) as a frame of reference for studies of common sense and consensus in organizational theory (Lant, 2002); or (c) to frame the expectations that people hold, and to understand how the level and violation of them trigger certain actions (Berscheid & Ammazzalorso, 2003). These different applications and others are exemplars that achieve to structure the unknown in ill defined situations (Weick, 1995); and reveal sensemaking as a tool to frame, understand and explain particular circumstances. Here, I posit that Weick's sensemaking is not only a

problem framer; but it holds the potential of framing the description of micro activities that participate in individual knowing process. This potential of a more generalized understanding – from sensemaking to knowing as it is proposed here – has been already exemplified in Weick, Sutcliffe and Obstfeldis (2005), when they argue in favor of sensemaking as organizing when they say:

> "If we conceptualize organizing as a sequence of ecological change-enactment-selection-retention with the results of retention feeding back to all three prior processes, then the specific activities of sensemaking fit neatly into this more general progression of organizing" (p. 414).

The reading that we proposed for framing Weick's (1995) sensemaking as individual knowing will try to reveal that the activities of sensemaking, as is, fits the individual knowing process.

Bruner's (1990) *Acts of meaning*, an approach that argues for a view than humans are meaning ready, is a well known proposal from cultural psychology studies that has been referenced by Spender and Grant (1996a) in their knowledge based-theory of the firm; and more recently Gourlay (2004) made reference to Bruner's (1978) previous works. Bruner's view is brought here, as we will see later in detail, because its constructs and the relationships among them are highly connected to the concept of organizational capabilities; and because, I believe, it brings more light to the issue of language as canonical vehicle in the understanding of the other views of knowledge at individual level.

Finally, Gourlay's (2004, 2006) semiotic approach is a draft proposal that searches into Dewey and Bentley's (1949) sign framework to reconsider the main tendency of recurring to the misread Polanyi's tacit knowledge.

4.4 POLANYI'S PERSONAL KNOWING VIEW

4.4.1 Polanyi's Writing Logic

Let's star saying that Polanyi's (1958) *Personal Knowledge – Towards a Post-Critical Philosophy* was mainly motivated as a response to the depersonalized approach to knowledge articulated in positivism (Polanyi, 1958, p. 9, 265; Miller, 2008, p. 936); in which his main postulate is that humans have the *intellectual ability* of holding deliberately unproven beliefs following self-set standards of reasonableness (Polanyi, 1958, p. 268), which ultimately are upheld by the confidence in themselves (p. 256), characterized by the vocation to the truth (p. 65) and submitted to reality (p. 63); claiming that man can rise above his own subjectivity by fighting avidly to satisfy his personal duties to universal standards (p. 17).

Now, let us continue, from the distance yet, reviewing what Polanyi (1958) offers as a description of knowing process that enacts the intellectual ability:

A subsidiary process (Polanyi, 1958, p. 59-61) – also called subsidiary awareness (1958, p. 55) - characterized by an initially uncritically assimilation (1966, p. 62), as in our own body, of certain set of un-asserted pre-suppositions – also called particulars – that are

used as an ultimate interpretative framework – tools, set of beliefs – for a purpose that is the centre of our focal attention – also called focal awareness (1958, p. 55).

Process in which:

"Subsidiarity" is achieved by a repeated mental effort aiming at the unarticulated instrumentalization of certain objects - physical or intellectual (1958, p. 59) - in which we commit and rely (1958, p. 61), acting with universal intent (p. 308) based on self-standards of usefulness (p. 63), in the service of some purpose (1966, p. 62).

"Initially uncritically assimilation of unasserted pre-suppositions" has its origins in (a) that the pre-suppositions show to be useful and confident (Polanyi, 1958, p. 59 - 60), and, (b) the initial acceptance of authority of others - adults, teachers, or leaders, that appears meaningless to start with, but in fact has an unarticulated meaning that is discovered by hitting in the same kind of indwelling as the other is practicing" (1966, p. 61-62).

At first instance, the previous summary and abstract description of Polanyi's (1958) personal knowledge does not reveals much to the organizational researcher; however it provides clues about the kind of challenge that implies framing a more concrete understanding of his theory.

Polanyi's (1958) writing maintains a consistent, but not obvious, logical structure that holds the tension of meeting two major objectives:

(1) Proposing a holistic and integrated epistemology capable of attending, from the personal knowing perspective, visions of the social world and the scientific world.

(2) Describing the particulars of the process of personal knowing from the restrained perspective that our knowing is tacit or founded in tacit knowing.

Then, Polanyi (1958) is broad and detailed simultaneously, and this provokes a tension that may look to the reader as a jumping around from the general to the particular, without easy recognition of which objective Polanyi is attending.

A few cycles of reading, analyzing, resting, and rereading reveal Polanyi´s (1958) intellectually beautiful recursive logic that he used to attend the two objectives:

(a) First, he framed the challenge by arguing that:

"[T]he act of knowing includes an appraisal; and this personal coefficient, which shapes all factual knowledge, bridges in doing so the disjunction between subjectivity and objectivity. It implies the claim that man can transcend his own subjectivity by striving passionately to fulfill his personal obligations to universal standards" (p. 17).

(b) Then, he develops key common concepts (e.g. appraisal of order, commitment, subsidiary, particulars, tools) to attend both challenges. The processual and very detail description of each concept, which does not state a direct definition, it is not in most cases easy to relate with the main objectives; but connections exist in a language that, due to its preciseness, asks for patient rereading.

(c) Finally, he reuses these common concepts by scaling them up or down through qualifications or specializations, fitting them to the flow of the arguments. This is observable, for instance, in the transition that goes from "appraisal of order" to "pattern contriving":

"*On these grounds I suggest, quite generally, that the appraisal of order is an act of personal knowledge, exactly as is the assessment of probability to which it is allied. This is, of course, quite evident when the ordered pattern is contrived by ourselves; such cases may help us therefore to recognize the principle asserted here and to see that it holds quite generally*" (p. 36).

In summary, Polanyi (1958) follows a modular, scalable and recursive approach to describe the fine details of knowing at individual level and the building blocks of a social and scientific epistemology.

4.4.2 Polanyi's Taxonomy of Knowing and Abilities

Polanyi (1958) did not make explicit a knowledge taxonomy; however, his work revealed a knowing taxonomy. Such taxonomy is not easy to frame since it holds the difficulty of differentiating contextualized meanings for some key terms like "articulate". The next paragraphs provide an account of framing difficulties:

(1) Polanyi (1958) follows a processual approach to describe his theory, that is, an emphasis on describing ongoing intellectual acts instead of describing the objects to which those acts are directed.

(2) Separation of what is qualified as "inarticulate" from what is qualified as "articulate", as follows:

(2a) "Inarticulate" comprises processes enacted by primitive knowing abilities related to intertwined sensory-motor-logical powers that humans share with animals (Polanyi 1958, pp. 96-98); and

(2b) "Articulate" comprises processes enacted by intellectual knowing abilities, which subsidiarily employ tools that may hold symbolic systems with different levels

of preciseness (p. 77), or richness (p. 86). When the symbol system in use is not adequate enough, in a particular striving of intellectual control, our knowing stays tacit; otherwise our knowing becomes explicit, at least a subset of it (Polanyi 1958, pp. 70, 86, 96-98, 328).

At this point, the reader may be worry for the lack of literal transcriptions that supports the interpretation assigned to the terms "articulate" or "inarticulate". The argument offered to dissipate the concern is to present a textual example of how Polanyi (1958), not only neglected a direct description of a concept, but also argued for a contextual understanding of it:

"*My use of the words 'articulate', 'articulation*, etc., in this chapter is wider than the common linguistic usage, in which these terms refer only to the actual enunciation of the sounds of language. The context, however, should make my meaning clear, and it is not without precedent. See for example: A. D. Sheffield, Grammar and Thinking, New York and London, 1912, p. 22: 'Psychologically, the simple assertory sentence expresses the articulation of a conceptual whole into such of its elements as are pertinent to the interest guiding the train of thought.*" (p. 70).

As a result, what it presented here as meanings of "inarticulate" and "articulate" corresponds to the effort of recognizing the patterns of usage of these two terms in Polanyi's (1958, 1966) whole texts, and then positing interpretations.

On this basis, I propose a simple taxonomy of knowing of two levels. At the first level, "Primitive inarticulate knowing" and "Articulate knowing" constitute "Knowing".

Here, articulate is understood as an incomplete formalization of the expression of ideas that recurs subsidiarily to a system of symbols and to its language laws.

At the second level, "Articulate knowing" is separated into (a) "Tacit Knowing" (subsidiary process that assimilates tools as part of oneself), (b) "Ability-based knowing" (focal process that follows private standards of usefulness or beauty), and (c) "Symbol-based knowing" (focal process that follows self-adhered public duties).

This taxonomy proposes that "knowing" be understood as the instrumentalization of objects, an understanding that holds different gradients of symbolic, systematized, and sharable content (see Table 13). This is an approach to knowledge that proposes an understanding, as we will see in detail at the end of the section, that makes the concept of knowledge more tractable from the perspective of management science.

Here, it is not argued that this is the only way of classifying knowing and knowledge, but positing a frame to read Polanyi's (1958, 1966) work given the approach of his writings, which essentially argues that the use of a symbol-based systems to gain intellectual control of situations establishes a breakpoint in human knowing (p. 95, 100, 193), indifferently if we achieve to use symbols to tell about it.

Polanyi's Taxonomy of Knowing and Knowledge

Primitive inarticulate knowing			
	Drives	**Abilities**	**Process**
	Appetite satisfaction, perceptual and surroundings sensemaking	Innate mix of sensory-motor-logical powers	Self-satisfaction of cravings as the way of assenting and knowing
	Evaluated in terms of innate private standards of satisfaction		
Articulate knowing	**Tacit knowing**		
	Subsidiary process that assimilates tools as part of oneself		
	Tools		
	Less symbol-based Less systematized Less shared	Knowledge as the instrumentalized objects	More symbol-based More systematized More shared
	Ability-based Knowing		**Symbol-based Knowing**
	Less Explicit		More Explicit
	Focal process that follows private standards of usefulness or beauty		Focal process that follows self-adhered public standard of duty

Table 13. Polanyi's (1958, 1966) Personal Knowing and Knowledge Taxonomy.

4.4.3 Primitive Inarticulate Knowing

Polanyi (1958, p. 71), following *Theories of Learning* of Hilgard (1956) and *Learning Theory and Personality Dynamics* of Mowrer (1950), who in their turn were guided by Tolman's (1932) *Purposive Behavior in Animals and Men* and Skinner's (1938) *The Behavior of organism* argues that our, both, understanding of knowledge and the consent that it is true, lies in our active innate sentience and abilities.

Such abilities correspond to (a) our innate sentience, alertness and motility which are actuated by appetitive drives (Polanyi, 1958, p. 96), (b) our innate sensory powers which react to the need of making sense of what is being perceived (p. 97), and (c) our innate mix of sensory-motor and primitive logical powers which are alive by our need to make sense of our surroundings (p. 98).

This Polanyi's approach to human powers is similar to psychology's nativism (Byrnes, 2001) which posits that humans are born with cognitive abilities that allow attaining more skills.

The effort to satisfy these appetitive and needs follows silent exploration guided by perception, which in the event of success leads to a silent affirmation; which is a primitive manner of establishing a fact. Moreover, the information that we acquire by sensory perception, for example by eating or making love, implies selecting, relating and judging the objects in relation to its own motivation; entering in this way in our picture of the world (Polanyi, 1958, p. 99).

However, Polanyi (1958) noted that human perceptual senses hold limits and that we make understandings and assert with conviction those understanding based on what we have perceived following the criteria of reasonableness (p. 96). Polanyi described these perceptual limits and dilemma with clarity in the following paragraph:

> "The muscles of the eye adjust the thickness of its lens, so as to produce the sharpest possible retinal image of the object on which the viewer's attention is directed, and the eye presents to him as correct the picture of the object seen in this way. … But *sharpness of contour* does not always predominate in the shaping of what we see. … when a ball set against a featureless background is inflated, it is seen as if it retained its size and was coming nearer. This illusion seems to be due to the fact that in this case we accommodate our eyes to a closer range, even though in consequence the object gets out of focus. Worse still, we simultaneously increase the convergence of our eyes so that the two retinal images are displaced from corresponding positions, which would normally make us see the object double. These *defects of the quality and position* of our retinal images are accepted here by the eye, in the urge *to satisfy the more pressing requirement of seeing the object behave in a reasonable way*. Since tennis balls are not known to blow themselves up to the size of footballs, …" (p. 96, italics added).

4.4.4 Tension between “Sharpness’ and “Reasonableness”

Polanyi’s (1958, pp. 95-97, 138) detailed description of perception should not pass without being commented. He defends two combined, but confronted, criteria for the right perception to determine what the eyes see: (a) “sharpness of contour”, and (b) “reasonableness of the image”. The tension that our senses experience in trying to make sense of an observation at the level of primitive knowing is analog to the tension that we hold at other levels of knowing; such is the case of the tension between "certainty" and “systematic relevance" for the criteria of scientific value. Nothing better than quoting him to describe this analogy’

> "Just as the eye *sees details that are not there* if they fit in with the sense of the picture, or overlooks them *if they make no sense*, so also very little inherent certainty will suffice to secure the highest scientific value to an alleged fact, if only it fits in with a great scientific generalization, while the most *stubborn facts will be set aside if there is no place for them in the established framework* of science." (p. 138, italics added).

These perceptual sensemaking criteria (sharpness - reasonableness) characterize the general profile of the knowing tension; however, tension origin holds more enriching antecedents. As we get (a) sensory clues of the present experience, and (b) react making sense of it, as best we can; (c) the resolutions “*appear to be evaluated together with an immense array of past clues, gone beyond recall – but not without effective trace*” (Polanyi, 1958, p. 97, italics added).

This perceptual sensemaking tension between “sharpness’ and “reasonableness” is eventually resolved in favor of rationality (Polanyi, 1958, p. 98), but within the limits of our

personal abilities and the benefit of un-specifiable effective "traced past cues" (p. 97); which it is no necessarily the truth, as it was evident with the case of closer tennis ball (p. 96).

The described tension holds a logic that is shared in the need of making sense of our surroundings, at the primitive knowing level, and in all knowing instances; as we will see later in the issues of skills, tools, language, and meaning.

However, in those knowing cases the tension's resolution criterion will migrate from a private perspective – usefulness – to a public one – duty, but retaining the self-adhere postulates of the personal knowing approach.

This section – a necessary deviation of the original planned sequential review of knowing and knowledge types – helps to appreciate a key seminal construct: *the persistent tension that knowing holds at different levels*; a characteristic that Polanyi (1958) rescues and emphasizes in his understanding of personal knowing.

4.4.5 Reversibility Criterion

Now, returning to the interviewed Polanyi in the issues of primitive knowing, he went on and said that appetitive satisfaction and perceptual sensemaking are the main interwoven sub-intellectual bare bones, but still inarticulate level, of intelligent behavior that we share with animals. This behavior takes the form of different types of learning: (a) Trick learning, (b) Sign learning and (c) Latent learning.

In trick learning, the subject achieves to contrive relationships between means and ends (e.g. the rat that learns to press a lever – mean – to get to eat a pellet – end).

In sign learning, the individual observe useful relationships between signs and events (e.g. the rat that learns to choose the marked door – sign – to get access to food – event).

In latent learning, problems and solutions (e.g. the rat that has learned, given that one of the path has been closed – problem – to choose the shortest alternative path – solution).

Trick learning extends on innate motility powers and it is mainly controlled by a purpose. Sign learning deploys innate sensory powers and is mostly guided by strained attention. And, latent learning uses a mix of sensory-motor and primitive logical powers and it is primarily actuated by the need of making sense of the surroundings (Polanyi, 1958, p. 71 – 75).

In each inarticulate learning type, there are two knowing stages: (a) the heuristic stage - when a mostly irreversible innovative actual learning happens, and (b) the routine stage – when a comparative reversible display of the knowledge learned happens (Polanyi, 1958, p. 76).

While in trick learning, contriving is the heuristic ability showed, observing is for sign learning, and understanding and reasoning is for latent learning (pp. 76, 328).

Polanyi's (1958) argument about the tacit characteristic of knowing starts here, at the inarticulate knowing level with the concept of reversibility. He applied this concept to discuss the reversibility of the three inarticulate learning types.

Piaget (1928) presents the criterion applied to evaluate reversibility (Polanyi, 1958, p. 75). He states that an inference is reversible when it can be traced back to its premises by achieving to establish an interpretative framework.

In trick learning and sign learning, the heuristic and routine stages are irreversible and reversible respectively.

However, while in latent learning the solution obtained in the heuristic stage could range from the result of a systematic exploration of a situation – framework building – to a flash of insight after a perplexed contemplation – no framing is possible.

Even more, in the routine stage of latent learning, ingenuity could be the source of the applied solution instead of the operation of a framework (e.g. for the rat experiment, it corresponds to the alternatives between the use of ingenuity or recurring to a mental map of the maze), Polanyi, 1958, pp. 74-75.

It is relevant to recall that reversibility in inarticulate knowing does not incorporates any symbolic externalization tool of the heuristic or routine premises of the framework in used; reversibility is analyzed at this level in terms of the possibilities of re-instantiating the framework that followed the mental abilities.

Recalling that the reversibility of the heuristic stage of this process, that is, tracing back its premises is denied when mainly sensory and motor powers participated, and it is possible when the primitive logical power are involved. However, even in those circumstances, there is the alternative of taking the ingenuity route (Polanyi, 1958, p. 74), which is irreversible in Piaget's (1928) terms.

In summary, this irreversible condition at primitive level set the drafts of the non-specifiable characteristic of the heuristic stage of knowing acts, when it is either based on

sensory and motor abilities, or based on logical abilities with ingenuity plays a role (see Table 14).

4.4.6 Self-Satisfaction of Cravings and the Truth

Briefly, Polanyi (1958) posits, in regards to inarticulate knowing, that individuals

(1) in search of successful self-satisfaction of fundamental human appetites, perceptual sensemaking, and surroundings sensemaking,

(2) by means of primitive innate sensory-motor-logical abilities,

(3) *inarticulately assert the truth* about facts and acquire knowledge about the world;

(4) while resolving perceptual and surrounding sensemaking tension between "sharpness' and "reasonableness" in favor of rationality in terms of the best of our innate abilities, and the reference of un-specifiable past cues;

(5) leaving the sensor-motor and ingenuity-based logical acts as non-reversible.

Polanyi's Personal Knowledge Framework: Primitive Inarticulate Knowing Section

Drives, Abilities, Constructs and Processes

Primitive Inarticulate Knowing	**Inarticulate knowing drives** *(performance criteria)*	Appetite and needs	Perceptual sensemaking	Surroundings sensemaking	Creating
		Evaluated in terms of innate private standards of satisfaction			
	Inarticulate knowing abilities (powers)	Innate motility powers	Innate sensory powers	Innate mix of sensory-motor-logical powers	
	Inarticulate abstract knowing abilities *(tension)*	Contriving	Observing	Understanding / Reasoning	
			sharpness of contour *vs.* image *reasonableness*		
	Inarticulate learning type	Trick learning	Sign learning	Latent learning	
	Relationship discovered	Means - end	Sign - event	Problem - solution	
	Reversibility of heuristic stage (tracing back to premises)	No	No	No: result of a flash of insight Possible: systematic exploration	Applying
	Routine stage of the learning type	Repetition of trick	Continuous responding to sign	Solving of a known problem	
	Reversibility of routine stage (tracing back to premises)	Yes	Yes	No: use of ingenuity Possible: operation of a known framework	
	Primitive inarticulate knowing process Self-satisfaction of cravings as way of assenting and knowing.	Individuals, (1) in search of successful self-satisfaction of fundamental human appetites, perceptual sensemaking, and surroundings sensemaking, (2) by means of primitive innate sensory-motor-logical abilities, (3) *inarticulately assert the truth* about facts and acquire knowledge about the world; (4) while resolving perceptual and surrounding sensemaking tension between "sharpness' and "reasonableness" in favor of rationality in terms of the competences of our innate abilities, and the reference of un-recallable past cues; (5) while recognizing sensor-motor and ingenuity-based logical acts as non-reversible.			Creating

Table 14. Polanyi's (1958, 1966) Personal Knowledge Framework: Primitive Inarticulate Knowing Section.

4.4.7 Articulate Knowing and Intellectual Sensemaking Logic

According to Polanyi (1958), the transition from inarticulate knowing – Trick learning, Sign learning and Latent learning – to their articulate counterparts – Discovering, Observing and Interpreting (p. 76 – 77) – is triggered by the human push for making intellectual sense of the experienced circumstances, an express as:

> *"... an urge to achieve intellectual control over the situations confronting it. ... This is the principle which guides all skills and connoisseurship, and informs all articulate knowing by way of the ubiquitous tacit coefficient on which spoken utterances must rely for their guidance and confirmation.*" (p.132).

Polanyi (1958) posits that almost all knowledge that man holds that exceeds animal knowledge is gained by the usage of language (symbol-based tool); operation of which relies in the tacit intellectual abilities that are continuous to those of the animals (p. 95). The understanding of an experience, together with the language we use to make reference of the experience is an effort that is attending to our needs of intellectual control (p. 100) that continuously feeds human knowledge domains.

Polanyi (1958, p. 172 - 173) argues that our strivings for the satisfaction of our intellectual appetites (our urge to make sense, not only of ever alert eyes and ears but to understand experiences) operate as the trigger of the articulate knowing framework. This trigger can go from motivating a student to solve a mathematical problem, to the joy of conceiving a whole scientific or cultural system (p. 173).

This intellectual appetite, which drives discovery, assumes the possibility that there is knowledge that satisfies the need and the ability of recognizing it as truth; without

assuming ability's infallibility, but its competence; and when it is successful, the found knowledge satisfies the urge (p. 173).

It is important to take note that at articulate level of knowing we complement to the innate private standards of satisfaction an acquired public standards of obligation.

Our primitive standards are predominantly innate and private, while intellectual standards are acquired by education, and at the highest level – scientific – we believe to be attending public universal obligations (Polanyi, 1958, pp. 174, 315).

In other words, knowing standards are characterized by the kind of appetite that invoked knowing, which ultimately rely on our self-adherence.

However, in articulate knowing, there is the case of ability-based performances that follow acquired self-set standards of usefulness that are private, but also may be partially public in the form of maxims that could be shared by masters or connoisseurs (experts), or have been made explicit from the successful applications of the skill (Polanyi, 1958, pp. 162).

Ability-based acts are not only the domain of artist or connoisseurs, but also domain of inventors, scientists, and good citizens; acts in which intellectual beauty guides, as we can interpret it from:

> *"[T]he assessment of what is of higher and what of lesser interest; what is great in science, and what relatively slight. …this appreciation depends ultimately on a sense of intellectual beauty; that it is an emotional response which can never be dispassionately defined, any more than we can dispassionately define the beauty of a work of art or the excellence of a noble action*" (p. 135).

Then, at the level of articulate knowing in general, we follow acquired private self-standards of usefulness and intellectual beauty at ability-based level (pp. 59, 60, 63, 135) and acquired public self-imposed obligations at symbol-based level (pp. 174, 315).

It is convenient at this point, to reproduce a text from Polanyi's (1958), which I believe it offers light about two important intertwined processes in articulate knowing: intellectual gratification and intellectual appetitive perpetuation:

> "*Our intellectual passions, however, differ essentially from the cravings and emotions which we share with the animals. The satisfaction of these terminates the situation which evoked them. Discovery likewise terminates the problem from which it started, but it leaves behind knowledge, which gratifies a passion similar to that which sustained the craving for discovery. Thus intellectual passions perpetuate themselves by their fulfillment.*" (p. 173).

I propose to understand Polanyi (1958) description of intellectual passion as the holder of, what is labeled here, the intellectual sensemaking logic, which posits:

(1) The belief that there is knowledge, in which our intellectual need declares its satisfaction.

(2) We hold the ability to recognize that knowledge as true – not infallibly, but our competence.

(3) That is, by accepting the discovery, our intellectual passions is satisfied.

(4) Since the discovered knowledge stays, it may trigger recursively more intellectual needs.

Now, it is time to direct our attention to the resources in charge of satisfying this intellectual appetite and passion.

4.4.8 Tacit Knowing

Identifying the abilities that satisfy our needs of intellectual control invites to recall that these abilities are tacit (Polanyi, 1958, p. 95).

More precisely, these abilities participate in a subsidiary process (p. 59 – 61) characterized by an initially uncritically assimilation (1966, p. 62), as in our own body, aim to the instrumentalization of certain objects (1958, p. 59), in which we commit and rely (1958, p. 61), in the service of some purpose (1966, p. 62) that is the center of our focal attention (1958, p. 55).

Then, we could say that these abilities are related to the committed instrumentalization of objects, in which physical objects, intellectual frameworks, language symbols or system of symbols are among the cases of instrumentalization.

The objective in the following sections is to argue that Polanyi (1958) posits that the tacit intellectual abilities that satisfy our intellectual cravings correspond to the following, here labeled, tacit heuristic abilities: (a) order and pattern recognition and contriving, (b) anticipating generalizations and (c) intellectual commitment.

These three elements of his view are constructs for which Polanyi dedicated a great deal of his work – Chapters 2 and 3 for "Order", Chapter 5 "Anticipations" , and Chapters 4 and 10 for "Commitment" – are key to understand the modular, scalable and recursive approach for explaining his personal knowledge view.

4.4.9 Order: Building Block of Future Suggestions

In the strivings of making sense of experience, we count with the heuristic ability of recognizing order in contrast to randomness (Polanyi, 1958, p. 38). This ability is best described by the process of making sense of our visual perceptions, in which we separate the field of vision into the figure of the object and its background.

This process is achieve by (a) identifying a set of particulars – figure – that retain its internal identity even though is moved against a (b) non-identifiable set of particulars – background – which retain its resting identity even though it may be subject to changes.

Then, the ordered particulars of the figure are recognized in contrast to the random particulars of the background by confirming that the nature of the relation between the particulars of the figure and the background are random (p. 38).

Moreover, we are able to appreciate in order certain degrees, like in the identification of the degree of symmetry in triangles. We can give account of the standard of symmetry of a scalene triangle and assert that is unsymmetrical, and assert than an isosceles triangle is symmetrical, but an equilateral triangle is more symmetrical than the isosceles triangle (p. 44).

Even further, man holds the intellectual ability to establish patterns (*contriving patterns*) in nature and the assessment of such order is made with universal intent (Polanyi, 1958, p. 37), that is, humans believe that such assessment of order is true and submits it to reality as a discovery (p. 63); in doing so the stated finding holds future implications that may convey a variety of, at present, non-specifiable true insinuations (p. 37).

Therefore, *"[a]ll kinds of order, whether contrived or natural, have existential meaning but contrived order usually also conveys a* message *[denotative meaning]"* (p. 58).

In abstract terms, the act of tacit knowing commits to certain standards of coherence – assessments of order – set by oneself (p. 63) believing (p. 303) that those standards are true, fit reality, and hold the capability of revealing true non-specifiable future insinuations (p. 37).

4.4.10 Anticipating Generalizations

One way to explain the heuristic ability of anticipation is to review how humans are able to assert with the word "chair" a particular object among many different objects once he had previously pronounced the word "chair" or listened others pronounced it in reference to the experience of any other chair (p. 92). Beforehand, it is necessary to qualify the act of denotation as "chair" the particular chair as an act of generalization. Then, the inquiry changes to "How are humans able to articulate generalizations?"

Polanyi (1958) argues that the human ability of pronouncing generalizations is rooted in his heuristic abilities of anticipation, which is manifested, in the case of language usage, while denoting an object with a symbol, when humans achieve to identify acceptable variances of the substantial character of the object under different experiences (1958, p. 80).

As we feel that the denotation is correct we accept language as part of a theory of generalization, in which the symbols of a vocabulary appears to constitute a theory of all the objects that can talk about now and in future occasions; which implies its applicability for experiences to come (p. 80).

In a more broad discourse, in the context of any object, symbol-based or not, we can understand generalization as an universal theory that is rooted in the anticipatory ability of identifying new instances of certain things that we know (Polanyi, 1958, p. 103).

Briefly, the anticipatory ability provides humans the capacity of asserting generalizations by recognizing new instances of certain known objects by identifying acceptable variances of the substantial character under different experiences (p. 110 – 112).

In a more specific discourse, to classify objects in terms of a range of non-formalized variations of the substantial character, for which there are symbols, holds certain indeterminacy that is resolved by the observer using a known but unspecified criteria (Polanyi, 1958, p. 80 -81).

This unspecifiable self-accreditation of language reveals: (a) an endorsement to our heuristic language skills, and (b) the personal tacit groundings of knowledge, since what we say or write assumes our endorsement (p. 81).

4.4.11 Intellectual Commitment: the Road to "Committed True Belief"

Polanyi (1958) made a consistent plea for "commitment" in the understanding of personal knowing. He presented many examples that followed a pattern, which is summarized in the following analysis.

The reading of letters presupposes that words and the objects they represent – a framework characterized by signs an meanings - have been absorbed as part of our own existence (Polanyi, 1958, p. 59). That is, we commit and rely on such instruments (p. 61) at

the service of some specific purpose (p. 62), in this specific example, the capturing of the meaning of the letter (p. 59).

The justification of the commitment to objects, assimilated as tools, that unconsciously function as extension of our bodies, is mainly based on our belief on their efficacy (p. 60), effectiveness or suitability (p. 59); which is gained while making sense of the experience of using them (p. 60) for the purpose at hand (p. 63); or based in our belief that they are able to validate (pp. 202, 312) the intellectual beauty that is privately demanded in discoveries, inventions or noble acts (p. 135), or based on in our belief that we should follow our self-adhered public duties (p. 315).

A more general understanding of intellectual commitment can be expressed as the ability of acting with universal intent (p. 308) based on self-standards of usefulness (p. 63), beauty (p. 321), or duty (p. 315) with the conviction that the assumptions in which we rely about the instrumentalized objects of experiences follows the truth (p. 305).

Our acts and thoughts in the search of truth imply a personal participation in the desire of something impersonal – universal – as the truth (Polanyi, 1958, p. 308).

Polanyi proposes conviction for the truth within the framework of the passionate aspects of intellectual commitment (Polanyi, 1958, p. 171). To explain this human passion for truth, Polanyi recalls that the strivings for satisfaction of our basic needs and fears depart from the supposition that there exist: (a) objects that satisfy our needs and fears, (b) the competence to reach them; and (d) that their fulfillment is a form of confirmation.

Then, understanding of the truth within the framework of commitment allows confining of the dangers of understanding knowledge as *justified true belief* (Gourlay, 2004).

Commitment is the competence that authorizes the choice of believing that something is true (Polanyi, 1958, p. 315). This a deliberate and necessary choice made by the call of the best of abilities (p. 315), that holds the tension between the wiliness of acting judiciously and the confidence of executing a novelty (p. 318).

In this approach, error is a possibility if we are not to lose contact with reality (p. 315).

4.4.12 Tools

Expliciting the conception of tools in Polanyi's (1958) follows three lines of reasoning. First, we will unveil the connection between tacit knowing heuristic abilities and the logic of contriving and using objects as tools. Second, we will explore the implications of Polanyi's language principles in the conception of symbol-based tools. Finally, we will posit that the understanding of tools as more or less symbol-based implies different process of knowing and ways of sharing knowledge.

This Polanyi's (1958) reading of knowledge as tools, holds the possibility of given a more tractable understanding to those theories of the firm that posit that knowledge is embedded in objects, however, as we will see later, this knowledge embedding in objects conception ask for certain necessary conditions that keep the knower as the enabler.

4.4.13 Tools' Contrivance and Usage Logic

Here, I am ready to make explicit a link between significant patterns and tools that Polanyi (1958) exposed extensively but only by indirect references. The purpose is to make explicit the logic for tools contrivance and usage, a sequence that goes from (1) pattern recognition or contriving, (2) trough pattern generalization, (3) to the committed instrumentalization of patterns.

First, I state my understanding clearly, and say, based on Polanyi (1958) that the order recognition and contriving ability, founded on the ability of assessing a degree of order to a set of objects while experiencing them, it is not only able to contrive a message about certain order (p. 58), but contriving it as a whole, that is, as a pattern, without taking focal attention to the assessed degree of order of the particulars, but subsidiarily (p. 57).

Second, I argue that the heuristic ability of anticipating generalizations able us to identify acceptable variances of the substantial character of the patterned objects under different experiences (1958, p. 80, 103).

Third and finally, here I argue that the previous abilities be considered as intertwined abilities – anticipating patterns from experiences – and that they set together the drafts of instrumentalization of intellectual or physical objects.

This instrumentalization is guided mainly by the committed belief that patterned objects are either useful, intellectually beautiful or duty complaint; that is they satisfy either the self-set standards of usefulness (p. 63), or intellectual beauty at the ability knowing level (p. 321), or self-set standards of duty at symbol-based knowing level (p. 315).

In summary, anticipating patterns leads to the subsidiary instrumentalization of certain intellectual or physical objects, that is, the recognition or contreiving of object or set objects as a tool or framework (Polanyi, p. 59).

This recognition implies that (a) we do know what these objects are for, (b) we believe them to be useful for those purposes; and that (c) on the contrary they will just look as strange objects (p. 56).

Furthermore, based on the extension of the visual and auditory wholes of Gestalt psychology and in particular in the Law of good forms (prägnanz), Polanyi (1958, pp. 56 - 57, p. 79) asserted that (a) the particulars of a tool or framework must be apprehended jointly, that is that the focus on the particulars separately forms no tool nor framework, implicating that when the usefulness of a tool is questioned its meaning as a tool is vanished; and (b) that we can focus our attention one at a time, that is, we cannot be aware at the same time of the subsidiary particulars of the tool or framework and be focally aware of the whole task or action of applying it.

The subsidiary awareness of tools or frameworks can be regarded as the act of making them a part of the body or the mind. This is best exemplified by recalling that when reading a letter we are aware of the words of a language only in a subsidiary manner, and that only when our understanding of the text is inadequate them the words will catch our attention (Polanyi, 1958, p. 57 - 59). That is, (c) efforts for specifying the subsidiary particulars is a destructive analysis of personal knowledge cause by the change of attention (p. 63).

In practical terms, as we learn to read a book, to handle a hammer, to drive a bicycle, we progressively become unconscious of the actions by which we accomplish the result (Polanyi, 1958, p. 61). The route to unconsciousness – "a change achieved by a repeated mental effort aiming at the instrumentalization of certain things and actions" (p. 62) - is accompanied by a newly acquired consciousness of the experiences regarding the specific purpose (p. 62).

Then, in summary to use an object as tool, according to Polanyi (1958) requires:

1. Our recognition and commitment of its utility for our purposes.
2. Our focus on the whole, since particulars of the instrumentalized object forms no tool.
3. Our progressive unconsciousness of the actions with the object by which we achieve our purposes.
4. Our evaluations of the object performance as tool follow either, self-set private standards of usefulness or intellectual beauty, or self-adhered public standards of duty.

4.4.14 Symbol-based Tools

Tools contriving and usage logic applies to any kind of tool, physical or intellectual; however, there is a characteristic at the tool level, through which Polanyi (1958) explains the progress of human kind: it's symbolic representation and operation; best exemplified in language.

Polanyi (1958) emphasizes the double role of language in the development of human knowledge. First, language explains the gains in the inventory of knowledge in respect to the animal level (p. 95), and second, language is also a response to the humans urge to make sense, not only by the ever alertness of our eyes and ears, but to understand experiences.

In this second issue, this reading of Polanyi understands language as the tool created by humans to support the efforts of intellectual control - the search for clarity and comprehension (p. 100).

Then, language, as tool, overcomes human memory limitations by (a) creating a set of manageable symbols that scale up or scale down the notation of objects of experiences to the dimensions of our comprehension, and (b) by organizing the combination of those symbols - which are in the range of 2000 to 3000 English words at speech level and 30000 at library level – to provide for precise or rich description of the experiences (Polanyi, 1958, pp. 78 – 80, 84).

The precision and richness of what can be explicated by using a language is described by Polanyi (1958) through what he called the laws of language representation and operation.

These laws state that language vocabulary must be poor enough to allow symbols to be remembered (Law of Poverty), and be repeatedly used to catch a recallable definite meaning (Law of Iteration), in a consistent way according to the theory of generalization following unspecifiable self-accreditation judgments (Law of Consistency).

This small enough recallable vocabulary counts with a fixed set of rules for the combination of symbols to provide for the great variety of meanings of life experiences (Law of Grammar).

Vocabulary and its combinations offer gradients of symbolic notation that allows for managing the scaling down or scaling up objects denotation, and allow for the discovery

of novel aspects of the life experience in which the object participates (Law of Manageability).

The first three laws correspond to the principle of language representation and the two aspects of the Law of Manageability constitute the principle of language operation, which assists the process of thought (p. 78 – 82).

In summary:

Principle of language representation:

Poverty: poor enough vocabulary allows remembering.

Consistency: consistent usage of symbols allows identifiably repetition.

Iteration: repeatedly usage of symbols catches a recallable definite meaning.

Grammar: fixed set of rules for combining symbols increases possibilities of meanings.

Principle of language operation:

Manageability: capability of the symbol system for scaling down or up the denotation of the experienced object, by offering a set of symbols that fits the dimensions of our comprehension, which eases the understandings of the experience, and allows for the discovery of novel aspects of it.

The possibility of subsuming an object, while denoting it, leads to a more general idea: the subsidiary modular and recursive construction of other tools; an understanding that is consistent with our cognitive human cravings.

An everyday example of this modularity happens at operational level when we read; in that process, while we pay attention to a sentence, we pay subsidiary attention to words in

the sentence and their structuring; and, while when we pay attention to a paragraph, we pay subsidiary attention to the sentences and their structuring (Polanyi, 1958, pp. 91 – 92).

Polanyi's approach to modular tools, even though is not labeled in such way, is similar to what Karmiloff-Smith (1996) proposed in *Beyond Modularity: A Developmental Perspective on Cognitive Science.*

Speaking holds a similar operational experience, which goes (a) from assigning a primary denotation to an object, (b) to reconsider the symbol assigned – reorganization, either by a novel reconsideration of the object or the decision to use of another set of symbols – e.g. equations instead of text; and finally (c) to the utterance of the result (p. 82).

These three stages of language usage can be described in relation to, and as an expansion of the three primitive types of heuristic abilities associated to inarticulate learning as is revealed in the following Polanyi's phrase:

> "To speak is to *contrive* signs, to *observe* their fitness, and to *interpret* their alternative relationships; though the animal possesses each of these three faculties, he cannot combine them" (p. 82).

The highest manifestations outcomes of intellectual articulate performance like (a) patents from contriving-based science like engineering and technology; (b) frameworks and diagnosis from induction-based sciences like natural and social sciences; and (c) intellectual objects from deduction-based and exact base sciences like mathematics, logic and mathematical physics; respectively (Polanyi, 1958, pp. 76 - 77, 328) are powered by a suitable symbolization.

This symbolization is effective because it is assisted by our heuristics abilities that support the uttering or writing of the results (Polanyi, 1958, p. 83); however, the reliance on these heuristic abilities does not apply in the same degree to all knowledge domains (p. 86).

In exact sciences, a mathematical symbol follows explicit operational known rules (Polanyi, 1958, p. 85), and a system of pure mathematics tell us something important, without mostly referring to anything outside itself; following predominantly the Law of Manageability (p. 86).

A manageable set of symbols embodied with a specified fixed set of complex rules may scale down or scale up objects of hard science notations to the dimensions of our comprehension (p. 81), which makes this type of body of knowledge more reversible (p. 86). However, this articulation is achieved with a sacrifice in content given the detachment from experiences of the symbolic framework applied (p. 86).

As a note, I emphasized that these hard science symbols are *habitually used in written form*, that is, we do observe most of the time when people is giving a speech that (a) they point to an equation without reading it aloud; or (b) they write silently and then they pronounce a contextually understandable utterance in reference to the written mathematical expression.

I argue that the emphasis given here on the written role of hard science symbols could be achieved through extreme inference of Polanyi's (1958) pages 82 to 87 as a whole.

Descriptive sciences provide a more comprehensive account of experiences using less precise language – e.g. the use of words in metaphors (p. 102). Here, the indeterminacy of discourse calls for the self-accrediting judgment ability in which "our personal

participation governs the richness of concrete experiences to which our speech can refer" (Polanyi, 1958, p. 87) referred by the Law of Consistency.

Finally, Polanyi posits that engineering sketches and drawings "picture the essentials of a situation on a reduced scale, which lends itself more easily to imaginative manipulation than the ungainly original" (1958, p.85).

These free forms and geometrical figures – ranging from (a) informal sketches that assist the imagination of the inventor (p. 85), to (b) very formal engineering drawings that guides the building of infrastructure to the operation of organizations – follow principally the Law of Manageability, and also Laws of Consistency and Iteration, otherwise the creator will not be able to read back his articulation.

Then, men have created three different forms of symbolic representation – hard science symbols, words and drawings – to make reference, with different levels of preciseness and richness, to the objects of experiences.

Also, symbols may be less systematic as in "[c]hurches and pyramids are symbols but they are not language because they cannot be easily reproduced or handled" (p.81); or more systematic, as is the case of language in its different forms.

Then, Polanyi (1958) achieved to describe – through the principles that guide symbolization – the characteristics of tools as symbol-based systems, which holds implications that are summarized as follows (see Table 15):

1. Tools take physical or intellectual form.
2. Symbolic characterization of tools is a response oriented to satisfy our intellectual needs to understand experiences, given our human limitations.
3. The level of symbolic systematization of tools, following representation and operational rules, defines the precision, richness, routine and novel aspects of its workings, and holds the:

   3.1 Symbol representation tension between:

   - *Precise, detach, and more reversible representation*, attained through:

     Specialized set of symbols (Poverty law)
     Stricter symbol combination rules (Grammar law)
     Repeated consistent usage of symbols (Consistency and Iteration laws)

   - *Rich, connected, and less reversible representation,* attained through:

     Generic set of symbols (Poverty law)
     Looser symbol combination rules (Grammar law)
     Sporadic and less consistent usage of symbols (Consistency and Iteration laws)

   3.2 Symbol operation tension between:

   - *Novel operations* attained through:

     Set of symbols and combination rules that allow for rich scalable denotation of the experience to allow for novel aspects of our comprehension (Manageability law)

   - *Routine operations,* attained through:

     Set of symbols and combination rules that allow for limited scalable denotation of the experience, which leads to the same routine comprehension (Manageability law)

   3.3 The level of symbolic systematization of tools, following representation and operational rules, defines the potential of tools to instrumentalized, modularly and recursively, more tools to satisfy cognitive human cravings.

4.4.15 Knowledge as the Instrumentalization of Objects

Now, we are ready to argue in favor of bringing some clarity in two Polanyi's (1958) conceptions that previous literature has missed. First, we will make clearer the difference between Polanyi's knowing and knowledge; second, we will establish the role of tools in knowledge and knowing.

At this point, our open coding approach reveals a pattern in the properties of the three different forms of knowing already reviewed (inarticulate knowing, articulate knowing, and tacit knowing) which corresponds to the instrumentalization and assimilation of objects as tools for satisfaction of certain personal appetite or purpose.

Such emerging theme is clearly supported by:

> "Subsidiary or *instrumental* knowing, as I have *labeled* it, is not known in itself but is known in terms of something focally known, to the quality of which it contributes; and to this extent it is unspecifiable. Analysis may bring subsidiary knowledge into focus and formulate it as a maxim or as a feature in a physiognomy, but such specification is in general not exhaustive. Although the expert … can indicate their clues and formulate their maxims, they know many more things than they can tell, knowing them only in practice, *as instrumental particulars, and not explicitly, as objects*. … This applies equally to connoisseurship as the art of knowing and to skills as the art of doing, wherefore both can be taught only by aid of practical example and never solely by precept." (Polanyi, 1958, p. 88, italics added).

Then, here it is posited that if knowing is about intellectual efforts in which certain human abilities participate instrumentalizing objects, them the instances of such enacted objects as tools constitute knowledge.

Polanyi's Personal Knowledge Framework – Articulate and Tacit Knowing & Tools Section

Drives, Abilities, Constructs and Processes

…2. Articulate Knowing	**Articulate behavior drive** **Intellectual Appetite → Intellectual Passion** In search of intellectual control of experiences following private self-set standards of usefulness or beauty at ability-based level, and public self-set standards of duty at symbol-based level, following a logic that perpetuates the intellectual passion drive.		**Intellectual sensemaking logic**: 1. There is knowledge in which our intellectual need declares its satisfaction. 2. We hold the competence to recognize that knowledge as true. 3. By accepting the discovery, our intellectual appetite is satisfied. 4. Since the discovered knowledge stays, it may trigger recursively more intellectual needs.		Creating & Applying
	Articulate heuristic ability	Discovering/Inventing	Observing	Interpreting	
	3. Tacit Knowing	**Tacit knowing process:** (1) Invoking subsidiarily a set of heuristic abilities to use tools (with or without symbolic representation) as part of our existence; (2) tools in which, we recognize or contrive certain order, anticipate generalizations, commit and rely; (3) for which the invoked abilities must meet truth-committed private or public self-adhered standards of performance in terms of the non-symbolic or symbolic nature of the tools in use, respectively; while we pay focused attention to the purpose of the supported act.	**Tacit knowing heuristic abilities:** 1. **Order and pattern recognition and contriving:** ability of recognizing and contriving patterns from experiences; and submitting such assessment of order with universal intent and instrumentation purposes, while embedding an unspecified transcending message. 2. **Anticipating generalizations**: ability of recognizing new instances of certain known objects by identifying acceptable variances of the substantial character under different experiences (universal theory). 3. **Intellectual commitment**: ability of acting with universal intent based on self-standards of usefulness, or intellectual beauty at ability-based knowing level; or self-imposed obligations at symbol-based knowing level; with the conviction that the assumptions in which we rely about the instrumentalized objects of experience are true, while holding the tension between the wiliness of acting judiciously and the confidence of executing a novelty.		
	4. Tools	**Drive:** Tools as a response to the need to understand experiences, given our human limitations. **Tools´ usage logic:** Commitment to its utility & progressive unconsciousness of the actions by which we achieve our purposes.	**Tools' contrivance logic** 1. Order recognition and contriving abilities recognized a degree of order in a set of objects while experiencing them, as a whole, without focally attending the assessed order of the particulars, but subsidiarily. 2. Anticipating generalization ability assesses such degree of order and contrives it as a pattern of past experiences to typify the set of objects of future experiences. 3. Intertwined ability of anticipating patterns to experiences sets the drafts for instrumentalization of intellectual or physical objects; this asks for the commitment to it, which is guided mainly by the belief on self set standards of usefulness or intellectual beauty at the ability knowing level or self set standards of duty at symbol-based knowing level.		Applying, Creating & Sharing
		Symbol Principles — **Principle of representation**	**Poverty**: poor enough vocabulary allows remembering. **Consistency**: consistent usage of symbols allows identifiably repetition. ***Iteration***: repeatedly usage of symbols catches a recallable meaning. **Grammar**: fixed set of symbols combination rules provides variety of meanings.		
		Principle of operation	**Manageability**: scaling symbols to fit dimension of our comprehension and allowing for discovery of novel aspects of the denote object.		
		Language-based systems	Informal sketch, tech drawings	Spoken and written words	Hard science notation (mathematics, logic, chemistry)
		Tool's symbolic content tension between:	*Representation: Rich, connected, and less reversible ↔ Precise, detach, and more reversible* *Operation: Novel operations (rich scalability) ↔ Routine operations (limited scalability)*		
		Drives with private → standards — *Action-oriented → knowing*	*Less shared* — *→ Less* — *Symbol-based, Systematic and Shared* — *More ←* — *More shared* — Communication-← oriented knowing — Drives ← with public standards		

Table 15. Polanyi's (1958, 1966) Personal Knowledge Framework: Articulate and Tacit Knowing, and Tools Sections.

4.4.16 Human Limits, Drives, Standards, Tools and Sharing

This reading of Polanyi (1958) reveals that the need and possibilities for sharing knowledge follows some chained conditions.

Human memory limitations (p. 78) and perceptual senses limitations (p. 96) are examples of the human conditions that shape the way in which personal drives – appetites, and perceptual, surroundings and intellectual sensemaking (p. 90) – are satisfied.

The self-set standards (criteria) of evaluation of the knowing skills to satisfy these personal drives are aligned with such human limitations (p.80).

At the ability-based level of knowing, the assimilated physical or intellectual tools participating in our knowing acts or thoughts are evaluated in terms of private criteria of usefulness (pp. 59, 60, 63, 135), or intellectual beauty (p. 321).

At the symbol-based level of knowing, the tools participating in our knowing are evaluated in terms of public self-imposed standards of duty (pp. 174, 315).

The private or public nature of such knowing standards becomes relevant in the understanding of knowledge sharing, because it shapes the symbolization requirements for the participating tools

If the knowing self-set standard is *private*, then most probably the individual holds no need for sharing; and if the knowing self-set standard is *public*, then most probably sharing is required.

In any case, the adequacy of the systematic symbolic content of the tool in use while knowing defines the possibilities and characteristics of our talking about of what is known, therefore the potential for sharing knowledge.

Then, (1) what triggers knowledge sharing is the need to overcome our human limitations in search of satisfying our appetites, while meeting self-set standards (private or public) of knowing performance; and (2) what shapes knowledge sharing possibilities is the adequacy of symbolic system hold and in use while knowing.

The following section will offer the details of how the above reading of Polanyi (1958) emerged.

4.4.17 Ability-based Knowing

Polanyi's approach to explain the articulation of knowledge postulates the persistent participation of the tacit process of knowing in the articulation of the known (p. 87).

The famous case argued by Polanyi, in which the tacit knowing predominates, is related to skillful doing. There, he starts arguing that we may say that we know how to ride a bicycle, and indeed ride it with mastery; however, our descriptive saying about how to ride is defective; because we know it only in an instrumental way, while practicing (p. 88). "When I am riding a bicycle …, I do not know [focally] the particulars of my knowledge and therefore cannot tell what they are" (p. 90).

Experts could describe some principles or maxims about this physical skill and state for example that. "analysis shows that for a given angle of unbalance the curvature of each winding is inversely proportional to the square of the speed at which the cyclist is

proceeding" (p. 50). However, we can recognize that such kind of "[r]ules of art [of skillful doing] can be useful, but they do not determine the practice" (p. 50).

Then, "[t]o assert that I have knowledge which is ineffable [subsidiary] is not to deny that I can speak of it, but only that I can speak of it adequately, the assertion itself being an appraisal of this inadequacy" (p. 50).

Complementary, following an example about the art of skillful knowing, related to the anatomic knowledge of the human body, Polanyi sets emphasis on the topographic understandings – intellectual skill – of the known particulars – organs – in relation to the whole – region of the body (p. 89 - 90).

This is a case in which the medical student may say with precision the location of the organs in the body, but it is the practice of the experienced surgeon that provides the understandings of the implications of the three dimensional arrangements (relationships of the particulars to the whole) which still remain incompletely narrated (p. 89 - 90); "particulars of which are fully accessible. The difficulty lies here entirely in the subsequent integration of the particulars…[a] process … left without formal guidance". (P. 90).

"This ineffable domain of skillful knowing … possess[es] the capacity for reorganizing their inarticulate knowledge and using it as an interpretative framework" (P. 90), that is, by following the heuristically irreversible ingenuity route (p. 74).

Then, we hold limitations, in case of physical skill, in speaking about the useful particulars of the act of assimilating the tool; and in case of intellectual skills, in speaking about the interpretative framework that explains the relationships of the particulars with the whole act. In ultimate instance, such knowing holds meanings for which *we do not always*

count with an adequate symbolic representation system (Polanyi, 1958, p. 90), for either describing the assimilation of tools, or the operation of interpretative frameworks..

While, tacit knowing invokes a set of fundamental and generic abilities – order recognition or contriving, pattern generalization, and the committed instrumentalization of patterns; ability-based knowing, following and supported in the tacit knowing logic calls for specific abilities that are linked to the particular act (pp. 49-63).

Then, Polanyi's ability-based knowing is a process exercised without any assisted formalism; by means of tools that are subsidiarily assimilated and that do not need to hold systematic symbolization; in which its performance is evaluated in terms of private self-set standards of usefulness for physical acts and intellectual beauty for intellectual acts.

Briefly, the principles that illustrate skillful knowing and doing are summarized as follow:

(1) Involves muscular or intellectual acts

(2) Exercised without any assisted formalism

(3) Skill premises about assimilation of tools for physical skills, or the operation of interpretative frameworks for intellectual skills are known subsidiarily.

(4) Skillful knowing is evaluated by private standards of usefulness for physical skills or intellectual beauty for intellectual skills.

(5) Skill maxims could be known by analyzing application and success.

(6) Talking about a skillful execution depends of the need of overcoming human limitations and the adequacy of the symbolic system known and in use.

(7) Skills maxims may guide learning and improvement as long they are re-integrated subsidiarily.

4.4.18 Symbol-based Knowing

The issue of counting with and effective set of language symbols has not been completely covered yet. Let's start quoting three paragraphs from Chapter 5 of Polanyi (1958), when he was referring to "thought and speech" and "text and meaning":

> "No such limitation is imposed on the articulation of a spatial topography, the particulars of which are fully accessible. The difficulty lies here entirely in the subsequent integration of the particulars, and *the inadequacy of articulation consists altogether in the fact that the latter process is left without formal guidance*." (p. 90, italics added).
>
> "*To assert that I have knowledge which is ineffable is not to deny that I can speak of it, but only that I can speak of it adequately*, the assertion itself being an appraisal of this inadequacy. Reflections of the kind that I made a moment ago ... Such reflections must of course appeal ultimately to the very sense of inadequacy which they intend to justify. *They do not try to eliminate, but only to evoke more vividly our sense of inadequate representation*, by persevering in the direction of greater precision and reflecting on the ultimate failure of this attempt." (p. 91, italics added).
>
> "The domain of sophistication [sophisticated usage of language], on which we now enter, is formed by not fully understood symbolic operations which can be:
>
> (a) a fumbling, to be corrected later by our tacit understanding
>
> (b) *a pioneering, to be followed up later by our tacit understanding.*
>
> More precisely speaking, we should say that we are referring in both these cases to a state of mental uneasiness due to the feeling that *our tacit thoughts do not agree with our symbolic operations*, so that we have to decide on which of the two we should rely and which we should correct in the light of the other." (p. 93, italics added)

The main interpretation raised here could be posited in a straight way: when the representation or operation of the set of language symbols in use is not adequate for a particular striving of intellectual control, our knowing may stay tacit. This insinuates the possibility of achieving to express such ineffable knowledge if: (a) such a symbol-based system is available, and (b) the knower knows about it, and commits to it.

The difficulty of such insinuation is that Polanyi (1958) argues for a tension in denotation systems between precision and richness, in which the content of what is experienced is sacrificed. If we are to be precise, Polanyi was making reference in this subject to how detached from the experience are the mathematical symbols (p. 86).

The issue here is not the possibility of articulating the known by additional means of technical or scientific methods and sophisticated language, but if the knowledge holder counts himself with the appropriate tool - set of symbols and related meanings - to express his understanding effectively, with the richness and precision demanded.

Finally, as we mentioned before, symbols operation hold the tension between routine operations and novel operations define by the level scalability of the symbols in use; now we enrich this idea with the alternative that holds the sophisticated usage of language as "a pioneering, to be followed up later by our tacit understanding" (Polanyi, 1958, p. 93).

In summary:

> *Communicating about the experiencing of objects use subsidiarily a symbol system that hold, to denote the experience, different levels of preciseness, richness, routine and novelty, to make explicit our knowing about it. When representation or operation of the set of symbols hold and in use is not adequate for a particular striving of intellectual control, our knowing may stay tacit and may trigger the knowing, with symbolic representation or not, of novel aspects of the experienced object.*

4.4.19 Language-oriented Meanings framed by Culture

The subsidiary usage of language is the center of Polanyi's approach for explaining meaning.

First, he starts arguing that our conceptions of objects and the reference to them through language terms is "achieved subsidiarily, while our attention is focused on making sense of a situation in front of us" (p. 112). The chosen term embodies a commitment to "the premises of the traditional interpretation of the universe" of the culture of the group to which we belong (p. 112).

In this sense the "*choice of language is a matter of truth or error, of right or wrong, of life or death*" (p. 113, emphasis added).

Then, following a conceptual view of meaning, in which the meaning of a term corresponds to the concepts of the properties associated with it (Quine, 1960); Polanyi (1958) goes on arguing that expanding our abilities of pattern recognition and anticipation is our ability of conceiving objective classifications.

This ability, Polanyi (1958) described, starts by (a) recognizing specifiable properties of objects and by denoting those objects to form a vocabulary. The next stage (b) involves organizing these denoted objects into denotable classes following intentional known but un-specifiable common properties. Noting that, the higher the intention, the more clearly will be the identification of the nature of the classifying properties (Polanyi, 1958, pp. 115, 80). Efforts of clarification of class terms hold a long tradition in history, with documented beginnings in the Socratic inquiries about the meaning of terms like virtue, justice, and courage (p. 115).

One outcome of these efforts is the articulation of a definition of the classified object, which should be understand as an incomplete formalization of its properties. This definition operates as kind of maxims that guide our understanding while dealing - practicing – with the essence of the subject matter (Polanyi, 1958, p. 116).

Finally, (c) there is the territory of the intentional designation of the yet to be known, it is the extreme application of our anticipatory abilities; believing it as real (Polanyi, 1958, p. 116). Here, "our tacit thoughts do not agree with our symbolic operations" (p. 93), it is either the territory of discovery/invention or the correction of a fumbling (p. 95). If successful, it will offer unexpected new ways of clarification and classification – pattern detection (p. 117).

Polanyi (1958) suggest confronting the conflicting situation, in which the same term can apply to different particulars, by: (a) admitting that terms has open texture, that is, the speaker's sense of fitness of the term is the one who judges that "his words express the reality he seeks to express" (p. 113); but (b) arguing that "disagreements on the nature of things cannot be expressed as disagreements about the existing use of words" (p.114), that is, for example, that we should not present grammar rule based arguments to solve misconceptions about the nature of the object (p. 114).

We could say that Polanyi (1958) described five principles that relate culture, meanings, and language; these, summarily, could be expressed as (see Table 16):

(1) Conception of meanings is a process that commits focally to a culturally constructed interpretative framework.

(2) Selecting language symbols, which denote our conception of the experienced object, is a subsidiary process in regards of the focally attended situation. Here, pattern recognition and contriving, and anticipatory abilities achieve to:

(2a) Organize classes of meanings by their known, but not specifiable common properties, and

(2b) Describe incompletely these meanings through definitions that expressed as maxims that guide understanding in action.

(3) In the case of conflicting denotations, speaker's sense of fitness to reality in terms of the notion of the object and not the symbol resolves the issue.

(4) In the case of disagreements between tacit thoughts and symbolic operations, the alternatives are to consider it, either an invention, or a correction of a fumbling; which if successful it will show novelties.

(5) When representation or operation of symbols in use is not effective for a particular experience, our knowing may stay tacit, and may trigger the knowing, explicit or not, of novel aspects of the experienced object.

Polanyi's Personal Knowledge Framework – Ability and Symbol-based Knowing Section

Language & Meaning Constructs and Knowing Processes

5. Ability-based Knowing	**Skillful Doing and Knowing Principles**	1. Involves physical or intellectual acts. 2. Exercised without any assisted formalism. 3. Skill premises about assimilation of tools for physical skills, or the operation of interpretative frameworks for intellectual skills are known subsidiarily. 4. Skillful knowing is evaluated by private standards of usefulness for physical skills or intellectual beauty for intellectual skills. 5. Skill maxims could be known by analyzing application and success. 6. Talking about a skillful execution depends of the need of overcoming human limitations and the adequacy of the symbolic system known and in use. 7. Skills maxims may guide learning and improvement as long they are re-integrated subsidiarily.			
6. Symbol-based Knowing	**Symbol-based knowing process** A focal process that uses subsidiarily symbol-based systems that condition the expliciting of the known.	1. Communicating about experiencing objects use subsidiarily a symbol system that hold, to denote the experience, different levels of preciseness, richness, and scalability, to make explicit our knowing about it. 2. When representation or operation of the set of symbols hold and in use is not adequate for a particular striving of intellectual control, our knowing may stay tacit and may trigger the knowing, with symbolic representation or not, of novel aspects of the experienced object.			
	Type of symbol-based system	Informal sketch Tech drawings	Spoken and written words	Hard science notation (mathematics, logic, chemistry)	
	Domains of the tacit	Particulars of the act of assimilating the tool	Relationships between particulars with the whole intellectual act	Anything not specifically written	
	Precision level	Lower: sketch, Higher: tech drawings	Lower	Higher	
	Richness level	Low: tech drawings, High: artwork	Higher	Lower	
	Scalability level	Higher	Intermediate	Lower	
	Personal attachment level	Higher: sketch, Lower: tech drawings	Intermediate	Lower	
	Knowing type and Knowing domains	Contriving-based sciences like engineering, technology	Induction-based and description sciences like social and natural sciences	Deduction-based and exact base sciences like logic, mathematics & math. physics	
	Main knowing outcomes	Patents, machines	Frameworks, diagnosis	Intellectually created objects	
	Principles of language-oriented meanings framed by culture Language and meanings co-operate in a cultural interpretative framework following tool's contrivance and usage logic, and symbols representation and operation principles.	1. Conception of meanings is a process that commits focally to a culturally constructed interpretative framework. 2. Selecting language symbols that denote our conception of the experienced object is a subsidiary process of the focally attended situation; in which pattern recognition and contriving, and anticipatory abilities achieve to: 2a. Organize classes of meanings by their known but not specifiable common properties. 2b. Describe incompletely these meanings through definitions that are expressed as maxims that guide understanding in action. 3. In case of conflicting denotations, it's solved by the speaker's sense of fitness to reality in terms of the object and not the symbol. 4. In case of disagreements between tacit thoughts and symbolic operations, this is consider either an invention or a correction of a fumbling; which if successful it will show novelties. 5. When representation or operation of symbols in use is not effective for a particular experience, our knowing may stay tacit, and may trigger the knowing, explicit or not, of novel aspects of the experienced object.			
					Creating and Applying

Table 16. Polanyi's (1958, 1966) Personal Knowledge Framework: Ability and Symbol-based Knowing Sections.

4.4.20 Intellectual Passion: Discovering Knowledge, Vision and Persuasiveness

Previously we reviewed in Polanyi (1958) the case of intellectual appetite as a drive that seeks intellectual sensemaking, following private self-adhere standards of usefulness for physical acts or intellectual beauty for intellectual acts. Now it is time to view drives in terms of interests – passion – instead of appetite (p. 174).

Polanyi (1958) described intellectual passion in the context of scientific knowing; however, Polanyi's premises explain a broader issue: the intellectual acts of educated people (p. 321).

In few Polanyi's (1958) passionate words, intellectual passion drives the selective function that discriminates between what is and what is not defined (p.142), by charging objects with attractiveness or repulsiveness (p. 134), and by accompanying it with assertions of fact that hold some personal persuasive feeling, otherwise they are words saying nothing. (p. 254).

Polanyi (1958) presents plausible arguments in support of the three previous phrases. Synthesis of his arguments emerged as the following propositions:

1. Discovery changes the way we see the world, it changes us, by changing our thinking, by crossing the problem-discovery heuristic gap (p. 143).
2. It is logically impossible to fill the heuristic problem-discovery gap by executing diligently any previously known and specifiable procedure; we achieved it "by relying on the unspecifiable impulse of our heuristic passion, and must undergo as we do so a change of our intellectual personality" (p. 143, italics added).

3. Vision that accompanies discovered knowledge "is foreknowledge of things yet unknown and at present perhaps inconceivable" and an indispensable guide for "the interpretation of all future experience" (p. 135).
4. New vision of reality separates us from others who still see in the old way. Heuristic persuasive passion is the personal ability we use to convert them to ours way of seeing (p. 150).
5. Discovery, to persuade, must suggest a plausible view that resolves the tension among (5a) its conceptions, backing facts (certainty, p. 138), contradicting evidence, and guide to reject baseless evidence (systematic relevance, p. 138); and (5b) the vision (intrinsic interest, p. 138) that guides "the kind of questions that should be reasonable and interesting to explore (p. 135). This tension is resolved in favor of the last priority (p.139) when theoretical interest (certainty and systematic relevance) are less attractive than practical interest (intrinsic interest) (p. 138).
6. Persuasive passion leads to controversy (p. 159).

Then, three ideas are important to recap at this point:

(a) Intellectual appetite (making intellectual sense of experience) is the drive that triggers ability-based knowing to direct the creation of knowledge, which submits its creation to private self set standards of usefulness for muscular/physical acts, or private intellectual beauty for intellectual acts that connoisseurs, inventors, scientists, and good citizens hold, or

(b) Intellectual passion (discriminating between what is and what is not defined) is the drive that triggers symbol-based knowing to direct the creation of knowledge, which

submits its creation to the private (intellectual beauty) and public (practical and theoretical interests) standards that educated people hold; and at the scientific level, the adhered public standard, is given by the methods and procedures that academics formally set.

(c) A creation, when conceived, changes oneself by framing a new way of seeing reality, and it drives to the conversion of others to this understanding by sharing a vision that is not only argue by its certainty or systematic relevance, but by its plausibility.

A combination of innate abilities (powers) and developed abilities interact in the intellectual passion's call. Innate abilities are not described at all in this stage of articulate knowing by Polanyi (1958); however, he did mentioned them while explaining denotations and the principles of representation and operation of language (p.80-82), which was review in the previous section.

We are referring here to a mostly subsidiary act; it is about the usage of symbol-based systems laws to describe incompletely our understanding (p. 70), labeled here as *symbolic denotation*. This human innate ability is stated explicitly to recognize formally the key role that play language-based systems, and more generally symbol-based systems in Polanyi's personal knowledge.

Articulation for Polanyi is an explicit act in which its performance is evaluated in terms of the expressed ideas, but is tacit in terms that the invocation of the system of symbols and its language laws happed subsidiarily (p.59). Now I dare to summarize the participating abilities as follows:

1. *Heuristic passion* works tacitly while crossing the problem-solution gap, it is about jumping from conception, backing facts, contradicting evidence and baseless evidence, to discovery; it is about changing our thinking, thus changing us (p. 143).
2. *Persuasive passion*, which is about the tacit building of the vision of the discovery, which advocates for its intrinsic interest and foreseeing of possibilities of the discovery, to persuade others about the proposed way of seeing (pp. 138-139, 145).
3. The final it's a ability labeled here as *plausible expliciting*, which is reveal in the way we use symbol-based tools to persuade others about the discovery. It is not only about the abilities of speaking or writing properly, like the mentioned at the beginning; it is about the plausible linguistic structuring of the new conception, its supporting facts, and convincing arguments oriented to convert others, including controversy managing, to the new framing of reality (p. 159).

Interestingly the sequence of these four abilities starts with a tacit knowing act and ends with an explicit manifestation (tacit/explicit (symbolic denotation), tacit (heuristic passion), tacit (persuasion passion), tacit/explicit (plausible denotation).

4.4.21 Authority and Trust: a Way of Sharing Meanings and Knowing Convivially

Previously, when discussing the possibilities of externalizing knowledge, it emerged that (1) knowledge sharing is triggered by the need to overcome human limitations in search of satisfying appetites, while meeting self-set standards (private or public) of knowing performance, (2) knowledge sharing possibilities are shaped by the adequacy of symbolic system hold and in use while knowing, and (3) knowledge externalization may

exclude premises about assimilation of tools for physical skills, and the operation of interpretative frameworks for intellectual skills, since they are known subsidiarily.

Extending those drivers and limitations, the desire for companionship is argue as the main reason for which humans talk to each other; even though company is in some cases silently enjoyed, and conversation is the most common mean of sharing experiences (Polanyi, 1958, p. 210).

Polanyi (1958) argues that learning a language ask for the imitation of other persons practicing the use of the language, and the effectiveness of this imitation pass thru the confidence that the learner places in his masters – the adult, the teacher, the speaker (p. 206).

Authority of the master and the trust of the learner support the learning of shared tools, like language, and their use for carrying messages among them. (p. 207).

In learning by example, in which one submits to the authority of the skillful master or the recognized connoisseur, it is trust – by believing in the knowledge of the connoisseur or master's ways of doing things, even when effectiveness cannot be verified (Polanyi, 1958, p. 208) – what drives the efforts of the apprentice to unconsciously learns how to use tools (p. 53-54).

Such is also the case of the infant that indwells in the practice of talking in order to learn the hidden meaning of speech from the adult behavior (1966, p. 61).

The messages transmitted include the historically accumulated intellectual artifacts and articulate traditions that are passed from one generation to another (Polanyi, 1958, p. 207). The assimilation of these artifacts and traditions is achieved by becoming an

apprentice of the community that nurtures these traditions; it starts with an act of affiliation to their values and a commitment to act according to their standards (p. 207 - 208) by indwelling in the practice (1966, p. 61).

Throughout life, the learner places confidence and accepts authority of the intellectual leaders of his community; however, this confidence is tacitly supported in a heuristic conjecture (Polanyi, 1958, p. 208).

When the learner becomes skillful and his practice shows results, then his knowing justifies the deposited confidence in his masters, releasing the tension of the conjecture. However, the proportion of the body of knowledge that we can personally justify is small, so we still go on trusting in the knowing authority of others for a huge domains of knowledge (p. 208 - 209).

In a long-term view, the accepting of a knowing authority and his doing and saying increases the consensus about his authority. In the opposite way, our dissent with a master by rejecting the imitation of his doings and sayings affects his authority in two contrasting but enlighten ways. First, the dissenter, if it wishes to impact, "must speak in terms that people can understand" (p. 209 – 210) and second, the dissenter is in the route of becoming a new teacher or master, a future holder of authority.

Characterizing many of these communication acts – asserting, accepting, dissenting, and explaining – is the nurturing of good fellowship (Polanyi, 1958, p. 210). Fellowship among family members, school, work and congregation members besides contributing to "the fulfillment of man's purpose and duty as a social being" (p. 211), it holds a practical purpose;

it makes more effective the combined activities of the group, and in this way confirms our ascription and search to companionship (p. 211).

Then, conviviality nurtures not only the communication and sharing of experiences, but also the participation in joint activities. At this level, cooperation follows the purposes that keep the group together.

However, conviviality may also be understood by its own right in the form of rituals – anniversaries, celebrations, events linked to the rhythm of the season – in which the members of a group emotionally "affirm the community of their existence, and at the same time identify the life of their group with that of antecedent groups, from whom the ritual has descended to them" (p. 211).

Therefore, convivial existence of a group transcends individuals and establishes continuity of the history of the group (p. 211), and by that, the continuity of the time instances when sharing of the knowledge of the community happens.

Summing up, based on the previous review, it is attainable to frame Polanyi's (1958) approach to share meanings by following the classical views of meaning: (1) the cultural view (the meaning of a term is given by the beliefs and desirables of the belonging culture, Bruner, (1990)); (2) the conceptual view (meaning of a term corresponds to the concepts of the properties associated with it, Quine (1960)); and (3) the referential view (the meaning of a term corresponds to the object of the world it refers to, Mill (1843)).

Then, Polanyi's shared meanings framework could be characterized as language-oriented meanings framed by culture, in which the:

(1) Cultural approach to meaning follows conviviality, authority, and trust to shape the general interpretative framework.

(2) Conceptual approach to meaning follows ordering, generalizing, and committing human's heuristic abilities to frame the particular experience.

(3) Referential approach to meaning follows poverty, consistency, iteration, grammar, and manageability symbols laws to denote objects by attending to their notions; while ineffective representation or operation may stay tacit, open to novel interpretations, with or without symbolic representations.

In addition, the sharing of knowledge in a community for Polanyi (1958) is explained by mainly the six following propositions, in which three constructs - *conviviality, authority, and trust* – play key roles:

(1) *Authority* of the master and the *trust* of the learner support the learning of language, skills, and its use to carrying messages among them and using shared tools.

(2) Assimilation of historically accumulated intellectual artifacts and traditions is achieved by becoming an apprentice of the community that *nurtures* these traditions; it starts with an act of *affiliation* to their values and a commitment to act according to their standards by indwelling in the practice.

(3) As the learner becomes skillful and shows results, then his *justified knowledge* validates the confidence in his masters, releasing the tension of the tacitly supported *trusting* heuristic *conjecture*.

(4) Given the *limited personally justified knowledge*, we still *continue trusting in the authority* of others for huge domains of knowledge.

(5) *Rejecting imitation of masters*' doings and sayings, affects his authority, and leads the dissenter in the route of becoming a new teacher, *gaining authority*.

(6) *Convivial existence* of a group transcends individuals and time, establishing continuity of the history of the group, and the *continuity* of future *knowledge sharing activitie*s; like in rituals as anniversaries, celebrations, events linked to the rhythm of the season

4.4.22 Expressing Polanyi's Personal Knowledge closer to Organizational Science Needs

Now we are ready to describe Polanyi's (1958, 1966) personal knowing in terms more close to organizational science; and say that personal knowing is about processes in which:

1. Inarticulate knowing level:

   Individuals, (1) in search of successful self-satisfaction of fundamental human appetites, perceptual sensemaking, and surroundings sensemaking, (2) by means of primitive innate sensory-motor-logical abilities, (3) inarticulately assert the truth about facts about the world; (4) while resolving perceptual and surrounding sensemaking tension between "sharpness' and "reasonableness" in favor of rationality in terms of the best of our innate abilities, and the reference of un-specifiable past cues; (5) leaving the sensor-motor and ingenuity-based logical acts as non-reversible..

2. Articulate knowing level:

   Individuals, (1) in search of intellectual control of experiences following private self-set standards of usefulness or beauty at ability-based level, and public self-set standards of duty at symbol-based level, following a logic that perpetuates

intellectual passion, that assumes (2) there is knowledge in which intellectual needs declares its satisfaction, (3) while holding the competence to recognize that knowledge as true; and that (3) by accepting the discovery, their intellectual passion is satisfied; and (4) since the discovered knowledge stays, it may trigger recursively more intellectual needs.

3. Tacit knowing:

   A process characterized by (1) a subsidiarily call of heuristic abilities to contrive ad use tools (physical or intellectual), in such a way that they operate as part of our body or existence; (2) tools in which, we recognize or contrive certain order, anticipate generalizations, commit and rely; (3) for which the invoked abilities must meet truth-committed private or public self-adhered standards of performance; while we pay focused attention to the purpose of another act.

4. Instrumentalization of objects:

   Individuals (1) in their need to understand experiences, and given our human limitations, (2) recognize or contrive order in physical or intellectual objects, generalize such order in patterns, and commit to its utility for their purposes; (3) while achieving progressive unconsciousness of the actions by which the purpose is accomplished, (4) following self-set private or public evaluation standards. (5) Such instrumentalization may be related to symbol-based content, (6) which follows representation and operation principles that (7) hold tensions (7.1) between (7.1.a) precise, detach and more reversible representation, and (7.2.b) rich, connected and less reversible representation; and (7.2) between novel and routine operations.

5. Ability-based knowing:

   Process that (1) involves physical or intellectual acts (2) exercised without any assisted formalism; (3), by means of objects subsidiarily used to support the purposes of the skill under execution, (4) in which its performance is evaluated in terms of private self-set standards of usefulness for physical acts and beauty for intellectual acts.

6. Symbol-based knowing:

   Individuals, when (1) communicating about experiencing objects use subsidiarily symbol-based systems, conceived with different levels of preciseness, richness, and scalability, to make explicit our understanding about it; (2) when representation or operation of the set of symbols in use is not adequate for a particular striving of intellectual control, our understanding may stay tacit and may trigger the knowing, with symbolic representation or not, of novel aspects of the experienced object.

7. Articulate knowledge sharing level:

   Individuals, when sharing meanings, by means of contrived symbol systems, consider their cultural baggage, in which:

   (1) authority of the master and trust of the learner support the learning of tools, like language, and their use for carrying messages among them;

   (2) assimilation of historically accumulated intellectual artifacts and traditions is achieved by becoming an apprentice in the community that nurtures these traditions; and it starts with an act of affiliation to their values and a commitment to act according to their standards by indwelling in the practice;

(3) learner's skillful performance justified his knowledge and release the tension in master's trusting conjecture,

(4) limited personally justified knowledge, keeps trusting in the authority of others for huge domains of knowledge,

(5) Rejecting imitation of masters' doings and sayings, affects his authority, and leads the dissenter in the route of becoming a new teacher, gaining authority; and

(6) convivial existence of a group transcends individuals and time, establishing continuity of the history of the group, and the continuity of future knowledge sharing activities.

8. Articulate knowledge creation level:

Individuals trigger either by its

(a) intellectual appetite (making intellectual sense of experience), recurring to ability-based knowing, create knowledge that submit it to private self-set standards of usefulness for physical acts, or private intellectual beauty for intellectual acts that connoisseurs, inventors, and good citizens hold; or

(b) intellectual passion (discriminating between what is and what is not defined), recurring to symbol-based knowing, create knowledge, that submit it to private (intellectual beauty) and public standards (of practical and theoretical interests) that educated people hold; and at the scientific level, the adhered standard, is given by the methods and procedures that academics formally set.

A creation, when conceived, changes oneself by framing a new way of seeing reality, and it drives to the conversion of others to this understanding by sharing a vision that is not only argue by its certainty or systematic relevance, but by its plausibility.

The above constructs, relationships among constructs, and propositions about Polanyi's personal knowledge view provide more specific handles to the organizational science researcher covering specifics on: (1) drives of knowing behavior, (2) personal knowing abilities, (3) participating knowing constructs, and (4) knowing principles and processes.

4.4.23 Polanyi's Modular, Scalable and Recursive Approach - In a Nut Shell

Polanyi (1958, 1966) follows a modular, scalable and recursive approach to describe the fine details of knowing at individual level keeping in mind social life and science epistemology requirements.

The key to understand the transversal coherence of Polanyi's personal knowledge self-crediting epistemological posture resides in recognizing that the theory provides the same consistent explanation for the most rudimentary intellectual behaviors of humans, like strivings for the satisfaction of appetites at organs level, to the need to make sense of our surroundings, and also for more advance cultural and intellectual behaviors; each time, in each level, increasing its scope and complexity, but recursively invoking, through specialization or integration, a set of seminal constructs that describe knowing.

Polanyi's approach to knowing, over simplify it, points out that humans, by instrumentalizing and assimilating physical and intellectual objects, seek to satisfy needs and duties related to survival and making sense of experiences; through a process in which acceptance performance criteria, understood as universal and truth confirming, are defined by self-committed private or public standards of coherence.

Such instrumentalization objects – modular, recursive and scalable – goes through the application of innate abilities, such as perceiving order, contriving patterns, and its commitment; to the more intelligent abilities that assimilate such tools subsidiarily as extensions of self; and to abilities that potentially denote the knowledge of applying such tools, in terms of the adequacy of symbolic system hold and in use, and ultimately, if the satisfaction of our knowing need makes the sharing call.

However, these transitions do not go easy, since assimilation of tools following self-set standards of coherence hold the tension between the wiliness of acting judiciously and the confidence of executing a novelty.

The framework draw in Table 17 and Table 18 shows in a tight nutshell – a two-page schema– a compact but dense externalization of an elaborated theory. This format is justified against the reading tension that provokes Polanyi's (1958) jumping around from the general to the particular, without easily recognizing what construct you are attending.

In this tabulated framework, except for articulate knowing, vertical pivots describe kinds of drives, abilities, and processes; horizontal layers describe the premises of the theory that consistently evolve from top to bottom reusing modularly previous premises but now specialized or integrated.

Such layers include primitive truth and knowing criterion, sensemaking logic, tool contrivance logic, knowing logic, ability-based and symbol-based knowing processes, principles of meaning, and principles of sharing meanings and knowledge.

Dispense me for showing such dense diagram of the framework, I believe it is useful as it provides an integrated view the knowing theory; a seeing annoyance that any PDF viewer will help to overcome in this now digitally enable world.

Polanyi's Personal Knowledge Framework in a Nutshell- 2/2

(1) Primitive inarticulate knowing

Drives	Abilities	Process
Appetite satisfaction, perceptual and surroundings sensemaking *Evaluated in terms of innate private standards of satisfaction*	Innate mix of sensory-motor-logical powers *Tension between sharpness vs. reasonableness*	Self-satisfaction of cravings as the way of assenting and knowing *Resolving in favor of rationality in terms of best of our innate abilities, and the reference of un-specifiable past cues.*

(3) Tacit knowing

Drive	Heuristic Abilities	Process
The need to make intellectual sense of experiences. *Evaluated by private or public self-adhered standards of performance, in terms of the non-symbolic or symbolic nature, respectively, of the tools in use.*	Order and pattern recognition and contriving Anticipating generalizations Intellectual commitment *Tension between wiliness of acting judiciously vs. confidence of executing a novelty*	Subsidiary call of heuristic abilities that assimilates tools and rely on them as part of oneself while paying focused attention to the purpose of another act.

(2) Articulate knowing

Ability
To recognize true knowledge that satisfies our needs – not infallibly, but our competence.

Recursive Process
By accepting discoveries, appetite is satisfied, and since knowledge stays, it may trigger more intellectual needs.

(4) Tools
Knowledge as the instrumentalized objects

Drive	Tools' Contrivance Logic	Symbols Representation & Operation
Tools as a response to the need to understand experiences, *given our human limitations*.	Goes from order recognition or contriving, through pattern generalization, to the committed instrumentalization of patterns.	Poverty, Consistency, Iteration, Grammar and Manageability Laws define how *symbols may scale up or down the notations of objects to the dimensions of our comprehension.*

Tool's symbolic content holds the tension between
Representation: Rich, connected, and less reversible ↔ Precise, detach, and more reversible
Operation: Novel operations(rich scalability)↔ Routine operations (limited scalability)

Tools Usage
Commitment to its utility and progressive unconsciousness of the actions by which we achieve our purposes.

Drives with private → standards	*Action-oriented → knowing*	*Less shared*	*→ Less*	*Symbol-based, Systematic and Shared*	*More ←*	*More shared*	Communication-← oriented knowing	Drives ← with public standards

(5) Ability-based Knowing

Skillful Doing and Knowing Principles

1. Involves physical or intellectual acts.
2. Exercised without any assisted formalism
3. Skill premises about assimilation of tools for physical skills, or the operation of interpretative frameworks for intellectual skills are known subsidiarily.
4. Skillful knowing is evaluated by private standards of usefulness for physical skills or intellectual beauty for intellectual skills.
5. Skill maxims could be known by analyzing application and success.
6. Talking about a skillful execution depends of the need of overcoming human limitations and the adequacy of the symbolic system known and in use.
7. Skills maxims may guide learning and improvement as long they are re-integrated subsidiarily.

(6) Symbol-based Knowing

Symbolic Knowing Process

(1) Communicating about experiencing objects use subsidiarily symbol-based systems, conceived with different levels of preciseness, richness, and scalability, to make explicit our understanding about it.

(2) When representation or operation of the set of symbols in use is not adequate for a particular striving of intellectual control, our understanding may stay tacit and may trigger the knowing, with symbolic representation or not, of novel aspects of the experienced object.

Principles of language-oriented meanings

Language and meanings co-operate in a cultural interpretative framework following tool's contrivance and usage logic, and symbols representation and operation principles.

Table 17. Polanyi's (1958 and 1966) Personal Knowledge Framework – (1 of 2).

(2) Articulate knowing

(7) Knowledge Sharing Logic

Authority and trust to share meanings and knowledge convivially

Sharing Meanings Framework

(1) Cultural approach: conviviality, authority, and trust shape the general interpretative framework.

(2) Conceptual approach: ordering, generalizing, and committing human's heuristic abilities frame the particular experience.

(3) Referential approach: follows poverty, consistency, iteration, grammar, & manageability symbols laws to denote objects by attending to their notions; while ineffective representation or operation may stay tacit, open to novel interpretations, with or without symbolic representations.

Knowledge Sharing Drives and Limitations

1. Triggered by the need to overcome human limits in search of satisfying appetites.

2. Shaped by the adequacy of symbolic system hold and in use while knowing.

3. May exclude premises about assimilation of tools for physical skills and operation of interpretative frameworks for intellectual skills, since they are known subsidiarily.

4. Desire for companionship: Triggers conversations, which is the most common mean of sharing experience.

Knowledge sharing propositions

(1) Authority of the master and the trust of the learner support the learning of shared tools, like language, and their use for carrying messages among them.

(2) Assimilation of historically accumulated intellectual artifacts and traditions is achieved by becoming an apprentice of the community that nurtures these traditions; it starts with an act of affiliation to their values and a commitment to act according to their standards by indwelling in the practice.

(3) As the learner becomes skillful and shows results, then his justified knowledge validates the confidence in his masters, releasing the tension of the tacitly supported trusting heuristic conjecture.

(4) Given the limited personally justified knowledge, we still continue trusting in the authority of others for huge domains of knowledge.

(5) Rejecting imitation of masters' doings and sayings, affects his authority, and leads the dissenter in the route of becoming a new teacher, gaining authority.

(6) Convivial existence of a group transcends individuals and time, establishing continuity of the history of the group, and the continuity of future knowledge sharing activities; like in rituals as anniversaries, celebrations, events linked to the rhythm of the season.

(8) Knowledge Creation

Knowledge Creation Logic

Knowledge created is submitted:

(1) at ability-based knowing, to private standards of usefulness & intellectual beauty that connoisseurs, inventors, and good citizens hold, or

(2) at symbol-based knowing, to private & public standard of intellectual beauty & practical or theoretical interest that educated people hold, and

(3) at scientific level, to the methods that academics formally set;

(3) such knowledge changes oneself by framing new ways of seeing reality, and

(5) drives to convert others by sharing a vision,

(6) that is not only argued by its certainty or systematic relevance , but by its plausibility

Knowledge Creation Drives

Intellectual appetite: Need to make intellectual sense of experience.
Intellectual passion: Selective function that discriminates between what is and what is not defined, by charging objects with attractiveness or repulsiveness.

Intellectual heuristic abilities and language oriented abilities

Articulating what is known

Symbolic denotation (labeled here) is about the usage of symbol -based systems laws to describe incompletely our understanding.

Heuristic passion works subsidiarily while crossing the problem-solution gap, and it is about jumping from conception, backing facts, contradicting evidence, and baseless evidence, to discovery; it is about changing our thinking, thus changing us.

Persuasive passion heuristic is about the subsidiary building of vision of the discovery, which advocates for its intrinsic interest and foreseeing possibilities of the discovery, to persuade others about the proposed way of seeing.

Plausible expliciting (labeled here) is about the plausible linguistic structuring of the new conception, its supporting facts, and convincing arguments, oriented to convert others, including controversy managing, to the new framing of reality.

Table 18. Polanyi's (1958 and 1966) Personal Knowledge Framework – (2 of 2).

4.5 WEICK'S SENSEMAKING AS INDIVIDUAL KNOWING

4.5.1 Weick's Sensemaking Unframed Characteristics

According to March and Olsen (1976), in organizations, assigning meanings to text, events, issues, situations, organizational hierarchies, work environments, and so on, reflects an interpretation of them by organizational actors and observers (p. 19).

This process of interpreting in organizations is best described by the sequence of assumptions of the empirical work of Porac, Thomas and Banden-Fuller (1989), where: (a) organizational activities and structures are specified in part by micro-momentary actions of their members, (b) actions that follow a sequence in which members focus on environmental cues, interpret them, and show their interpretations by means of concrete activities, (c) then, meaning is developed when cues are linked to learned or in progress cognitive structures, and (d) organizational members are able to externalized their interpretations and the process followed to arrive to those meanings.

Weick (1995) critically examined this previous interpretation sequence and identify that the above conception of interpretation left unspecified some important issues like how the particular cues were choose from the ongoing situation, how are the interpretations revealed as concrete activities (p. 8), and how do we go from discovering meanings to creating meanings (p. 9).

In order to attend to this issues, he did not question such conception of interpretation but advocates for the understanding of *sensemaking* as a concept (Weick, 1995, p. 4 - 62), which is here summarily described as an interactive process that is invoked in ill-defined

situations (Weick, 1995, p. 4; Schon, 1983), characterized by incoherent and unordered events, in which issues and surprises (Louis, 1980), current and possible, are retrospectively analyzed, progressively clarified (Weick, 1995, pp. 4, 11), and justified from an anticipated conclusion to the later revealed definitions, and explained as coherent (Weick, 1995, pp. 10-11; Garfinkel, 1967; Louis, 1980).

Then, the sensemaker selects, labels with a sharable language, places and links objects of the situation, and sets its boundaries (Weick, 1995, p. 9; Schon, 1983; Shotter, 1993), in a social ongoing conversation with others and himself, among the many he is, in regards of the appreciations that the implicated members hold about him and about the situation; with a triple intention: (a) describing self and thus defining self (Knorr-Centina, 1981); either by (a1) following a self-image maintaining options (Dutton & Dukerich, 1991), or by (a2) following a innovating transacting pattern (Ring & Van de Ven, 1989); (b) shaping or reshaping of a plausible story, revealed sometimes as frame of reference ((Starbuck & Milliken, 1988), or cognitive map (Gioia & Chitipeddi, 1991), and other times articulated as a metaphor (Shotter, 1993); and (c) enacting workable understandings that tells "as it is", but also "as it might be", voicing a leading and compelling way of seeing the situation (Thayer, 1988).

Thus, giving plausible prospection and reverse clarification, sensemaking is about reading and discovering, but also about authoring and invention, (Daft & Weick, 1984); it is about structuring the unknown (Waterman, 1990) and about defining and creating the faced environment (Pondy & Mitroff, 1979); and about the alternatives of *describing self and thus defining self*, or *defining self and thus describing self (*Knorr-Centina, 1981).

In this sensemaking interactive process Weick (1995, p. 17) discussed and worked with seven characteristics historically considered in the literature of sensemaking: (1) grounded in identity construction, (2) retrospective, (3) enactive of sensible environments, (4) social, (5) ongoing, (6) focuses on and by extracted cues, and (7) driven by plausibility rather than accuracy).

He offered then as raw material and as an observer's manual, neglecting for then a framing, other than a sequence, and inviting to refine and test them (p.18). However, trying to apply Weick's sensemaking narrated view in observations in everyday life and in the life of organizations, as is, ended, after persistently trying, being a confusing and incomplete effort.

Weick's observer's manual is a profound narrated structuring of the main constructs that participate in a human act that deals with the structuring of the unknown, called "sensemaking'. His guide asks for a tentative explicit frame with more identifiable propositions (p. 18) than the ones than are being offered if one will like it to test it, or apply it. I could not find such framing in extant literature.

4.5.2 Weick's Sensemaking as Individual Knowing

When sensemaking is argued extensibility by Weick to be more than interpreting or meaning making (1995, p. 6-16); among the arguments he presented, there is one that invites to:

"… think about the wonderfully compact account of sensemaking mentioned by Graham Wallas. "The little girl had the making of a poet in her who, being to be sure of her meaning before he spoke, said: 'How can I know what I think till see what I say'" (p. 12).

I argue here that such quotation equates sensemaking to knowing; in the same way that it does the following Weick's example of sensemaking:

"… a pivotal painter or sculptor or poet gives those who follow him (or her) a different way of "seeing" - and therefore saying and doing and knowing in the world" (p. 10).

Reviewing in detail the sensemaking process – defined as the dealing with ill defined situations (p. 9), or confronting the stimulus placed into framed situations (pp. 4, 31), or more generally conceived as the need to structure the unknown (p. 4) – will reveal that Weick's sensemaking describes an integrated approach and process of individual knowing that includes the self, logical, emotional, social and actionable perspectives of individual knowing.

The case presented to understand individual sensemaking as individual knowing will be fully crystallized in the next sections. The approach follows rigorously Weick's (1995) sayings, and corresponds to its open coding (Strauss & Corbin, 1998) that tries to make explicit the sensemaking propositions and the relationships among them.

4.5.3 Plausible knowing: Skills and Context Shape and Limit Stories Told

To structure the unknown of ill-defined situations, citing Miller (1978), Weick (1995, p. 57) argues that (1) people invokes filters to avoid data overflow, and that (2) given this human limitation, the filtering of cues makes accuracy meaningless.

From that position, Weick posits, that we tend to choose among the multiple filtered cues, one that we embellish. Such embellishing is frequently achieved by linking the cue to a more general idea that mostly brings memories of interpretation form the past. In doing so, time plays a role, in which (3) quick responses shape meaning before the accurate one, together with an implied lower cost (p.58).

However, in situations in which accuracy is critical, (4) we are able to attend such requirement in a circumscribed way; that is, focally and for a short period; this is due to our human limits and to the speed of changes of the world, and because (5) accuracy demands constant stimulus, a condition that seldom happens (p.58).

In any case, (6) personal abilities for action affect what is believed and acted; then accuracy stops being the target, since (7) it holds immobilization powers, which is avoided through simplification (p. 60).

In such process, Weick (1995, p.61) argues that (8) a plausible story, instead of an account that tells with accuracy the perceive objects of a situation, is more viable. Plausible, coherent, and reasonable stories, in the form of metaphors, paradigms, or cause maps, reveal patterns of what is already in the mind of the actor and insinuate more order for the future.

In few words, the structuring of a plausible story is shaped and bounded by certain specific characteristics of personal skills and contextual issues (see Table 19).

Weick's Sensemaking as Individual Knowing Framework

Plausible knowing: *Skills and context shape and limit stories*

Propositions		Participating Factor	Factor Type
1	People invoke filters to avoid data overflow.	Human memory limits Perception filtering	Constrain Skill
2	Accuracy is meaningless with filtered cues.	Human memory limits Perception filtering	Constrain Skill
3	Quick responses shape meaning before accuracy.	Cost benefit assessment	Context
4	Circumscribed accuracy is the most we can hope in a changing world.	Human limits of attention Speed of changes of the world	Skill Context
5	Accuracy demands steady stimulus, state that seldom happens.	Limits in external stimulus	Context
6	Human capabilities affect what is believed and acted, accuracy is not the goal.	Misaligned human abilities	Constrain
7	Accuracy can immobilize, to avoid it people simplify.	Pattern simplification	Skill
8	Instead of accuracy, plausible, coherent, and reasonable stories show patterns of what is already in the mind and insinuate more order for the future.	Pattern recognition Pattern contriving Story telling	Skill Skill Skill

Table 19. Weick's (1995) Sensemaking: Framing Plausible Knowing.

4.5.4 Prospective Knowing: Faithful Presumption of certain Contextual Order

While plausibility defines the kind of story that will structure the unknown, the logic that defines the referent of the story, as we will see in certain detail, is prospection for a cue to which we will faithfully follow (Weick, 1995, p. 54).

This prospection generally goes on by noticing particular cues from a situation in which (1) we extract a characteristic as representation of a whole noticed object (Weick, 1995, p. 49). This extracted cue highlights distinct implication of the whole

object (p. 50), and (2) points to it offering several possible expressions, in which the actual one is progressively specified while interacting with its context (Weick, 1995, p. 51; Shotter, 1983).

Here, context influences what is noticed and (4) how is extracted (Weick, 1995, p. 53; Leiter, 1980):

(3) What is noticed as a clue follows criteria like (3a) time (speed, frequency), (3b) valuation of experience (positive, pleasant, extreme), and (3c) form (color, shape).

(4) Context provides a frame to decide meanings of objects like in (4a) social context (Salancik & Pfeffer, 1978) (norms and expectations), (4b) institutional and political context (explanations of struggles) (Hall, 1984), or (4c) organizational context (expert's openness to changes and generalist's preference for stability) (Starbuck & Milliken, 1988).

Then, when conceiving extracted cues as a point of reference, (5) we presume cognitively certain contextual order. The faith on such conception leads people to act, which materializes order (p. 54; Weick, 1983), given space to a self-fulfilling prophecy that mutually informs and adjust the reference point according to the emerging situation (see Table 20).

Weick's Sensemaking as Individual Knowing Framework

Prospective Knowing: *Faithful presumption of a contextual order*

<table>
<tr><th>Context guides
What is noticed</th><th>Cue Prospection Logic</th><th>Context guides
How is extracted</th></tr>
<tr><td rowspan="2">(3) Context influences what is noticed as a clue, following criteria of:
(3a) Time (speed, frequency).
(3b) Valuation of experience (positive, pleasant, extreme).
(3c) Form (color, shape).</td><td>(1) Extracted cue (property of the object) is taken as the object's representation, and that highlights the distinct implication of the object.</td><td rowspan="2">(4) Context provides frame to decide meanings of objects:
(4a) Social norms and expectations.
(4b) Institutional and political explanations of struggles.
(4c) Organizational account for expert's openness to changes & generalist's preference for stability.</td></tr>
<tr><td>(2) Extracted cue points to object as a whole, offering several possible expressions, the actual one is progressively specified in interaction with its context.</td></tr>
<tr><td colspan="3">(5) Faith and action over -> extracted cue's presume contextual order -> leads to tangible order = Self-fulfilling prophecy</td></tr>
</table>

Table 20. Weick's Sensemaking (1995): Framing Prospective Knowing.

4.5.5 Retrospective Knowing: a Stimuli-based Reverse Clarification Process

Retrospection is set as the most relevant feature of sensemaking and meaning building by Weick (1995, p. 24). Let us start its framing by synthesizing the five key propositions that Weick states about retrospection (p. 24 – 30).

Weick says first, (a) that situations are experiences of the past; then the act of attention is focus on what has already occurred; that is, experiences will be known only when they have been completed.

Second, (b) what is occurring at the moment of attention influences the meaning discovered. The implication of this is that given the several independent projects that one maybe participating at one moment, in which particular private and not necessarily compatible purposes are pursued, the sensemaker confronts the challenge of equivocality due to the many meanings that may surge from the retrospective synthesis.

Then, this equivocality challenge asks for values and priorities to clarify what is relevant in the analyzed experience (Weick, 1995, p.28). Notice that, if the time span between act and reflection is short it implies that our memory is fresher and that there are fewer projects ongoing in the mind, making distortion less significant.

Third, (c) that these experiences of the past are in our memory and anything affecting remembering will affect the meaning assigned to those memories. This is, that giving the different level of awareness, due to the passing of time, which we hold about experiences, past is rebuild knowing the conclusion by tending to erase causal links that make difficult the arrival to it (Weick, 1995, p. 28; Starbuck & Milliken, 1988, p. 37).

Fourth, (d) what we chose as stimulus affects the choice of meanings of the experiences, that is motivations make reading of past experiences as ordered and holder of clear causality, even if it sounds as a poor story (Reason, 1990, p. 91).

And fifth, (e) different situational contexts affect choices of stimulus and meaning, that is, as present projects and goals change, meanings change (Weick, 1995, p.26; Gioia & Chittipeddi, 1991, p. 435).

Weick closed the review of the features of retrospection by saying that the current context determines the meaning of past, and when a situation is seen from a high order level, the sensemaker is focused on issues like strategy, risk and speed factors; while at the operational level, sensemaker is more concerned with tactics, entrepreneurship and accuracy (Gephart, 1992, Fiske, 1992).

There is a need to comment here that, since the implications of the human memory limits have already been argued and framed while discussing *Plausible Knowing*; concerns may question its double referencing. To attend this, we have to recall that its previous framing followed a structural and given cause (skill) and here, the approach is a processual and intended cause (logic of retrospection).

In summary, Weick's picture of retrospection for meaning building is characterized by (1) experiencing a specific later contextualized attention, (2) influenced and stimulated by: (2a) current values and priorities (it helps to reduce equivocality due to data overload), (2b) role (which focuses attention in their corresponding rights and dues), and (2c) goals and other ongoing projects (their changes, change meanings of actual situation); (3) using a logic that (3a) searches for unproblematic cues, (3b) selects imperfect memories of past situations, and (3c) structures causal links that explain a previously known conclusion.

However, the following question rises "*How does this description of retrospective knowing offers lights on what triggers knowing reactively or knowing proactively?"* I believe that a possible answer is buried in the values, priorities and preferences that are suggested by Weick (1995, p. 27), when he posits that values may make clearer what

matters in a specific experience giving the multiple interpretation paths offered by the sensemaker's current several ongoing projects.

In other words, values hold the capability of influencing interpretation on either the passive reading of the situation or the active authoring of the particular situation (p. 7). Then, proposition 2a regarding current values and priorities is not only oriented to reduce the equivocality due to data overload, but also to influence the reading-authoring knowing posture (see Table 21).

Weick's Sensemaking as Individual Knowing Framework

Retrospective Knowing: *A stimuli-based reverse clarification*

1.	Attention is contextualized and focused on what has already occurred.
2. Stimulus	Influenced and stimulated by :
	(2a) Current values & priorities: to call reading-authoring knowing postures to reduce equivocality due to data overload
	(2b) Role which focuses attention in their related rights and dues
	(2c) Goals and other ongoing projects their changes, change meanings of actual situation
3. Logic	Shaped by the chosen stimulus toward:
	(3a) Unproblematic searches (3b) Selection of imperfect memories of past situations (3c) Reverse clarification of causal links

Table 21. Weick's Sensemaking (1995): Framing Retrospective Knowing.

However, this approach raises a new question, "*How is that the issue of values, as a caller of the reading-authoring knowing posture, is framed in the retrospective knowing characteristic and not in the apparently more appropriate prospective knowing?"*

Intents to answer are based on the believe that a seminal prospection (Proposition 1 of prospective knowing: Extracted cue is taken as object's representation and highlights a distinct implication) triggers retrospective knowing to choose a distinct cue stimulated by values (proposition 2a), and then goes back to prospective knowing to frame the presumed contextual order (propositions 2 to 5). Of course, this answer is a systemic oversimplification, however a plausible one, among many others.

4.5.6 Emotional Knowing: Interruptions Invoke our Emotional Memory

Weick's (1995) on-going characteristic of sensemaking, describes humans as living in a continuous flow of simultaneous projects in which (1) cues are extracted from the flow of projects through interruptions (p. 43). This (2) interruptions provoke a slow arouse of a rudimentary sensemaking (p. 45; Mandler, 1984) that insists in completing the sequence of the ongoing activities (p.46). The (3) longer the primitive search for sense, the stronger the emotion (pp. 45, 48; Mandler, 1984) that accompanies the cognitive appraisal of the link between the actual situation (at the point of the interruption) and the relevant prior situation (p. 46;). (4) Speed, kind (positive or negative) and intensity of triggered emotions are proportional to (4a) how tight the activities are organized, (4b) how important they are, and (4c) the level of alignment of the interruption with the execution (p.47 – 48).

Closing this on-going characteristic Weick's (1995) posits that (5) cue recalling tend to be mood congruent (p. 49, Snyder & White, 1982), that is, past experiences are framed in present not only by its similar look, but also by its similar feeling.

Then, e*motional knowing* is trigger by interruptions which affect cue noticing and shaping in *prospective knowing* and *retrospective knowing*, but also what is noticed in them also shapes emotional knowing.

Now that we understand that (1) plausible knowing shapes and limit the story, (2) prospective knowing faithfully follows presume contextual order towards a tangible ordered story, (3) retrospective knowing searches for causal links of the known order stimulated by values, role and goals, and (4) emotional knowing affects cue noticing; we can notice the multiple relations that they hold among them, and propose to conceive them as intertwined activities that invoke each other interactively (see Figure1).

4.5.7 Self knowing: Describing Self or Defining Self

From a Weickanian (1995, pp. 18-61) perspective in which sensemaking is an ongoing retrospective process grounded in the construction of identity, focus on and by the extraction of cues, to enact a sensible and plausible environment.

Here, knowing starts with oneself by conversing among the many that we are (pp. 19-20), developing understandings while either describing self and thus defining self (Knorr-Centina, 1981), or defining self and thus describing self, in such a way that the definition operates in the service of three personal needs: (1) self-enhancement, (2) self-efficacy, (3) self-consistency (Weick, 1995, p. 20; Erez & Earley, 1993).

The sensemaking pattern proposed by Weick (1995) to service these three self-image needs follows two different approaches, the first one, a *reactive* one, holds an adaptive reading tone of context; the second approach, a *proactive* one, follows a leading and creative tone.

In the sensemaking reactive approach, the previously three declared identity needs reveal dependence of our perception of the assessments of our image by others. Thus, preservation or repairing of image follows a certain adaptive pattern as described by Weick (1995, p. 21) when following Dutton and Dukerich (1991), summarized as follows:

(a) Owning or disowning actions depending on how favorable they attend identity needs, or

(b) When actions represent a personal image threat related to identity needs, then people may opt to search for a new sense of their images, including the chance to change the situational image, or

(c) When redefinition of the situational image does not work, them people may even search for another frame of reference (e.g., professional, political, religious).

So, the rephrasing of these ideas in the context of *self-knowing*, portraits s*elf-image caring behavior options* that are enacted by (a) selecting cues from the situation that are compatible with oneself and personal image in the situation, or (b) re-interpreting threatening cues as benign, when possible, or (c) trying to adapt the situational image to assimilate these threatening cues, or (d) looking for a less-threatening elsewhere to shared meanings with, when the previous actions fail.

In the sensemaking proactive approach, the identity needs reveal a simultaneous reacting and shaping of the situation. Weick (1995, p.22), when referencing Ring and Van de Ven (1989) and Louis (1980) on occasions of transacting in innovation in organizations described a sensemaking pattern - label here *innovative transaction behavior pattern* - that is basically characterized by following four central ideas (Louis, 1980; Reason, 1990: Weick, 1995, p. 23-24):

(1) Selecting the role that one will be played in the situation, taking into account the consequences for oneself.

(2) Extracting cues according to the chosen role.

(3) Enforcing workable understandings according to chosen role.

(4) Invoking mutability, flexibility and adaptability approaches to deal with inconsistencies of oneself and of the situation.

However, following this *self-knowing* framing raises a relevant question "*What does trigger the reactive self-image caring behavior options or the proactive innovative transaction behavior pattern*?

Weick's (1995, pp. 24 - 30) description of the retrospective characteristic of sensemaking as framed in the proposition 2a in the section *Retrospective Knowing: A stimuli-based reverse clarification* offers hints for an answer: values hold the capability of influencing interpretation on either the passive reading of the situation or the active authoring of the particular situation.

4.5.8 Social Knowing: Workable Social Understandings

Since (a) the work of Schutz (1964), in which the requisites for participation in a social group follows interpretations and interactions that recur to natives' constructs, to (b) the updated version of the socialization of apprentices, from Lave and Wenger (1991), in which new comers become familiar with tasks, vocabulary, and organizing principles of the community through peripheral activities; learning has been conceived as a social activity and Weick (1995) follows that lead when talking about the social characteristic of sensemaking.

However, Weick (1995) emphasizes, from the perspective of social knowing in two central main ideas that, as we will see, they are recognizable, but they are not enough developed as to be easily framed as propositions.

The first one, simply set, it is that we hold conversations with others and selves about what the implicated others think about the situation (p. 39). These conversations covers a variety of issues like promises, lies, threats, rumors, commitments in which words, working as categories, help to develop stable connections that guide people in their endeavors (Weick, 1985, p. 128; 1995, p. 41).

The second idea, confines the purpose of social interaction to agree on, or better to trigger joint action (Weick, 1995, p. 42). However, this is not only about sharing meanings, but also about a variety of approaches for arriving to joint action. A brief review of these workable social mechanism can sent light about their reading or authoring posture for joint action.

Non-disclosive intimacy (Eisenberg, 1990) corresponds to the shared sufficient condition that allows the relating among participants and the coordination of actions "as long as the task stays constant and the environment remains stable" (p. 160).

Equivalent meanings (Donnellon, Gray, and Bougon, 1986) correspond to those interpretations of participants about a shared object or situation that are equifinal, which is "interpretations that are dissimilar but that have similar behavioral implications" (p. 44).

Satisficing naming (Turner, 1978; Czarniawska-Joerges, 1992) corresponds to the satisficing denotation of objects, from the participants, that allows action to follow, or to the taking of decisions.

Distributed meanings (Rasmussen, Brehmer & Leplat, 1991) is described as the approach in which participants shared cognitions by means of symbolic representations encapsulated in entities that people use as tools. Such entities offer handles that other participants may use to invoke cognitions similar to the intended representation, however, such representations may fail or provoke different cognitions to the intended one.

Collective action (Hardy, Lawrence and Grant, 2005) corresponds to the process in which participants, while discoursing, construct a collective identity that relates them to shared issues and to each other, which lead them to collaborate in innovative actions, while participants discoursing keep on.

Overlapping views of ambiguous events (Eisenberg, 1984) is described as the kind of communication process among participants that "foster(s) agreement on abstractions without limiting specific interpretations" (p. 235) in search of flexibility, creativity, and adaptability.

Then, (1) conversation with others and self about what the implicated think about the situation, and (2) workable social formations oriented to joint action based on (2a) non-disclosive intimacy, (2b) equivalent meanings, (2c) shared meanings, (2d) satisficing naming of objects, (2e) distributed meanings, (2f) collective action, (2g) overlapping views of ambiguous events, constitute the central ideas of *social knowing*.

4.5.9 Enacting Knowing: Constraining or Habilitating Acts

When we confront either meaning making as, either, the interpretation that explains the things that exist, or as the sensemaking that explains how things come to exist (Weick, 1995, p. 30), we are dealing with graded scenarios, in which, in one extreme, people face a situation to discover meanings following self-image caring behavior

options; and, in the other extreme, people face a same situation to construct new realities (p. 31) through authority acts following a innovative transaction behavior pattern.

In any case, people's acts create objects that become constrains or opportunities – stimulus – that will: (a) confront their own created challenge, (b) face reactions of our pre-announce posture, or (c) pay the consequences of our own created increasingly uncontrolled situation (Weick, 1995, p. 31).

In this mutual interaction that cause the individual to act with the activity that himself produced, Weick (p. 32) poses that the individual behavior should be understood as the active process of the relating activities – meeting and interpreting; in which intervening parts continuously change due to their own responding act, by the very process of expecting a meeting, and by the meeting itself we become something different (Follet, 1924, p.62 – 63).

In the context of the individual knowledge framework, these interdependent relating activities with the environment are understood, in the case of the more passive knowing reading tone (Weick, 1995, p. 34), as the enactment of a form of resistance to change (p. 33) - by bracketing experiences and imposing known categories to things discovered in the specific situation (p. 35) - through acts that create constraining objects (p. 31).

In addition, in the more active knowing authoring tone, these relating activities are understood as the enactment of a form of confrontation of possible incompatible interests - in which judgment is temporarily suspended (Weick, 1995, p. 33) to achieve possibilities of integrating differences (p. 34) - through acts that create opportunities (p.31) - to invent and construct (p. 36); that is, by proposing new categories to interpret

the situation. What is created is given meaning (p. 38), "[i]n other words, people set in such a way that their assumptions of realism become warranted" (p. 36).

Summing up, enactment of discovering or inventing in certain situations correspond to a behavioral process, and not to the outcome of the process, in which interdependent relating activities between individuals and the situation produce changes in interpretation just by expecting to act and by acting itself. In this process, discovering and inventing follow different routes, but it is in these enactments, when successful, that the recognition of knowers happens.

Discovering is enacted by: (1) resisting change by means of instantiating constraining objects or events; which is, by imposing known categories to the situation; thus (2) discovering meanings of what is there.

Inventing is enacted by: (1) embracing change by creating opportunity-enable objects or events; which is, by exploring with new categories to frame the situation. This ask for (1.a) suspending judgment, and (1.b) confronting and, if possible, integrating differences; which in summary corresponds to (2) assigning meanings to the created reality.

4.5.10 Weick's Sensemaking Framework

Weick´s (1995) sensemaking activities are interactive and recursive; nevertheless, a departing point is a helpful way to star adding conditions and refinements within an initiative that tries to frame sensemaking as knowing. We have already characterized some of the sensemaking activities and events, and among them are:

(a) *Ill-defined situations*, which are defined as events that trigger the structuring of the unknown. This is a starting point that follows the structure "*knowing drives - knowing abilities"*.

(b) Enactment of constrains (*constraining acts*) or opportunities (*habilitating acts*) that create situations that also ask for their structuring.

These two departing points (ill-defined situations and enactments) are a simplified way of understanding the triggering of knowing in everyday situations, and a useful path for drafting a scheme of the knowing process.

The graphical representation of the framework showed in *Figure 1* posits a way of seeing Weick's sensemaking from the perspective of individual knowing. A way that shows a continuous flow of interacting activities (*1 to 8*) that are invoked by changes in the situation (*1 and 8.3*), other activities, and *interruptions* of the knowing process. Weick's (1995) recalls us, that we attend many projects in a certain moment, this framework assumes that attending to other knowing processes is another kind of interruption.

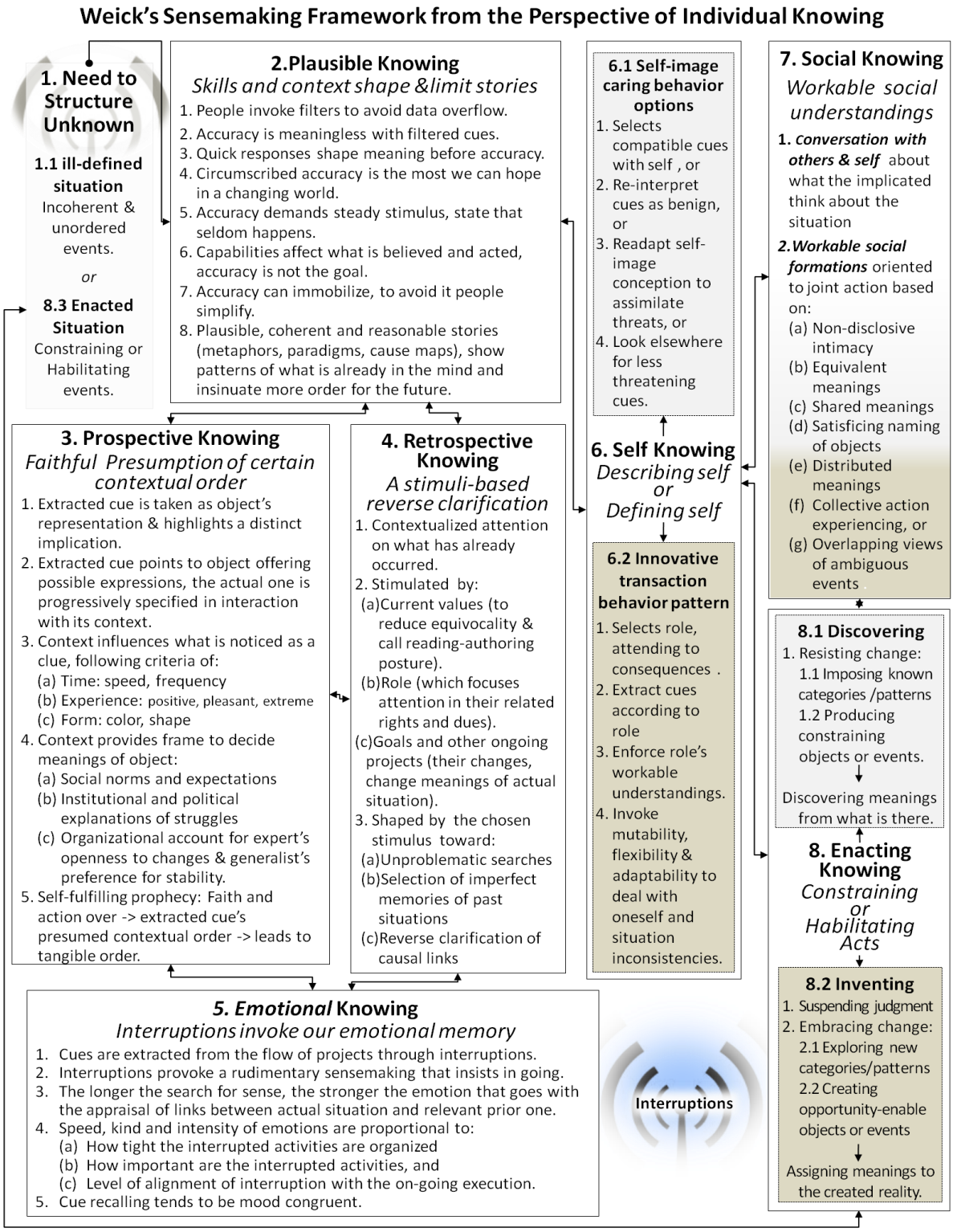

Figure 1. Weick's (1995) Sensemaking Framework in the context of Individual Knowing.

4.5.11 Matching Weick's Sensemaking Constructs with Individual Knowing

The emerged constructs, relationships among constructs and propositions about Weick's sensemaking, framed, as individual knowing, are now ready for the discovery of the following specifics (through the grounded theory): (a) personal knowing abilities, (b) drives of knowing behavior, (c) participating knowing constructs, and (d) knowing principles and processes.

In terms of Weick, drives of knowing behavior are given by the human need of structuring the unknown manifested in (a) making sense of ill-defined situations or (b) enacted situations through constraining or habilitating objects or events (see Table 23).

While interviewing Weick's (1995) text, personal knowing abilities were made explicit in some of the sensemaking stages, not so much in others. What comes next is a summarized description of the axial coding process, in which the (a) Ability's reference numbering with [brackets] follows Table 23, and the (b) Proposition's reference numbering without brackets follows Weick's Framework diagram in Figure 1.

> In the Plausible knowing stage, we identify the following four abilities: [1] Perception filtering, [2] Pattern recognition, [3] Pattern simplification, [4] Pattern contriving, and [11] Plausible storytelling.
>
> In the Prospective knowing stage, proposition 5: Faith and action over presumed contextual order leads to tangible order, allows to posit [5] Commitment as knowing as a personal ability.
>
> In the Retrospective knowing stage, is easy to recognized that the abilities invoked are [2] Pattern recognition and [3] Pattern simplification.

In the Emotional knowing stage, proposition 5: Cue recalling tends to be mood congruent; leads to a broader understanding of Patterning recognition. The proposition posits that we do not only incorporate recalled past events due to how they look, but also how they feel (Weick, 1995, p. 49). Therefore, the specialization of the ability 5 into: [2a] Perceptual pattern recognition and [2b] Emotional pattern recognition is more plausible.

Self Knowing stage invokes, for the case of Self-image caring behavior options, to [2] Pattern recognition, [3] Pattern simplification, and a specialization of [5] Commitment, which is [5a] Tight commitment to recognized pattern ability.

Stage Self Knowing invokes, for the case of Innovative behavior transaction pattern, to [2] Pattern recognition, [3] Pattern simplification, [4] Pattern contriving; and a specialization of [5] Commitment; which is [5b] Loose commitment to contrived patterns ability.

In the Social knowing stage, given the already explained difficulties to elaborate propositions for this stage; the most we can say is based in the tradition of socialization studies (Schutz, 1964; Lave & Wegner, 1991), which is that the knower needs to be competent in interacting with others by being familiar with vernacular interpretation framework, language and artifacts of the participating community ([7] Interacting through vernacular language and artifacts).

Also, we could say that the concept of workable social understandings, with its variety of ways of driving joint action through social meaning (non-disclosive intimacy, equifinal meanings, shared meanings, satisficing naming of objects, distributed meanings, collective action, and overlapping views of ambiguous events) portrays a set of personal knowing abilities, label here as [8] Forming social workableness.

These abilities were listed above and grey tinted in the diagram of the frame (Figure 1) following the reading-to-authoring order (later and darker for the more loose and flexible understandings).

Finally, Enacting knowing stage, in case of the Discovery posture, invokes the abilities [2] Pattern recognition, [3] Pattern simplification, and [9] Imposing known categories/patterns; and, in case of the Inventing posture, the abilities invoked are [6] Suspending judgments, [4] Pattern contriving and [10] Exploring new categories/patterns.

Knowing constructs that relates language with knowledge are evident in the (a) Plausible knowing stage in the proposition 2.8 about *telling a plausible story*; and in the (b) Social knowing stage in propositions 7.1 which is related to *conversations with others and self*, and the proposition 7.2d which says about assigning satisficing name to objects.

Knowing constructs that relates meaning with knowledge are all over the framework given the sensemaking approach.

Finally, the knowing process progressively emerged; piece by piece, capture in the central idea of each section and labeled along the titles assigned to each stage of the framing and revealed as a schematic account of them. The detail account of all the emerging categories is listed in Table 22, Weick´s Sensemaking as Integrated Knowing Framework is showed in Tables 23 and 24, the graphical approach of this framework is presented in Figure 1, and its narrated version comes next:

In structuring the unknown, trigger by the need to make sense, personal skills and context shape and bound the stories told; in which a faithful presumption of certain contextual order is followed by a stimuli-based reverse clarification process; in which interruptions invoke our emotional memory; all this in search of describing self or defining self; through workable social understandings that triggers constraining or habilitating acts in a now redefined situation that invites to more knowing.

Weick's Sensemaking as Individual Knowing Framework

Detailed Knowing Constructs

Framework Reference		Knowing Context	Knowing Constructs		
1	In structuring unknown	Ill defined situation	(1) Undefined situation	(2) Undefined problem	(3) Need to make sense
2	Plausible knowing	Skills and Context shape and limit the stories told	(4) Memory limits (5) Biological limits (6) Data overflow / overload (7) Data filtering (8) Accuracy (9) Circumscribed accuracy (10) Context (11) Constant stimulus	(12) Skill (13) Aligning personal skills (14) Goal (15) Accuracy immobilization (16) Simplification (17) Coherent story (18) Reasonable story	(19) Plausible story/storytelling (20) Conceived order (21) Plausible pattern (22) Insinuating future order (23) Metaphor (24) Paradigm (25) Cause map
3	Prospective Knowing	Faithful presumption of certain contextual order	(26) Cue (27) Extracted cue (28) Distinct implication (29) Possible expressions (30) Progressive specification (31) Interaction with its context (32) Context influencing criteria	(33) Time (34) Experience assessment (35) Form (36) Social norms (37) Institutional explanations (38) Political explanations (39) Organizational guides	(40) Expert's openness to changes (41) Generalist's stability preference (42) Self-fulfilling prophecy (43) Faith (44) Action (45) Presumed contextual order (46) Tangible contextual order
4	Retrospective Knowing	Stimuli-based reverse clarification process	(6) Data overflow / overload (75) Alignment of interruption (48) Past (49) Stimulus (50) Current value (51) Equivocality reduction (52) Reader posture	(53) Author posture (54) Role (55) Focused attention (56) Obligation (14) Goal (57) Ongoing projects (58) Project change	(59) Meaning change (60) Chosen stimulus (61) Unproblematic search (62) Selection of memories (63) Causal link (64) Reverse clarification
5	Emotional Knowing	Interruptions invoke our emotional memory	(27) Extracted cue (65) Interruption (66) Ongoing insistence (67) Emotion (68) Actual situation (69) Prior situation	(63) Causal link (70) Speed of emotions (71) Kind of emotions (72) Intensity of emotions (73) Tightness of activities (74) Importance of activities	(76) Cue recalling (77) Emotional memory (78) Mood congruent
6	Self Knowing	Describing self or Defining self	(79) Self (80) Describing self (81) Compatible cue (82) Re-interpret cue (83) Readapt self-image (84) Look elsewhere	(85) Threatening cues (86) Defining self (87) Role selection (88) Consequence acceptance (89) Select cue (90) Workable understandings	(91) Enforce understandings (92) Mutability (93) Flexibility (94) Adaptability (95) Inconsistencies
7	Social Knowing	Workable social understandings	(96) Conversing with self (97) Conversing with others (98) Talking about the situation (99) Workable social formations (100) Joint action	(101) Non-disclosive intimacy (102) Equivalent meanings (103) Shared meanings (104) Satisficing object naming (105) Collective action experiencing	(106) Distributed meanings (107) Overlapping views (108) Ambiguous event
8	Enacting Knowing	Constraining or Habilitating	(109) Constrain (110) Constraining act (111) Change resistance (112) Discovering meaning (113) What is there	(114) Habilitation (115) Habilitating act (116) Confront differences (117) Integrate differences (118) Suspend judgment	(119) Create opportunities (120) Assign meanings (121) Created reality
8.3	Redefined situation	Enacted situation invites to know	(122) Enacted situation (123) Invitation to know (124Created challenge	(125)Face reactions (126) Pay consequences (127) Uncontrolled situation	

Table 22. Weick's (1995) Sensemaking: Detailed Knowing Constructs.

Weick's Sensemaking as Individual Knowing Framework

[Drives and Abilities]

[a] Knowing Drives What triggers the application, creation and sharing of knowledge?	Making sense of ill-defined situations, self-enacted situations	*Applying / Creating / Sharing*

[b] Knowing Abilities Which are the personal abilities that drive the application, creation and sharing of knowledge?			
[Ref]	***Knowing Ability***	***Knowing Stage***	***Activity type***
[1]	Perception filtering	*Plausible knowing*	*Creating / Applying*
[2]	Pattern recognition	*Plausible knowing*	*Creating / Applying*
		Retrospective knowing	*Creating / Applying*
		Self Knowing - Self-image maintenance posture	*Applying*
		Enacting knowing - Discovery posture	*Applying*
		Self Knowing -Innovative posture	*Creating*
[2a]	Perceptual pattern recognition	*Emotional knowing*	*Creating / Applying*
[2b]	Emotional pattern recognition	*Emotional knowing*	*Creating / Applying*
[6]	Suspending judgments	*Enacting knowing - Inventing posture*	*Creating*
[3]	Pattern simplification	*Plausible knowing*	*Creating / Applying*
		Retrospective knowing	*Creating / Applying*
		Self Knowing - Self-image maintenance posture	Applying
		Self Knowing -Innovative posture	*Creating*
		Enacting knowing - Discovery posture	*Applying*
[4]	Pattern contriving	*Plausible knowing*	*Creating*
		Enacting knowing - Inventing posture	*Creating*
[5]	Commitment	*Prospective knowing*	*Creating / Applying*
[5a]	Tight commitment to recognized patterns	*Self Knowing - Self-image maintenance posture*	*Applying*
[5b]	Loose commitment to contrived patterns	*Self Knowing -Innovative posture*	*Creating*
[7]	Interacting through vernacular language and artifacts	*Social knowing*	*Sharing / Applying / Creating*
[8]	Forming social workablenesses	*Social knowing*	*Sharing / Applying / Creating*
[9]	Imposing known categories/patterns	*Enacting knowing - Discovery posture*	*Applying*
[10]	Exploring new categories/patterns	*Enacting knowing - Inventing posture*	*Creating*
[11]	Plausible storytelling	*Plausible knowing*	*Sharing / Creating*

Table 23. Weick's (1995) Sensemaking: Framing Knowing Drives and Abilities.

Weick's Sensemaking as Individual Knowing Framework

[Language and Meaning Knowing Constructs and Knowing Processes]

Participating Knowing Constructs and Processes

[c1] Language and Knowledge

What is the role of language in the application, creation and sharing of knowledge?

Knowing Stage		***Constructs*** *with references to Figure 1 are shown between [brackets]*	***Activity type***
2	Plausible knowing	[2.8] Plausible, coherent, and reasonable stories (metaphors, paradigms, cause maps), show patterns of what is already in the mind and insinuate more order for the future.	*Creating / Applying / Sharing*
7	Social knowing	[7.1] Conversation with others and self about what the implicated think about the situation.	*Sharing*
		[7.2.d] Satisficing naming of objects	*Sharing*

[d1] Language, Meaning and Knowing Process

Which are the principles, logic and processes that guide the application, creation and sharing of knowledge?

	1	**Structuring unknown**	In structuring the unknown, trigger by a need to make sense,	*Creating / Applying / Sharing*
	2	**Plausible knowing**	skills and context shape and bound the stories told;	
	3	**Prospective Knowing**	in which a faithful presumption of certain contextual order	
	4	**Retrospective Knowing**	is followed by a stimuli-based reverse clarification process;	
	5	**Emotional Knowing**	in which interruptions invoke our emotional memory;	
	6	**Self-Knowing**	all this in search of describing self or defining self;	
	7	**Social Knowing**	through workable social understandings	
[d2] Recognition of the quality of knower	8	**Enacting Knowing**	that triggers constraining or habilitating acts in a now redefined situation that invites to more knowing.	

Table 24. Weick's (1995) Sensemaking: Framing Knowing Constructs and Processes.

4.6 FRAMING BRUNER'S ACTS OF MEANING AS INDIVIDUAL KNOWING

4.6.1 Bruner's Call against Information Processing

Bruner (1990) is a call to for the recovering of the original drives that originated cognitive psychology back in 1950, a recovering from the computational oriented conception of mind that was dominating research in 1990. His call remembers that "it was, we thought, an all-out effort to establish meaning as the central concept of psychology – not stimuli and responses, not overtly observably behavior, not biological drives and their transformation, but meaning." (p. 2). The scope of such endeavor was supposed to follow an interpretative approach to discover and describe the symbolic devices that we use to make sense of the living situation and of ourselves.

The processing of information, Bruner's (1990) said is a completely different from the construction of meaning. While 'information comprises a pre-coded message in the system" (p. 4) and information processing can deal with meaning in the lexical, dictionary, pre-defined rules or algorithms sense, there is no place for intentional states - believing, desiring, intending - in such conception (p. 4-8). Construction of meaning happens within a culture of shared rhetoric for negotiating meanings and interpretations, even within ambiguous discourses (pp. 11-12). That is, an ethno methodological approach to meaning that frames the social assessments that people under study made in their everyday life (Garfinkel, 1967).

Giving his motivations, Bruner's (1990) work reveals a complete theory of meaning in the context of a cultural oriented cognitive psychology. His theory argues for humans

as holders of a set of native communication primitive skills oriented to trigger more advance narrating abilities that use the constructs of "ordering events" and "value-based assessing of events", to structure and plot, in search of legitimacy, a particular situated interaction of acting and saying. This narrative, if successful, creates and shares meanings.

These events happen in a cultural setting that is characterized by a set of beliefs and desirables; which also counts with a set of symbolic tools, like language, a tools built up to overcome human's biological limits. These cultural settings are challenged and enriched, to handle changes and complexity of life, with new created and shared meanings and with new symbolic tools.

In summary, Bruner's (1990) theory holds two intertwined drivers: the shaping of culturally situated meaning and the building of culture itself, the later understood by its values, desirables, and symbolic tools.

4.6.2 Bruner's Framing Challenge

This intended framing of Bruner's (1990) acts of meaning makes a rigorous reading and interpretation of his theory in the context of individual knowing; such framing, at the best of my knowledge, has not been published in academic literature.

Bruner's approach centrally argues that significant outcomes of our native predispositions, characterized by primitive communication functions, are our shared symbol-based systems – e.g. language -, which are the tool kits through which human knowledge becomes enculturated knowledge (p. 21).

However, the framing of Bruner's act of meaning also read Bruner in the context of our particular quest: understanding the relationships of shared meanings with language and knowledge.

Then, even though the final exposed understanding holds and integrated view; it also presents emphasis on specifics related to: (a) "What is the role of language in the creation and sharing of meanings?" and (b) "What is the role of meanings in the creation and sharing of knowledge?".

Bruner (1990) does not posits propositions, neither he describes a neat explicit meaning construction and sharing process; however he does posits (a) two universals drives that explain causes for human action, and (b) descriptions of the constructs that participate in those universals; revealing in them certain relationships among each other.

Attending to these universals propositions for human action, and constructs about culture and meaning building achieved to contrive a plausible interpretative story about individual knowing.

However, such story, in the disciplined side, asks for some alphanumerical references, which are written between brackets ([#a#]), which allows for an easy matching with the emerging framework (see Figure 2).

4.6.3 Bruner's canon and narrative-based knowledge construction approach

Bruner (1990) argues in favor of multidisciplinary culturally oriented studies in which the relationship between action and saying is interpretable, and that the relationships

between the meaning of what we say and what we do guide the interactions with one another (Bruner, 1990, p. 19).

Here, action and saying are understood; first, as situated in a [2] cultural setting that is characterized by [2a] a shared interpretative system to organize and to know about experiences and social transactions, built around established or expected canonical patterns (pp. 35, 50); and second, they are not about any [1] human behavior, but about the intentionally counterpart of behavior, including what we act and say about our intentional states – beliefs, desires, intentions, moral commitments (pp. 9, 19); which are sufficiently coherent and organized, as to describe a committed disposition to a "way of life" (p. 38).

To avoid the eventual indeterminacies of cultural relativism critic and the need of particulars parameters to account for local variations in a cross-cultural approach, Bruner (1990, pp. 20 - 21) proposed to understand that the universals that cause human action have to do with higher-level issues: [6] culture building and [3] the quest of meaning within culture.

In this way of seeing, the two central arguments that explain the triggering of human actions are defined: first, by the [6a] limits of our biological substrate, that while it constrains us, it also challenges [6] our cultural inventiveness through the creation of soft and hard tools (p. 21), which enrich our [2] cultural setting; and second, [3c] by the breach between world states and personal intended states, which leads either to [5] meaning construction within the existing [2] cultural setting. Otherwise, [3b] existing meanings are applied.

These two Bruner's (1990) universal departing drives take us to - what I believe it is the foundation of Bruner's theory: the argument that (5e) humans hold a native and primitive readiness for social meaning creation and sharing (p. 71). In more detail words, humans come equipped with a set of protolinguistic predispositions [5e1] to grasp the significance of situations (Bruner, 1990, p. 72) by [5e3] means of praxis (pp. 70, 74), and [5e2] to construe the social world over which we act upon (p. 73).

These predispositions are characterized by certain [5e3] native and primitive communication functions and skills like indicating, labeling, requesting, misleading, joint attention; turn taking and mutual exchange (p. 71).

Significant outcomes of these native predispositions are [2b] our shared symbol-based systems (e.g. language) which are the tool kits through which [6b] human knowledge becomes enculturated knowledge (p. 21), which also overcome our biological limits (e.g. immediate memory (Miller, 1956)); allowing the handling of complex meanings through [2b] communal agreed notations (p. 21), which in turns enrich our knowledge, therefore our [2] cultural settings.

Moreover, Bruner (1990) argues, that when people, guided by our natural human motives, for example get hungry or sexy, it is not a simple conversion of biological drives into psychological preferences, *but a mediation of the symbolic means of a culture that guide our way of life* (p. 22) .

This is a belief that a certain mode of life is worthy, even if suffering is necessary. However, Bruner recognized that there are biological constrains linked to the extreme

pain or physical exhaustion that break the cultural connection that offers direction to our strivings (Scarry, 1985).

In other words, generally, and excluding unsurpassed biological constrains, in the context of a [2] shared cultural setting, we go from [1] personal intended behavior and states to [5] the construction and sharing of meanings when there is a gap between outside world states and personal intended states by means of a [2a] shared interpretative system and [2b] shared symbol-based systems.

Bruner's (1990) approach to cultural psychology is a called for aligning, while interpreting, our cultural creations and inventiveness – instead of our biological limitations - with the ends we profess (pp. 23-24); an alignment that is also expressed as an optimistic prescriptive message, as we will see in detail in the next paragraph.

In his constructivist approach, in which every belief is as good as any other; and in which the corresponding pragmatic inquiring procedure suggests asking questions like "What it would be to believe that?" or "What would I be committed myself if I believed that?" (Rorty, 1982); values are neither discovered from every situation as in rational choice theory (Friedman and Hetcher, 1988), nor a function of gut reactions as in the irrational approach (Ferenczi, 1968), but values underlay our way of life.

Here, values are shared and hold consequences (Bruner, 1990, pp. 27 - 30), in the sense that commitment to them "provide[s] either the basis for satisfactory conduct of a way of life or, at least, a basis for negotiation" (p. 29) the world-view differences.

As we can see, for Bruner, values hold a normative status; and as we will see farther in the specifics, he prefers referencing to them with the terms “canons” and “canonical” since those notations hold the mediation role of symbols in the cultural setting.

It is in his prescriptive approach of cultural psychology that, I believe, Bruner (1990) configured a clearer appreciation of the alignment between our cultural creations and our desires; and the role of values in it.

He argued, referencing the democratic culture of Skinner (1972), for open-mindedness; and in it, he demanded to “be conscious of how we come to our knowledge and as conscious as we can be about the values that lead us to our perspectives” (Bruner, 1990, p. 30).

Here, Bruner insisted that being accountable of what and how we know does not imply a single way of constructing meaning, or only one right way; it is about the values that fit best to cope with changes in life (p. 30); freedom, democracy and accountability are presented as particular instances of normative constructs in this prescriptive way of conceiving personal knowing. Prescription that is understood here, taking a distance from these particulars values, as the canonical approach to knowing, in which cultural canons are revealed by observing the adherence to them.

Then, we could follow that, if the [1] situated adhered values guide the [5] construction of meanings, and the relationships between the meaning of [5b1] what we do and what [5b2] we say guide the interactions with one another, and that what we say is mediated through [2b] shared symbol-based tools.

Then, inferring from Bruner (1990), I suggest to appreciate a relevant key role for the language symbols that we associate with cannons and values in the construction and sharing of meanings (a relation between [5b1] and [5b2]).

This suggested relevance of the link between language symbols and values can be also appreciated when Bruner (1990) argues that humans hold a [5d] native and inherent narrative structure in the praxis of social interaction even before we can achieve our first [5e] linguistic expression (pp. 77 - 79).

Bruner's main arguments on this issue goes on detailing that, when the structure of narrative is effective, it asks for four requirements: (a) [5b1] sets emphasis on the agency of human interaction toward goals (Brown, 1973), (b) [5c1] maintains a sequential order of events and states (Levelt, 1989), (c) [5c2] holds *sensitivity to the canons* of what is usual or unusual in human interaction, and (d) [5b2] reveals the *narrator's perspective* (Stern, 1977).

Since humans reveal innate readiness to satisfy this requirements, showed by Bruner through many examples and references in his book, then this [5e] primitive ability to organize narratives allows humans to understand and use language - and its more [5d] powerful narratives manifestations - through the [2b] symbol-based tools and traditions that constitute the culture in which we participate (p. 80).

Here, "*sensitivity to cannons*" and "*narrator's perspective*", as part of the narrating structure, reveal the confrontation of two sets of values – [2] cultural interpretative system and [1] personal states - that guides [5b] human rhetoric as an instrument toward

goals, in which [5b1] action is not enough, but [5b2] "telling the right story, putting her actions and goals in a legitimizing light, is just as important" (Bruner, 1990, p. 86).

At this point, before getting into specifics about how the legitimized story is build, it helps to recall the *intentional* counterpart of the construction and sharing of meanings, that is, to give attention to the question: "What are the motivations that drive the efforts of building shared meanings?" will provide a more holistic view of the matter at hand.

Bruner (1990) undertake this issue by recognizing [7] an outside world in which our actions are situated, and this world holds certain states that *provides reasons for our* [1] beliefs and desires*;* however, it is when our [1] personal beliefs and desires, by themselves, confront the perceived [7] world states, and discover a breach between them, it is that our actions lead to [5] meaning construction and sharing (pp. 39 - 43), otherwise [4] narrating, therefore, meaning sharing and creation, is unnecessary (p. 40).

Here, then, I propose a straight forward reading of Bruner (1990), and say that for him, [5] meaning creation and sharing is about the integrative effort of: [5a] recognizing and understanding the normative values of the culture in which we participate, [5b1] acting in ways that depart from the "way of life" canons toward certain goals, [5b2] narrating, in our social interactions, an orderly canon-based story of justified acts searching legitimacy, which in turns achieves to go from [5c1] meanings creation, by the explication embedded in the structuring of events, [5c2] to meanings sharing, by the acceptance of its legitimacy, and of ourselves indeed, as part of the culture in which we participate.

The previous stated Bruner's (1990) reading about the [5c1] creation and [5c2] sharing of meanings asks for some specificity of the meanings attached to "values" and the now emerging concept of "order".

These two concepts are intertwined when they are seen from the narrating perspective; starting with the initial efforts to [5c1] make sense of some acts, we connect the referencing to these acts in certain order and sequence (e.g. "and", "then", "because"), noticing their quantitative *canonical* characteristics, expressing then as usual or unusual, in terms of their frequency, steadiness or reliability of the acts (e.g. "sometimes", "always"), and eventually incorporating [5c2] qualitative normative forms, manifested by a deontic modal expression (e.g. "got to", "must"), to finally incorporate a personal evaluation using epistemic normative expressions (e.g. "I think", "It is surely the case") (pp. 90 – 92).

Simplifying and framing, [5c1] "order", a construct related to meaning creation, is about sequential connections and canonical frequency-based qualifications of actions; and [5c2] "values", a construct related to meaning sharing, is about deontical causations and epistemic conclusions in the [1b] context of cultural canon-based shared interpretative system and in search of legitimization.

Then, Bruner's (1990) [3d] human's native narrative abilities for the praxis of social interaction, in relation to meaning creation and meaning sharing could be break down further in two main ideas: [3d1] humans' order recognition and order establishing abilities (sequencing and frequency-based normative qualifying) guide the structure of the narrative, and [3d2] human's value appreciation and influencing abilities (obligation, causation and conclusion issues) guide its dramatized content.

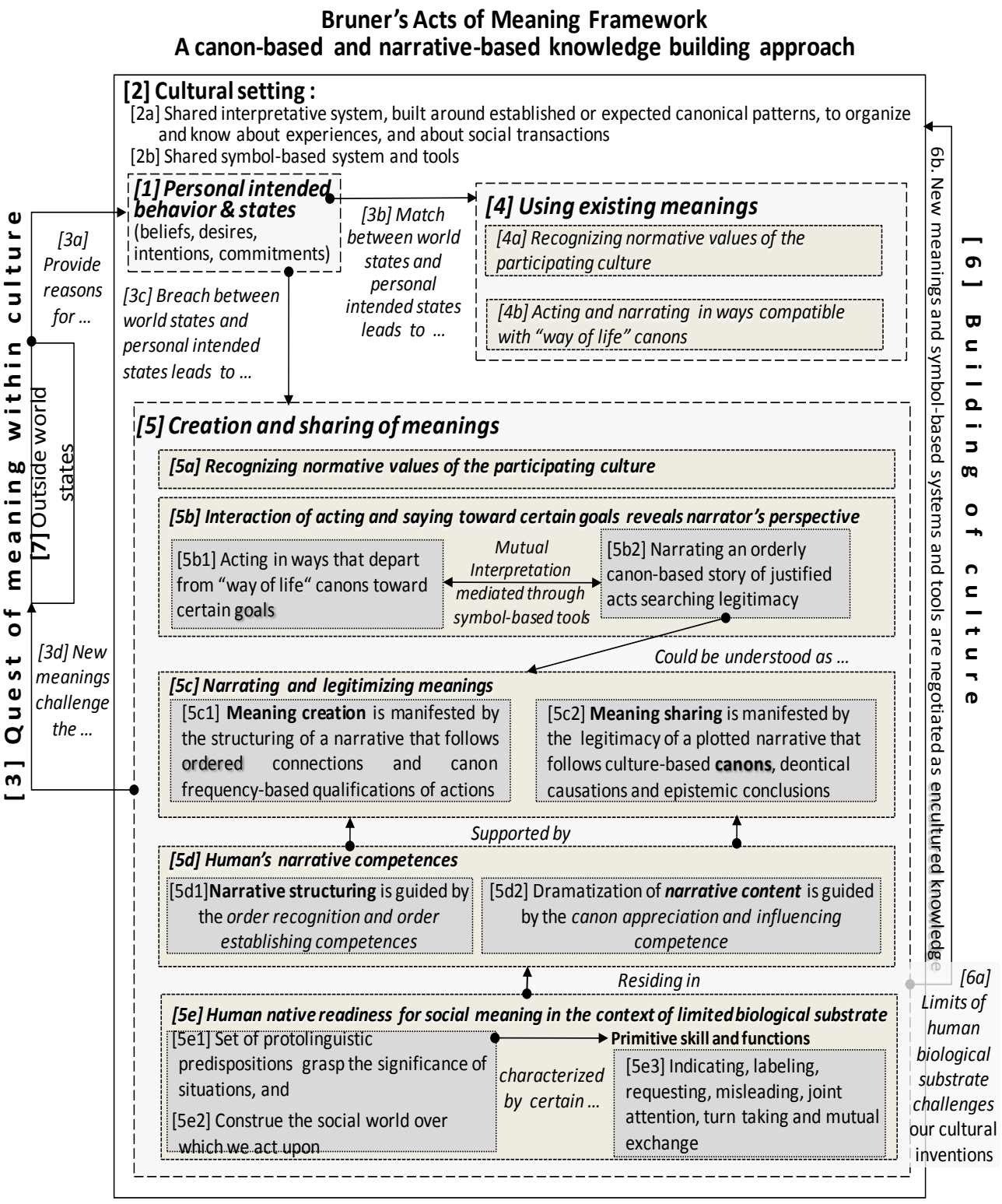

Figure 2. Bruner's (1990) Acts of Meaning Framework.

4.6.4 Matching Bruner's Acts of Meaning Constructs with Individual Knowing

The above constructs, relationships among constructs and propositions about Bruner's acts of meaning, framed as individual knowing, provides an opportunity to explore specifics of the originally set individual knowing structure: [a] actuators of knowing behavior, [b] personal knowing abilities, [c] participating knowing constructs, and [d] knowing principles and processes.

Bruner's Acts of Meaning - A canon-based and narrative-based knowledge building approach

Individual Knowing Drives and Knowing Abilities

[a] Drives of knowing behavior			
Framework Reference		**Drive**	**Activity Type**
3	Quest of meaning within culture	*(1) Breach between world states and personal intended states leads to meaning construction; otherwise, existing meanings are applied.*	*Applying* *Creating* *Sharing*
6	Building of culture	*(2) Limits of biological substrate, while it constrains us, challenges our cultural invention to construe and use soft and hard tools.*	*Applying* *Creating* *Sharing*

[b] Personal knowing abilities				**Activity Type**
Framework Reference		**Abilities**	**Acts exemplifying the ability**	**Activity Type**
5e	Human native readiness for social meaning	*(1) Protolinguistic sensemaking* (protolinguistic predispositions to grasp situation significance)	Indicating, labeling, requesting, misleading, joint attention, turn taking and mutual exchange	*Applying* *Creating* *Sharing*
5d	Human's narrative abilities	*(2) Order recognition*	Sequencing events Qualifying events with frequency-based canons	*Applying* *Creating*
		(3) Order establishing		*Creating* *Sharing*
		(4) Canon appreciation	Recognizing canons Building causation Positing conclusions	*Applying* *Creating*
		(5) Canon influencing		*Creating* *Sharing*

Table 25. Framing Bruner's (1990) Acts of Meaning: Knowing Drives and Abilities.

Bruner's (1990) text interview revealed nativism and constructivism views of knowing in its two drives of knowing behavior – (1) overcome breach between world and our intentions, and (2) overcome our biological limits. A similar dual approach is founded in their five personal knowing abilities, at the level of human native readiness for social meaning we find the (1) Protolinguistic sensemaking ability, and at the level of human's narrative abilities; we find (2) Order recognition, (3) Order establishing, (4) Canon appreciation, and (5) Canon influencing abilities (see Table 25).

Coding Bruner (1990) reveals 38 participating knowing constructs, they help to reveal from the stages (4) *Using existing meanings*, (5) *Construction and sharing of meanings*, and (6) *Building of culture* of the contrived framework (Figure 2) which are the relationships between language, meaning and knowledge (see Table 26).

Using existing meanings starts with (4a) recognizing normative values of the participating culture, and ends with (4b) acting in ways compatible with "way of life" canons. *Construction and sharing of meanings* starts with (5a) recognizing normative values of the participating culture, follows with (5b) interaction between acting and saying toward certain goals revealing narrator's perspective, and ends with (5c) narrating and legitimizing meanings.

In these two stages (4 & 5) the recognition of the quality of knower is presented in two different forms; as *application of knowledge* when the knower recognizes cannons and acts accordingly (4a & 4b), and as *creation of knowledge* when the knower narrates an orderly cannon-based story of justified acts searching for legitimacy (5b2).

Building of culture stars with (6a) assessing personal biological limits as a challenge, and ends with (6b) negotiating as enculturated knowledge new meanings and symbol-based systems and tools.

The six main knowing processes show clearly that Bruner's framed his theory following a canonical narrative-based knowledge construction approach, which assumes a native readiness for narrating, in particular, and abilities for social meaning, in general (See Figure 2).

These human abilities are challenged, in the context of recognized biological human limitations, and respond by creating new meanings to attend individual intentions, and new knowledge, as systems and tools, that redefined way of life.

Then, Bruner's meanings has to do with the particulars of canon-evaluated acts and narratives about human intentions, believes and desires, directed to certain goals; and knowledge has to do with human conceived symbol-based tools and systems that has been assimilated by the cultural setting as respond of (a) a particular persistent or key challenge presented by the outside world, and (b) the overcoming of human limitations.

In summary, Bruner's posits, from the perspective of knowing and meaning that:

(1) Individuals, as holders of certain personal intended behavior and states, share with others

(2) cultural settings that work as

(2a) interpretative systems, built around established or expected canonical patterns, to organize and know about experiences, and about social transactions; supported by

(2b) shared symbol-based systems and tools; in which

(3a) outside world states provides reasons for beliefs and desires; that is, the

(3) quest of meaning within culture; and that in the case of a

(3b) match between world states and personal intended states, it leads to keep

(4) using existing meanings, by

(4a) recognizing normative values of the participating culture; and

(4b) acting in ways compatible with "way of life" canons; and in the case of a

(3c) breach between world states and personal intended states, it leads to the

(5) construction and sharing of meanings by

(5a) recognizing normative values of the participating culture, in which the

(5b) interaction of acting and saying toward certain goals that reveals the narrator's perspective; which could be understood as

(5c) narrating and legitimizing meanings supported by means of

(5d) human's narrative abilities; which assumes

(5e) a human native readiness for social meaning that eventually confronts the

(6a) limits of the human biological substrate, which in turns challenges our cultural inventions by proposing

(6b) new meanings and symbol-based systems and tools, that are negotiated as enculturated knowledge; that is, the

(6) building of culture, which also implicates that

(3d) new meanings challenge the outside world states; which takes us back to the individual in a world of states that provide reasons for action and narratives, in a continuously constructed culture.

Bruner's Acts of Meaning - A canon-based and narrative-based knowledge building approach

Language, Meaning, and Knowing Constructs

Reference	Knowing Constructs' Context	Construct/Activity type		Knowing Constructs
1 Personal intended behavior and states	Outside world states provides reasons for personal intended behavior and states			*(1) Belief* *(2) Desire* *(3) Intention* *(4) Commitment*
2 Cultural setting	Shared interpretative system, built around established or expected canonical patterns, to organize and to know about experiences and about social transactions	Meanings	Sharing	*(5) Interpretative system* *(6) Established canonical patterns* *(7) Expected canonical patterns* *(8) Knowing experiences* *(9) Social transactions*
	Shared symbol-based system and symbol-based tools	Language	Sharing	*(10) Symbol-based system* *(11) Symbol-based tools*
3 Quest of meaning within culture	New meanings challenge the outside world states which provides reasons for personal intended behavior and states			*(12) Meaning* *(13) Outside world* *(14) Reasons for intended behavior* *(15) Reasons for intended states* *(16) Intended behavior* *(17) Intended states*
	Breach between world states and personal intended states leads to the construction and sharing of meanings	Meanings	Creation	*(18) Breach between world and intentions* *(19) Intended states* *(20) Construction of meaning* *(21) Sharing of meanings*
	Match between world states and personal intended states leads to use existing meanings	Meanings	Applying	*(22) Match between world and intentions* *(23) Usage of meanings*
4 Using existing meanings	4a. Recognizing normative values of the participating culture	Relation meaning–language / Recognition of the quality of knower	Applying & Sharing	*(23) Culture canons*
	4b. Acting and narrating in ways compatible with "way of life" canons			*(24) Routine act*
5 Construction and sharing of meanings	5a.Recognizing normative values of the participating culture	Relation meaning – language / Recognition of the quality of knower	*Creation & Sharing*	*(25) Culture canons*
	5b. Interaction of acting and saying toward certain goals revealing narrator's perspective departing from "way of life" cannons while searching legitimacy.			*(26) Act* *(27) Say* *(28) Goal* *(29) Narrator's perspective*
	5c. Narrating and legitimizing meanings			*(30) Narrate* *(31) Legitimize*
	Human's narrative abilities			*(32) Order recognition* *(33) Order establishing*
	Human native readiness for social meaning			*(34) Grasp situation significance* *(35) Construct social world*
6 Building of culture	6a.Biological limits challenge			*(36) Biological challenge*
	6b. New meanings and symbol-based systems and tools are negotiated as enculturated knowledge	Relation meaning-language - knowledge	Creation & Sharing	*(37) New meaning* *(38) Symbol-based system* *(10) Symbol-based tool* *(11) Enculturated knowledge*

Table 26. Bruner's (1990) Acts of Meaning: Framing Language, Meaning, and Knowing Constructs.

4.7 GOURLAY'S SEMIOTIC TACIT KNOWING

Gourlay's (2004; 2006) works question the lack of specifics about the concept of tacit knowing in extant research and reviews its theoretical a practical aspects.

Gourlay (2006) invokes a research procedure that mirrors the constant comparison method from grounded-theory studies (Strauss & Corbin, 1990); and through it exhausted the distinctions of the usage of the concept of tacit knowledge in empirical research published peer-reviewed journals in the fields of management, organizational and social studies.

Gourlay (2006) arrived to three distinct categories that described tacit knowledge as (a) the knowledge that in some degree had been externalized at certain time, (b) knowledge that could not be made explicit by the actor, but feel it; and (c) the behavior that could be observed, but the actor cannot provide an account of it.

In an effort to bound the issue of tacit knowledge, Gourlay (2006) argues that only observable behavior underpinned by unarticulated knowledge is an empirical phenomenon that provides firm grounds for inferring tacit knowledge; and that for the other cases we should consider leaving philosophical tribulations to philosophers.

Gourlay (2004) proposes a draft schema for a semiotic approach for knowing based on Dewey and Bentley's (1949) semiotic framework. Gourlay (2004)´s taxonomy of knowing proposes a transition that goes from (1) no symbol-based system in used (signals), to (2) loose symbol-base system in use (language, narratives), and (3) precise symbol-based system in use (mathematics, scientific denotation); and their associated types of activities: no-verbal, verbal.

Gourlay (2004) postulates that:

(a) Maybe the sign process component of behaving is knowing.

(b) Understanding of the sign process should be broad and include perceptual, manipulative, cognitive and linguistic manifestations.

(c) Explicit knowledge lies within the name designation and symbolic activities.

(d) Tacit knowledge is equivalent to pre-linguistic modes of human knowing, that is, knowing without designation (Gourlay made reference here to Dewey & Bentley's (1949) 'signal' and Bruner's (1966) 'enactive and iconic').

Gourlay (2004) ended his work inviting to study tacit knowing as a non-verbal signal-based process, to discover if we could manage it by training people to read it.

Gourlay (2004) provides a view of tacit knowing, departing from different seminal works (Dewey & Bentley, 1949; Bruner, 1966), that I found enriching, and at the same time compatible to the framed Polanyi (1958, 1966). (see Tables 16 and 17).

In response to professor´s Stephen Gourlay invitation, first it is interesting to recognize that clarity about individual knowing may come from different strings of research. The approach followed here to framed Polanyi (1958, 1966) provided a description of the tacit knowing process; description that I believe provides some light to professor Gourlay's postulates, as follows:

Polanyi's (1958) framed description of the instrumentalization of objects coincides with professor Gourlay's statements (a) and (b) regarding sign process as knowing, and that such understanding should be include perceptual, manipulative, cognitive and linguistic manifestations.

Polanyi's (1958) framed description of symbol-based knowing coincides with professor Gourlay's statements (d) regarding that explicit knowledge lies within the name designation and symbolic activities.

> Polanyi's (1958) framed description of inarticulate knowing and tacit knowing coincide with professor Gourlay's statements (d) regarding as being equivalent to pre-linguistic modes of human knowing, that is, knowing without designation.

Given Gourlay´s (2004) invitation, an exploratory approach could consider Polanyi's (1958) language laws to explore the concept of signals laws in tacit knowing.

Such exploration holds two strings of actions. First, Gourlay (2004) insistence on observing "non-articulated knowledge revealing behavior", as the empirical phenomenon that gives account of tacit knowing, could be used to validate Polanyi's (1958) tacit knowing abilities, like confirming if people is *recognizing or contriving certain order, anticipating generalization,* and so on.

The second action proposes a line of research into novel aspects of tacit knowing, like the case of the public and known tendency of enacting new symbol-based systems through information and communication technology.

I argue that we are in the need of a semiotic frame of reference for understanding knowing when the symbol-based system used to designate objects, actions and behavior provides designations that are similar in scale to the perceived signal.

The insinuated challenge is related for instance to the understanding of the tacit knowing of kids when they play and win in electronic games; a knowing that they cannot explain with words much about it; but explain it with incomplete descriptions while interacting with the video-based system embedded in the game.

Soon, those kids will be managing organizations interacting with devices in which signs and signals are equivalent.

4.8 INDIVIDUAL LEVEL KNOWING - AN ENRICHED PERSPECTIVE

Here, I advocate that the understanding of knowledge as committed (Polanyi, 1958, 1966), enculturated (Bruner, 1990), and enacted (Weick, 1995) offers an enriched perspective for the understanding of the process of knowing; an integrated perspective that holds no conflicting claims; but better, it captures a compelling frame, in which the three qualifications fit together and complement or extend each other. In order to appreciate their complementarities let's star summarizing their respective ontology:

In Polanyi (1958) there is a reality that its framing asks for my commitment, in which I recognized that my limited perception abilities hold the tension between sharpness and reasonableness.

In Bruner (1990) there is a reality that challenges my intentions and there is a shared culture, through which, or by enriching it, I legitimize the satisfaction of the intentions.

In Weick (1995) there is a reality that I can accept or interpret differently by enacting it.

In these ontological stances, the personal interpretation framework is related to different, progressive and complementary tensions, which could be characterized within the biological (Polanyi, 1958), cultural (Bruner, 1990) and intellectual (Weick, 1995) approaches. We could also say that such tension is exemplified in the personal posture assumed to interpret reality, which goes from a passive reading of reality that eventually shapes us, to an active reading that focus in shaping a different reality.

In the epistemological side of these theories, so far, we have reviewed extensively each epistemology independently, now we will explore them critically from an

integrating posture. Knowing drives, knowing abilities, language and meaning constructs, and knowing processes will be compared to identify complementarities and conflicts.

One relevant idea of this integration is that it proposes a way of clarifying the tension between tacit knowing and explicit knowing, by (a) understanding them as dependent on the level of the systematic symbolic content in the knowing and (b) how this knowing is assimilated and enacted subsidiarily.

That is, human knowing drives contrive and use tools to satisfy urges, and it is in that process that the level of the symbolic preciseness and scalability of the participating knowing tool defines the level of representation (explicitness) of the knowledge in play.

By following these general ontological and epistemological postures, the integrated description of personal drives, abilities, language, meanings and knowing processes will finally portray an enriched perspective of individual knowing that is built over extant and well referenced knowing theories, that had not been previously integrated, or in some cases partially misread.

4.8.1 Knowing Drives and Abilities

Ten different types of drives trigger knowing according to Polanyi (1958), Weick (1995) and Bruner (1990) in human beings. These drives cover most aspects of human nature, from basic biological human urges, to the need for situational sense, the passion for intellectual sense, the attention to personal desires and intentions, the challenges implied in the recognition of human limits and personal intentions, and finally the desire for companionship.

The specific list includes (1) Appetite satisfaction, (2) Perceptual sensemaking, (3) Surrounding sensemaking, (4) Need of intellectual sense, (5) Passion for intellectual sense, (6) Desire for companionship, (7) Ill-defined situations, (8) Enacted situations, (9) Breach between world states and personal intend, and (10) Challenge to the limits of our biological substrate (see Table 30).

This inventory of knowing drives says a lot about the foundations of asserting the truth (satisfaction of needs), the discovery process (sense making), inventing (intellectual passion, overcoming limits, and self-triggering), and knowledge sharing (need for companionship and attending desires).

Here again, at this level there are not conflicting approaches, but plausible complementarities. That is even the case between the (4) Need of intellectual sense and (7) Ill-defined situations, since the first one ask for intellectual satisfaction, as explicitly posit by Polanyi (1958), the second drive considers a complex set of rational, emotional and social needs (Weick, 1995).

Attending these drives invokes a set of knowing abilities that are grouped in three sequentially supportive categories: (a) Native knowing, (b) Ability-based knowing, and (b) Symbol-based knowing (see Table 31).

Polanyi, Weick, and Bruner present similar sets of abilities, but with different emphasis, however all of them depart from order or pattern recognition, and end with plausible expliciting.

Polanyi (1958) argues for 10 abilities grouped in the primitive, heuristic and intellectual categories. This set of abilities excludes emotional aspects and considers

cultural issues partially (see Table 27). Abilities for knowledge creation are considered mostly from the perspective of the linkage between language and meaning.

Weick (1995) argues for 13 abilities that reveal a very well structured set that considers rational, emotional and social aspects. However, native abilities are not considered in his approach (see Table 28).

Bruner (1990) argues for two sets of abilities. First is the native readiness for social meaning presented as protolinguistic sensemaking ability. The other set correspond to the four legitimizing abilities regarding cannons recognitions and establishing. These abilities focus on recognizing and following the patterns of a given culture or legitimizing new patterns through plausible linguistic artifacts (see Table 29).

Difference in the description of abilities resides in the level of details. Polanyi's approach presents a foundational set of 10 heuristic abilities (pattern recognition, generalization and commitment), Weick offers the most granular explanation for sensemaking with 13 rational and emotional abilities for making sense of everyday life, and Bruner presents five (5) abilities to attend cannon appreciation and influencing within a culture and in the world.

All of these 28 abilities conform together a non-conflicting set that attends most knowing human urges.

4.8.2 Knowing Constructs: Language and Meanings

The understanding of the language and meaning constructs in the context of knowing follows two complementing routes.

The first, proposed by Polanyi, presents an integrated and balanced approach that flows from symbolic representation and operation to meaning and back.

The second, proposed by Weick and Bruner, departs from a higher level in the usage of language – narratives - while making emphasis in meaning.

Polanyi achieves to integrate language, meaning, and knowledge following a framework that covers the three classical approaches to meaning: cultural (general interpretative framework), conceptual (logic to frame the meaning of experiences), and referential (principles of symbol representation and operation to denote objects of experience) (see Table 27).

Weick and Bruner do not talk about the logic of language denotations, however Bruner's approach refers to the usage of certain terms that operate as culture-based canon qualifiers (e.g. always, frequently) and argument concatenation (e.g. and, but, therefore); while Weick refers to conversing about plausible stories while using satisficing naming of objects. Both of them argue about the logic of telling a plausible story; Bruner making emphasis in legitimacy within the cannons of the culture or by overcoming human's limits by negotiating the creation and acceptance of new tools and symbol-based systems; and Weick in conversations with others and self to enact emerging patterns (see Tables 28 and 29).

Weick goes beyond in the issue of sharing meanings and posits, what it is labeled here as *workable social formations*, seven approaches to joint action: (1) non-disclosive intimacy, (2) equivalent meanings, (3) shared meanings, (4) satisficing naming of objects, (5) collective action experiencing, (6) distributed meanings, and (7) overlapping views of ambiguous events.

Then we have here, two complementary approaches, one that emphasizes language as meaning building, and other that describes social acts as meaning building.

Interestingly, both approaches get close when Polanyi (1958) talks about failures in symbolic representation that may rigger innovative actions with or without symbolic representation, and Weick (1995) refers to socially satisficing naming of objects in the context of habilitating acts.

4.8.3 Knowing Principles and Processes

The comparison of the knowing processes of Polanyi (1958), Weick (1995) and Bruner (1990) is segmented in three aspects: (a) tools roles, (b) knowledge application and creation process, and (c) knowledge sharing.

Polanyi and Bruner argue for (a) tools as a human's response to overcome our limitations, and conceive its instrumentalization as knowledge (Polanyi's instrumentalization of objects and Bruner's enculturated knowledge). Both of them refer to the symbolic content of tools (Polanyi's language principles and Bruner's assimilation of symbol-based systems to the cultural interpretative framework).

In (b) knowledge application and creation process, Polanyi breaks apart the knowing process into the subsidiary tacit knowing, ability-based knowing, and symbol-based knowing; however, our reading emphasizes the process of instrumentalization of objects as the mechanism that separates ability-based knowing (with the usage of non-symbol based tools) from symbol-based knowing (with the usage of symbol-based systems).

Weick and Bruner treat only the symbol-based knowing process. Weick describes the logic of discovering by telling and enacting constrains that lead to accept reality as is, and the logic of inventing by telling and enacting enablers that lead to create a new reality.

Complementarily, Bruner describes the dilemma of satisfying personal intentions and desires in the context of an outside world that may be compatible with the meanings of our culture, in which case we go by using existing tools of our culture; but in the case of an unsolved breach, we either narrate a legitimization of our non-orthodox canonical acts, or, if need it, we construct tools or symbol-based systems to bridge the gap with the outside world, which eventually are negotiated as enculturated knowledge.

Finally, (c) in the knowledge sharing approach, Polanyi (1958) recalls the need to overcome human limits as driver for sharing knowledge, the externalization of it is shaped by the adequacy of the symbolic system of the tool in used, and observes that it may exclude premises about assimilation of tools for physical skills, and operation of interpretative frameworks for intellectual skills, since they are known subsidiarily.

Polanyi also describes a framework that recognizes the authority of the master in the context of the trust of the learner in a convivial environment; while Weick makes emphasis in the search of describing self or defining self by means of conversations with self and others regarding the situation on hand through vernacular language and artifacts to form workable social understandings; and Bruner, complementarily follows the recognizing normative values of the participating culture to narrate a legitimizing story of the shared meanings.

See Tables 27, 28, and 29 for a summary of each individual level knowledge view, and Table 30 for an integrated view of them.

Polanyi's Personal Knowing: A commitment to heuristics, instrumentation, intellectual passion, and convivial approach

Summary of Drives, Abilities, Constructs and Processes

[a] Drives of knowing behavior	[b] Knowing abilities	[c] Knowing constructs: [c1] Language & knowledge – [c2] Meanings & knowledge	[d] Knowing principles or processes: [d1] Principles & processes – [d2] Recognition of quality of knower
Knowledge activities: [A]pplication, [C]reation or [S]haring			
Inarticulate drives:	**Primitive abilities:**	**[c1&c2] Principles of language-oriented meaning framed by culture**	**[d1]Tacit knowing process & Instrumentalization of objects**
A C 1. Appetite satisfaction	A C 1. Innate motility power	A 1. Meanings commits focally to a culturally constructed interpretative framework.	A **subsidiary process** characterized by:
A C 2. Perceptual sensemaking	A C 2. Innate sensory power		A 1. Invoking subsidiarily a set of **heuristic abilities** to use **tools** (with or without symbolic representation) as part of our existence. C
A C 3. Surrounding sensemaking	A C 3. Innate mix of sensory-motor-logical powers	A 2. Selecting language symbols is subsidiary, in a focally attended situation; in which pattern recognition and anticipatory abilities:	A 2. **Tools** in which, we recognize or contrive certain **order, anticipate generalizations, commit** and rely. C
Articulate drive:	**Tacit heuristic abilities:**	C 2a. Organize classes of meanings by common not specifiable properties.	A 3. Invoked abilities must meet truth-committed **private or public standards** of performance in terms of the **symbolic nature of the tools** in use. C
A C S 4. Need of intellectual sense	A C 4. Ordering & pattern recognition & contriving	C 2b. Describe incompletely meanings through definitions expressed as maxims that guide understanding in action.	A 4. While holding tool's symbolic content tension between: Rich, connected & less reversible ↔ Precise, detach & more reversible Routine (rich scalability) ↔ Novelty (limited scalability) C
	C S 5. Anticipating generalizations		
	A C S 6. Intellectually commitment	C 3. Conflicting denotations are solved by the speaker's sense of fitness to reality in terms of the object and not the symbol.	**[d2] Knowledge sharing propositions - Recognition of knower**
Knowledge creation drives:	**Intellectual abilities:**	C 4. Disagreements between tacit thoughts and symbolic operations is considered either invention or correction of fumbling; which if successful it will show novelties. S	S 1. **Authority** of master and **trust** of learner support learning of shared tools and their use for carrying messages among them. A
C S 5. Passion for intellectual sense	A C S 7. Denoting symbolically		S 2. Assimilation of historical intellectual artifacts and rituals starts with an **act of affiliation** to a community that nurtures its traditions and values, and follows with a commitment to act according to their standards **by indwelling in their practice.** A
	C 8. Heuristic passion		
	C S 9. Persuasive passion	C 5. When representation or operation of language symbols in use is not effective for a particular experience, our knowing may stay tacit, and may trigger the knowing, explicit or not, of novel aspects of the experienced object. S	
	C S 10. Plausible expliciting		
	[d1] Knowledge creation logic		A 3. As learners show results, their justified knowledge validates confidence in masters, **releasing** the tension of **the trusting** heuristic **conjecture**.
Knowledge sharing drive:	C Knowledge created is **(1)** submitted to the personal adhered public standard that educated people hold, and **(2)** at scientific level, to the methods that academics formally set, **(3)** such knowledge changes oneself by framing new ways of seeing reality, and **(4)** drives to convert others by sharing a vision, **(5)** that is not only argue by its certainty and systematic relevance, but by its plausibility. S	**[c1 & c2] Sharing meanings framework**	
A S 6. Desire for companionship		S 1. **Cultural approach**: conviviality, authority, and trust shape the general interpretative framework.	S 4. Given **limited** personally **justified knowledge**, we **continue trusting authority** of others for lots domains of knowledge. A
S 7. Overcome human limits		A **2. Conceptual approach**: ordering, generalizing, and committing human's heuristic abilities frame the particular experience.	C 5. **Rejecting imitation** of masters' doings and sayings, affects his authority, and leads the dissenter to be a new teacher, **gaining authority**.
		C 3. **Referential approach**: follows poverty, consistency, iteration, grammar, and manageability symbols laws to scale up or down the notation of objects to the dimensions of our comprehension; while ineffective representation or operation may stay tacit, open to novel interpretations, with or without symbolic representation.	S 6. **Convivial existence** of a group transcends individuals and time, establishing **continuity** of future knowledge **sharing activities**.
			Note: Triggered to overcome human limits, shaped by symbolic system in use & may exclude premises about tools assimilation & operation of interpretative frameworks

Table 27. Polanyi's (1958, 1966) Personal Knowledge: Summary of drives, abilities, constructs, and processes.

Weick's Sensemaking: A plausible and enacted knowledge discovering and inventing approach

Summary of Drives, Abilities, Constructs and Processes

[a] Drives of knowing behavior			[b] Knowing abilities				[c] Knowing constructs: [c1] Language & knowledge – [c2] Meanings & knowledge				[d] Knowing principles or processes: [d1] Principles & processes – [d2] Recognition of quality of knower			
Knowledge activities: [A]pplication, [C]reation or [S]haring	**Knowing drives:**		**Sensemaking abilities:**				**[c1] Language in Plausible knowing**				**[d1] Language, Meaning and Knowing Processes**			
	A		A	C		1. Perception filtering		C	S	[2.8] Plausible, coherent, and reasonable stories (metaphors, paradigms, cause maps), show patterns of what is already in the mind and insinuate more order for the future.	A	C		[1] In Structuring the unknown, …
	C	1. Ill-defined situations	A	C		2 & 3. Pattern recognition					A	C	S	[2] Skills and context shape and bound the stories told; in which a …
	S													
	A	2. Enacted situations	A	C		2. Perceptual pattern recognition					A	C		[3] Faithful presumption of certain contextual order is follow by a …
	C													
	S													
			A	C		3. Emotional pattern recognition	**[c1] Language in Social knowing**				A	C		[4] Stimuli-based reverse clarification process; in which …
			A	C		4. Pattern simplification			S	[7.1] Conversation with others and self about what the implicated think about the situation.	A	C		[5] Interruptions invoke our emotional memory; all this …
				C		5. Pattern contriving			S	[7.2.d] Satisficing naming of objects	A	C	S	[6] In search of describing self or defining self; …
			A	C		6 & 7. Commitment	**[c2] Meanings as Workable Social Formations**				A	C	S	*[7] Through workable social understandings that …*
			A			6. Tight commitment to recognized patterns	A			[7.2.a] Non-disclosive intimacy	**[d1 and d2] …and Recognition of quality of knower**			
				C		7.Loose commitment to contrived patterns	A		S	[7.2.b] Equivalent meanings	A	C	S	*[8] Triggers constraining or habilitating acts, in a now …*
				C		8. Suspending judgments	A		S	[7.2.c] Shared meanings	A	C		*[8.3] Redefined situation that invites to more knowing.*
			A	C	S	9. Interacting through vernacular language and artifacts	A	C	S	[7.2.d] Satisficing naming of objects				
			A	C	S	10. Forming social workablenesses	A	C	S	[7.2.e] Collective action experiencing				
			A		S	11. Enacting known categories/patterns	A	C	S	[7.2.f] Distributed meanings				
				C		12. Enacting new categories/patterns	A	C	S	[7.2.g] Overlapping views of ambiguous events				
				C	S	13. Plausible storytelling								

Table 28. Weick's (1995) Sensemaking: Summary of drives, abilities, constructs, and processes.

Bruner's Act of meaning: A canonical narrative-based knowledge building approach

Summary of Drives, Abilities, Constructs and Processes

[a] Drives of knowing behavior			[b] Knowing abilities				[c] Knowing constructs: [c1] Language & knowledge – [c2] Meanings & knowledge				[d] Knowing principles or processes: [d1] Principles & processes – [d2] Recognition of quality of knower				
Knowledge activities: [A]pplication, [C]reation or [S]haring															
Knowing drives:			**Native readiness for social meaning**				**[c1 & c2] Applying existing language & meanings**				**[d1] Knowing Processes**				
	A	**Quest of meaning within culture:** Breach between world states and personal intended states leads to meaning construction.	A	C	S	1.Protolinguistic sensemaking	A	C	S	1. Recognizing normative values of the participating culture	*Individuals, as holders of certain …*				
			Legitimizing abilities				A		S	2. Acting and narrating in ways compatible with "way of life" canons		1. Personal intended behavior and states, *share with others …*		
			A	C		2. Order recognition	**[c1 & c2] Creating narratives and sharing of meanings**					2. Cultural settings *that work as …*		2a.Interpretative systems, built around established or expected canonical patterns, to organize and know about experiences, and about social transactions, *supported by …*
				C	S	3. Order establishing	A	C	S	3. Recognizing normative values of the participating culture				2b. Shared symbol-based system and tools; *in which …*
	C		A	C		4. Canon appreciation								3a. Outside world states provides reasons for beliefs and desires, *that is, the …*
				C	S	5. Canon influencing		C	S	4. Interaction of acting and saying toward certain goals revealing narrator's perspective		3. Quest of meaning within culture; *and that in the case of a …*		3b. Match between world states and personal intended states, *it* leads *to keep …*
	S							C	S	5. Narrating and legitimizing meanings	**[d1] Knowing processes & [d2] Recognition of quality of knower**			
								C	S	6. New meanings challenge the outside world states	A	C	S	4. Using existing meanings, *by …*	4a. Recognizing normative values of the participating culture, *and …*
							[c1 & c2] Creating enculturated knowledge				A		S		4b. Acting in ways compatible with "way of life" canons; *and in the case of a …*
								C	S	7. New meanings and symbol-based systems and tools are negotiated as enculturated knowledge					3c. Breach between world states and personal intended states, *it leads to the …*
	A	**Culture building:** Limits of our biological substrate are overcome by our cultural inventions.									A	C	S	5. Construction and sharing of meanings *by …*	5a. Recognizing normative values of the participating culture, *in which the …*
												C	S		5b. Interaction of acting and saying toward certain goals reveals the narrator's perspective, *which could be understood as …*
	C											C	S		5c. Narrating and legitimizing meanings *supported by means of …*
											A	C	S		5d. Human's narrative competences, *which assumes a …*
	S										A	C	S		5e. Human native readiness for social meaning, *that eventually confronts the …*
											[d1] Knowing Processes				
														6. Building of culture, *which also created …*	6a.Limits of the human biological substrate, which in turns challenges our cultural inventions *by proposing …*
												C	S		6b. New meanings and symbol-based systems and tools, *that* are negotiated as enculturated knowledge; *that is, the …*
															3d. New meanings challenge the outside world states; *which takes us back to the individual in a world of states that provide reasons for action and narratives in a continuously constructed culture.*
												C	S		

Table 29. Bruner's (1990) Act's of meaning: Summary of drives, abilities, constructs, and processes.

I n d i v i d u a l K n o w i n g V i e w

S u m m a r y o f K n o w i n g D r i v e s , K n o w i n g A b i l i t i e s , K n o w i n g C o n s t r u c t s a n d K n o w i n g P r o c e s s e s

[a] Drives of knowing behavior				[b] Knowing abilities				[c] Knowing constructs: [c1] Language & knowledge – [c2] Meanings & knowledge				[d] Knowing principles or processes: [d1] Principles & processes – [d2] Recognition of quality of knower			
Polanyi	A	C	S	1. Appetite satisfaction	A	C		**Primitive abilities:** Innate sensory-motor-logical powers	**[c1 & c2] Language-oriented meanings framed by culture**				**[d1] Subsidiary knowing process & Instrumentalization of objects**		
	A	C	S	2. Perceptual sensemaking	A	C	S	**Tacit heuristic abilities:** patten recognition, generalizing and committing			S	**Cultural approach**: conviviality, authority, and trust shape the general interpretative framework.	A	C	Invoking subsidiarily heuristic abilities to use tools as part of our existence. Tools in which, we recognize or contrive order, anticipate generalizations, commit and rely. Abilities must meet private or public standards of performance in terms of the symbolic nature of tools in use. While holding tool's symbolic content tension between: Rich & Precise, and Routine & Novel.
	A	C	S	3. Surrounding sensemaking					A			**Conceptual approach**: ordering, generalizing, and committing human's heuristic abilities frame the particular experience.			
	A	C	S	4. Need of intellectual sense	A	C	S	**Intellectual abilities:** Denoting symbolically, heuristic passion, persuasive passion, and plausible expliciting		C		**Referential approach:** follows poverty, consistency, iteration, grammar, and manageability symbols laws to scale up or down the notation of objects to the dimensions of our comprehension; while ineffective representation or operation may stay tacit, open to novel interpretations, with or without symbolic representation.	**[d1] Knowledge creation logic**		
		C	S	5. Passion for intellectual sense										C	S	Knowledge created is submitted to the personal adhered public standard of educated people or at scientific methods that academics formally set; such knowledge changes oneself by framing new ways of seeing reality, and drives to convert others by sharing a vision, that is not only argue by its certainty and systematic relevance, but by its plausibility.
	A		S	6. Desire for companionship									**[d2] Knowledge sharing propositions - Recognition of knower**		
			S	7. Overcome human limits				**Sensemaking abilities:** Perceptual and emotional pattern filtering, recognition, simplification and contriving; suspending judgment, vernacularly interacting, tight and loose committing, forming social workablenesses, enacting known or new categories / patterns, and storytelling.	**[c1]Language in *plausible* and social knowing**				A		S	Master's authority and learner's trust support learning of shared tools and their use for carrying messages among them; traditions and values are assimilated by indwelling in the community's practice. Trust in master is validated by results; and given limited personally justified knowledge, we continue trusting others. Rejecting imitation of master, affects his authority, and leads dissenter to authority. Convivial group's existence transcends individuals and time, establishing the continuity of sharing activities.
Weick	A	C	S	8. Ill-defined situations					A	C	S	*Plausible* stories show patterns and insinuate the future through conversations with self and others using satisficing naming.			
	A	C	S	9. Enacted situations					**[c2] Meanings as Workable Social Formations**						
									A	C	S	Oriented to joint action based on: Non-disclosive intimacy, equivalent meanings, shared meanings, satisficing naming of objects, collective action experiencing, distributed meanings, overlapping views of ambiguous events.	**[d1, d2] A *plausible* & enacted knowledge discovering and inventing approach**		
Bruner	A	C	S	10. Breach between world states and personal intend					**[c1 & c2] Applying existing language and meanings**				A	C	S	In structuring the unknown, skills and context shape and bound the stories told; in which a faithful presumption of certain contextual order is followed by a stimuli-based reverse clarification process; in which interruptions invoke our emotional memory; all this in search of describing self or defining self; through workable social understandings that triggers constraining or habilitating acts in a now redefined situation that invites to more knowing.
	A	C	S	11. Limits of our biological substrate are overcome by our cultural inventions.	A	C	S	**Native readiness for social meaning:** Native protolinguistic sensemaking	A		S	Recognizing normative values of the culture and acting and narrating in ways compatible with canons of the "way of life"			
	7 + 2 +2 = 11 Knowing Drives								**[c1 & c2] Creating narratives and sharing of meanings**						
					A	C	S	**Legitimizing abilities:** order recognition, order, establishing, canon appreciation, and influencing		C	S	Interacting toward certain goals revealing the narrator's perspective, while recognizing the normative values of the participating culture, to narrate legitimate meanings that challenge the states of the outside world.	**[d1, d2] A canonical narrative-based knowledge**		
									[c1 & c2] Creating enculturated knowledge				A	C	S	Individuals, holder of intentions, share with others a canonical interpretative system to know about experiences; that is supported by shared symbol-based systems and tools; in which the outside world provides reasons for beliefs and desires. The matching of world states with intentions leads to act according to canons; but in case of a mismatch, it leads to building and sharing meanings by narrating legitimizations through our native readiness for social meaning, which eventually confronts own limits, which triggers inventions that propose new meanings, systems and tools, negotiated as enculturated knowledge.
					10 + 13 + 5 = 28 Knowing Abilities					C	S	To overcome biological limits, humans challenge them with new meanings and symbol-based systems that are negotiated as enculturated knowledge.			

Table 30. Individual Knowing View (IKV): Summary of drives, abilities, constructs, and processes.

4.8.4 Individual Knowing (IK) Framework: Personal, Cultural and World States Layers

Another way of seeing the integration of these three theories of individual knowing is to recognize that the reviewed individual knowing theories follow, in their understandings the same ontological structure – (P) Personal, (C) Cultural, and (W) World states layer – and a similar logical structure for explaining their epistemology (knowing drives, knowing abilities, knowing performance criteria, and tools). See Table 31.

The (P) Personal layer is structured in a hierarchy composed by (K1) Native knowing (white colored), (K2) Ability based-knowing (light gray colored), and (K3) Symbol-based knowing (dark gray colored), in which K1 supports K2 and K3, and K2 supports K3 (ass denoted by the arrows). All these three knowing sub layers are logically explained by the sequence given by five structural elements of the (P) Personal layer: (PL) Human biological limits, (PD) Knowing drives, (PA) Abilities, (PC) Performance criteria, and (PT) knowing Tensions.

At this Personal layer there are personal tools (PT1 and PT2) that correspond to less or more sharable knowledge respectably that denotes instrumentalized physical or intellectual objects based on personal native abilities (PA.1) and general physical and intellectual heuristic abilities (PA.3) for less shareable tools (PT1), and based on PA.1, and sensemaking abilities (PA.4) for more shareable tools (PT2),

The (C) Cultural layer is described by two elements. First, by its (CI) Interpretative Systems, which is composed by the (CI.1) Initial assimilation processes and the (CI.2) Ongoing workable social formations; and second by its (CT) Tools, which in turns are composed by (CT.1), Non-symbolic tools and (CT.2) Shared symbol-based systems.

The (W) World states layer is described by the capacity to (W1) Provide humans reasons for beliefs and desires in which the (W1.1) Match between world states and personal intended states leads to either the use of existing (CI) Interpretative systems and (CT) Tools through the (PA.6) Cannon appreciation ability; and the (W1.2) Gap between world states and personal intended states leads to either the triggering of (PA.6) the Cannon influencing ability for the case that the gap could be plausible justified using existing meanings and tools, or the triggering of either the (PA.4) Sensemaking abilities or the (PA.5) Intellectual abilities to invoke human inventiveness to conceive (CI.2) Workable social formations or (CT) Tools that bridge the gap between world states and personal intended states.

At the (P) Personal layer, the (P1) Human biological limits mainly defined by the limits of our (P1.1) Memory capacity and (P1.2) Perceptual sharpness, which characterize the limits of all of our (PA) abilities and the tension of our knowing performances (PT); and defines the threshold in which humans start searching for the instrumentalization of objects to overcome our limits. This overcoming holds the alternative of either following the (K2) Ability-based knowing route to use or create (CT.1) Non-symbolic tools, or the (K3) Symbol-based knowing route to use or create (CT.2) Shared symbol-based systems. This last case is triggered by the primitive (PD.2) Desire for companionship driver and supported by the (PA.2) Native proto-symbolic predisposition to social meaning ability.

The (PD) Knowing drives are composed by two (K1) Native knowing drives, the (PD.1) Primitive biological and perceptual appetites and the (PD.2) Desire for companionship (which explains the development, in the (C) Cultural layer, the formation of (CT.2) Shared symbol-based systems). At (K2) Ability-based knowing level there is a general drive called the (PD.3) Fundamental need of intellectual sense. At (K3) Symbol-based knowing level, the drives are

triggered by the (PD.4) Situational sensemaking appetite, (PD.3) Educated and scientific passion for intellectual sense, or (PD.3) Personal intended behaviors and desires.

The (PA) Knowing abilities are composed by two (K1) Native knowing abilities, the (PA.1) Primitive innate sensory-motor-logical powers and the (PA.2) Native proto-symbolic predisposition to social meaning. At (K2) Ability-based knowing level there is a set of three abilities grouped under la the label (PA.3) General physical and intellectual heuristic abilities, which is composed by the Order Recognition, Pattern Generalization, and Commitment to instrumentalization abilities. At (K3) Symbol-based knowing level, the corresponding abilities are the (PA.4) Sensemaking abilities, (PA.5), the Intellectual abilities, and (PA.6) Legitimizing abilities. Notice however, that some abilities composing PA.4 and PA.6 are part of the ability-based knowing set (shown in dark gray in Table 31).

The (PC) Performance criteria at (K1) Native knowing is the (PC.1) Private standard of appetitive satisfaction. At (K2) Ability-based knowing level there is a set of two criteria grouped under the label (PC.2) Heuristics Criteria, which is composed by the Private standard of usefulness for physical acts and Private standards of intellectual beauty for intellectual acts; and there is also, at K2 level, the (PC.3) Private standard of everyday sensemaking. At (K3) Symbol-based knowing level, the corresponding criteria are the (PC.4) the Public standard of intellectual duty, and the (PC.5) Public standard of canonical duty).

The (PT) Tensions at (K1) Native knowing corresponds to the tension between (PT.1) Sharpness of contour and Image reasonableness. At (K2) Ability-based knowing level there are the tensions (PT.2) Heuristic Tension that corresponds to the tension between Wiliness of acting judiciously and Confidence of executing a novelty, and the tension (PT.3) between Self-image caring behavior and Innovative transacting behavior. At (K3) Symbol-based knowing

level, the corresponding tensions are (PT.4) between Constraining acts and Habilitating acts, the tension (PT.5) among Certainty and Systematic relevance and Plausibility, and the tension (PT.6) between Committing to existing canons and Building and sharing new canons.

The sequences showed between the personal, cultural and world layer using blue arrows are not exhaustive, but examples that illustrate the level of explication of the model.

This personal knowing framework while integrating descriptions of primitive knowing, ability-based knowing, everyday knowing, and intellectual knowing; also incorporates descriptions for the role of language, meaning and the processes of sharing and creating knowledge, and proposes in an integrated way the epistemological and ontological drafts of the routine and the innovative knowing behavior.

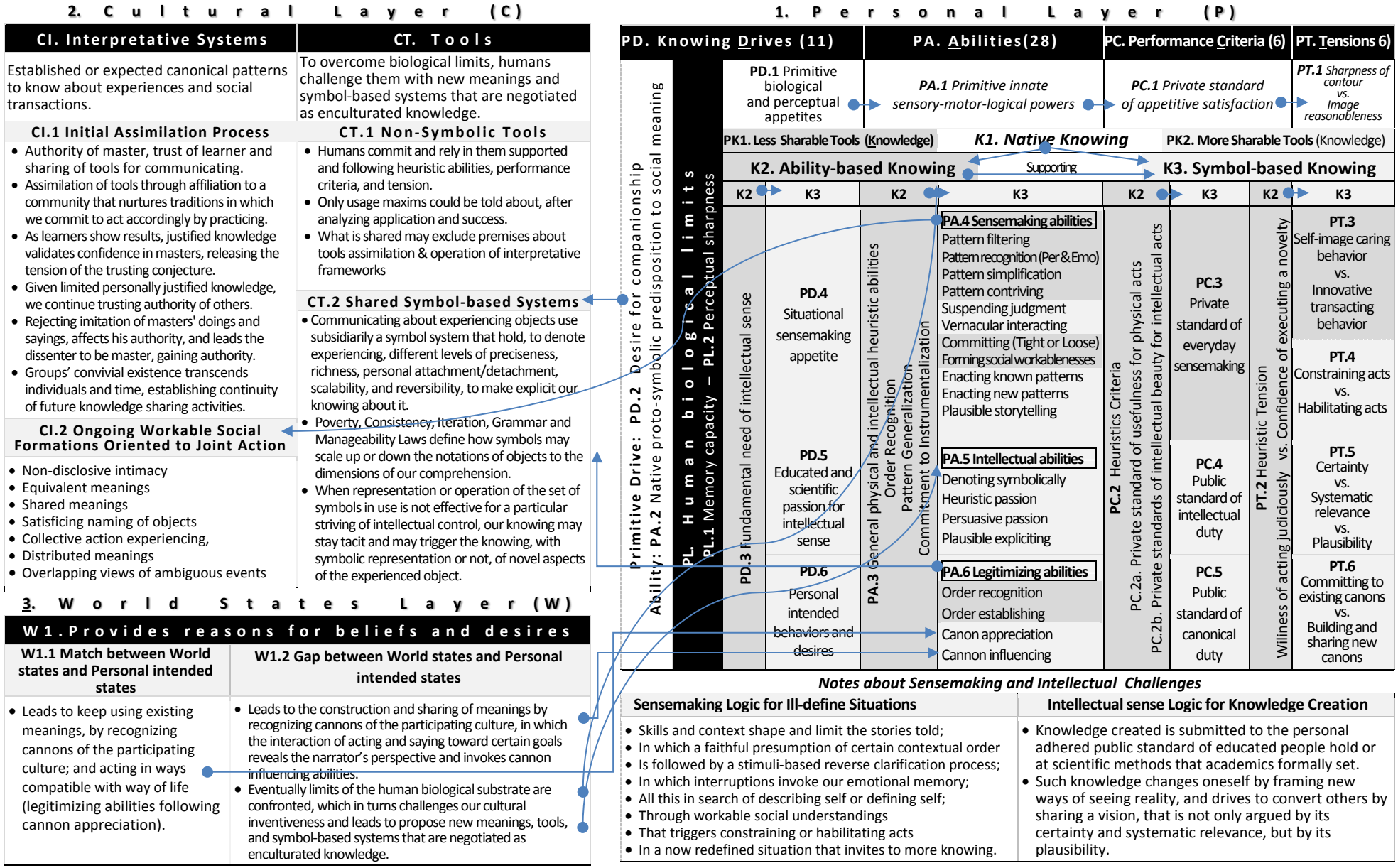

Table 31. Integrated Knowing Framework (IKF): Personal, Cultural and World states layers.

4.8.5 Integrated View of Language, Shared Meanings and Recognition of Knowers

Considering the emerged Individual Knowing View (Table 30), we are ready to explore an integrated view of (a) language, (b) shared meanings, and (c) the criteria by which a knower is recognized. This view attends

This view (see Table 32) will point out (*in italics),* the implied type of knowing activities (sharing knowledge, applying knowledge, and creating knowledge).

Interestingly the proportion of activities types characterized by the "language" construct (4) is lower than those related to "shared meanings" (8), and much lower than those related to "recognition of knowers" (11).

Since all these activities implied some level of tension, a preliminary discovery is that knowing-who related activities may hold greater tension that the other types of activities.

In addition, given that (a) "language" may invoke 3 sharing, 1 applying, and 2 creating instances of knowing types; and (b) "shared meanings" may invoke 4 sharing, 5 applying, and 5 creating; and (c) "recognition of knowers" may invoke 4 sharing, 4 applying, and 8 creating instances of knowing types, then (a) "language" reveals to be tool oriented for sharing knowledge, (b) "shared meanings" presents a more balance profile among knowing activity instances, and (c) "recognition of knowers" seems to be the tool for creating knowledge.

In here, (1) language is conceived as:

(1a) shared contrived cultural tools, based on symbol-based systems used subsidiarily for communicating about the experiencing of objects or events to make explicit our knowing about them (*language as tool for sharing knowledge*).

(1b) tools that denote our knowing to the dimensions of our comprehension with different levels of preciseness, richness, attachment/detachment, scalability, and reversibility depending on the poverty, consistency, iteration, and grammar that govern the systematization of the symbolic system (*different characteristics of the symbol system hold and in use implies different gradients of knowledge sharing*); and

(1c) when representation or operation of the set of symbols in use is not effective for a particular striving of intellectual execution, our knowing may stay tacit and may trigger the knowing, with symbolic representations or not, of novel aspects of the experienced object (*ineffectiveness of the symbol system in use may limit knowledge sharing or trigger creating knowledge*).

(1d) And finally, language is conceived as a challenging and changing symbol-based tools in which specific symbols reflect the sensitivity to cultural canons and to human‘s limits. Here, narrating structures reveals either teller’s compliance to existing symbols or systems or legitimating of new ones (*human limitations confronting challenges may trigger either the application of the existing symbol system to narrate a legitimating or plausible approach, or the creation of new symbols or new symbol systems that re-state the challenge*).

Complementarily, (2) shared meanings first is understood (2a) threefold in the tension among:

(2a1) its conception through perceptual or emotional heuristic ordering, generalizing, and tight or loose committing – conceptual approach (*different gradients of commitment implies a transition from knowledge application to knowledge creation*),

(2a2) its enactment through workable social formations oriented to trigger different gradients of reading-authoring joint actions – cultural approach (*each type of workable social formations holds different levels of sharing, applying and creation of knowledge*), and its

(2a3) denotation through symbolic systems – referential approach (*symbolic systems as a way of sharing meanings*); including the possibility of being ineffective.

In this last understanding (referential), it is that shared meanings (2b) could be seen as:

(2b1) plausible stories that show patterns and insinuate the future through conversations with self and others through satisficing naming (*sharing and applying knowledge by representing its meaning through existing shared symbolic systems*), or as

(2b2) canon legitimization stories that enrich cultures (*sharing and applying knowledge by representing its meaning through existing shared symbolic systems*).

Finally, (2c) shared meanings hold the reactive-proactive tension among:

(2c1) acting according to the way of life canons (*applying existing knowledge through culturally acceptable actions*),

(2c2) construction of culture (*creating knowledge through actions that will be culturally acceptable*), and

(2c3) challenging the outside world states (*creating knowledge through actions that create new tools and symbol systems negotiated as enculturated knowledge)*.

To close, recognition of individual knowing domains is understood as a cultural-based disposition in which individual are recognized as holders of certain ability-based or symbol-based knowledge. Instances of these cultural dispositions happen at the:

(3a) initial cultural assimilation stage, like in:

(3a1) the master's authority and learner's trust relationship (*sharing knowledge*),

(3a2) the master's confidence validation through learner's results (*applying knowledge*)

(3a3) when limitations to validate vast domains of knowledge keep our trust in the authority (*applying knowledge*)

(3a4) by rejecting imitation of masters' doings and sayings, which affects his authority, and leads the dissenter to be a new master, gaining authority (*creating knowledge*).

(3b) ongoing cultural stages instances like in:

(3b1) the successful enactment of plausible workable social understandings (*sharing, applying and creating knowledge in terms of the workable social formation type*),

(3b2) the successful legitimizing of sayings and acts in terms of current cultural cannons (*creating knowledge within the current system of symbols or tools*),

(3b3) successful legitimizing of sayings and acts in terms of challenging cultural cannons or states of the outside world (*creating knowledge by enacting new system of symbols or tools*), explains better the recognition of knowers.

In more general terms, when recognizing knowers

(3c), individuals are known for setting the standards (*creating knowledge*) for

(3c1) usefulness for physical acts,

(3c2) intellectual beauty or duty for intellectual acts,

(3c3) everyday sensemaking for constraining or habilitating behaviors, and

(3c4) canonical duty for committing to or legitimizing values.

Integrated View of Language, Shared Meanings, and Recognition of Knowers

1. Language	*Type of Knowing Activity (4)*	2. Shared Meanings	*Type of Knowing Activity (8)*	3. Recognition of Knowers	*Type of Knowing Activity (11)*
1a. Language as shared contrived cultural tools for expliciting knowledge.	*1a.* Sharing knowledge	**2a.** Shared meanings as the tension among: **(2a1)** its conception through tight or loose committed perceptual or emotional patterning,	*2a1. Different gradients of commitment implies a transition from* applying knowledge *to* creating knowledge	**3a.** Recognition of knowers, at the cultural assimilation stage, follows the authority-trust relationship, like in: **(3a1** Master's authority and learner's trust relationship,	*3a1.* Sharing knowledge
1b. Language as systematic symbolic tools - with different levels of preciseness, richness, attachment, scalability, and reversibility - use to denote our knowing to the dimensions of our comprehension.	*1b. Different characteristic of the symbol system in use implies different gradients of* sharing knowledge	**(2a2)** its enactment through workable social formations, and	*2a2. Each type of workable social formations holds different levels of* sharing knowledge applying knowledge, & creating knowledge	**(3a2)** Master's confidence validation through learner's results,	*3a2.* Applying knowledge
				(3a3) Limitations to validate vast domains of knowledge keep our trust in the authority	*3a3.* Applying knowledge
		(2a3) its denotations through symbolic systems, including the possibility of ineffectiveness.	*2a3. Symbolic systems as a way of sharing meanings (**sharing knowledge**)*	**(3a4)** Rejecting imitation of masters' doings and sayings, affects his authority, and leads the dissenter to be a new master, gaining authority	*3a4.* Creating knowledge
1c. Language as ineffective expliciting and innovative symbolic systems.	*1c. Ineffectiveness of the symbol system in use may limit the* sharing knowledge *or trigger* creating knowledge	**2b.** Denotations of shared meanings as: **(2b1)** *plausible stories* that show patterns and insinuate the future through conversations with self and others through satisficing naming, or as	*2b1.* Sharing knowledge & applying knowledge *by representing its meaning through existing shared symbolic systems*	**3b.** Recognition of knowers, at the cultural ongoing stage, follows: **(3b1)** the successful enactment of plausible workable social understandings	*3b1.* Sharing, applying & creating knowledge *in terms of the workable social formation type*
1d. Language as challenging and changing symbol-based tools reflecting cultural canons and human's limits.	*1d. Human limitations confronting challenges may trigger either the* application *of the existing symbol system to narrate a legitimating or plausible approach* (applying knowledge) *or the **creation** of new symbols or new symbol systems that re-state the challenge (**creating knowledge**)*	**(2b2)** *canon-based legitimization stories* that enrich culture.	*2b2.* Sharing knowledge, applying knowledge & creating knowledge *by representing its meaning through existing shared symbolic systems*	**(3b2)** the successful legitimizing of sayings and acts in terms of current cultural cannons	*3b2.* Sharing, applying & creating knowledge *within the current system of symbols or tools*
		2c. Shared meanings as the reactive-proactive tension among:		**(3b3)** successful legitimizing of sayings and acts in terms of challenging cultural cannons or states of the outside world	*3b3. **Sharing** &* creating knowledge *by enacting new system of symbols or tools*
		(2c1) acting according to the way of life canons	*2c1.* Applying knowledge *through culturally acceptable actions*	**3c.** Recognition of knowers is linked to the setting of knowing standards of: **(3c1)** usefulness for physical acts	*3c1.* Creating knowledge
		(2c2) construction of culture, and	*2c2.* Creating knowledge *through actions that will be culturally acceptable*	**(3c2)** intellectual beauty or duty for intellectual acts	*3c1.* Creating knowledge
		(2c3) challenging the outside world states	*2c3.* Creating knowledge *through actions that create new tools and symbol systems negotiated as enculturated knowledge*	**(3c3)** everyday sensemaking for constraining or habilitating behaviors	*3c1.* Creating knowledge
				(3c4) canonical duty for committing to or legitimizing values	*3c1.* Creating knowledge
3 Sharing, 1 Applying, 2 Creating Types		4 Sharing, 5 Applying, 5 Creating Types		4 Sharing, 4Applying, 8 Creating Types	

Table 32. Integrated View of Language, Shared Meanings, and Recognition of Knowers (IVLSR).

4.8.6 Knowing and Knowledge: Emerged Brief Descriptions

Brief descriptions about complex issues are risky and tensioning, since they usually do not capture with sufficient emphasis those details that characterized integrity; however, they are necessary if we intend to offer some clarity and trigger appetite for further discovering. Then, I dared to summarized knowing and knowledge as follows:

> *Knowing is understood as the committed instrumentalization, or socially workable enactment, or normative enculturation of objects or behaviors, in which the subsidiary process of assimilating tools, characterized as either more or less ability-based or symbol-based, invokes private or public self-adhered, intended to be universal, standards of usefulness, plausibility (including emotional valuations), scientific or normative acceptability; an about which the knower hold different gradients of shared symbolization, that when inadequate, it may either limit sharing about it, staying tacit, or trigger innovative behaviors.*

Two more memorable descriptions of the *integrated view of knowing*, with lesser details, are offered for quick referencing as follows:

> *Knowing as the committed instrumentalization, or socially workable enactment, or legitimized enculturation of objects or behaviors, about which knower may hold a shared symbolization, that when inadequate, it may either limit sharing about it, staying tacit, or trigger innovative behaviors.*

If we dare to encapsulate "*committed instrumentalization, or socially workable enactment, or legitimized enculturation*" in "*instrumentalization*" under the argument that such detonation will trigger the question for the contriving logic that drives objects and behaviors into tools, we could consider the following shortened description:

> *Knowing as the committed instrumentalization of objects or behaviors, about which knowers may hold or not an adequate shared symbolization system.*

Finally, an extrapolated description of knowledge is proposed next:

Knowledge as the committedly instrumentalized, or socially workable enactment, or legitimately enculturated object or behavior that when it is applied, shared or created meets private or public self-adhered standards of usefulness, plausibility (including emotional valuations), scientific or normative acceptability, and about which the knower may hold a shared symbolization system, that when inadequate, it may either limit her (his) communicating about it, staying tacit, or trigger innovative enactments.

Recurring to the previous argument of encapsulating into commitment the ideas behind workableness and legitimization, we could consider the following shortened description:

> *Knowledge as the committedly instrumentalized object or behavior, that when it is applied, shared or created meets standards of usefulness, plausibility, scientific or normative acceptability, and about which knowers may hold or not an adequate shared symbolization system.*

Within such understanding, we should recall that the instrumentalized object or behavior could only be considered knowledge while knowing.

4.8.7 Epistemological Note about Knowing and Commonness Criterion

In Chapter 2, while presenting the arguments that characterized the knowledge domain within which commonness happens, the knowledge definition of Tsoukas and Vladimirou (2001) – "*Individual capability to draw distinctions, within a domain of action, based on the appreciation of context or theory, or both*" – was used to argue for organizational context as the bounding reference. Now, that an integrated view of knowledge has emerged, it is necessary to justify the epistemological compatibilities of both approaches.

The main components of the Tsoukas and Vladimirou (2001) knowledge definition ("*Individual capability to draw distinctions, within a domain of action, based on the appreciation of context or theory, or both*") that our boundary-finding argumentation invoked could be summarily approached within three issues: (a) knowledge residency, (b) normative expectations, and (c) intuitive appreciation of consequences. The high level of similarities of both understandings to knowledge allows attending these issues unproblematicly:

(a) The residency of knowledge remains in the individual in both approaches.

(b) The "*tacit awareness of the normative expectations*" (Schutz, 1970; McCarthy, 1994) that supports the idea of *"based on the appreciation of context or theory, or both*" (Tsoukas & Vladimirou, 2001) fits with no problems with "*subsidiary personal process… holds the tension of invoking private or public self adhered, intended to be universal*".

(c) The proposition "*an intuitive appreciation of the consequences that might follow from breaking them*" (McCarthy, 1994) that supports the idea of "based on the appreciation" (Tsoukas & Vladimirou, 2001) fits unproblematicly *with* "*subsidiary personal process... holds the tension of invoking… universal, standards… which characterizes, whether, the usefulness, plausibility (including emotional valuations), scientific or normative acceptability criteria*"

CHAPTER 5: FRAMING ORGANIZATIONAL CAPABILITIES

5.1 A READING POSTURE ABOUT KNOWLEDGE IN KBV OF THE FIRM

This chapter looks into relevant theories and views of the firm in which knowledge is key in the formulation of the capability to reveal their body of knowledge. The theories considered, including also pre-KBV of the firm, are Satisficing Heuristics (Simon, 1947), SOP-based (Cyert & March, 1992), Organizational Routines (Nelson & Winter, 1982, Levitt & March, 1988), Industry Recipes (Spender, 1989, 1992), Organizing Principles (Kogut & Zander, 1992) and Knowledge Integration (Grant, 1996a, 1996b).

As we discussed in chapter 1, most knowledge-based approaches of value creation have assumed that the residency of knowledge is both at personal level and at organizational level. However, without denying the personal characteristic of knowledge, these views have emphasized organizations as knowing entities and used abstractions related to organizational knowledge as unit of analysis (Felin & Foss, 2004, Grant, 1996a).

These conceptions about the residency of knowledge, holds serious implications for the verification and advancement of the theories of the firm; especially if we assume that they posit the general framework for the study of organizations.

Following the integrated knowing framework of the previous chapter, to understand, while building theories of the firm, a theory of knowledge that conceives knowing and sharing of what one knows:

- As resident and happening at individual level.
- As a need to make intellectual sense of experiences or as response to overcome own human biological limitations.

- Manifested in what we say or act (physical or intellectual) subsidiarily or focally.
- As committedly instrumentalized (Polanyi,1958; 1966), or normatively enculturated (Bruner, 1990), or socially enacted (Weick,1995).
- With or through historically evolved, tangible or intangible, instrumentalized, socially workable or normative legitimized objects or behaviors (tools) with different gradients of shared and systematic symbolic content.
- As evaluated by the intended to be universal private or public self adhered standards of performance, in terms of their non-symbolic or symbolic nature, respectively, of the tools in use; being this either useful, plausible (including emotional valuations), or scientifically or normatively acceptable.

From such knowing posture, the coming reading of competing knowledge-based views of the firm pays attention to the epistemological posture about the residency of knowledge, to, more than, comment the problematic approach, but to recognize the body of knowledge represented in the artifacts (seeing them as tools while knowing) participating in the proposed organizational capability. Such inventory is useful data, indifferent of its argued residency, which will help to define the context, domain and boundaries of common knowledge in organizations.

Then, instead of disqualifying such knowledge-based theories or capabilities, here they are re-read with the understanding that the knowing objects or knowledge embedded objects or behaviors corresponds to the instrumentalization of objects or to the instrumentalized objects or behaviors, respectively.

5.2 FRAMING CAPABILITIES – A NOTE ON METHOD

Framing organizational capabilities follows Strauss and Corbin's (1998) coding procedure as the method that guides the interpretation of the theories of the firm.

Coding of the theories was executed in two stages. First, open coding was applied to the text of the following theories: Simon's (1955, 1991a), Cyert and March (1992) Nelson and Winter (1982), Spenders' (1992), Kogut and Zander's (1992) and Grant (1996a). In this first stage, each document was study as a whole asking the questions "How does an organization function within this theory of the firm?" and "What does it make this theory the same as, or different from, the previous one that I coded?" (Strauss & Corbin, 1998, p. 120). The purpose was to identify a set of categories that reveal the common structure of the capabilities of the firm, if any.

At this stage, the finding is that literature on theories or views of the firm embeds in their descriptions three common categories. [a] First, there are some *presumptions about* the organizational *context; which* frequently interprets risk and/or uncertainty in certain ways. [b] Second, there are *actors*, real or socially constructed, playing certain roles and holding/affecting expectations about the accomplishment of some objectives; bounded by the previously mentioned presumptions. [c] Third, there is a certain way of conceiving the organization; an approach that even though is sometimes presented upfront, it is also the most subtle category. It is the subjacent logic of how the organization achieves its objectives while governs the relationships among actors.

This last category exhibits two dimensions. The first tells that theories of the firm follow two, non-necessarily exclusive alternatives: (a) the exploitation of existing routines, and (b) the exploration of new alternatives. The second dimension tells about the challenge of attending the epistemology of possession and practice (Cook and Brown (1999) when conceiving knowledge in organizations, as it was discussed in Chapter 1. Such view lead to us to consider (a) the conception (design) of the organization, in one side; and about (b)

the execution in the other side, they are labeled *Organizational design premises* and *Organizational execution premises*, respectively, in this framing.

Then, considering these two dimensions, the description of the organizational capability of the theory of the firms will be frame by a schema – labeled "Organizational Capability Framework" – with the shape of a two-by-two matrix; in which one axis belongs to the dichotomy exploration-exploitation; and the other axis belongs to the alternatives: organizational design premises and organizational execution premises (see Table 33).

Organizational Capability Framework

	[a] Theory's contextual presumptions *[b] Actors' roles and expectations about objectives* *[c] Logic of achievement of objectives and actors' governance*	
	Organizational Design Premises	***Organizational Execution Premises***
Exploitation Approach	***Capability's Body of Knowledge*** *[d] Residency of knowledge domains* *[e] Participating knowledge domains* *[f] Personal knowledge types* *[g] Common knowledge types*	
Exploration Approach		

Table 33. Organizational Capability Framework (OCF) in the context of Theories of the Firm.

The second coding stage complies with axial coding; here the paradigm in use with the departing categories and dimensions corresponds to the schema that emerged during open coding – Organizational capability framework. However, recalling the constructivist approach to grounded theory described by Charmaz (1993), and sensing that there is additional data in the text that can be interpreted, and that the outcomes of such interpretation is aligned with the purpose of the quest, I pledged for questioning the text,

additionally, with: (1) “What knowledge sustains the organization capabilities in this theory?” (2) , and “Who possesses the knowledge, or in whom resides the knowledge that sustains the organizational capability?” (Simon, 1991a, p. 126).

These two questions lead to add two categories to the axial coding paradigm: [d] “Residency of knowledge domain” and [e] “Participating knowledge domain”. Additionally, the identified knowledge domains will be typified either as ability-based or symbol-based under the category [f] “Personal knowledge type”, and [g] typified as “common language”, “shared meanings”, or “recognition of knowers” under de category “Common knowledge type”.

In summary, axial coding asks each theory’s text questions about presumptions, participating actors, the relationships among these categories; and the knowledge domains that sustains either of the two capability approaches (exploration-exploitation) for the design and execution activities.

Framing of the body of knowledge of these views follows a sequence. First, we will question the text about [a] presumptions, [b] actors’ role and expectations about objectives, and [c] logic of achievement of objectives and actors’ governance, all these to understand the subjacent logic behind the organizational capability, and from it, then, make explicit the domain of knowledge that sustains that logic, based on [a], [b] and [c].

The reading of each theory of the firm is characterized by a constant effort of: (a) sub-categorizing the references and examples of the participating constructs presented in the text considering the essential property that characterized the instance, (b) assessing instances in a sub-category to look for additional instances in the text that complete or contradict the emerging pattern of the category given the actual set of instances, (c) look

for direct and indirect relationships in the text among the identified categories, and (d) articulate the understanding that depicts the subcategory and its relationships with others (Strauss & Corbin, 1998).

Before applying axial coding to the theories of the firm, it offers a clearer appreciation, for the task at hand, to examine the seminal work that elaborates on the basic foundations of the dichotomy exploration of new alternatives and the exploitation of existing ones (March, 1991). However, since March (1991) is not a theory of the firm, applying axial coding will show only a single mixed dimension of the organizational premises. Afterwards, we will enjoy the discoveries that axial coding of Simon (1955, 1991a), Nelson and Winter (1982), Cyert and March (1992), Spenders' (1992), Kogut and Zander's (1992) and Grant (1996a) will reveal.

5.3 KNOWLEDGE EXPLORATION AND EXPLOITATION

James March's (1991) seminal work about exploration and exploitation in organizational learning formalized the discussion about the explicit and implicit choices that organizations make between new possibilities and existing certainties.

Explicit choices about exploration and exploitation in organizations are about the evaluation of alternative investments – the use of present technologies versus and new ones; or the refinement of an existing technology versus the invention of a new one (Levinthal & March, 1981); or alternatives strategies – the consolidation of existing markets or products versus the exploration of new markets an offerings (March, 1991).

Implicit choices about exploration and exploitation in organizations are contained in buried elements of the (a) organizational design like risk incentive systems, in the (b)

organizational culture like the ways in which objectives are set and refined, or in (c) organizational norms like routines for accumulating and reducing slack (March, 1991).

March (1991) analysis and modeling of these two choices is characterized by: (a) the "development and use of knowledge in organizations" (p. 71) and (b) the implicit assumption of the dual residence of knowledge – individuals and organization. These two central ideas are the core of his models which is best described by his words:

> *Organizations store knowledge in their procedures, norms, rules, and forms. They accumulate such knowledge over time, learning from their members. At the same time, individuals in an organization are socialized to organizational beliefs. Such mutual learning has implications for understanding and managing the trade-off between exploration and exploitation in organizations. (p. 73).*

March (1991) modeled exploitation and exploration using adaptive processes, that is "the process of performing computations on a set of measured or presented data (believed to be) from a physical, i.e. natural, source in such a way as to develop a "best" parametric model of that physical source, i.e. one that best fits the observed data according to some error criterion" (Daintith, 2004).

5.3.1 Arbitrary Socializing Capability

Basically, March's (1991) model assumptions for the exploitation approach starts with a closed system that holds three dimensions: a fix quantity of members (50) with certain beliefs about reality (30); a fix representation of reality (30) and a representation of the organizational set of beliefs (30) referenced by March as the Organizational Code. Even though the number of repeated simulations was set to 80, March argues that the quantitative outcomes of the modeling depend in these specifications; however the qualitative results –

his conclusions – are insensitive to the quantity of members and representations of reality (1991, p 75). Summing up, this simulation is a closed system that shows that changes in members' beliefs is directed to the reduction of differences between the members beliefs and organizational code, thus they converge over time (p. 75).

In order to make the system more open, March (1991) incorporated two properties to the model: personnel turnover and environmental turbulence. Personnel turnover is implemented through the supposition that in each iteration, members of the organization have a certain probability of exiting the organization and being replaced by a new member with a set of naive beliefs (p. 78). The environmental turbulence is implemented through the supposition that in each iteration, each representation of reality has certain probability of shifting the numeric value assigned from 1 to -1 or from -1 to 1. (p. 79).

Based on this modeling, March (1991) offered some qualitative findings that basically stated that the exploitation approach ask for: (a) speed-regulated knowledge socialization design, (b) intended turnover of organizational members; and also warns that (c) in competitive environments these actions may not be sufficient to be the leader, (see Table 34).

There is another way of seeing the effects of members turnover, besides the suggested regulated adaptation – intended turnover - described by March (1991); it is the one presented by Simon (1991a, p. 127), which is the case of the organization that tries to distance itself from the nearby social beliefs to preserve its distinct world view. In this case, personnel turnover increases socialization costs since organizational members need to be trained from the ground up. In a way, we could consider this as intended turnover with a tabula rasa standard.

Contrasting Exploitation and Exploration Approaches in Organizations

Levitt and March (1988), David (1990), March (1991) and Levinthal & March (1993)

Exploitation Approach	Exploration Approach
Improvement of existing skills makes experimentation of other alternatives less appealing (Levitt & March, 1988, p. 322).	Exploration of new alternatives reduces the speed of improving existing skills (Levitt & March, 1988, p. 323).
Certainty, clarity and proximity of exploitation increase its tendency and reduce exploration (David, 1990), making organizational adaptive processes to environmental changes potentially self-destructive, since long run depends on sustaining some level of exploration (March, 1991, p. 73).	The outcomes of exploring new ideas, new products, new markets, or new social networks are more uncertain, diffused and characterized by longer time frames than exploiting existing ones (March, 1991, p. 85).
Mutual learning between organizations and its members shows a convergence between organizational and individual beliefs; which reveals the possibility that individuals may assimilate organizational knowledge before organizations learn from them. (March, 1991, p. 85).	Tendency to retain and promote individuals linked to success and to demote and remove individual linked to failures under-sample population with failure experiences creates an illusion of success and control; and losing of valuable lessons learned (Levinthal & March, 1993, p.109).
Slow socialization of new members and moderate turnover sustain variability in individual beliefs, thus improving organizational and average individual knowledge in the long run (March, 1991, p. 85).	Selecting and promoting individuals with risk seeking preferences, and setting for them targets slightly above their aspiration of success would increase their exploratory behavior (Levinthal & March, 1993, p. 109).
Knowledge increments by personnel turnover may be insufficient to surmount the adverse effects created by lower variability if finishing near the top is important in competitive environments (March, 1991, p. 85).	Risk-averse members of the organization could be induced to feel more confident and adopt risk seeking behavior through managing risk perception – downplaying (Levinthal & March, 1993, p. 108).
	In general, incentives in the form of big rewards, like sharing property rights, for those linked with successful explorations are effective; but it has better results providing safety-nets for failures (Levinthal & March, 1993).

Table 34. Contrasting Exploitation and Exploration Approaches in Organizations.

All this implies that what is relevant in guiding choices in organizations in the exploitation approach are processes like: (a) norms development process, (b) norms socialization process, (c) organizational members' turnover process and (d) norms feedback process; which indeed offer a characterization of the organizational capability and of the body of knowledge embedded in it in the form of norms, procedures, rules and forms; which are referenced, loosely without these specifics, by March (1991) as Organizational Code. Summing up, in organizations, *in the exploitation approach, organizational code is dynamically shaped by speed regulated socialization and intended membership* (See Figure 3).

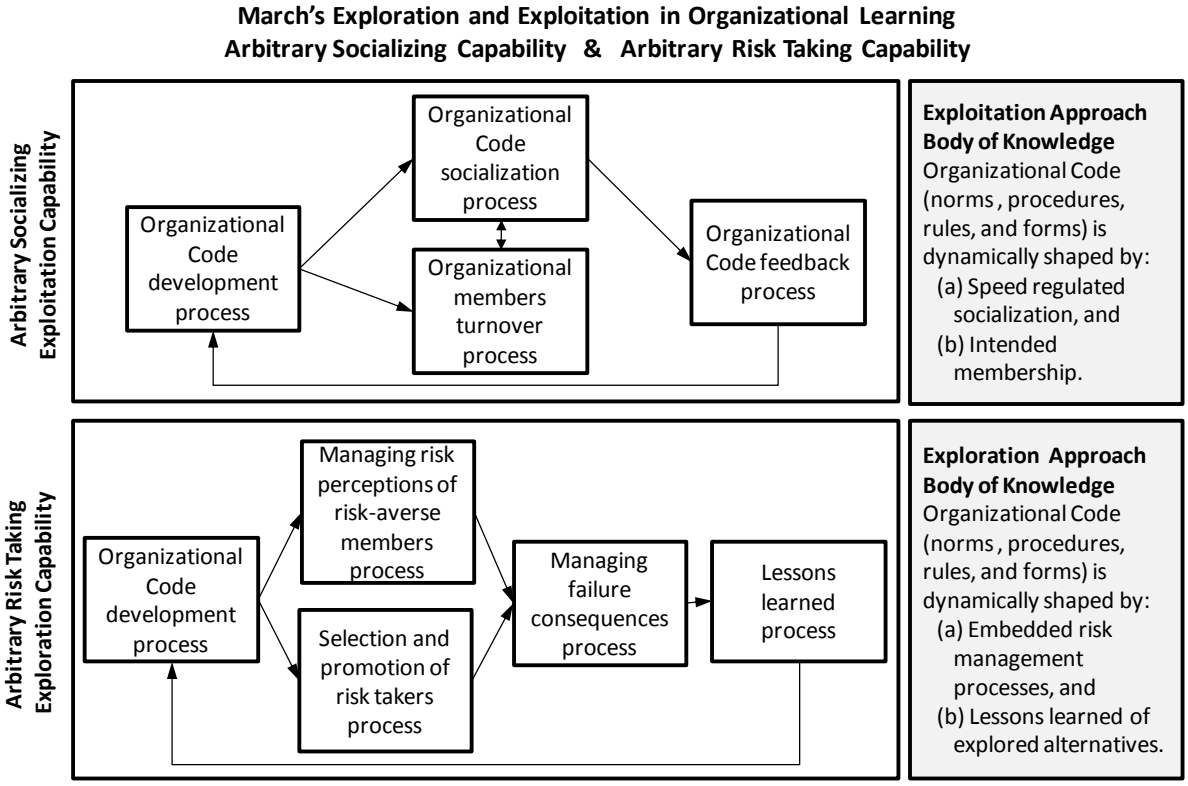

Figure 3. March´s (1991) Socializing Exploitation Capability and Risk Taking Exploration Capability

5.3.2 Arbitrary Risk Taking Capability

March's (1991) also models the exploration approach and concludes that exploration is challenging. He goes on saying that there is ambiguity in the results of the simulation for the exploration approach in competitive environments; and clearly described it with the comments told by Polanyi (1963, p. 1013) regarding one of his contributions to physics: "I would never have conceived my theory, let alone have made a great effort to verify it, if I had been more familiar with major developments in physics that were taking place. Moreover, my initial ignorance of the powerful, false objections that were raised against my ideas protected those ideas from being nipped in the bud."

In a posterior related work Levinthal and March (1993, p. 107) brought some light to the kind of interventions that could sustain the exploration approach with these findings: (a) promoting risk takers and managing their expectations increase exploratory behavior, (b) downplaying risk perception of risk-averse members increase exploratory behavior, (c) property rights incentives are effective, but safety-nets are better; and finally they warn about (d) the retention and promotion of successful members and the removal and demotion of failing ones which could create an illusion of control and losing of lessons learned. Thus, following Levinthal and March, the following risk management processes can be identified in the exploration approach as: (a) managing risk-averse member's perception process, (b) members selection and promotion of risk takers process, (c) managing success and failure consequences process, and (d) lessons learned process. And, if we still follow March's (1991) conception of organizational knowledge – code -, it could be said that *in organizations, in the exploration approach, organizational code is*

dynamically shaped by risk management processes that induce exploratory behavior; and lessons learned process of explored alternatives (See Figure 3).

In closing March's (1991) discussion of the exploration approach in his seminal work, it is convenient to recall the wisdom versions of his findings: "the returns to fast learning are not all positive", "rapid socialization may hurt the socializers even as it helps the socialized", "development of knowledge may depend on maintaining an influx of the naive and ignorant", and that "competitive victory does not reliably go to the properly educated" (p. 86).

Finally, the issue of knowledge residency in March´s (1991) exploitation and exploration approaches reveals itself as problematic since not all the exploit or explore knowledge in organizations could be explained in terms of coded norms regarding the socialization, turnover, promotion, risk management and outcomes management, unless individuals by themselves and other stakeholders besides organizational members have nothing to say

March's modeling does offer the possibility to appreciate the contribution of organizational modulating processes, like the speed regulated socialization and intended membership of the exploitation approach, and the risk management design and lessons learned process of the exploration approach, in characterizing how knowledge could be integrated in a organizational capability and what is the body of knowledge sustaining it; however, still is a distant computational account of the human participation in the application and creation of knowledge in organizations.

5.4 SIMON'S ADMINISTRATIVE BEHAVIOR

5.4.1 Bounded rationality

Simon's (1955) *A Behavioral Model of Rational Choice* and his later related works are a reaction against economists' view of rational decision making as maximizing behavior. He argues, as a main assumption, that decision makers use suboptimal decision heuristics and from that position he postulates a theory that basically says that decision making involves limited search for satisficing alternatives. This human bounded view of rationality is characterized by: (1) considering a limited set of alternatives, (2) counting with incomplete information about payoffs of future states, (3) having incomplete information about the probability of occurrence of any particular state, and (4) adjusting aspirations over time. In this context we, says Simon, as rational delimited humans, use efficient procedures to find good *satisficing* solutions, not necessarily best solutions, oriented to goals, about which the preferences are given.

In 1991a, Simon, while trying to explain that the unit of analysis of organizational learning research is at the organizational level, make clear that: "All learning takes place inside individual human heads; an organization learns in only two ways: (a) by the learning of its members, or (b) by ingesting new members who have knowledge the organization didn't previously have" (1991a, p. 125); and added that this human learning and ingestion is a phenomena – influenced by the organization and with consequences for the organization – that could not be understood simply by observing isolated individuals (p. 127). Then, Simon posits residence of knowledge in the members of the organization, but argues for observing the process of knowledge assimilation at organizational level; to which we could agree, but making clear that since individual are

who interact, then a theory that explains individual knowing is co-need it to understand the ingestion phenomena.

Simon's concentrated his research in human mental capacities, and this can be appreciated in a summary of his findings (1991a, p. 129); in which he posits that a world-class expert in any field can be described as a professional with no less than ten years of full-time dedication to learn his business in action. This expert, as the holder of some 50,000 indexed memory chunks (+/- one order of magnitude) of relevant information, is prepare, within the domain of his/her expertise, to respond to many situations intuitively by recognizing clues in them and evoking an appropriate response, and also ready to handle more protracted and systematic analysis of difficult problems.

In this recalling, Simon (1991) links this individual expertise to automated expert systems that makes organizational memory less vulnerable to personnel turnover. In other words, Simon posits that this goal-satisficing heuristic-oriented rationality, resident in individuals, could be rationalized and made it explicit. We should also note that his decisional heuristics excluded manifestations of knowledge-based decisions executed through tacit bodily activities – skills.

In this last issued, Miller (2008, p. 945), following Polanyi (1958) and Wittgenstein (1958), goes further, and argues that: "Practices express rationality in ways that cannot be captured fully by verbal or symbolic representations", implying that rationality as explained by Simon (1955) and later works are incomplete.

In summary, Simon sets emphasis on cognition over action, explicit knowledge over tacit knowledge; systematic information processing over human judgment, and means over ends (Miller, 2008, p. 949).

5.4.2 Administrative Behavior, Organizations and Markets

Administrative Behavior - Herbert Simon's (1947) doctoral dissertation - which is the departure point of most his work, achieves to describe the administrative man, a role described in contrast to the maximizing behavior of the economic man, as an actor that looks for a course of action that is satisfactory or good enough when confronting situations; by characterizing them by few relevant and crucial factors and by considering the consequences of few alternatives based on heuristics accumulated over experiences. Then, Simon anchored in this description of the individual as the administrative man, proposed that organizational processes should be designed in terms of establishing and maintaining the premises that influence the decisions into the chosen overall direction (Simon, 1997, p. 322).

Before going further, I have to state that open and axial coding was executed against Simon's (1991b) *Organizations and Markets, an* article in which he presents a theory of organizations, and in which he made references to Simon (1947). Finally, you will also see here references to Simon (1997), which is the 4th Edition of *Administrative Behavior*, book that was consulted directly guided by the narrative of Simon (1991b).

In Simon's (1991b), the structure of the organizational capability is characterized by the design of an organization as an equilibrium system, which is constituted with three categories of actors – owners, employees and customers – were goals and investments are

provided by the entrepreneurs / owners in exchange of nonmaterial values, such as of power or prestige, and also in exchange of profits and growth (Simon, 1997, p. 146). Employees receive wages and non-material incentives like facilitating the satisfaction of personal goals in exchange of time, effort and willingness to follow decisions while employed (p. 144); recalling that their efforts assume the exercise of the decision making based on heuristics. Customers, here, are served by the organization with its products, and in exchange, they contribute with their money, considering also that organizational objectives could be adapted to the values and preferences of customers, and that those customers could be induced to accept organizations objectives – products and services – through advertising (p. 147).

In this organizational capability reading of Simon (1997), the conclusion is that the organization is oriented to the exploitation of knowledge; with some capacity of adapting to customers' values. This is depicted as a returning flow from Customers to Organizational design in the capabilities framework. (See Figure 4).

Simon's implicit organizational design provides general stimuli to the members of the organization to create mutual stable expectations of behavior in the provided direction (1997, p. 110). This is achieve through: (1) general planning, which provides a strategy to limit future possibilities and stated goals as decision criteria (p. 109); and (2) five design mechanisms - (a) Organizational structure based on the hierarchy of decisions, (b) Division of work, (c) Communication channels, (d) Standard practices, and (e) Alignment, based on training and indoctrinating (p. 112).

The implicit modeling of organizational execution includes attention-directors that cause behavior to keep on in a particular direction, once it has been turned in that

direction (Simon, 1997, p. 110). Administrative behavior alignment is achieved through the following five modes of influencing: (a) Authority, understood as the power to make decisions which guide the actions of another without deliberation on the premises (p. 179); (b) Communication, in its formal way, it is about informing decisions and consequences; and in its informal, it is a about the social relationships of the members (p. 208); (c) Training prepares members to reach satisfactory decisions reducing the exercise of authority or advice (p. 13); (d) Organizational loyalty, which concerns with achieving that a person identifies himself, while taking decisions, with his group, and the consequences of such decisions for his group (p. 284); and (e) the Criterion of efficiency is a based on two simple choosing rules stated as: "demands that, of two alternatives having the same cost, that one be chosen which will lead to the greater attainment of the organization objectives; and that, of two alternatives leading to the same degree of attainment, that one be chosen which entails the lesser cost" (p. 149).

5.4.3 Goal-Satisficing Heuristic-Oriented Rational Organizational Capability

In summary, under the presumption of a administrative man instead of the economic man; Herbert Simon's (1947) *Administrative Behavior*, as described by Simon (1991b), while defining the administrative man as a goal-satisficing heuristic-oriented rational decision maker, shapes an understanding of an organization that operates in exploitation approach and in which its organizational capability establishes and maintains stimulus and premises that influence the decisions into the chosen goals.

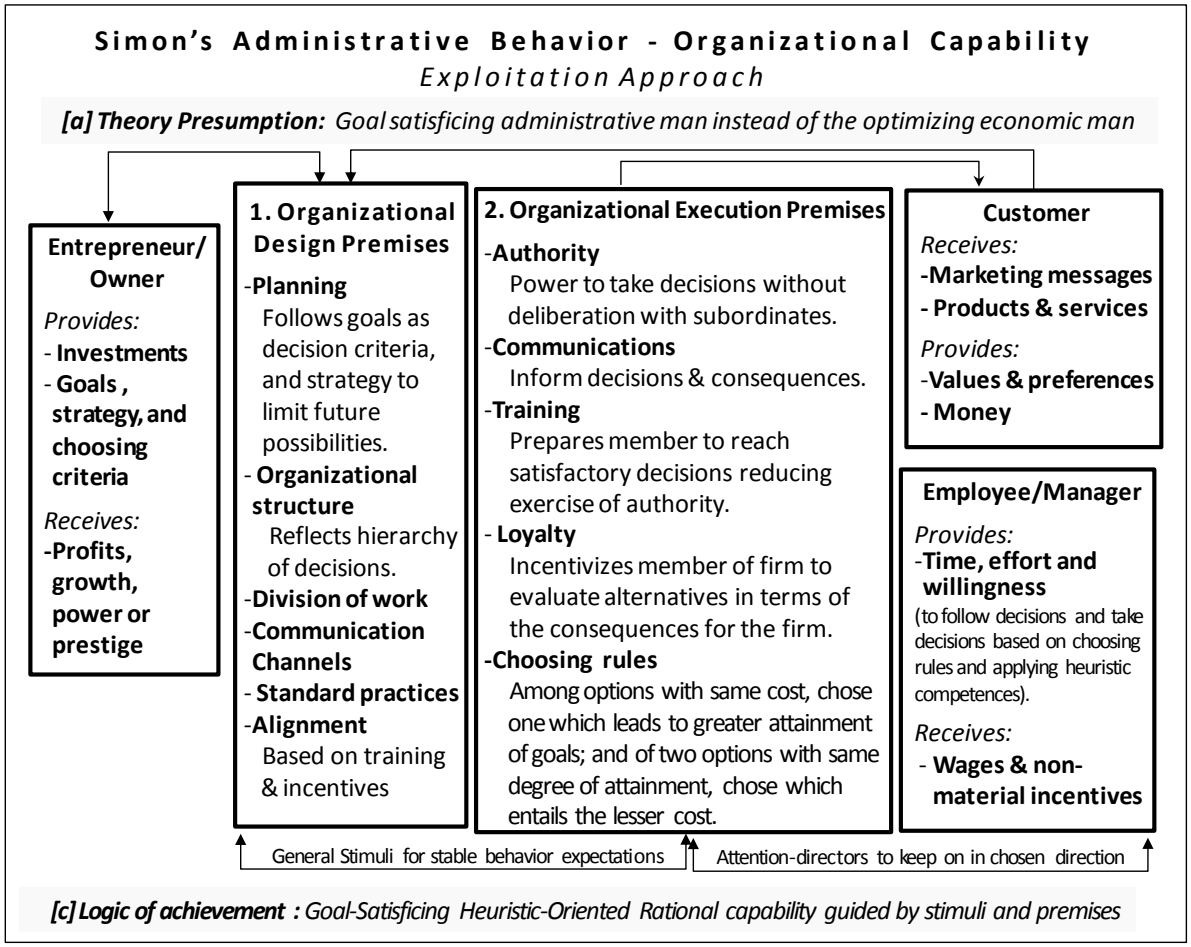

Figure 4. Simon´s (1947 & 1991b) Exploitation Capability in Administrative Behavior.

In that context, *Organizational design knowledge* provides the general stimuli for stable behavior expectations in the organization and it is characterized by: (a) knowledge of owners in the form of strategy and goals, which defines the patterns of decisions in the organization, (b) knowledge of managers in the form of classical managerial knowledge, refined by the goal-satisficing heuristic-oriented rationality, which shapes the design of organizational structure, division of work, communication channels, standard of practices and alignment processes, and (c) knowledge of managers about customers, in the form of product preferences, which refines the goals of the organization (see Table 35).

Simon's Administrative Behavior

Body of Knowledge of the Exploitation Capability

[a] Theory presumption	Goal satisficing administrative man, instead of the optimizing economic man	
[b] Actors' expectations	Entrepreneur/Owner	Profits, growth and non-material values, such as of power or prestige.
	Employee/Manager	Wages and non-material incentives like facilitating the satisfaction of personal goals.
	Customer	Alignment of products and services to their preferences.
[c] Logic of achievement of objectives and actors' governance	Goal-satisficing heuristic-oriented rational capability guided by stimuli and premises (strategy and choosing rules). See Figure 4 for details.	

1.Organizational Design knowledge		**2.Organizational Execution Knowledge**	
Knowledge: [d] Residency, [e] Domain, [f], and Type (A: Ability-based, S: Symbol-based)			
[d] Entrepreneur/Owner:		**[d] Employee/Manager:**	
1.1 Goals, Strategy and Choosing rules Defines patterns of decisions in the organization.	S	2.1 Classical RRHH managerial knowledge Shapes the workings of authority, communications, training, and loyalty in the organization toward goals in the intended direction.	S
[d] Employee/Manager:			
1.2 Classical managerial knowledge Shapes planning, organizational structure, division of work, communication channels, standard of practices and alignment based on incentives and training.	S	2.2 Classical Marketing & Operational knowledge Shapes de marketing initiatives and delivery of products and services	S
		2.3 Goals & Choosing rules Leads to opt for satisficing decisions with lower costs.	S
1.3 Customer preferences Refines goals of the organization.	S		
[d] Customer:		2.4 Expert's choosing heuristics Aligned by incentives and training to the authority and to the established decision making direction.	A
1.4 Customer preferences Defines buying decisions.	S	**[d] Customer:**	
		2.5 Customer preferences Defines marketing initiatives.	S

Table 35. Simon's (1947; 1991b) Body of knowledge of the Exploitation Capability of Administrative Behavior.

And, *Organizational execution knowledge* provides attention-directors to keep on the chosen direction and it is characterized by: (a) knowledge of employees in the form of specialized indexed memory chunks and heuristics to apply them, which is aligned by incentives and training to the organization, the authority and to the established decision

making direction, and (b) knowledge of employees about the criterion of efficiency in the form of choosing rules, which leads to lower costs and attainment of objectives.

5.5 CYERT AND MARCH'S BEHAVIORAL THEORY OF THE FIRM

In the same research field than Herbert Simon, but refining the assumption from bounded rationality to adaptively rational, Cyert and March's classic *A Behavioral Theory of the Firm,* originally published in 1963, presents a view of the firm as a coalition of individuals, with sub-coalitions in it, which in business organizations correspond to stockholders, managers, employees, customers, suppliers and regulatory institutions and governmental institutions (1992, p. 31); that learns from experience and avoid environment uncertainty (p. 167). This organizational coalition agrees around imperfect rationalized and imperfect tested goals that are expressed in terms of expectations with certain aspiration levels, not always about operational issues, with no clear preference ordering, no much agreement in sub-goals, and refining – the goals - in response to experience (p.37); where consistency depends on the bargaining management capabilities, the sequence of demands, and the scarcity of resources. (p. 37). In summary, this theory was an attempt to complement the extant understanding of economic market factors with an understanding of the firm as developer of goals, manager of expectations and choice executer.

In this theory, bargaining is the way of agreeing organizational goals; and *side payment* is the conceptual bargaining instrument, which takes the forms of money, organizational policies, personal treatment, authority (Cyert & March, 1992, p. 33). Total value of side payments is a function of the composition of the coalition; and total utility of side payments

is a function of the level of complementarily and conflict of the needs of its members (p. 33). Here, the coalition, not the typical power-based asymmetric group in which the goal of the organization is to maximize profit (p. 34), but a group in which the bargaining processes characterized the demands of members of the organization. In these negotiations, a relevant number of side payments are in the form of policy commitments (p. 35).

In this bargaining process, side payments hold certain attributes: (a) scarce resources, like money, limits bargaining alternatives, (b) some class of members are passive most of the time, with demands that can easily be satisfied, (c) some side payments are complementary, that is, they correspond to different policies that do not compete and are consistent in respect to goals, (d) some side payments conflict, that is, they correspond to the same policy and represent an inconsistency in respect to the policy (Cyert & March, 1992, p. 37), (e) information on actual prices of demands is hard to obtain, often misunderstood, and frequently unreliable, (f) market information related to demands needs to be searched and the search is typically initiated by some signal of failure, and (g) adaptation to demands is slow, still in the existence of pressure (p. 42).

Even though side payments agreements are partial and do not foresee all upcoming circumstances; the coalition is motivated to function under such agreement and deploy reciprocal self-confirming control systems like budgeting and allocation of functions (Cyert & March, 1992, p.37-38). In this process, past bargaining becomes a guide for the future budget and allocation of functions and tend to institutionalization (p. 39). However, the characteristics of the demands change with experience and members are prone to attend to a small set of their demands depending in their participation in the organization and their focus of attention (p. 40). Here, attention focus is guided by either

adversity, that is the problems to be attended, or by solutions, that is the stimulation to satisfy goals (p. 40).

Giving the adjustments of side payments and demands usually there is an excess of payments to members, labeled *organizational slack* (Cyert & March, 1992, p. 42). When the environment shows difficulties this organizational slack helps to absorb some of the variability, on the contrary when environment is booming the organization has the chance to capture resources in excess of its demands. Thus, organizational slack helps on dealing with the variability of the environment (p. 43).

Assumptions about organizational goals ask for some assumptions about expectations in the formation and handling of environmental information used in decision making related to achieving of organizational goals (Cyert & March, 1992, p. 52, 55). These expectations are not protected from organizational members' hopes, wishes, or needs. This conscious and unconscious bias in expectations is characterized by (a) optimistic or pessimistic predispositions, (b) being a member of subunit goals, (c) performance expectations, or (d) a priori preferences. Thus, the search for information is influenced by considerations that are important for the individual or subunit. And in general, following a scarcity criteria, search will be more intense in case of small organizational slack, and on the contrary, when slack is high, search becomes a typical routine (p. 95).

Therefore, organizational decisions will depend on concrete information and estimates that may differ from reality, based on some characteristics of the organization and decision procedures; which depend on organizational goals, personal goals, and organizational slack (Cyert & March, 1992, p. 99). However, these decision procedures are relevantly condition by rules that hold uncertainty avoiding learning processes by

which the organization adapts to the environment (p. 99). When reading uncertainty in the environment, the rule is to substitute feedback data with expected data, that is, the organization learns from the environment in a limited way, where decisions consider feedback but the decision-rules that process this feedback hold their own goal aligning rules (p. 117).

Then, the organizational choice mechanism is characterized by: (a) trying to choose an alternative that meets multiple changing aspiration-stated coalition demands, (b) choosing the first satisfactory call to mind alternative, considering existing policies as a fast track or intensifying search when failure calls, (c) avoiding uncertainty by committing to existing procedures instead of forecasting the environment, (d) applying standard operating procedures for the short run decision-making and implementation (Cyert & March, 1992, p. 134).

This understanding of organizational procedure-based behavior asks for principles that guide the choice of procedures to be used for each situation. Cyert and March call them "general choice procedures" (1992, p. 121) and are assumed as learned – we will have to suppose by the members of the firm, since it is not specified; otherwise the procedures would be part of a never ending hierarchy. These principles to select procedures hold Cyert and March's central idea of organizational capability. It takes the form of three premises, that are about *uncertainty management, trust and adaptation*: (1) Avoid uncertainty (chose procedures that minimize future uncertain situations), (2) Maintain rules (do not abandon rules, otherwise problems could get worse), and (3) Use simple rules (take decisions using the basic simple procedure provided, in case of an unexpected situation review the list of considerations and conditions under which the

procedure may be modified; remembering that the firm relies on individual "judgment") (p. 121). This last rule invites to take initiatives, as a last resort, in the context of certain explicit goal oriented considerations. A final idea of Cyert and March about the systemization potential that standard procedures hold – the adaptively rational strategy of the firm - is best described in the following sentences: "In fact, we can specify rather easily a set of environmental conditions and internal constrains that make these general rules sensible from the point of view of long-run rational." (p. 121).

In the context of our quest, understanding the details of *standard operating procedures* (SOP) of the Behavioral Theory of the Firm helps to identify the characteristics of the body of knowledge that is embedded in this view of the firm. Cyert and March (1992, p. 120) argue for a characterization of SOP , that *learns and adapts*, in the form of: (a) well-defined specific rules to change behavior according to a short-run feedback, and (b) general rules to change more specific rules in response to longer-run and feedback, and (c) a hierarchy of rules where lower-level rules learn from higher-level rules.

SOP description as an organization abstract object that learns and adapt without referring to members of the organization, defines humans as *procedure adapter and procedure follower.*

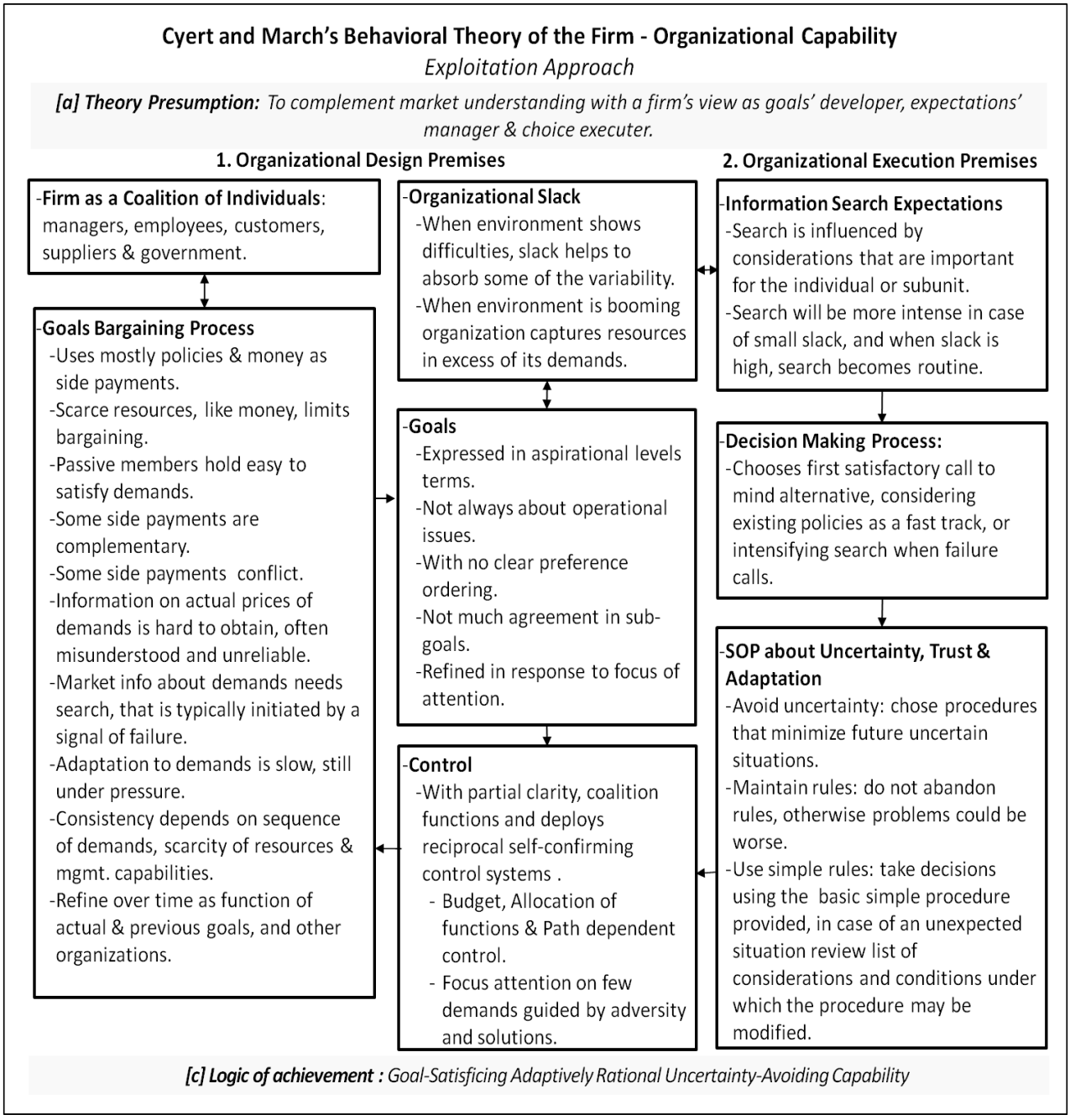

Figure 5. Cyert and March´s (1992) Exploitation Capability in Behavioral Theory of the Firm.

5.5.1 A Goal-Satisficing Adaptively Rational Uncertainty-Avoiding Capability

Cyert and March's *Behavioral Theory of the Firm*, while describing an understanding of organization as a goal bargainer, with search and choice satisfying orientation, uncertainty avoiding SOP follower, and slow experiential learner, reveals an organization

that, from the perspective of our quest, could be described by the following two of knowledge domains:

Organizational Design Knowledge characterized by: (a) knowledge of the coalition, characterized by goals and policies refined through actual and past experience, (b) managerial bargaining knowledge that hold the potential to influence value creation through balancing and prioritizing demands, and (c) classical managerial control knowledge.

Organizational Execution Knowledge characterized by: (a) knowledge of managers and employees related to the information search and decision making processes, and oriented to satisfy organizational goals with the influence of own and subunit expectations, and (b) knowledge of managers about organizational Standard Operating Procedures (SOP) oriented to avoid uncertainty, keep operations running, and last-resort explicit goal-oriented norms to modify procedures (see Table 36).

Cyert and March's Behavioral Theory of the Firm

Body of Knowledge of the Exploitation Capability

<table>
<tr><td>[a] Theory presumption</td><td colspan="3">The main idea is to complement extant theories about economic market factors with a firm's view as developer of goals, manager of expectations and choice executer.</td></tr>
<tr><td>[b] Actors' expectations</td><td>Firm's coalition: stockholders, managers, employees, customers, suppliers, regulatory and government institutions</td><td colspan="2">Organizational coalition agrees around imperfect rationalized and imperfect tested goals that are expressed in terms of expectations with certain aspiration levels, not always about operational issues, with no clear preference ordering, no much agreement in sub-goals, and refining – the goals - in response to experience; in which consistency depends on the bargaining management capabilities, the sequence of demands, and the scarcity of resources.</td></tr>
<tr><td>[c] Logic of achievement of objectives and actors' governance</td><td colspan="3">A Goal-satisficing adaptively rational uncertainty-avoiding capability guided by standard operating procedures.</td></tr>
<tr><td colspan="2">1.Organizational Design knowledge</td><td colspan="2">2.Organizational Execution Knowledge</td></tr>
<tr><td colspan="4">Knowledge: [d] Residency, [e] Domain, and [f] Type (A: Ability-based, S: Symbol-based)</td></tr>
<tr><td colspan="2">[d] Firm's Coalition:</td><td colspan="2">[d] Employee/Manager:</td></tr>
<tr><td>1.1 Goals and policies refined through actual and past experiences.</td><td>S
A</td><td>2.1 Information search and decision making toward organizational goals and influence by own and subunit expectations.</td><td>S
A</td></tr>
<tr><td colspan="2">[d] Manager:</td><td rowspan="2">2.2 Uncertainty, Trust & Adaptation SOPs: rules to avoid uncertainty, run the operation as usual even under failure, and last-resort explicit goal-oriented norms to modify procedures.</td><td rowspan="2">S</td></tr>
<tr><td>1.2 Bargaining knowledge use to leverage value creation by balancing demands.</td><td>S
A</td></tr>
<tr><td>1.3 Classical managerial control knowledge</td><td>S</td><td colspan="2"></td></tr>
</table>

Table 36. Body of knowledge of the exploitation capability of Cyert and March's (1992) Behavioral theory of the firm.

5.6 NELSON AND WINTER'S EVOLUTIONARY BEHAVIOR VIEW OF THE FIRM

Richard Nelson and Sidney Winter proposed in 1982, in theirs *An Evolutionary Theory of Economic Change*, a general way of theorizing about economic change. Their exposition holds as assumption Polanyi´s limitations about expliciting knowledge, implying that the best way to share what they, as authors, know, accepting their own limitations, is to present few specific examples – models - of their evolutionary view (p. 399).

Among Nelson and Winter's (1982) examples, there is an evolutionary view of the firm. This view is an account of the firm economic capabilities in which they use the *analogy that links individual skills to organizational routines* – "a repetitive pattern of activity in an entire organization" (p. 97) – to argue, through three main ideas, (a) that much of the knowledge that lies beneath effective performance in the organization is tacit knowledge (p. 134), (b) that as in individual skills, in organizational routines most of the choosing is automatic (pp. 82, 134), and (c) that the details of the routine behavior can only be described by its effectiveness (pp. 89, 134).

Nelson and Winter also invoke the *routine as genes metaphor* to argue that like genes the routines holds a persistent trait that determines possible behavior (1982, p. 14) and thus, it explains the evolutionary aspects of organizational design and behavior of the firm.

Nelson and Winter's view, from the perspective of our quest, is revealing in three senses. First, it proposes a clear distinction between individual knowledge and organizational knowledge by arguing that the organizational context operates as the memory of the organization. Second, it develops an evolutionary routine-based approach to understand persistent behavior, grow, contraction, heuristic-based problem-solving and innovation in the firm (1982, p. 98 & 99); this routine-based approach explicitly and implicitly describes an organizational body of knowledge for both the exploitation and exploration organizational capabilities; however, as we will discover later, the proposed scope for the innovation capability is limited (p. 133). Finally, the critical reading of the evolutionary view of the firm invites to consider the conflicting views that exists around two key concepts that defined organizational routines: tacit knowledge and bounded rationality (Miller, 2008; Foss, 2003a, 2003b).

5.6.1 Organizational memory and Organizational context

According to Nelson and Winter (1982) organizational knowledge resides mostly in organizational memories, which is instantiated – thus exists – while exercising the organizational routines, that is remembering by doing (p. 99). This exercising requires that all members of the organization knows their jobs by knowing their repertories of routines and knowing which and when to invoke an specific routine once a message is received from the organization, or from the external environment (p. 100).

Messages, here, are manifested in two ways. Through either [4.4] internal and external explicit messages in the form of directives, needs, description of situations, and other communication devices like hand language, signals, gestures, glances, whistles that hold invitations to action; and [4.5] implicit messages in the form of subtle (1) descriptions of situations, or (2) changes in the state of the working environment due to execution of another organizational routine, or (3) changes in the external environment, or (4) triggers form timers or gauging artifacts related to the working environment (Nelson & Winter, 1982, p. 101). It is relevant to notice that this picturing of messages assumes that organizational routines [4.6] proactively read explicit and implicit messages. Note: numbers in [brackets] refer to the elements in the Figure 6.

The repertoires of routines of that organizational members hold – individuals or subunits –include the ability to operate equipment, the whole plant, or in general, to exercise the productive practice upon materials and customers, in other words, as a whole this could be recognized as the list of ingredients of the organizational capability (Nelson & Winter, 1982, p. 103). Complementarily, the sequencing of tasks to accomplish a result and the knowledge of technologies that support it could be called the organizational

capability recipe (p. 104). However, what is central to this organizational capability is the coordination that guides the correct [4.7] interpretations of received messages to [4.8] invoke "the associations that link the incoming messages to the specific [4.9] performances that they call for" (p. 104).

This [4.7] interpretative and coordination knowledge may be understood as shared and residing in the individuals of the organization; and Nelson and Winter are clear about this issue, when they say that this individual knowledge is only meaningful and effective in the context of the organization (1982, p. 106). The organizational context [4.11] here holds an specific an revealing structure compose of [4.2] forms of external memory – electronic files and documents – that are [4.9] maintained by organizational routines, [4.3] durable physical structures, equipment and work environments that are ordered and repaired by organizational routines, and [4.1] a shared communication system (p. 105). This last component is characterized by the knowledge of the natural language - English or the spoken languages in the organization, and the organizational dialect – informal names of products, customers, suppliers, locations of things in the organization, and the localized meanings of certain words, like "promptly" or "slower" (p. 102).

Thus, the Nelson and Winter's (1982) proposed [4.7] organizational interpretative and coordination system is context-modulated, and this organizational context [4.11] – proposed as the memory of the organization – relates to the order and structure of symbol-based documents, durable objects, and the shared language of the organization - which, from the perspective of our epistemological posture of recognizing knowledge as resident in individuals, it corresponds to the Interpretative system and Tools of the Cultural layer of the Integrated Knowing Framework (Table 31) examined in the previous

chapter. Seeing it in this way – mapping Nelson and Winter's organizational context to our Bruner's (1990) Cultural Layer (see Table 31) the is not incompatible with Nelson and Winter's (1982) theory, but better it removes the Simon's (1991a) and Grant's (1996a) reifying worries about knowing organizations.

This Nelson and Winter's organizational context [4.11] and the [4.7] shared interpretative and coordination system, together with the aggregated repertories of routines resident in individuals, could be understood as the organizational execution capacity that: [4.6] proactively perceives messages from the internal and external environment, [4.7] contextually interprets those messages, [4.8] evoke from a repertoire an effective routine, [4.9] perform productive actions according to the chosen routine, and [4.10] sends contextual-based messages implicitly or explicitly as part of its actions; recalling that in which not all of it can be articulated since it is partially based in individuals tacit knowledge. See Figure 6 and Table 37.

5.6.2 Organizational design as Truce and Control routines

Theories about firms ask for a description of the firm's objective resolution approach, and Nelson and Winter's (1982) posture about firm's objectives is closed to Cyert and March's (1992) in respect that [1] there is no need of clear objectives, what is needed is a procedure that defines the course of action based on a choosing criteria. The main argument presented to sustain this affirmation is that in the real world organizations can drive their way without explicit and precise articulation of their objectives (Nelson & Winter, 1982, p. 57). Stakeholder's motivational forces modulate the behavior of the organization; these forces, understood as a constant stress on decisions, are root in

differing interests and complex intra-organizational political processes (p. 58); and are the result of a not completely rational evolutionary clean-up of motives, which conflicts extremely with the survival of the organization (p. 58).

The discussion of which firms' objective should be met is not complete without a reference on why members of the organization will chose to do what is required. Rule-enforcement mechanisms [2.2], based on supervision and sanctions, are necessary for effective performance but they demand continuous monitoring of organizational members, which it is not very convenient for higher levels in the organizational hierarchy. Motivational designs [2.1] - based on (a) rewards linked to output levels, (b) alignment between organizational expected behavior and what is attractive to the individual member, or (c) the expectation of a rewarded long-term relationship in exchange of an effective present behavior (Nelson & Winter, 1982, p. 110), together with rule-enforcement mechanisms, creates a stable but still conflicting situation.

The above mentioned intra-organizational conflict follows a largely persistent [2.3] truce tradition terms of which are not fully explicit (p.111); however it follows a pattern were (a) provocative actions - signaling a lower commitment to the truce, including anything that looks as a new initiative - are executed with caution; and (b) defensive responses - revealing the alertness of the organizational member to defend their vested interest - reject even inoffensive actions that might be misinterpreted as breaking of the truce (p. 111). This understanding of [2] truce as a routine – based on alignment through [2.1] motivational design, [2.2] rule-enforcement mechanisms, and a (c) tradition of apprehensions about breaking the truce – reveals an approach to organizational design that is persistent, but also not a very open system.

Complementary to the organizational design are the [3] control routines, those that keep routines running smoothly, take care of the non-homogeneous productive inputs – materials, equipment, and personnel – by: (a) *select*ing from market those productive inputs that are compatible with the routine, (b) *modify*ing – filter, order, dilute, train – inputs to meet the standards of the routine, (c) *monitor*ing the process to detect productive input or behaviors failures - like a slow worker - and then re-invoke *select*ing a replacement or *modify*ing and (d) *adapt*ing the routine to the new ranges of inputs being offer by the market, and compensating others routines as necessary (Nelson & Winter, 1982, p. 114). Note: Nelson and Winter's (1982) *"select", "modify", "monitor" and "adapt"* routine tactics are originally emphasized, but narrated in present simple tense.

The main challenge for continuously running routines is the lost of knowledge that happens with personnel turnover (p. 115), in which the worst scenario - a situation when turnover was unanticipated, no one else knows about the routine, and the knowledge involved is mainly tacit - may imply a temporary shutting down of operations or deliveries (p. 115 & 117). Less complicated scenarios may imply mutations of routines with desirable or undesirable performances. In any case, the control routine tends to resist mutation by maintaining the terms of the truce – for example by resisting the innovative approach of the newcomer (p. 116), and *modify*ing individual behavior to what is required.

5.6.3 Organizational Execution as Target, Control, Grow, Contracting and Innovation Routines

When the idea of *keeping the existing routines running smoothly* is view as difficult, then smooth execution of routines could be interpreted as the organizational target (Nelson & Winter, 1982, p. 112). However, a conflicting situation arises since organizational targets may change and truce routines implied an organizational persistent behavior. An initial solving approach to this apparent conflict could be best summarized in the continuum that goes from the phrase (a) *let's perform as effective like we did yesterday*, to the phrase (b) *let´s perform a similar successful action as of our competitor is doing, but better and cheaper* (p. 112). The general view of this evolutionary approach for organizational execution include the already described [4] target routines that together with [5.1] replication and [5.2] imitation routines tactics describes how firms grow. Complementarily, target routines in combination with [5.3] contraction routines tactics is the route suggested for discarding failures and even the downsizing of the firm. Finally, target routines with [6] *adap*ting, *replac*ing and *recombin*ing, and *problem-solving* routine tactics are propose to understand the bridge into innovation opportunities (pp. 134-135).

The replication routine tactics [5.1] - capability of adding an identical production unit delivering a particular output mix, in a particular way, from particular inputs - is understood in Nelson and Winter (1982) in the context of what is possible to achieve from the status quo of a running routine (Nelson & Winter, 1982, p. 118). Replication routines follow the pattern of the control routines, which is, the replicated routines confront a set of varied productive inputs – equipment, material, personnel - but with much larger variability, thus *select*ing and *modify*ing tactics are invoked more intensely

in replication than in control routines (p. 119). Here, existing routines are used as templates that embrace the functioning of a whole system, nevertheless the high cost of replicating individuals tacit knowledge cannot be avoided; this knowledge transferring is handled typically by either (a) training new members in the old facility, and (b) transferring selected experienced members to the new facility (p. 120). Nevertheless, difficulties like teaching disabilities, unwillingness to transfer knowledge and personal relationships are potential obstacles to replication, provoking mutations of routines (p. 121). In such cases truce and control routines are invoked and *adapt*ing the routines to the new facility may be necessary; recalling that what is to be accomplished is not an identical new facility but a comparable overall performance (p. 121).

Contract routines tactics [5.3], those mandatory organizational routines invoked for routines that fail to make a positive contribution (Nelson & Winter, 1982, p. 121 - 122), as is the case of routine outputs that do not achieve to cover routine input cost, initiates a search for a new viable routine under conditions of adversity, given the limited resources originated in the failure and the persistent behavior approach focused on the current routine. If the search is successful then the firms "carry out the new routine"– here we label this tactic as *replace* – which becomes the new organizational target (p. 122). However, if the failing is considered to be temporal, the only search invoked is for resources that sustain the functioning of the failing routine. In cases when that searching for resources fails short and the replacement of the routine is not possible then firm reduce its scales and eventually the firm may entirely disappear. However, unpredictable behavior may be expected under broad failing of routines, since truce routines may not be sustainable (p. 122).

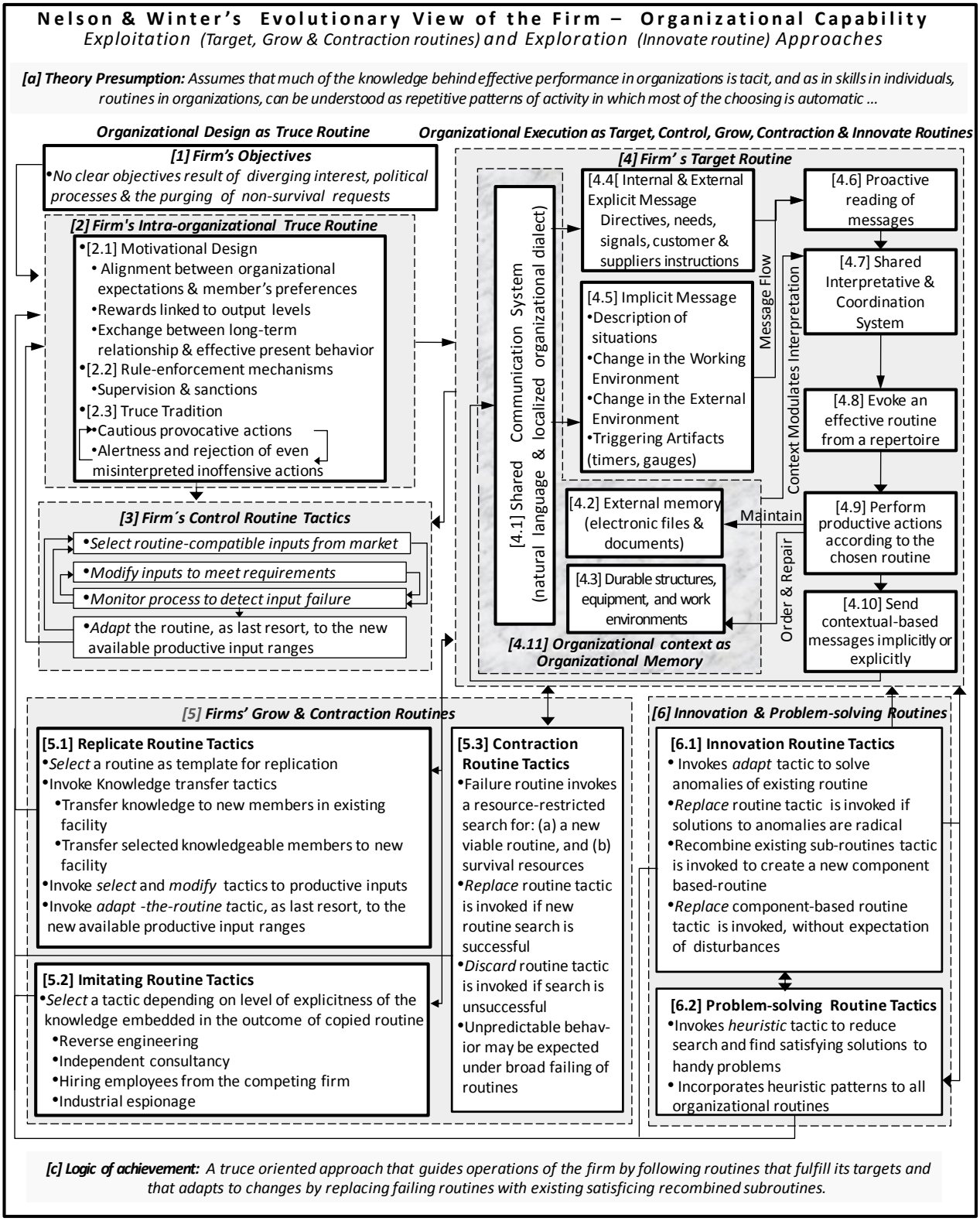

Figure 6. Nelson and Winters's (1982) Exploitation and Exploration Capability in the Evolutionary View of Firm.

Imitating routines tactics [5.2] are often initiated when a firm will like to be able to do what other firm is more successfully doing. In this case, the target routines are not available as templates, implying that the copied routine will be, if success greets, a mutation of the original with a different behavior; which is not relevant if the routine economic performance is within the acceptable range. Imitation is additionally motivated by the knowing that there is already a workable design for the routine, and the tactics to achieve imitation vary depending on the level of explicitness of the knowledge embedded in the components of the original routine outcomes – from standard to idiosyncratic tacit knowledge. This tactics include (a) reverse engineering, (b) independent consultancy, (c) hiring employees from the competing firm, and (d) industrial espionage (Nelson & Winter, 1982, p. 123 - 124).

Innovation and routines [6] may be considered opposites; however Nelson and Winter (1982) achieve to describe [6.1] innovation as organizational routine tactics. The initial argument is a motivational one, and it is related to the challenge that puzzles and anomalies of prevailing routines sometimes show up. Often solving the anomalies of existing routines – *adapt*ing – presents no resistance from control and truce routines since functioning routines will continue to be the organizational targets; however, it may lead to innovations in the productive process. In other situations, the proposed solution to the anomalies may be radical and in such case *adapt*ing is not the sequence to follow but a large replacement of equipment, material or personnel might implied to *replace* the routine (p. 129 – 130). The other argument to understand innovation as a routine it is essentially anchored in the distinction between innovation as an activity and the innovation as a result. Anchoring in the former understanding of innovation, Nelson and Winter advocate for two additional approaches - routines as components and routines as heuristics (p. 130 – 132) - directed to provide innovation capability

to the firm, leaving clear that the issue of prediction of effective results with these approaches is best view as stochastic (p. 136).

Routine as component is an approach that proposes to understand innovation as (a) the tactics that *recombine* existing sub-routines in search of a new routine, and (b) the tactics that *replace* existing sub-routines for a better new one, in the context of surrounding activity that expects for no disturbances during the replacement (p. 130). This component approach asks for routines to be reliable and to hold a scope that is well-understood (Nelson & Winter, 1982, p. 131) to avoid unexpected behaviors and routine integration problems.

Finally, [6.2] routine as heuristics – "any principle or device that contributes to the reduction in the average search to solution" (Newell, Shaw & Simon, 1962, p. 85) – is a problem-solving approach that follows Simon's (1955) goal satisficing search of solutions, that is, the first founded instance that satisfies the problem at hand, after following a systematic sequential search, is accepted as a definite solution. Nelson and Winter's view do not only propose to count with an heuristic routine to approach problems, but the broad incorporation of heuristic patterning to the concept of routine (Nelson & Winter, 1982, p. 131).

Certainly, the routine approach to describe what the organization has learned and apply it severely limits the role of the individual in the organization to: a) the matching of routines to situations, b) interpreting the feedback to adjust the routine or increase the confidence on it, c) interpreting an experience as a lesson learned, and d) transform the lesson learned in one of the forms of the routine.

Nelson & Winter's Evolutionary View of the Firm

Body of Knowledge of the Exploitation and Exploration Capability

<table>
<tr><td>[a] Theory's presumption</td><td colspan="3">Assumes that much of knowledge beneath effective performance in organizations is tacit, and as in skills in individuals, routines in organizations, are repetitive patterns of activity in which most of the choosing is automatic, and known only by its effectiveness, and persistent trait, as if they were genes, which determines possible evolutionary designs and behaviors of the firm.</td></tr>
<tr><td rowspan="2">[b] Actors' expectations</td><td rowspan="2">Stockholders, managers and employees</td><td>Stakeholder's motivational forces modulate the behavior of the organization and constantly stress decisions because:
• They are rooted in differing interests.
• Generate complex intra-organizational political processes result of not completely rational evolutionary clean-up of motives.
This conflicts with the survival of the organization.</td></tr>
<tr><td>Members of the organization will chose to do what is required based on:
• Rewards linked to output levels.
• Alignment between organizational expected behavior and what is attractive to the individual member.
• Expectation of a rewarded long-term relationship in exchange of an effective present behavior.
• Rule-enforcement mechanisms.
This, in any case, creates a stable but a still conflicting situation.</td></tr>
<tr><td>[c] Logic of achievement of objectives and actors' governance</td><td colspan="2">A truce oriented approach that guides operations of the firm by following routines that fulfill its targets and that adapts to changes by replacing failing routines with existing satisficing recombined subroutines.</td></tr>
</table>

<table>
<tr><th colspan="2">1. Organizational Design knowledge</th><th colspan="2">2. Organizational Execution Knowledge</th></tr>
<tr><td colspan="4">Knowledge: [d] Residency, [e] Domain, and [f] Type (A: Ability-based, S: Symbol-based)</td></tr>
<tr><td colspan="4">Combined Exploitation and Exploration Capability</td></tr>
<tr><td colspan="4">Exploitation knowledge domains</td></tr>
<tr><td colspan="2">[d] Stockholder/Manager:</td><td colspan="2">[d] Manager/Employee:</td></tr>
<tr><td>Truce routine:
- Motivational, Rule-enforcement and Truce mechanisms guide alignment to truce</td><td>S/A</td><td>Target routine:
- Organizational memory: documents, work environment, and organizational dialect.
- Internal & external, explicit & implicit messages.
- Shared interpretative & coord. system: molded by organizational memory invokes actions & notifications.</td><td>S/A</td></tr>
<tr><td>Control routine: alignment and monitoring of resources, and adjustment of routines</td><td>S/A</td><td>Replicate routine tactics: transferring workers & knowledge, and select aligned resources</td><td>S/A</td></tr>
<tr><td rowspan="2">Grow and contraction routine: defines the tactics to follow for replication, imitation and contraction</td><td rowspan="2">S/A</td><td>Imitating routine tactics: reverse engineering, consultancy and hiring the competing' employees</td><td>S/A</td></tr>
<tr><td>Contraction routine tactics: restricted search for survival resources & discard routine at failure</td><td>S/A</td></tr>
<tr><td colspan="4">Exploration knowledge domains</td></tr>
<tr><td colspan="2">[d] Stockholder/Manager:</td><td colspan="2">[d] Manager/Employee:</td></tr>
<tr><td>Truce routine: (see above description).</td><td>S/A</td><td rowspan="2">Innovation routine tactics: adapt routine for simple anomalies, otherwise replace it with existing or recombine routines</td><td rowspan="2">S/A</td></tr>
<tr><td>Control routine: (see above description).</td><td>S/A</td></tr>
<tr><td>Innovation routine: defines innovation & problem solving tactics</td><td>S/A</td><td>Problem- solving routine tactics: heuristic search for satisficing solutions as pattern for all routines</td><td>S/A</td></tr>
</table>

Table 37. Body of knowledge of the exploitation and exploration capability of Nelson and Winters's (1982) Evolutionary View of Firm.

Here, we understand Nelson and Winter's (1982) evolutionary conception of the workings of the firm as embedded with a combined exploitation and exploration organizational capability that follows a context modulated tacit and bounded-rational patterns for achieving [2] truce among the stakeholders' objectives at organizational design level, while [4] accomplishing survived firm's targets through a context-modulated interpretative and coordination system, which evokes [5] grow and contraction routine tactics, and [3] control routine tactics at execution design level in the exploitative side; and evokes [6] innovation and problem solving routines and control routine tactics at execution design level in the explorative side (see Table 38).

5.6.4 Routines: Conflicts between Tacit knowing and Bounded rationality

The conception of heuristic patterning as a generalized characteristic of routines (Nelson & Winter, 1982, p. 131) invokes Simon's (1991a) bounded rationality approach – decision-making involves limited search for satisficing alternatives. This epistemological feature holds difficulties according to Miller (2008) and Foss (2003a, 2003b), given the already argued tacit knowing (Polanyi, 1958) characteristic of routines (Nelson & Winter, 1982, p. 134).

The raised epistemological difficulties are best summarized in:

> *Simon's research emphasized cognition over action, explicit knowledge over tacit knowledge, mechanistic information processing over human judgment, and means over ends. Polanyi provides counterbalancing emphases for each of these orientations (Miller, 2008, p. 940).*

The perspective of the Individual Knowing (IK) Framework (Table 31) and the Integrated View of Language, Shared Meanings and Recognizing of Knowers (see Table 32), in which ability-based knowing and symbol-based knowing differ, at contrivance stage, by the tools in use (non-symbolic and symbolic), proposes a non-conflicting explanation for the tactic-bounded rationality incompatibility.

Accepting that enacting organizational routines are characterized by a tacit knowing process, then making explicit the systematic rules that bounded rationality asks for decision-making depends on the level of preciseness of the symbol system in use. The symbolic system described by Nelson & Winter (1982) in the shared communication system is the natural spoken language and the localized organizational dialect, and in this sense that the raised difficulties appeared to hold grounds, sine not all knowledge (rules) hold by members of the organization to take decisions could be denoted by those symbolic systems. However, (a) maxims could be available by analyzing application and success, (b) and bounded rationality's criterion of success is satisfaction – achievable through maxims, and (c) since Nelson and Winter's approach for the creation of knowledge follows the recombination of existing routines, then opportunities for analyzing application and success of components is highly probable. Therefore, Nelson and Winter's organizational tacit component of routines hold only the tension, but not the incompatibility, of characterizing its heuristic patterning component through maxims.

5.7 SPENDER'S KNOWLEDGE APPLICATION AND GENERATION

With different motivations and denotations (labels) than previous theorists, John-Christopher Spender (1992) also wrote about the choices that organizations make between

generating new possibilities in uncertain conditions – exploration - and applying the known in existing certainties – exploitation. He refereed them as knowledge generation (KG) and knowledge application (KA) respectively. His motivation had as a context the Soviet Union´s ceasing to exist as of December of 1991, and that fifteen countries were moving form socialism to capitalism. In that background, Spender wrote an article questioning the usefulness of management theories to help the organizations in those countries to develop management capacity, re-structure industry, and introduce competition. The questioning started with the existing criticism of management education; however, his relevant argument was that institutional systems – property, insurance, and stock markets – were being defined in these countries while management theories assumed these institutions, and their corresponding operational uncertainty management capacity, as given.

Spender' (1992) whole knowledge-based view of the firm is barely hinted in the article, in a context of a particular challenging situation – Soviet Union uncertainty scenario. The hints are provided through an open set of coherent premises that insinuates a *recipe* based on plausible and enlighten arguments referencing extant theories and findings; though it is revealed as to be completed by the reader researcher.

5.7.1 Spender's Theory of Postindustrial Organizations

In that context, it could be said that Spender (1992) achieves to describe the elements of a theory of postindustrial organization (p. 397), that sketches an understanding of the organization, that to deliver its purposes starts recognizing that the organization operates under risk and uncertainty; and that such attending is directed toward four contextual factors: (a) the state of the assumptions that drives action in the organization, (b)

beneficiaries of residual rights (shareholders, employees, customers, or state), (c) the risk management capacity of the institutional systems of the industry where the organization operates, and (d) the beneficiaries of externalities costs (ecological damage, employee' education and health).

Spender's (1992) theory, instead of presenting the conflicting choice between exploiting existing knowledge and exploring for new knowledge of March (1991), argues for a coupling approach that goes from knowledge application (KA) to knowledge generation (KG). The initial difference that should be noted between these two approaches is characterized by the reactive to proactive switch in appreciation of the four contextual factors: assumptions for action, beneficiaries of residual rights, social institutions, and beneficiaries of externalities cost. Spender moves from: identifying them; to: asses them, influence them and define them; within the same contextual factors, but extending its understanding.

In describing his theory, he presents three complementary snapshots for the analysis of organizations and their industry. Spenders called them levels, but that label generates unfulfilled understanding expectations related to hierarchies, whereas the idea of snapshot works better, as we will see. The first one, related to operation of an organization under certainty environments; it is where conventional organizational theory is presumed to be adequate. The second has to do with social institutions and how they define the feasibility of the economic activity. The third is about organizational designs oriented to the management of uncertainties.

At the first snapshot – the knowledge application (KA) approach, conventional organizational theory presumes that appropriate information and knowledge is freely

available (Spender, 1992, p. 409). Here, the sought purposes define the organization; and the manager's task is to bring the correct knowledge in action and to know how to structure the organization using that knowledge. (p. 397). In the process, managers address the appropriate division of labor, its coordination and control (p. 409).

In this KA approach, teamwork is managed with tactical teams (Larson and LaFasto, 1989 p. 42); which are "focused workgroups, highly trained with stable roles and relations in which the structure of the team is set by the knowledge to be applied, especially when much of this knowledge is built into specific apparatus" (Spender, 1992, p. 404).

At the second snapshot of analysis, its central assumption is supported by North (1991, p. 97) by saying that institutional systems have been devised by human beings to create order, and reduce uncertainty in exchange. Together with the standard constraints of economics they determine transaction and production costs and hence the profitability and feasibility of engaging in economic activity (Spender, 1992; p. 398); however they are more helpful when we become aware of the cultural and historical contingencies embedded in the social dimension of these institutional systems (p. 410), like the historical commitments to develop a law system, contrasted against the stories of frauds and regulatory failures (p. 398).

Property, employment and insurance are the main social institutions referred by Spender (1992, p. 406). Other institutions like university research facilities, trade federations, stock exchanges, professional associations; and nucleus of legal, financial, and technical experts are mention as relevant western institutions (p. 407).

The western organizational theory, Spender (1992) argues, counts implicitly with a systems of law, professional etiquette, and commercial custom and practice, which add force to contracts and affect course of actions of contending parties (p. 398). The next four paragraphs give account of Spender's view of the role of social institutions in the industry.

Property is described as a critical social institution (Nedelsky, 1990) that calls for attention. While there is considerable experience with the development and regulation of financial and stock market institutions, the history also counts with not few misbehaviors and regulatory failures in which the wanted results, like the market expansion thru the flow of savings into economic and technological enterprises, could be quickly defeated by unwanted skilled operators that take advantage of naive investors with new Ponzi schemes or South Sea Bubble, right in front of inexperienced regulators armed with breakable legislation (Spender, 1992, p. 398).

Deficient intellectual property rights knowledge and law will make more complex for organizations to store knowledge independent of the personnel who participate in its development (Spender, 1992, p. 406).

In the employment contract, four factors are relevant: authority, rewards, organizational identification, and coordination (Simon, 1991b, p. 24). This cannot develop without certain society's arrangement, like employment law, welfare systems, education, and taxation (Spender, 1992, p. 399). Depending on them many different employment and management norms will emerge, like: a) those in Japan – with poor external labor market and high retention (Aoki, 1990) - or Scandinavia, and Nigeria (Spender, p. 399); or b) the case of knowledge specialists that could become the limiting or strategic factor if a good external

labor market develops and allows foreigners workers to move in; thus it will slow the rate of technology introduction in workers' regions. (p. 406).

Insurance is also critical to transform organizational uncertainties into risks, as is the case of international trade. Comparable significance can be attached to institutions which make portfolio diversification possible, without them capital market cannot be successful (Spender, p. 407), see Figure 7.

Finally, the third snapshot of analysis - the knowledge creative organizational level (KG) that confronts circumstances of uncertainty. Here, mainly two organizational mechanisms develop answers to uncertainty: (1) an internal approach that corresponds to certain non-bureaucratic types of organizational teams; and (2) an outbound approach that defines the management role in regards to the institutional context. In both uncertainty-dealing mechanisms, Spender (1992) explicitly states that these processes consider the role and production of tacit organizational knowledge (p. 409).

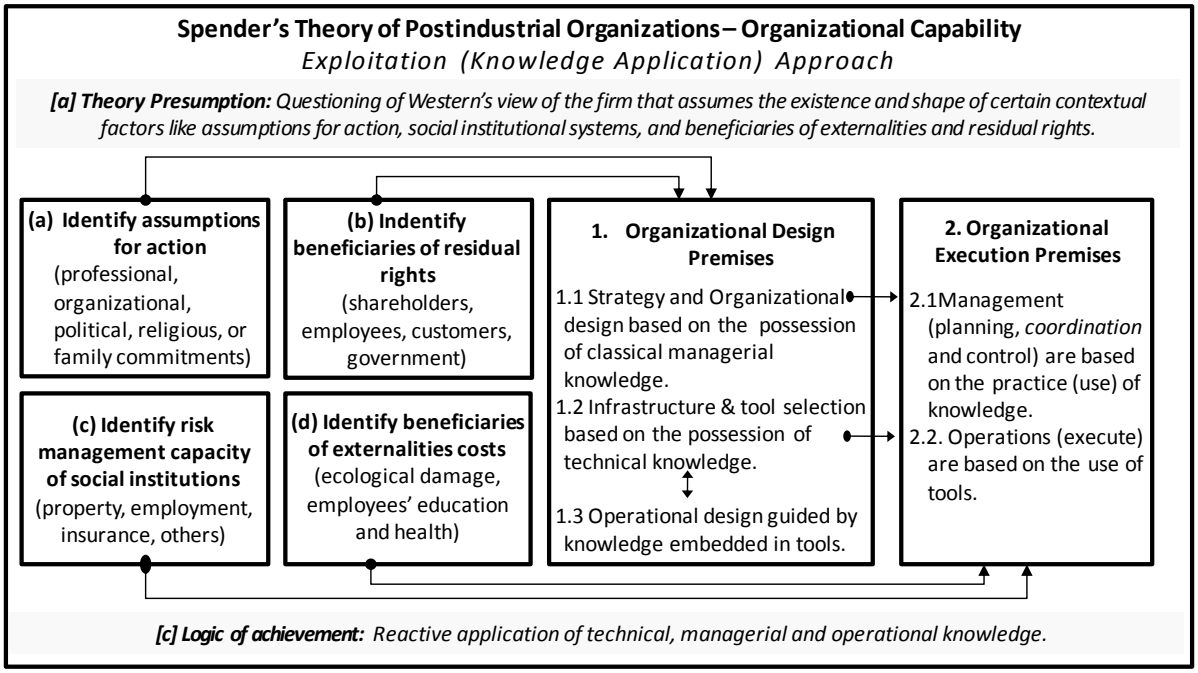

Figure 7. Spender's (1992, 1989) Exploitation Capability in the Theory of Postindustrial Organizations.

A bureaucratic structure depends on knowledge at hand. Uncertainty, argues Spender, asks for workgroups that hold together under the conditions of bureaucratic failure by institutional forces, rather than by rational administration. Social institutions, outside the organization, happen to be relevant because they define the institutional bases for such teams (Spender, 1992, p. 390). Team members' reflections on the institutions, in which they are embedded, offers them a sense of identity (p. 406) and defines a team social structure that is not dependent on the knowledge or tool necessary for the task at hand, but arises from patterns of social interaction with, but not limited to, school ties, religious affiliation, family membership, professional affiliation, or membership of a creative team (p. 406).

Spender suggests that in the raised social structure, the team can cope with and focus on the uncertainty to be attended, it allows them to: (a) experience uncertainty, (b) develop suitable frameworks and set of symbols, (c) communicate, (d) bring their problem-solving abilities to bear, (e) develop the new knowledge, which (f) gives socialized members the confidence that the uncertainty is resolved (Spender, 1992, p. 406).

Spender, following Larson & LaFasto (1989), told us about two additional kinds of teams – besides the tactical team - that fit in this KG approach. These are: *(1) Problem-solving teams* that are in charge of dealing with situations that have already been framed and defined (Spender, 1992, p. 404). Their discovery resides in the non-defined cooperative activities to find a solution to a predefine problem. *(2) Creative teams* that are the intense version of problem-solvers, responsible of developing new possibilities, approaches, and frameworks. Their final delivery and work process cannot be defined by the tool or knowledge to be applied and, as a result, it is impossible to control, (Spender, 1992, p. 404). Creative teams ask for a complete set of characteristics: (a) an elevating

goal, (b) a results-driven structure, (c) a collaborative climate, (d) internalized standards of excellence, (e) external support, and (f) principled leadership, (Larson & LaFasto, 1989: 26). Here, we label this team's patterns of interaction with social institutions and it's sustaining characteristics as "team recipe".

Leadership in these teams may be as co-member, with supplementary externally defined responsibilities, or from outside the team, controlling team's interactions with the environment. There is no role for an organizer (Spender, 1992, p. 404). "The relationship between individuals and the social institutions that emerge as they move into cooperation is complex and cannot be usefully reduced to leadership alone" (p. 405), especially if we are considering societies other than the Western.

One issue that Spender (1992) states as relevant is that in some societies there may be political, religious, and family commitments and little commitment to organizations (p. 399). Thus, when researchers talk about "trust" and "commitment" as the bonding basis for effective teamwork, they do so because these are common for society's western societies (p. 405). Sociology (Denhardt, 1981) had suggested that commitment to the capitalistic forms of work often requires a shift in the individual's institutional commitments, away from politics, religion, and the family. Middle-class, in the Western, looks to their professional and organizational commitments for their sense of identity and the rules that direct their lives. (Spender, 1992, p. 399).

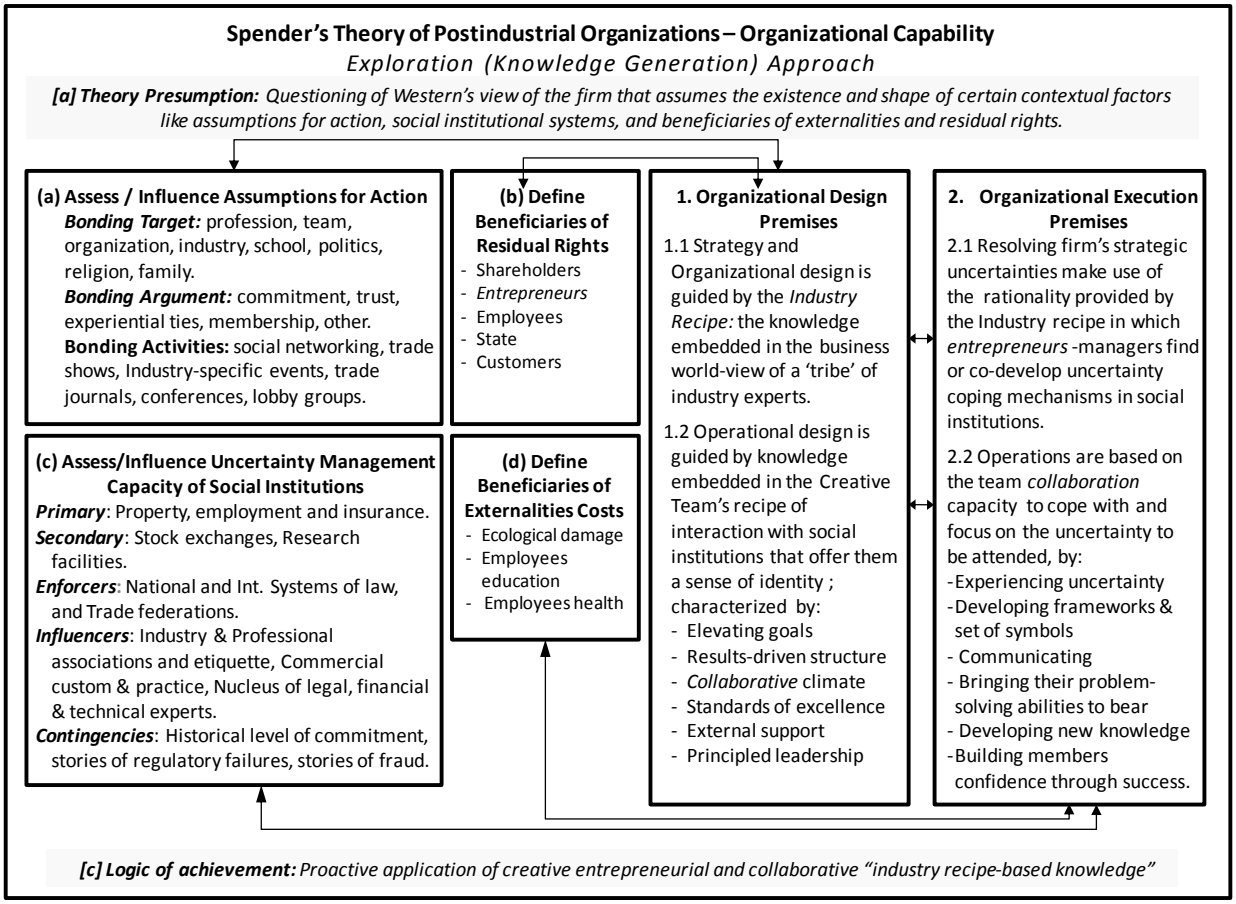

Figure 8. Spender´s (1992, 1989) Exploration Capability in the Theory of Postindustrial Organizations.

Spender's (1992) third analysis snapshot suggests that, when managers face uncertainties – "define as a condition of information deficiency in which the data by themselves neither contain nor determine a conclusion" (Spender, 1989, p. 173) - they look around for guidance, primarily from other managers operating in the same industry (p. 173).

Industry-specific activities, such as networking, trade shows, trade journals, conferences, and lobby groups, provide members of an industry with a socializing language (Spender, 1992, p. 407). This allows managers to take on an approach for looking at their situations that is widely shared within their industry (Spender, 1989, p.

173). Spender calls this pattern of judgments the industry's "recipe". The industry recipe is knowledge embedded in the business world-view of a 'tribe' of industry experts (p.7); it represents knowledge about the industry where the organization operates; and it becomes the organization's primary analytic environment (p. 60). Complementary, managers might built or find, depending of the development stage of social institutions, uncertainty coping mechanisms in this institutions (Spender, 1992, p. 407); and these mechanisms are embedded in the rationality of the industry recipe. Industry recipe is seen as the rationality that managers invoke to resolve firm's strategic uncertainties; an assessment that does not deny the existence of other rationalities (Spender, 1989, p. 60). Then, in Spender´s view, industry recipe holds the body of knowledge that supports the knowledge creation (KG) approach in organizations. (See figure 8).

5.7.2 Spender's assumptions for action, institutions, externalities and residual rights

This reading of Spenders' (1992) knowledge-based view of the firm is characterized by a constant effort of: (a) categorizing the references and examples of the four uncertainty shaping constructs introduced in the text – assumptions for action, social institutions, beneficiaries of residual rights, and beneficiaries of externalities cost; and (b) indentifying the signaled or insinuated dependencies between these constructs and the characterization of the organization. In the second issue, given Spender's departing arguments, the criterion chosen for the KA approach was "risk management" and the criterion used in the KG approach was "uncertainty management".

Complementarily, categories were introduced into the four risk and uncertainty shaping constructs, considering the essential property that characterized the instances being categorized and making sure that the set of categories assign to the construct covers to the whole domain of instances of the construct. The purpose of this categorization is dual. First, it reveals that the reading is rigorous to the instances of the references presented in the article - no category was introduced without an explicit textual reference. Second, it is a structural coherent approach for reveling more specifics of Spender's knowledge-based view of firm; that is, categorization of textual instances allow adding more instances to the categories or identifying missing categories in respect to the whole.

As it was commented before, the level of abstraction applied in this reading allows conceiving, for both, the KA and KG approaches, an identical structure of constructs, but with extended characterization and relationships for the KG approach. By applying such categorizing guideline, *Assumptions for Action* and *Uncertainty Management Capacity of Social Institutions* constructs were framed with extended characteristics:

[a] Assumptions for Action:

- Bonding Target: indentifies those instances of social institutions that are the target of affiliation, it includes: profession, team, organization, industry, school, politics, religion, family.
- Bonding Argument: identifies the beliefs that sustain the affiliation to the social institution and assumptions for action, it includes: commitment, trust, experiential ties, membership, other.

- Bonding Activities: identifies those instances of social activities through which affiliation is built, it includes: social networking, trade shows, industry-specific events, trade journals, conferences, lobby groups.

[c] Uncertainty Management Capacity of Social Institutions:

- Primary Institutions: Identifies those instances of social institutions that hold a historically evolved discourse of transforming uncertainty to risk or stability and that are globally use. It includes property, employment, and insurance.
- Secondary Institutions: Identifies those instances of social institutions that hold a more recent discourse of transforming uncertainty to risk and that while globally known, its capacity is dependent of other conditions like population size or local culture. It includes: stock exchanges, research facilities.
- Enforcers: Identifies those instances of social institutions that hold an enforcement capacity to make parties behave according to their obligations. Includes: national, international systems of law and trade federations.
- Influencers: Identifies those instances of social institutions that hold an influence capacity to shape de discourse of social institutions. I includes: industry associations, professional associations, professional etiquette, commercial custom, commercial practice, nucleus of legal, financial & technical experts.
- Contingencies: Identifies those instances in the history of social institutions and the public opinion about them that describe the level of coherence or incoherence with its discourse. It includes stories of commitment, stories of regulatory failures, and stories of fraud.

The characterization of an organization that reflects Spender's (1992) theory reveals the two intertwine bodies of knowledge, the first one related to the design of the

organization and the other about the execution of activities of the organization. Then, in Spenders' theory [1] organizational design knowledge corresponds to classical managerial knowledge and knowledge embedded in the selected infrastructure and tools; and [2] organizational execution knowledge corresponds to coordination (for KA) or collaboration (for KG) orientation to the delivery of the firm's purposes.

Then, the dependences between the domains of knowledge - *organizational design knowledge* and *organizational execution knowledge* - and the four uncertainty shaping constructs are similar for the KA and KG approaches, with the only key exception that in the KA approach the dependences are unidirectional - reactive - while in the KG approach the dependences are bidirectional – proactive; that is, in KG organizational design and execution knowledge also could shape assumptions, institutions and beneficiaries. Of course, knowledge content is different. While in KA, the classical management knowledge and knowledge embedded in tools guide the organizational design and execution; in KG, the industry recipe and creative team recipe do the designing and executing job.

In summary, the knowledge application approach (KA) holds a reactive tone, in which:

> Organizational Design knowledge is constituted by [1.1] strategy and organizational design knowledge, [1.2] technical knowledge, and [1.3] the embedded knowledge of the selected infrastructure and productive tools, which is shaped by: [a] the assumptions for action, and [b] the beneficiaries of residual rights. Additionally, [1.2] technical knowledge and the [1.3] embedded knowledge of the selected infrastructure and productive tools shape them mutually.

Organizational Execution Knowledge is constituted by the [2.1] practice of management and the [2.2] practice of operational skills, which is shaped by: [c] the management risk capacity of social institutions, the [d] beneficiaries of externalities cost. Additionally, the [2.1] practice of management is shaped by [1.1] strategy and organizational design knowledge. Additionally, the [2.2] practice of operational skills is shaped by the [1.2] embedded knowledge of the selected infrastructure and productive tools selected in operational design.

It is important to notice how Spender (1992) extended the concept of "knowledge built into specific apparatus" (Spender, 1992, p. 404) form tangible infrastructure and tools in KA, to intangible social artifacts in KG. Given the epistemological posture of recognizing knowledge as resident in individuals, here, these Spenders' conceptions of embedded knowledge are understood as form of symbol-based knowledge with high precision and none scalability for KA; and high richness and high scalability for KG.

In summary, the knowledge generation approach (KG) holds a proactive tone, in which:

Organizational Design knowledge is constituted by [1.1] Industry Recipe and [1.2] Creative Team's Recipe, which gives shape and are shaped by: [a] the assumptions for action, and [b] the beneficiaries of residual rights.

Organizational Execution Knowledge is constituted by [2.1] the uncertainty coping mechanism of the [2.2] Industry Recipe and the Creative Team's Recipe collaboration skills, which give shape and are shaped by: [c] the uncertainty management capacity of social institutions, [d] the beneficiaries of externalities cost, and [1] the organizational design knowledge. Additionally, [1.1] interacts with [2.1] and [1.2] interacts with [2.2]. See Table 38.

Spender's Theory of Postindustrial Organizations

Body of Knowledge of the Exploitation (Application) and Exploration (Generation) Capabilities

<table>
<tr><td>[a] Theory's presumption</td><td colspan="2">Questioning of Western's view of the firm that presumes the existence and shape of certain contextual factors like assumptions for action, social institutional systems, and beneficiaries of externalities and residual rights.</td></tr>
<tr><td rowspan="2">[b] Actors' expectations</td><td rowspan="2">Stockholders, managers, employees, customers, suppliers, regulatory and government institutions</td><td>Exploitation approach: Expectations are related to operation of organizations under measurable risky environments; in which conventional organizational theory is presumed to be adequate and social institutional systems function as uncertainty to risk transformers.</td></tr>
<tr><td>Exploration approach: Expectations are related to the operation of organizations under uncertainty and to the bureaucratic failure of institutional forces, in which the knowledge or tool necessary for the task arises from patterns of interaction with social institutions, outside the organization, like, but not limited to, school ties, religious affiliation, family membership, professional affiliation, or membership of a creative team.</td></tr>
<tr><td rowspan="2">[c] Logic of achievement of objectives and actors' governance</td><td colspan="2">Exploitation approach: Reactive application of technical, managerial, and operational knowledge presuming certain actors' assumptions for action (professional, organizational, political, religious, or family commitments).</td></tr>
<tr><td colspan="2">Exploration approach: Proactive application of creative entrepreneurial and collaborative "industry recipe-based knowledge" by assessing and influencing actors' assumptions for action.</td></tr>
</table>

1.Organizational Design knowledge		**2.Organizational Execution Knowledge**	
Knowledge: [d] Residency, [e] Domain, and [f] Type (A: Ability-based, S: Symbol-based)			
Exploitation Capability *(Knowledge Application)*			
[d] Manager:		**[d] Manager/Employee:**	
1.1 Classical managerial knowledge shaped by the (a) assumptions for action and by (b) the expectations of the beneficiaries of residual rights.	S	2.1 Practice of classical managerial knowledge shaped by the (c) risk management capacity of social institutions and the (d) beneficiaries of externalities cost.	S A
1.2 Technical knowledge defines the characteristics of the productive apparatus and shapes the operation of the organization.	S	2.1 Practice of classical operational knowledge shaped by the selected productive apparatus.	S A
Exploration Capability *(Knowledge Generation)*			
[d] Entrepreneur/Manager:		**[d] Entrepreneur/Manager/Employee:**	
1.1 Industry recipe knowledge and creative team 's knowledge about socially-built identity patterns give shape and are shaped by the (a) assumptions for action, the (b) beneficiaries of residual rights.	A	2.1 Individuals' skills on Industry Recipe's uncertainty coping mechanism, and Creative Team's collaboration skill's on attending uncertainty give shape and are shaped by (c) social institutions' uncertainty management capacity, and (d) beneficiaries of externalities cost.	A

Table 38. Body of knowledge of the exploitation and exploration capability of Spender's (1992, 1989) Theory of Postindustrial Organizations.

5.7.3 Integrating Knowledge Application (KA) and Generation (KG) Capabilities

In Spender's theory (1992), two final issues are still pending for discussion. The first one has to do with the question "What motives managers to care about coupling successfully with uncertainty?" The answer may be hidden in the swift transition along Spender's text that goes from the label "managers" to the label "entrepreneurs", in reference to those in charge of coupling with uncertainty (Spender, 1992, pp. 406 - 407). The theoretical arguments for this question are to be found in a brief reference to Knight (1965). Frank Knight published in *Risk, Uncertainty and Profit*, in 1921, the seminal ideas that argue that entrepreneurship is focused on managing uncertainty, and in taking the responsibility of decision-making in such conditions. Here, the entrepreneur arises as new productive agent. He is called to take chances under ignorance, based on opinion rather than knowledge, like forecasting consumer demands while never knowing in advance if his expectations are correct, but always being responsible for the results of decisions (Knight, 1965).

Knight (1965) went on arguing that in corporations, where decisions are delegated, the true entrepreneur is the one who is responsible for decisions; even he did not take one in particular. Here, the critical decision is the selection of men who make decisions. In this context, the entrepreneur is not the mere manager who provides resource coordination as a routinely productive service, and who receives an imputed contractual value for it; but he is the responsible decision-making actor and the insurer of incomes to factors owners; and who receives a profit which magnitude is determined by the competition of rival entrepreneurs and non-entrepreneurs. Profits act as an entry and exit

signal influencing the entrepreneur and the factor owners, as they can see opportunities for better returns.

Thus, when Spender (1992) switches from managers to entrepreneurs in his text, it is assumed that he is not talking about mere managers but of entrepreneur-managers in which being a beneficiary of residual rights is his suggested answer to the motives of caring about coupling successfully with uncertainty; and hence the relevant factor in the knowledge generation approach (KG) while modeling organization design and execution design.

The second and final issue has to do with the *integration* of the KG and KA approaches or *coupling* as is called by Spender (1992, p. 405). Even though that KA and KG structures in Spender´s theory, the constituting constructs are identical and that difference is focused on that dependences among the constructs follow the reactive to proactive transition respectively; it is not completely obvious how the coupling between KA and KG occurs; that is "Which organizational design and execution pattern is in charge of transferring the outcomes of the KG´s uncertainty-solving knowledge to the KA´s bureaucratic and optimizing knowledge?"

The answer is embedded in the essence of his view. Since the KG approach copes with uncertainty in search of an externalized risk, and when this transformation successfully happens it becomes unproblematic for the KA approach to deal with that kind of knowledge since the KA design is ready for risk-managed environments. Of course, this changes the question to "How do organizations protect this intellectual property called uncertainty-solving knowledge?" And the answer to this question goes back to the contextual factor like the identification and shaping of assumptions for action

and the definition of residual rights at the organizational design level; and to social institutions, like property and employment at organizational execution level.

5.8 KOGUT AND ZANDER'S THEORY OF REPLICATION AND COMBINATIVE CAPABILITIES OF THE FIRM

Kogut and Zander (1992) argue that firms' organizational context allows the sharing and transfer knowledge of individuals and groups within an organization better than markets (p. 383). They departing point, when presenting the theory, is to find an explanation for the growth of the firm, in which they recognize the challenge of devising a capability that (a) facilitates knowledge transferability to drive organization's grow by the replication of current activities, and (b) reduces the risk of imitation by the competition (p. 383). In this sense, then, the goal of the firm is to reduce the cost of transferring knowledge by replicating existing activities while preserving the knowledge's value (p. 390).

Kogut and Zander (1992) proposed a theory of the firm that goes as: "Firms exist because they provide a social community of voluntaristic action structured by organizing principles that are not reduceable to individuals" (p. 384), in that line posed that organizations are "what they know how to do" (p. 383); and that the knowledge implicated in the transformation of products and services in an organization is embedded in "the persistence in the organizing of social relationships" (p. 384) or better said, firm's know-how content is to be found "in the regularity of the structuring of work and of the interactions of employees conforming to explicit or implicit recipes" (p. 387).

Here, given their pledged unit of analysis (organizational knowledge), Kogut and Zander (p.399) recognized the tacit component of personal knowledge (Polanyi, 1966) only in terms of the organizing challenges that personal ability-based knowledge holds. In order to frame

their understanding they focally described problem-solving skills as "search rules, or heuristics, which identify the problem and the elements consisting of the solution" (Polanyi 1966, pp. 23-24).

This distinction about the residency of knowledge – personal knowledge and social knowledge – is somewhat similar to what Nelson and Winter (1982) proposed when they explained individual skills and organizational routines; however Kogut and Zander (1992) pointed out the difference of their approach when they say that learning – as is emphasized in the concept of routine – "has little significance in the absence of a theory of organizational knowledge" (p. 386), implying that Nelson and Winter (1982) did not provided such theory. Assertion that may be questionable given that our axial reading of Nelson and Winter (1982) unveiling their organizational capability and body of knowledge sets that the organizational context operates as an interpretative and coordination system.

Besides classifying knowledge by its residency (personal knowledge and social knowledge), Kogut and Zander (1992, p. 387) also categorized knowledge into information (blueprints, declaratives, facts) and of know-how (recipes, procedures, process, accumulated practical skill). However, the transferability issue is not attended but such knowledge taxonomies, but by considering two static properties of knowledge: codifiability and complexity.

Codifiability is related to the structuring of knowledge "into a set of identifiable rules and relationships that can be easily communicated" (Kogut & Zander, 1992, p. 387). Both, know-how and information may not always be encoded, as is the case of the recipe that should capture all the skillful actions of a musical instrument builder or the specifications of all the data considered by an actor to take an action (p. 387). Codification depends on the

identification of a backing theory, explicit scientific theory (Dreyfus & Dreyfus, 1988) or a derived theory-in-use (Argyris & Schoen, 1978, p. 11), which guides knowledge representation – the coding scheme.

Codification, when possible, most frequently, transforms the nature of the knowledge. A coding scheme habilitates the functioning (exploitation) of a complex knowledge embodiment, by reducing its complexity; but also may neglect the substantive technology of its workings (knowledge to create the embodiment). Codification allows the separation of the expert knowledge required to create something and the skill to use it (p. 390).

Complexity is best described in terms of simplification, which is use of a coding scheme to reduce the number of parameters to define a problem or system (Pringle, 1951), that is, to reduce the degree of complexity and knowledge transferring cost (Kogut & Zander 1992, p. 388). This simplification carries on a transformation of the nature of the organizational knowledge through the separation of substantive knowledge, which is nested and hidden behind a set of available functions – functional knowledge - that at the same time ease and restrict organizational members' choices (p. 390). A simpler common coding scheme is easy to learn (p. 391); and a familiar language facilitates learning; however, it presents difficulties for describing complex knowledge (p. 391; Pappert, 1979, p. 77) and makes difficult addressing environmental changes. The corollary here is that simple coding schemes are useful for the short-term survival (Kogut & Zander, 1992, p. 396).

The paradox is that while codification of knowledge holds the advantage of lower intra or inter-firm technology transfer cost, preserving quality, exploiting value, and guiding firm's grow through replication - exploiting capability (p. 391); codification also runs the risk of

encouraging imitation by competitors (p. 390); and eventually triggering decreasing returns (Kogut & Zander, 1992, p. 385).

Then, the choosing of a knowledge coding scheme deserves discussion. The main issue here when attending changes in the environment is the existing tension between (a) the desired level of easiness to learn new codes, due to that we see as changing is familiar with what we already know, and (b) the unwanted level of difficulties of learning an unfamiliar language code given that environmental changes are understood as novel (Papert, 1979; Kogut & Zander, 1992, p. 391).

In the context of this tension, Kogut and Zander (1992) argues for conceiving an organizational capability that explores for the new, by exploiting existing knowledge, by recombine it (p. 391). In this conception of capability - combinative capability - the chosen coding scheme is more closely it related to the existing practice (p. 392) and the selection is justified on: (a) the unpredictable probabilities of success, similar to a start-up, when a firm moves away from his exiting knowledge base (Lippman & Rumelt, 1982), (b) that the growth of our knowledge is guided by an existing set of stable know-how and information (Nelson & Winter, 1982), that is, learning is path dependent, and (c) that even though that personnel rotation may bring new knowledge into the organization, capabilities are dependent of what is currently organized (Kogut & Zander, 1992, p. 392).

Then, Kogut and Zander's organizational combinative capability is a bet for a coding scheme that is proximal to our existing knowledge, which proposes a code set that is chosen as the organizational common language, to be used to communicate and combine expert knowledge (p. 390).This also implies that when the gap between environmental needs and the language in use is wide, the response, in the best case, may be survival labyrinthic

workings, as a result of the struggling with language constraints (Pappert, 1979, p. 77). In the worst case, environmental changes may go unknown (Kogut and Zander, 1992, p. 392), given the unsuitableness of the language to recognize the particular change.

Knowledge of the firm must be understood, also, as socially constructed and resting in the path dependent localized learning of the organizing of human resources (p. 388), in which the transfer of knowledge within groups is facilitated by (a) information about who knows what, (b) sharing of a common stock of technical and organizational knowledge to economize in communication (Arrow, 1974, Katz & Kahn, 1978), and (c) learning a set of values, through a shared language, (Berger & Luckman, 1967) which provides "a normative sanction of how activities are to be organized or what information is to be collected and evaluated how activities are organized" (Kogut & Zander, 1992, p. 389).

However, reading the theory in this isolated way is to lose its core competence, the most dynamic aspect of it: the balancing between (a) the capability of applying what the firm knows how to do well, and (b) the capability of creating by recombining what the firm knows how to do; to achieve (c) valuable platforms to get into new markets (Kogut & Zander, p. 395), and better if this combinative effort is focused on market-valued bottleneck factors (pp. 392-393).

Summing up, Kogut and Zander (1992) posit to reframe research about the use and creation of knowledge in organizations to focus on applying and building knowledge-based capabilities. Firms grow through exploiting capabilities that replicate, through a common language, either, (a) existing codified knowledge, or (b) licensed complex ready to be used technology (pp. 390 - 391).

Firms, also, grow through combinative capabilities that recombine, through organizing principles (coding scheme) and common language, the organization's social cumulative knowledge. A capability that deters imitation, since theirs inert resources – social knowledge and organizing principles – are difficult to imitate and redeploy (pp. 383 – 385).

This combinative approach suggests that the coding scheme and its organizational common language is an explicit issue at organizational design time. Common language includes the set of organizational values, inventory of bottleneck market-valued factors, formal organizational structure; and the coding scheme is mainly defined by the incentives to follow and exercise authority, inventory of substantial knowledge, inventory of functional knowledge, resource accessing procedures, protocols for transacting and cooperating, knowledge boundary spanners protocols, and innovative collaboration flow (see Table 39).

From the perspective of organizational execution, Kogut and Zander's (1992) both capabilities are about organizational facts, product information, accounting data, communication skills, problem solving skills, crafting skills, informal organizational structures. The combinative capability adds to the previous four more items: who know the technical what, managerial knowledge to organized activities, feedback responsibilities among functions, establishing long term relationships, and (pp. 387 - 389).

Kogut and Zander's Kogut Theory of Replication and Combinative Capabilities

Body of Knowledge of the Exploitation (Replication of Technology) & Exploitation (Recombination of Knowledge) Capabilities

[a] Theory's presumption	Firms' organizational context allows the sharing and transfer knowledge of individuals and groups within organizations better than markets.	
[b] Actors' expectations	Stockholders, managers, employees	- Act according to shared values.
[c] Logic of achievement of objectives and actors' governance	**Exploitation approach:** Replication of activities by a shared language that eases knowledge transferability and exploitation of complex knowledge embodiments. **Exploration approach:** Use of knowledge through organizing principles that (a) recombine functional knowledge focused on market rewarded bottleneck capabilities, through a coding scheme and shared language that encapsulates substantial knowledge, and (b) by recognizing social knowledge, embedded in social relationships of HHRR, as source of inert resources. **Actors' governance:** Incentives to follow and exercise authority.	

1.Organizational Design knowledge		**2.Organizational Execution Knowledge**	
Knowledge: [d] Residency, [e] Domain, and [f] Type (A: Ability-based, S: Symbol-based)			
Exploitation Capability *(Replication of Technology)*			
[d] Manager/Employee:		**[d] Manager/Employee:**	
1.1 Social knowledge		2.1 Individual knowledge (Information and Know- how):	
Shared language (common code):		Organizational facts (transactions, events)	S
Formal organizational structure	S	Product and accounting data	S
		Communication skills	A
		Problem solving skills	A
		Crafting skills	A
		2.2 Social knowledge	
		Informal organizational structure	S/A
Exploration Capability *(Recombination of Knowledge)*			
[d] Manager/Employee:		**[d] Manager/Employee:**	
1.1 Social knowledge		2.1 Individual knowledge (Information and Know- how):	
Shared language (common code):		Organizational facts (transactions, events)	S
Set of organizational values	S	Product and accounting data	S
Inventory of bottleneck market-valued factors	S	Communication skills	A
Formal organizational structure	S	Problem solving skills	A
Shared coding scheme (Organizing principles):		Crafting skills	A
Allocation of incentives to exercise authority	S		
Inventory of substantial knowledge	S	2.2 Social knowledge	
Inventory of functional knowledge	S	Informal organizational structure	S/A
Knowledge codifying approach	S	Who knows the technical what	S
Resource accessing procedures	S	Managerial knowledge for organizing activities	S
Protocols for transacting and cooperating	S	Responsibilities of feedback among functions	S
Knowledge boundary spanning	A	Establishing long term relationships	A
Innovative collaboration flow	S/A		

Table 39. Body of knowledge of the exploitation and exploration capability of Kogut and Zander´s (1992) Theory of Replication and Combinative Capabilities.

5.9 GRANT'S KBV OF THE FIRM AND ITS INTEGRATION CAPABILITY

Similar to Kogut and Zander (1992), Grant's (1996a, 1996b) view of the firm makes explicit its organizational capability: knowledge integration.

His firm's view presumption is that since explicit knowledge holds inherent value appropriation limitations through market contracts (once it is exposed it can be taken for free by competition), and tacit knowledge, acquired by and stored within individuals, requires specific environments for its transferability (which markets may not easily provide), the firm may be viewed as an institution that integrates a wide array of knowledge to convert inputs into outputs. This leads to a definition of the firm in which knowledge, explicit and tacit, is the principal productive resource of the firm.

Grant published two main articles regarding KBV of the firm. In the first one, Grant (1996a) introduces the knowledge application approach (integration). In the second article (1996b), he proposes to understand and extend the knowledge integration capability in the context of firms prospering in dynamically competitive environments.

In both articles he argues (a) that knowledge holds residence in individuals (Polanyi, 1966), (b) that knowledge follows the tacit and explicit dichotomy, and (c) for the positive role of three [4Aa] common knowledge types in the [4a] efficiency of the knowledge integration capability that transforms inputs into outputs, see Figure 9.

These common knowledge types are described by Grant (1996a, pp. 114-115) in general terms as: (a) common language (rules, directives, English, literacy, numeracy, computer software, statistics, and commonality in the specialized knowledge), (b) shared meanings (common cognitive schema, metaphor, analogy, and stories), and (c) recognition of knowledge domains (recognizing abilities of others).

Grant (1996a) posits that in the exploitation approach (knowledge application) the main concern of management is to coordinate the knowledge integration of the specialist of the firm into products and services. While, he said, that most research has been directed to the problem of cooperation – the challenge of reconciling and subordinating the dissimilar objectives of firm members – the coordination of day to day operations, even in the case when no goal conflicts exist, it is not an easy task when members' tacit knowledge holds a significant role in production (p. 113).

The recognized difficulties of transferring such tacit knowledge (Nonaka, 1994; Brown & Duguid, 1991) and the unpractical approach of learning everything that others know, leads Grant (p. 114) to argue in favor of proposing knowledge transfer minimization in the context of *members' interdependence*; in which managers choices hold a prevailing role over the production technology in use in the firm.

Supported in the research into integration across specialized units (Thompson, 1967; Van de Ven, Delbecq, & Koenig, 1976), Grant (1996a) pointed out four types of interdependence among organizational members and their related knowledge integration mechanisms.

In *pooled interdependence* [3A], coordination is driven by rules and directives, which do not only reduce communication needs among specialist, but also lead to revealing tacit knowledge as explicit maxims. Their knowledge content (directives) does not sustain the bureaucratic authority, but is oriented to induce sharing of specialists' knowledge.

In *sequential interdependence* [3B], plans, understood as time regulated activities dependent in great deal by production technology, achieve effective coordination through manager's discretional decisions about activities sequencing, overlapping or concurrence.

In *reciprocal interdependence* [3C], mutual adjustment, in the form of routines that support, in one dimension, automatic complex patterns of interaction, which includes simultaneity of execution; and in other dimension, the holding of a flexible repertory of responses that see individual actions as part of an implicit grammar (Pentland & Rueter, 1994).

Finally, in *team interdependence,* planned and unplanned meetings achieve group coordination through group problem solving and decision making, see Figure 9.

Grant (1996a) argues that efficiency in organizations is mostly related to rules, plans, and routines, and "reserve[s] problem solving and decision making by teams to unusual, complex, and important tasks" (p. 115), neglecting any proposition regarding "meetings" as integration mechanism.

Most of these knowledge integration mechanisms, except for routines, fit into the organizational design premises, that by the criteria of knowledge transferring minimization, it does not follow the traditional authority hierarchic.

Instead, a [4Ac] modular team-based organizational design and supporting technology – in which membership is fluid and individuals engage in multiple organizational roles in multiple teams in overlapping or simultaneous execution (extending Clark and Fujimoto, 1991) – allow accessing and applying specialists' knowledge situated anywhere in the firm.

In addition, since stockholders and employees mutually own firm knowledge, then *firms are understood as a system of joint dual control* in which decisions requiring ability-based knowing – strategic planning, assessment of investments, and operational

issues — are decentralized; and those dealing with symbol-based knowing — explicit quantifiable treasury and financial risk issues – are centralized (Grant, 1996a, p. 119)

Here, knowledge dependence also defines the boundary of the firm. The higher level of knowledge dependence between the output and inputs of units of production tends to keep productive units within the firm; and when such dependence is low, separated firms operating through a market interface may be more efficient.

Complementarily, [2B] effective knowledge utilization requires high correspondence between knowledge domains and product domains. However, since knowledge demanded by the products supplied by the organization is not completely hold within the organization, and since products do not represent symbolically all organizational knowledge, then knowledge trading opportunities emerge, and may take the form of strategic alliances (Grant, 1996a, pp. 119-120).

In his second article, Grant (1996b) goes further and develops four specific propositions regarding (see Figure 9):

(1) The nature of the firm [1A] (integrate specialist knowledge into the outcomes of the productive practice).

(2) The architecture of the knowledge integration capability into products and services [2A] (hierarchical knowledge integration structures in which at the base are the individual specialized knowers, and then moving up are the simple single task, the specialized task, the coordinated activities, the broad functional (manufacturing, logistics, finance, …), and finally, the cross-functional capabilities (new products/services, customer support, quality management, …)),

(3) Three knowledge integration mechanisms ([3A] directives, [3B] plans, and [3C] routines).

(4) The relationships between knowledge integration capabilities attributes ([2B] effectiveness, [4A] efficiency, [4Cb] flexibility, and [4B] potential) and the achievement of competitive advantage in the context of the nature of the firm [1A].

Efficiency [4a] of the knowledge integration capability is the attribute most extensible described by Grant (1996b). About this, he argues for two factors to achieve efficient knowledge integration: (1) the level of common knowledge [4Aa], (2) the lower frequency and variability of the organizational activities [4Ab].

Grant's common knowledge behaves as the members' communication and interpretative system that poses (1) Organizational design premises that [4Ac] structure the organization, [2A] architect the capability, and focus the integration of knowledge through [3A] directives and [3B] plans; and (2) Organizational execution premises that [3C] routinely integrated knowledge through a pattern of actions that hold flexibility through an implicit shared grammar of actions.

Grant's organizational execution knowledge involves organizational routines that follows organizational architecture, structures and mechanisms like in Nelson and Winter's (1982) firm's Target Routine, with the difference that Grant's approach suggest to frame the shared communication and coordination system (common language, share meanings and knowledge domains) in design time instead of leaving as emergent during execution. See Figure 9 and Table 40.

Grant's (1996b, p. 379) pledge to understand organizational routines as coordination mechanisms that hold two apparently incompatible attributes: repetitive patterns of actions and flexible responses. However, Grant achieved to reframe this conflicting issue.

First, sharing with Nelson and Winter (1982) the same epistemological posture, routines enactment are supported by ability-based knowing; in that sense patterns of interaction allows repetitively integration of specialized knowledge without the cost of much explicit communication.

Then, following Pentland and Rueter's (1994) approach to organizational routines as grammars of action, Grant invites the reader to see that patterns of actions are reflection of implicit language rules that allow members to construct a diversity of organizational routines that guide members in the creation of flexible responses in complex situations (3C).

This way of seeing an organizational routine is similar to Nelson and Winter's (1982) recombined tactic to create components, however Grant´s approach argues that routines implicitly shared operational language principles, which in our reading of individual knowing means that the activities that constituted routines are part of a systematic symbolic tool with low levels of preciseness, and scalability, and reversibility; and high levels of richness and attachment.

In summary, Grant's common knowledge behaves as the members' communication and interpretative system that poses (1) Organizational design premises that [4Ac] structure the organization, [2A] architect the capability, and focus the integration of knowledge through [3A] directives and [3B] plans; and (2) Organizational execution premises that [3C] routinely integrated knowledge through a pattern of actions that hold flexibility through an implicit shared grammar of actions.

That is, in terms of the proposed integrated individual knowledge-based view, Grant´s organizational common knowledge is to be understood as a set of shared tools (directives, plans, routines, organizational structures and capability architecture) that hold different gradients of shared and systematized symbolic content that adhere to certain shared public standards of performance about which members of the organization declare their commitment with universal intent and enact them subsidiarily for integrating members´ specialized knowledge into the productive practice.

These tools, as committedly instrumentalized, or socially workable enacted, or legitimately enculturated knowledge, can be viewed from three different, typified, but integrated dimensions: common language, shared meanings, and the shared recognition of knowers.

Finally, within our research questions, Grant´s proposition [4Ab] regarding the categories of common knowledge (common language, shared meanings, shared recognition of knowers) is now understood with a different perspective; the three common knowledge categories are now understood as dimensions of the five organizational tools (directives, plans, routines, structures and capability architecture).

Grant's Knowledge-based View of the Firm

Body of Knowledge of the Exploitation (Knowledge Integration) Capability

[a] Theory's presumption	Since explicit knowledge holds inherent value appropriation limitations through market contracts, and tacit knowledge, acquired by and stored within individuals, requires specific environments for its transferability, the firm is viewed as an institution that integrates a wide array) of knowledge (mix of explicit an tacit to create value.	
[b] Actors' expectations	Stockholders, employees	- Coordination of activities based on the co-ownership of knowledge.
[c] Logic of achievement of objectives and actors' governance	Firms, as institutions for knowledge application and creation, have the fundamental task of integrating efforts of many specialists into goods and services, and the key to do it efficiently is to minimize knowledge transfer through use of common knowledge. **Actors' governance:** Given the co-ownership of knowledge, interdependence among actors is part of organizational design (ability-based knowing is decentralized, and symbol-based knowing is centralized).	

1.Organizational Design knowledge		**2.Organizational Execution Knowledge**	
Knowledge: [d] Residency, [e] Domain, and [f] Type (A: Ability-based, S: Symbol-based)			
Exploitation *(Application)***Capability**			
[d] Manager/Employee:		**[d] Manager/Employee:**	
1.1 Interdependent integrating mechanisms		2.1 Interdependent integrating mechanisms	
Directives (rules and procedures)	S/A	***Organizational routines*** (patterns of interaction that integrates specialized knowledge without much communication and through the sharing of grammars of action)	A
Plans (time regulated activities guided by production tech and managers discretional decisions about sequencing and overlapping)	S/A	2.2 The commitment to and subsidiary enactment of capability architectures, organizational structures, and integration mechanisms (directives, plans and routines) as the shared interpretative and communication tools of the members of the organization. Tools, understood as plausible instrumentalized enculturated knowledge, can be viewed from three different, but integrated dimensions:	
1.2 Architecture and Structure			
Organizational structure (Modular team-based with fluid multiple role & simultaneous membership)	S/A		
Capabilities architecture (product knowledge hierarchy that goes from specialist simple task to cross functionality)	S/A	Common language Shared meanings Recognition of knowers	A A A
		2.3 Application of specialized knowledge	A

Table 40. Body of knowledge of the exploration capability of Grant's (1996a, 1996b) Knowledge integrating view of the firm.

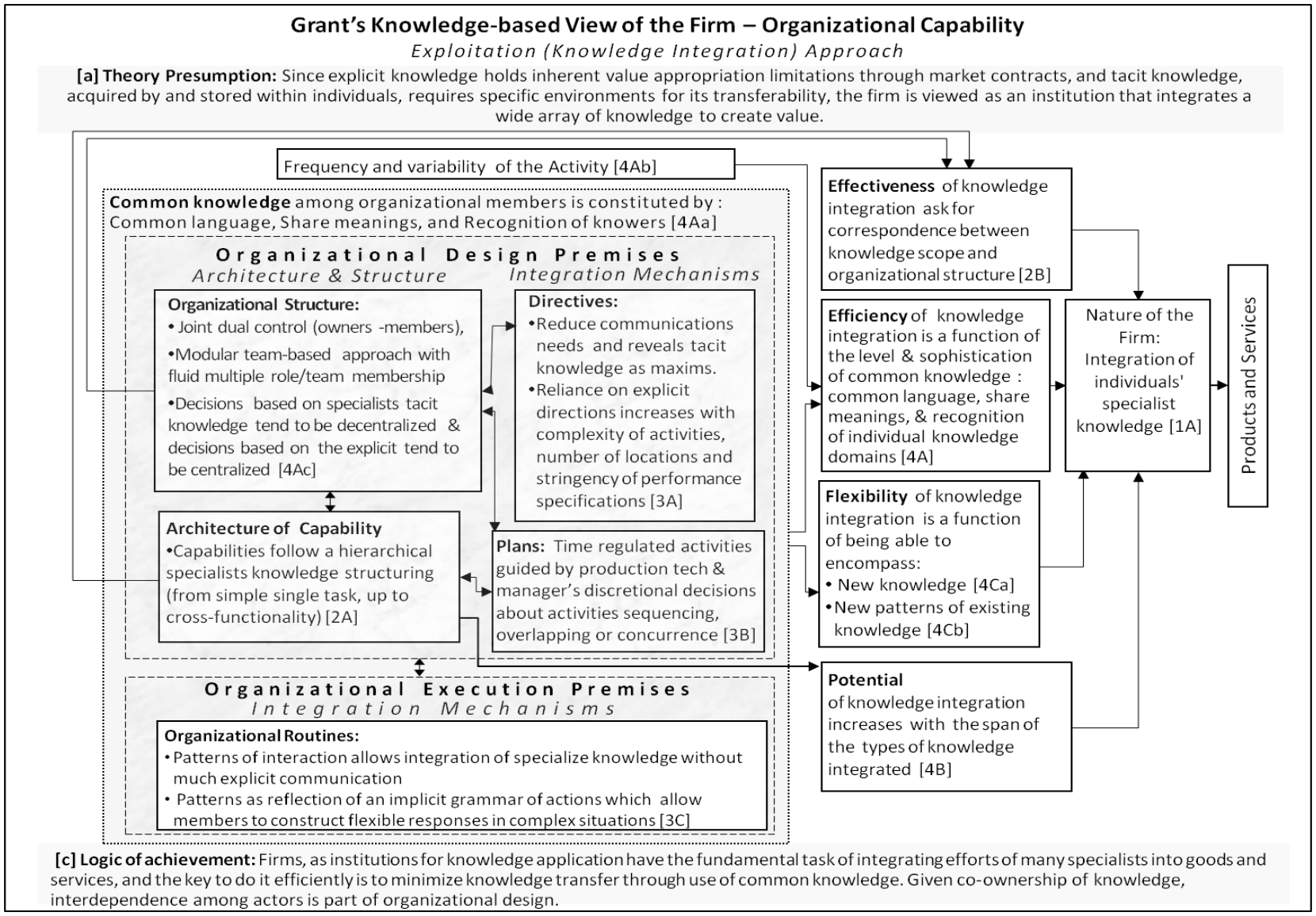

Figure 9. Grant's (1996a, 1996b) Exploitation Capability in the KBV of the Firm.

5.10 COMPARING KNOWLEDGE DOMAINS OF CAPABILITIES

Knowledge domains of the reviewed organizational capabilities of the views and theories of the firm could be further examined (a) by qualifying their knowledge through the lenses of the proposed integrated view of language, shared meanings, and recognition of knowers presented in the previous chapter (see Table 32), (b) by accepting the organizational capability as the theory in use that characterizes the domain of knowledge within which CKO comes to exists, and (c) by accepting that CKO commonness criterion correspond to the domain of practices of the theory in use in the organization, which avoids misunderstandings and allows loose coordination of actions, as argued in section 1.7 in the first chapter.

Choosing rules (Simon, 1991b), standard operating procedures (Cyert & March, 1992), organizational routines (Nelson & Winter, 1982), industry recipe (Spender, 1989; 1992), organizing principles (Kogut & Zander, 1992), and knowledge integration mechanisms (Grant, 1996a; 1996b) are competing ways of seeing knowledge-based organizational capabilities and reveal different axles around which the instances of common language, shared meanings and recognition of knowers spin (see Tables 35, 36, 37, 38, 39 and 40).

Comparison of CKO in this KBV of the firm is not complete without contrasting [a] theory's contextual presumptions, [b] actors' roles/expectations about objectives, and [c] logic of achievement of objectives and actors' governance (see Organizational Capability Framework in Table 33).

The origins of matches and misses surge from the shared goal-orientation that these theories hold and the diverse logics of achievement follow by them. Interestingly, the organizational design dimension of the framework sent light about the problematic issue

of goal agreeing, and the organizational execution dimension illustrated the goal achieving mechanisms (see Table 43).

Seeing these theories and their capabilities from such contrasting perspective allows appreciating that their knowledge domains (Tables 41 and 42) follow tool-oriented approaches to attend organizational goals. These made sound obvious, but it stop being when, for example, "truce mechanisms for goal agreement" (Nelson & Winter, 1982) shows up as one of the organizational tools.

Them, except for Simon (1991b), who assumed goals as given, theories of the firm propose conceptions of organizations that count within their knowledge domains with ability-based tools for arriving to a set of organizational goals like bargaining, truce-arriving, two-way socialization, valued-based agreeing, and interdependent governance.

A similar pattern

- Simon's (1991b) (a) given goals and (b) expert's choosing heuristics;
- Cyert and March's (1992) (a) goal bargaining, and (b) standard operating procedures for managing uncertainty, trust and adaptation;
- Nelson and Winter's (1982) (a) truce mechanisms for goals agreement, and (b) the organizational context as the memory that modulates communication and coordination of goals;
- Spender's (1989; 1992) (a) manager/entrepreneur' assumptions for action and residual rights as mechanism for goals shaping; and (b) members skills on uncertainty coping mechanism/institutions, and the agreement about the beneficiaries of externalities costs as tools for goal attainment;

- Kogut & Zander's (1992) (a) common language, common values, shared inventory of bottleneck market-valued factors, and a common coding system that encapsulates substantive knowledge to offer functional knowledge as the mechanisms by which members share given goals; and (b) data about organizational facts, individual skills, the sharing of who knows what and the establishing of long term relationships as the mechanisms for achieving those goals; and
- Grants' (1996a; 1996b) (a) interdependence of goals governance given the recognition of the co-ownership of knowledge (individual and organization), which shapes organzitional tools (*directives, plans, capabilities architecture and organizational structure)*; and (b) the enacting of *routines* as grammars for action while committing to *organizational tools*, as the interdependent mechanism that integrates specialized knowledge into the productive practice that leads to the accomplishing of objectives.

In summary, we here have advanced in responding our main research question and secondary research questions from the theoretical standpoint (see Tables 41, 42, 43, 44 and 45), and the same time have achieved to develop a common knowledge conceptual framework as departing point for analyzing our case study (see Table 43).

Summary of Organizational Capabilities and its Knowledge Domains in Theories of the Firm - 1/2

[a] Views of the Firm	[c] Logic of achievement of objectives and actors' governance	[e] Organizational Design Knowledge and [f] type (Symbol/Ability based)		[e] Organizational Execution Knowledge and [f] type (Symbol/Ability based)		[g] References to Common Knowledge					
						Common Language		Shared Meanings		Recognition of knowers	
Simon's Administrative Behavior	*Exploitation approach:* Goal-satisficing heuristic-oriented rational capability guided by stimuli and premises (strategy and ***choosing rules***).	Goals, Strategy and Choosing rules	S	Classical RRHH managerial knowledge	S	D		D			
		Classical managerial knowledge	S	Classical Marketing & Operational knowledge	S						
		Customer preferences	S	Goals & Choosing rules	S			D	E		
				Expert's choosing heuristics	A						E
Cyert and March's Behavioral Theory of the Firm	*Exploitation approach:* A Goal-satisficing adaptively rational uncertainty-avoiding capability guided by ***standard operating procedures***.	Goals and policies refined through actual and past experiences	S	Information search and decision making toward goals and influence by own and subunit expectations	S/A	D			E		
		Bargaining knowledge use to leverage value creation by balancing demands	A	Uncertainty, Trust & Adaptation SOPs: avoid uncertainty, run the operation as usual even under failure, and last-resort explicit goal-oriented norms to modify procedures	S		E	D	E	D	E
		Classical managerial knowledge	S							D	
Nelson & Winter's Evolutionary View of the Firm	*Combined Exploitation and Exploration approach:* A truce oriented approach that guides operations of the firm by following routines that fulfill its targets and that adapts to changes by replacing failing **routines** with existing satisficing recombined subroutines.	Truce routine: motivational, rule-enforcement, and truce mechanisms	S/A	Target routine: shared comm. & shared interpretative & coordination systems	S/A		E	D		D	E
		Control routine	S/A	Replicate routine tactics	S/A						
		Grow and contraction routine	S/A	Imitating routine tactics	S/A						
		Innovation routine	S/A	Contraction routine tactics	S/A						
				Innovation routine tactics	S/A						
				Problem- solving routine tactics	S/A						
Spender's Theory of Postindustrial Organizations	*Exploitation approach:* Reactive application of **technical, managerial, and operational knowledge** presuming certain actors' assumptions for action and expectations of beneficiaries of residual rights.	Classical managerial knowledge	S	Practice of managerial knowledge	S/A				E	D	E
		Technical knowledge defines the characteristics of the *productive apparatus and shapes the operation of the organization.*	S	Practice of operational knowledge shaped by the *selected productive apparatus.*	S/A	D		D	E	D	E
	Exploration approach: Proactive application of creative entrepreneurial and collaborative ***industry recipe***-based knowledge" by assessing and influencing actors' assumptions for action.	Industry Recipe knowledge and creative team's knowledge about socially-built identity patterns give shape and are shaped by the assumptions for action, and the beneficiaries of residual rights.	A	Manager' skills on Industry Recipe's uncertainty coping mechanism, and Creative Team's collaboration skill's shape and are shaped by uncertainty management institutions, and beneficiaries of externalities cost.	A	D	E	D	E	D	E

Table 41. Organizational Capabilities and Knowledge Domains in Views and Theories of the Firm (Part 1 of 2).

Summary of Organizational Capabilities and its Knowledge Domains in Theories of the Firm - 2/2

[a] Views of the Firm	[c] Logic of achievement of objectives and actors' governance	[e] Organizational Design Knowledge and [f] type (Symbol/Ability based)	[e] Organizational Execution Knowledge and [f] type (Symbol/Ability based)	[g] References to Common Knowledge: Common Language		Shared Meanings		Recognition of knowers	
Kogut And Zander's Theory of Replication and Combinative Capabilities	*Exploitation approach:* Replication of activities by a shared language that eases knowledge transferability and exploitation of complex knowledge embodiments.	Social knowledge - Organizing principles:	Individual knowledge (Information & Know- how):						
		Shared language (common code)	Product information & Accounting data S		E	D			
		Formal organizational structure S	Communication, problem-solving & craft skills A	D		D	E	D	
			Social knowledge - Organizing principles						
			Informal organizational structure S/A				E		E
	Exploration approach: Use of knowledge through ***organizing principles*** that (a) recombine functional knowledge focused on market rewarded bottleneck capabilities, through a coding scheme and shared language that encapsulates substantial knowledge, and (b) by recognizing social knowledge, embedded in social relationships of HHRR, as a source of inert resources.	Social knowledge	Individual knowledge (Information & Know- how):						
		Shared language (common code):	Organizational facts (events) S						
		Set of organizational values S/A	Product and accounting data S	D	E	D			
		Inventory of bottleneck market-valued factors S	Communication, problem-solving and crafting skills A	D		D	E		E
		Formal organizational structure S	Social knowledge:	D		D		D	
		Coding scheme (organizing principles):	Informal organizational structure S/A			D	E		E
		Incentives to exercise authority S	Managerial knowledge for organizing activities S	D		D	E	D	
		Inventory of substantial knowledge S	Responsibilities of feedback among functions S	D		D		D	
		Inventory of functional knowledge S	Establishing long term relationships A	D		D	E		E
		Resource accessing procedures S	Who knows the technical what S/A	D	E	D	E	D	E
		Transacting & cooperating protocols S		D		D		D	
		Knowledge boundary spanning A		D		D		D	
		Innovative collaboration flow A		D		D		D	
Grant's Knowledge-based View of the Firm	*Exploitation approach:* Firms, as institutions for knowledge application have the fundamental task of ***integrating knowledge*** of many specialists into goods and services, and the key to do it efficiently is to minimize knowledge transfer through use of common knowledge.	Interdependent integrating mechanisms	Interdependent Integration mechanisms						
		Directives (rules and procedures) S/A	Organizational **routines** (as grammars for action)	D	E	D	E	D	E
		Plans S/A	Committing to directives and plans A	D		D	E	D	E
		Architecture and Structure	Committing to organizational structure A		E		E		E
		Organization structure (modular) S/A	Committing to capabilities architecture A	D		D	E	D	E
		Capabilities architecture (hierarchical) S/A	Application of specialized knowledge A	D		D		D	E
	Actors' governance: Given the co-ownership of knowledge, interdependence among actors is part of organizational design, in which symbol-based knowing is centralized and ability-based knowing is decentralized.								

Table 42. Organizational Capabilities and its Knowledge Domains in Views and Theories of the Firm (Part 2 of 2).

Comparison of Organizational Capabilities of KVB of The Firm

KVB of the Firm	[a] Theory's contextual presumptions	
	[b] Actors' roles/expectations about goals: ***(1) Organizational Goals Agreeing***	**[c] Logic of achievement of goals and actors' governance:** ***(2) Organizational Goal Achieving***
Simon (1991b)	Goal satisficing administrative man, instead of the optimizing economic man.	
	Goals are given	*Expert's choosing heuristics*
Cyert and March (1992)	Complement extant theories of economic market factors with a firm's view as goal developer, manager of expectations and choice executer.	
	Goals are the result of a bargaining process	*Standard operating procedures for managing uncertainty, trust and adaptation*
Nelson and Winter (1982)	Much of knowledge in organizations is tacit, and as in skills in individuals, routines in organizations, are repetitive patterns of activity, and known only by its effectiveness, and persistent trait, as if they were genes, which determines possible evolutionary designs and behaviors of the firm.	
	Goals are agreed following truce mechanisms	*Organizational context as the memory that modulates communication and the coordination of goals*
Spender (1989; 1992)	Questioning of presumptions about the shape of certain contextual factors like assumptions for action, social institutional systems, and beneficiaries of externalities and residual rights.	
	Goals are shaped by manager /entrepreneur' assumptions for action while attending beneficiaries of residual rights	*Members skills on uncertainty coping mechanism/institutions while agreeing about the beneficiaries of externalities costs*
Kogut and Zander (1992)	Organizational context allows the sharing and transfer knowledge of individuals and groups within organizations better than markets.	
	Given goals are shared though common language and values, a shared inventory of bottleneck market-valued factors, and a coding system that encapsulates substantive knowledge to offer it as functional	*Data about organizational facts, individual skills, the sharing of who knows what, and the establishing of long term relationships*
Grant (1996a; 1996b)	Since symbol-based knowing holds inherent value appropriation limitations through market contracts, and ability-based knowing, acquired by and hold by individuals, requires specific environments for its transferability, the firm is viewed as an institution that integrates a wide array of knowledge (mix of ability-based and symbol-based) to create value.	
	Goals are governed by the interdependence that surges from recognizing knowledge as co-own (personal and organizational), that shapes directives, plans, capabilities architecture and organizational structure, in which symbol-based knowing is centralized and ability-based knowing is decentralized.	Enacting of routines as grammars for action (repetitive patterns of actions and flexible responses) while committing to directives, plans, capabilities architecture, and organizational structure, with the purpose of integrating specialized knowledge into the productive practice.

Table 43. Comparison of Goal Achieving Approaches of Theories and Views of the Firm.

5.11 CKO FRAMEWORK IN THE CONTEXT OF VIEWS OF THE FIRM

The interception of (a) the Integrated view of language, shared meanings and recognition of knower (Table 32) emerged in the context of individual knowing theories with (b) the Organizational Capability Framework (Table 33), and the transversal application of (c) the Commonness Criterion – understood as the domain of practices exercised within the framework of the theory in use by the members of the organization, to economize in communications, recognize, reconcile and share understandings, replicate and protect key knowledge, and ease coordination of actions – allows for the elaboration of a conceptual model that served as a departing point to observe empirical instances of common knowledge within the context of the different views or theories of the firm.

The application of such framework to the different organizational capabilities – Satisficing Heuristics (Simon, 1947), SOP-based (Cyert & March, 1992), Organizational Routines (Nelson & Winter, 1982, Levitt & March, 1988), Industry Recipes (Spender, 1989, 1992), Organizing Principles (Kogut & Zander, 1992) and Knowledge Integration (Grant, 1996a, 1996b) – reveals specific instances of observable common knowledge types for each capability.

Framework of Common Knowledge Types in Views/Theories of the Firm 1/2

Organizational Common Knowledge (CKO) & Commonness Criteria (CC)		***Individual Knowing View*** *Knowing as the committed instrumentalization, or socially workable enactment, or legitimized enculturation of objects or behaviors, about which knower may hold a shared symbolization, that when inadequate, it may either limit sharing about it, staying tacit, or trigger innovative behaviors..*		
		Language	***Shared meanings***	***Recognition of knowers***
CK: is about what actors, which know about the other; jointly know about a particular situation (Wilby, 2010). **CKO and CC:** Domain of practices exercised within the framework of the theory in use by the members of the organization (Tsoukas and Vladimirou, 2001; Schutz, 1970; McCarthy, 1994; Argyris & Schön, 1974), to economize in communications (Arrow, 1974; Grant, 1996), recognize, reconcile and share goals (Brown & Duguid, 1991), replicate and protect key knowledge (Kogut & Zander, 1992), and ease coordination of actions (Nonaka, 1994; Thompson, 1967, Demsetz, 1991, Spender, 1989).		**1a.** Shared contrived cultural tools for expliciting knowledge.	**2a.** ***(2a1)*** Conception through tight or loose committed perceptual or emotional patterning, ***(2a2)*** enactment through workable social formations, and ***(2a3)*** denotations through symbolic systems.	**3a.** At cultural assimilation stage, it follows the authority-trust relationship.
		1b. Systematic symbolic tools with different levels of preciseness, richness, attachment, scalability, and reversibility	**2b.** ***(2b1)*** Plausible stories that show patterns and insinuate the future, or ***(2b2)*** canon-based legitimization stories that enrich culture.	**3b.** At cultural ongoing stage, it follows the successful restricting or habilitating saying/acting instances.
		1c. Ineffective expliciting and innovative symbolic systems.		
		1d. Challenging and changing symbol-based tools reflecting cultural canons and human's limits.	**2c**. As the reactive-proactive tension among **(2c1)** acting according to the way of life canons, **(2c2)** construction of culture, and **(2c3)** challenging the outside world states.	**3c.** Recognition ofknowers is linked to the setting of knowing standards.

KBV View or Theory of the Firm	***Organizational Capability Approach***		***Theoretical Instances of Common Knowledge Types***		
			Common Language	***Shared meanings***	***Shared recognition of knowers***
Simon's Administrative Behavior	*Choosing rules (Exploitation)*		- Goals & choosing rules - Customer preferences	- Goals, Strategy and Choosing rules	- Experts' choosing heuristics
Cyert and March's Behavioral Theory of the Firm	*Standard operating procedures (Exploitation)*		- Goals and policies - Uncertainty, Trust & Adaptation SOPs	- Bargaining knowledge - Subunit expectations - Uncertainty, Trust & Adaptation SOPs	- Managers' goal bargaining abilities - Manager's control knowledge
Nelson & Winter's Evolutionary View of the Firm	Combined Exploitation and Exploration Capability	*Routines (Exploitation)*	- Organizational memory: documents, work environment, and organizational dialect. - Routine repertories	- Motivational mechanisms. - Rules enforcement mechanisms - Truce tradition. - Shared message interpretation and routine coordination system. - Current routine as replication template.	- Manager's control actions for monitoring & aligning resources and routines - Expert's imitation abilities - Manager's survival resources finding abilities
		Routines (Exploration)			- Manager and experts' recombination abilities - Experts' choosing heuristics
Spender's Theory of Postindustrial Organizations	*Technical and managerial knowledge (Exploitation)*		- Technical knowledge defines characteristics of productive apparatus	- Technical knowledge shapes operation of the organization - Practice of managerial & operational knowledge	- Managers' classical managerial knowledge - Expert's technical knowledge recognition
	Industry recipe (Exploration)		- Industry, professional or vocational bonding language	- Industry, professional or vocational assumptions for action. - Socially-built identity patterns: elevating goals, results-driven structure, collaborative climate, standards of excellence, external support, and principled leadership.	- Entrepreneurs' uncertainty coping mechanism through social institutions - Team's uncertainty collaborating abilities

Table 44. Framing Common Knowledge Types in Views and Theories of the Firm (Part 1 of 2).

Framework of Common Knowledge Types in Views/Theories of the Firm 2/2

Organizational Common Knowledge (OCK) & Commonness Criteria (CC)			***Individual Knowing View*** *Knowing as the committed instrumentalization, or socially workable enactment, or legitimized enculturation of objects or behaviors, about which knower may hold a shared symbolization, that when inadequate, it may either limit sharing about it, staying tacit, or trigger innovative behaviors..*		
			Language	***Meanings***	***Recognition of knowers***
CK: is about what actors, which know about the other; jointly know about a particular situation (Wilby, 2010). **CKO and CC:** Domain of practices exercised within the framework of the theory in use by the members of the organization (Tsoukas and Vladimirou, 2001; Schutz, 1970; McCarthy, 1994; Argyris & Schön, 1974), to economize in communications (Arrow, 1974; Grant, 1996), recognize, reconcile and share goals (Brown & Duguid, 1991), replicate and protect key knowledge (Kogut & Zander, 1992), and ease coordination of actions (Nonaka, 1994; Thompson, 1967, Demsetz, 1991, Spender, 1989).			**1a.** Shared contrived cultural tools for expliciting knowledge.	**2a.** ***(2a1)*** Conception through tight or loose committed perceptual or emotional patterning, ***(2a2)*** enactment through workable social formations, and ***(2a3)*** denotations through symbolic systems.	**3a.** At cultural assimilation stage, it follows the authority-trust relationship.
			1b. Systematic symbolic tools with different levels of preciseness, richness, attachment, scalability, and reversibility	**2b.** ***(2b1)*** Plausible stories that show patterns and insinuate the future, or ***(2b2)*** canon-based legitimization stories that enrich culture.	**3b.** At cultural ongoing stage, it follows the successful restricting or habilitating saying/acting instances.
			1c. Ineffective expliciting and innovative symbolic systems.		
			1d. Challenging and changing symbol-based tools reflecting cultural canons and human's limits.	**2c**. As the reactive-proactive tension among **(2c1)** acting according to the way of life canons, **(2c2)** construction of culture, and **(2c3)** challenging the outside world states.	**3c.** Recognition of knowers is linked to the setting of knowing standards.
View or Theory	***Approach***		***Theoretical Instances of Common Knowledge Types***		
			Common Language	***Shared meanings***	***Shared Recognition of knowers***
Kogut & Zander's Theory of Replication and Combinative Capabilities	Combined Exploitation and Exploration Capability	*Replication of activities (Exploitation)*	- Formal structure - Product & Accounting data	- Informal structure - Communication, problem-solving & craft skills	- Members' formal authority and ability-based recognition
		Organizing principles (Exploration)	- Organizational values - Market-valued factors - Formal structure - Authority Incentives - Inventory of substantial knowledge - Inventory of functional knowledge - Resource accessing proc. - Trans. & coop. protocol - Knowledge boundary spanning - Innovative collaboration flow - Product & Accounting data - Who knows the tech. what	- Organizational values - Market-valued factors - Formal structure - Authority Incentives - Inventory of functional knowledge - Resource accessing proc. - Trans. & coop. protocol - Knowledge boundary spanning - Innovative collaboration flow - Communication, problem-solving & craft skills - Informal structure - Organizing activities - Establish long term relationships - Who knows the technical what	- Members' formal authority - Members' ability-based recognition - Member's relationships-based recognition - Expert's technical knowledge recognition
Grant's Knowledge-based View of the Firm	*Common Knowledge (Exploitation)*		1. **Directives** (rules and procedures). 2. **Plans.** 3. Organizational **routines** (patterns & grammar). 4. Organizational **structure** (Modular team-based). 5. Capabilities **architecture** (Product knowledge hierarchy).	1. **Directives** (rules and procedures). 2. **Plans**. 3. Organizational **routines** (patterns & grammar). 4. Organization **structure** (Modular team-based). 5. Capabilities **architecture** (Product knowledge hierarchy).	1. **Directives (**rules and procedures). 2. **Plans**. 3. Organizational **routines** (patterns & grammar). 4. Organization **structure** (Modular team-based). 5. Capabilities **architecture** (Product knowledge hierarchy).
			The commitment to and subsidiary enactment of these 5 tools operate as the shared interpretative and communication system of the members of the organization.		

Table 45. Framework of Common Knowledge Types in Views and Theories of the Firm (Part 2 of 2).

CHAPTER 6: FINDINGS AND CONCLUSIONS

6.1 THEORETICAL FINDINGS

Most views of organizations that gear knowledge as their impeller stage common knowledge as relevant (Simon, 1991a; Cyert & March, 1992; Nelson & Winter, 1982; Spender, 1992; Kogut & Zander, 1992; Grant, 1996a).

Understanding and explaining common knowledge in organizations in the context of such views of the firm asks for clarity about (a) knowledge, (b) organizational capability and (c) commonness criterion.

The extensive variety of approaches to knowledge in organizations, its non-operationalized status (Alvesson & Kärreman, 2001; Kakihara & Sorensen, 2002), and critics about the miss-read or mixing of incompatible epistemologies that organizational studies hold (Gourlay, 2004; 2006; Foss, 2003a; 2003b; Miller, 2008) lead to verify the theoretical and empirical status of research work about knowledge and common knowledge in organizations.

Literature review showed a recent focus in action, that is knowing and practice, instead of knowledge types and their conversion (Wenger, 1998; Cook & Brown, 1999; Bou et al., 2004a; 2004b).

However, such research works leave as pending the previously mentioned epistemological questionings about knowledge, and extend the epistemological gap to discuss its linkage to practice.

Literature review of organizational capabilities reveals rich understandings about the subject from several authors (see Table 2), and from them the following emerging definition captures their main properties:

> *Organizational capabilities are complex patterns of coordination, between people and between people and resources for the purpose of creating value.*

Surprisingly, no organizational capability framework accompanied such understandings, or it has been published later. Neither the associated knowledge domain has been explicitly identified; an issue that is key, when talking about common knowledge.

Contrasting this joint action-oriented and people-based definition of capability are (a) the variety of knowledge conceptions and assumed residency, mostly proposed in views of the firm within which such capabilities were conceived (see Table 3).

Within this views of the firm, knowledge conceptions include concepts like satisficing heuristics, routines, tacit knowledge, operating procedures, industry recipe, productive infrastructure, organizing principles, shared coding system, shared meanings, and know-who.

There, knowledge is described as residing in individual, organization, physical, abstract, and social objects, documents, infrastructure, cultural and social processes, and social tools.

Finally, organizational research works have omitted, in general, the discussion of the criterion by which knowledge is common, and they had treated the issue with the labels shared, collective or social without specifics of they common denominator.

Given the lack of definite understandings within organizational studies, the idea of common knowledge and its commonness criterion was discussed following philosophical and cognitive psychology approaches.

Such discussion revealed three main features embedded in the idea of common knowledge: (a) the object of attention, (b) the actors attending the object, and (c) the jointly understood social situation as the generating property that calibrates interactions to reach common knowledge (Campbell, 2005; Wilby, 2010).

In few words, common knowledge and the commonness criterion are understood as:

> *Common knowledge is not only what actors share about a particular situation, but about what actors, who know about the other, jointly know about a particular situation.*
>
> *Commonness criterion corresponds to the reference that drives joint actions toward a jointly understood situation.*

The definition of *organizational knowledge* of Tsoukas and Vladimirou (2001) leaded the specialization of the arrived understanding of common knowledge for the scope of organizations. Such definition bounded knowledge to the appreciation of theory or context (see Section 2.2.4).

Adherence to both criteria allowed to asses many the descriptions of common knowledge in communication and organizational studies and achieved to describe common knowledge in organizations (CKO) as:

Domain of practices exercised within the framework of the theory in use by the members of the organization, to economize in communications, recognize, reconcile and share understandings, replicate and protect key knowledge, and ease coordination of actions.

This understanding of common knowledge and CKO (see Section 2.1.7) sets the focus of attention in action and practice. Such focus confirmed the requirement of exploring theories of knowledge from both perspectives knowledge and practice.

Then, following a methodological re-reading, invoking grounded theory (Strauss & Corbin, 1998; Charmaz 2000; 2006), knowledge theories and knowledge-oriented views of the firm provided, first, a well-founded and framed understanding of knowledge and knowing in the context of views of the firm; and second, a framed understanding of organizational capabilities, together with their knowledge domains, and typified instances of common knowledge.

Coding (Strauss & Corbin, 1998) Polanyi's (1958, 1966) tacit knowing, Weick's (1995) sensemaking, Bruner's (1990) enculturated knowing, and Gourlay's (2004) semiotic knowing approach from the perspective of a sensitizing concept (Charmaz 2000; 2006) like views of organizations (Grant, 1996a; b) revealed from the beginning a structured and integrated way of querying about knowing and knowledge from the perspective of organizational studies.

Emerged questions like What triggers knowing? Which abilities participate in knowing? What is the role of language and meaning in knowing and knowledge? How are the processes of applying, sharing and creating knowledge? and How is the process of

recognizing knowers? (see Table 12) revealed organizational studies research-aligned details that may been previously raised in an isolated way (Gourlay, 2004; 2006; Foss, 2003a; b; Miller, 2008), neglecting the opportunity of interpreting them as a whole..

From such inquiry emerge an understanding of knowledge and knowing that adheres to the truth within the framework of commitment, which allows confining of the dangers of understanding knowledge as justified true belief (Gourlay, 2004), by proposing knowing and knowledge as (see Section 4.8.6) :

> Knowing *as the committed instrumentalization, or socially workable enactments, or legitimized enculturation of objects or behaviors, characterized by a more or less ability-based or symbol-based subsidiary process of assimilating tools, about which knowers may hold a shared symbolization system, that when inadequate, it may either limit sharing about it, staying tacit, or trigger innovative enactments.*
>
> Knowledge *as the committedly instrumentalized, or socially workable, or legitimately enculturated object or behavior that when it is applied, shared or created meets private or public self-adhered standards of usefulness, plausibility (including emotional valuations), scientific or normative acceptability, and about which the knower may hold a shared symbolization system, that when inadequate, it may either limit her (his) communicating about it, staying tacit, or trigger innovative enactments.*

This is an approach to knowing and knowledge, emerged from extant knowing theories, that in the general aspects about knowledge:

(1) Proposes instrumenting and instruments (tools) as the key to understand the integration of the knowing and knowledge epistemologies.

(2) Attends to the practical, intellectual, social and cultural instances of knowing.

(3) Reinterprets the tacit-explicit knowledge dichotomy as the ability-based to symbol-based knowing continuum, translating the focus to the active side.

This Individual Knowing View reveals a logical link among (a) knowing drives (motivations), (b) knowing abilities in play, (c) knowing performance criteria, and (d) knowing tensions hold while knowing. In brief, this view:

(4) Identifies a holistic set of *drives* (11) of knowing behavior including appetite, sensemaking, intellectual, desire of companionship, enacted situations, meeting desires and overcoming human limits (Table 30).

(5) Frames knowing abilities as recursive and scalable (28)

(a) grouping them as native, heuristic, sensemaking, intellectual, and legitimizing, and

(b) reveling in them orientations to the application (pattern recognition, tight commitment, enacting known categories) or to the creation (pattern contriving loose commitment, enacting new categories) (Tables 27, 28, 29 & 30).

(6) Characterizes the criteria of knowing performance (6) as either private standards of satisfaction (appetitive, usefulness, beauty and sensemaking) or public standards of duty (intellectual and canonical), thus defining the stance in which knowledge is assessed as such (Table 31).

(7) Identifies the variety (6) of tensions (sharpness vs. reasonableness, judicious vs. novel, self-image caring vs. innovative transacting, constraining vs. habilitating, certainty vs. systematic vs. plausibility, cannon following vs. reframer), which characterize the alternatives between routine and innovative knowing at different levels of knowing (native, ability-based, symbol-based) (Table 31).

This view also depicts the roles of (a) language, (b) shared meanings and (c) recognizing knowers in the process of knowing, summarized as follows:

(8) Points out language as (a) capable of denoting enculturated knowledge, (b) with different levels of richness, attachment, scalability and reversibility, which (c) sometimes is ineffective at expliciting knowledge, thus either limiting sharing, or triggering creations, which (d) may be legitimized within extant culture or reframe culture with new symbol-based systems (Table 32).

(9) Proposes that (a) lower gradients of commitment to shared meanings may imply transitions from applying to creating knowledge, and that (b) workable social formations (non-disclosive intimacy, equivalent meanings, shared meanings, satisficing naming of objects, collective action experiencing, distributed meanings, overlapping views of ambiguous events) trigger different levels of sharing, applying and creating (Tables 28 & 30).

(10) Clarifies that in know-who:

(a) At the initial stage of membership, the role of trust-authority relationship follows an opening conjecture, in which the trust in the expert or superior is validated by results; and given the limited personally justified knowledge, we continue trusting them; however, rejecting imitation of them affects their authority, and leads dissenter to authority.

(b) At the ongoing stages of membership, individuals are recognize as knowers for setting standards, which is revealed through the beauty or usefulness of their physical acts, or the beauty or dutifulness of their intellectual acts. (Tables 26, 27 & 28).

Finally, this view achieves to describe the (a) sharing, (b) applying and (a) creating knowing activities within the framework of instrumentation of objects and behaviors, in which we recognize/contrive certain order, anticipate generalization, and commit and rely; in which:

(11) Sharing is motivated by needs; it is shaped by the adequacy of symbolic system, and may exclude premises about tools assimilation in ability-base knowing, or operation of interpretative framework for symbol-based knowing given their irreversibility (Table 27 & 30).

(12) Identifies instances of applying knowledge as related to: useful acts, beautifully intellectual acts, plausible and legitimized communicating, and socially workable acts (Table 30).

(13) Identifies that knowledge creation activities may be triggered either by (a) needs to overcome the limits of our biological substrate, (b) ineffective symbolizations or conceptions, (c) needs of social self-definitions, (d) search of legitimacy within cultural settings (Table 30).

The Individual Knowing View (Table 30), the Integrated Knowing Framework (Table 31), the Integrated View of Language, Shared Meanings, and Recognition of Knowers (Table 32) synthetizes these theoretical findings and show the relationships among them.

Now, by accepting organizational capability as the theory in use that characterizes the domain of knowledge within which CKO comes to exists, and by accepting that CKO commonness criterion correspond to the domain of practices of the theory in use in the organization, it comes as a requirement to unveil (Strauss & Corbin, 1998) knowledge domains of the organizational capabilities of competing knowledge-based views of the firm through the lenses (Charmaz 2000; 2006) of the emerged integrated view of knowing.

The framing of such firm´s theories, following an emerged schema (see Table 33) (Strauss & Corbin, 1998) revealed for each view its [a] theory's contextual presumptions, [b] actors' roles and expectations about objectives, [c] logic of achievement of objectives and actors' governance, [d] residency of knowledge domains, [e] participating knowledge domains, [f] personal knowledge types, and [g] common knowledge types (see Tables 35 - 40). All this within the dichotomies exploitation-exploration and design-execution.

The goal orientation of the theories of the firm, which are captured in the ideas of (1) goals agreeing approaches (at the organizational design stage) and (2) goal achieving approaches (organizational execution stage), shows that the logic that attends such conception is impelled by knowledge-based tools (see Table 43).

Such tool-oriented conception of organizations is compatible with the instrumental view of knowing of the examined knowledge theories.

Then, the knowledge domains that emerged from coding views of the firm (see Table 35-40) show a diversity of tools, like:

(1) Simon's (1991b) (a) given goals and (b) expert's choosing heuristics; or

(2) Cyert and March's (1992) (a) goal bargaining, and (b) standard operating procedures for managing uncertainty, trust and adaptation; or

(3) Nelson and Winter's (1982) (a) truce mechanisms for goals agreement, and (b) context as the memory that modulates communication and coordination of goals; or

(4) Spender's (1989; 1992) (a) managers´ assumptions for action for goals shaping; and (b) members skills on uncertainty coping mechanism as tools for goal attainment; or

(5) Kogut & Zander's (1992) (a) coding system of functional knowledge for sharing given goals; and (b) long term relationships as mechanisms for achieving goals; or

(6) Grants' (1996a; 1996b) (a) knowledge co-ownership (individual and organization) as shaper of *directives, plans, capabilities architecture and organizational structure*; and (b) the enacting of *routines* as grammars for action while committing to *organizational tools*, as the mechanism to achieve objectives.

Examining these goal-oriented organizational tools through the lenses of the framework of common knowledge types in views/theories of the firm show a variety of theoretical instances of common language, shared meanings and know-who for each view of the firm (see Tables 44 and 45), which constitute a rich and detailed specification of observable instances of OCK.

In the context of the framed Grant (1996a; 1996b) KBV of the firm (Figure 9), its organizational capability holds the intertwined tension among organizational tools and the goal of efficiently integrating such instrumentalized instances into productive outcomes.

In such tension, the body of knowledge of the capability revealed five categories of tools: directives, plans, organizational routines, organizational structure, and capabilities architecture.

These organizational tools [OT], which only come to be knowledge in terms of organizational member's enactments, are understood, within Grant´s (1996a) view, as:

> [D] Directives: rules and procedures published by authorized members of the organization and expected to be followed.
>
> [P] Plans: time regulated activities guided by technical and production requirements and managers discretional decisions about sequencing and overlapping.
>
> [R] Routines: patterns of interaction among individuals that integrate specialized knowledge without much communication through the sharing of grammars of action.
>
> [S] Structure of the organization: modular team-based fluid organizational designs in which members play multiple roles within the team and are open to simultaneous membership.
>
> [A] Architecture of the capability: design of the product or service knowledge hierarchy.

It is within these theoretical instances of organizational tools that the commonness criterion (*the reference that drives joint actions toward a jointly understood situation)* is applied to reveal instances of OCK related to common language, shared meanings and recognition of knowers.

In summary, *Grant's OCK works as communication and interpretative system that structure the organization, architect the capability, focuses the integration of knowledge through directives and plans; and that routinely integrated knowledge through pattern of actions that hold flexibility through an implicit shared grammar.*

At this point, significant advancement has been achieved in responding our main research question (*How is common knowledge in organizations related to the knowledge integration capability?*) and secondary research questions from the theoretical standpoint, and at the same time, we have achieved to develop a common knowledge conceptual framework (Table 44 & 45) as departing point for analyzing empirical observations.

6.2 EMPIRICAL FINDINGS

Findings revealed that all five theoretical organizational tools are represented in the empirical instances of the Lessons learned case study. Such empirical instances are also found to be related to the second dimension of the observational framework, that is, they represent instances of common language [CL], share meanings [SM], and recognition of knowers [RK], see Tables 46-48.

Analyzing such CKO empirical instances in search of categories that may shape dimensions of an emerging paradigm (Strauss & Corbin, 1998) revealed them as instrumentalizing behaviors.

Also, the set of empirical instances in each OT shows [1] drafts of the knowing integration tensions described in the IKF (Table 31, section PT.2), [2] drafts of the logic of the contrivance of tools (Table 31, section CT), [3 and 4] criteria for recognizing knowers in either of the two stages (Table 31, section CI.1 and CI.2), and [5] abilities by which knowers are recognized (Table 31, section PA.3).

It should be noticed, at this point, that common knowledge types are still a dimension through which we understand the emerged processes (see Tables 49 and 50).

These findings, summarized in Tables 49 and 50, describe, in a rich and structured way, the role of the five organizational tools (OT) in relation with the efficiency of the knowledge integration capability (EKIC).

Methodological note: Back tracking information was incorporated in the tables to satisfy the internal validity and reliability criteria (Yin, 2003a, p. 34).These tables (46, 47 and 48) show the synthesized open coding process (Strauss & Corbin, 1998) following the format [CL, SM or RK #], where 1 stands for directives, 2 for plans, 3 for routines, 4 for organizational structure, and 5 for capability architecture. In addition, when the instance of common knowledge is related to an specific PMI´s knowledge area, letter(s) is(are) coded following the format: Lessons #: S, T, R, C, Q, P, H, Cm I, F, Sh or G), where # stands for lessons from 1 to 36, and the letter or letters stand for the selected underline letters of the PMI's knowledge areas (Scope, Time, Risk, Cost, Quality, Procurement, HHRR, Communication management, Integration, Financial management, Stakeholder management or Governance).

Empirical Instances of Common Knowledge Types founded in the Lessons Learned Case 1/3

Organizational Common Knowledge (OCK) & Commonness Criteria (CC)		*Integrated View of Individual Knowing* — *In the context of Individual knowing theories (see Table 32)*		
		Language	***Shared Meanings***	***Recognition of Knowers***
CK: is about what actors, which know about the other; jointly know about a particular situation (Wilby, 2010). **CKO and CC:** Domain of practices of the theory in use in the organization (Tsoukas and Vladimirou, 2001; Schutz, 1970; McCarthy, 1994; Argyris & Schön, 1974), which avoids misunderstandings and allows loose coordination of actions (Brown & Duguid, 1991; Arrow, 1974; Weick, 1995; Polanyi, 1966; Leudar, 1992; Clark, 1996; Cramton, 2001; Krauss & Fussell, 1990; Nonaka, 1994; Thompson, 1967).		**(1a)** Shared contrived cultural tools for expliciting knowledge. **(1b)** Systematic symbolic tools with different levels of preciseness, richness, attachment, scalability, and reversibility **(1c)** Ineffective expliciting and innovative symbolic systems. **(1d)** Challenging and changing symbol-based tools reflecting cultural canons and human's limits.	**(2a)** Shared meanings as the tension among: ***(2a1)*** Conception through tight or loose committed perceptual or emotional patterning, ***(2a2)*** enactment through workable social formations, and ***(2a3)*** denotations through symbolic systems, even if it is ineffective. **(2b)** Denotations of shared meanings as: ***(2b1)*** Plausible stories that show patterns and insinuate the future, or ***(2b2)*** canon-based legitimization stories that enrich culture. **(2c)** As the reactive-proactive tension among: **(2c1)** acting according to the way of life canons, **(2c2)** construction of culture, and **(2c3)** challenging the outside world states.	**(3a)** At cultural assimilation stage, it follows the authority-trust relationship, like in: **(3a1)** master-learner relationship, **(3a2)** master's validation through learner's results, **(3a3)** limitations to validate knowledge keep trust in authority, **(3a4)** rejecting masters imitation affects his authority, leading dissenter to be a new master **(3b)** At cultural ongoing stage, it follows the successful: **(3b1)** enactment of workable social understandings, **(3b2)** legitimizing of says/acts in terms of cultural cannons, or **(3b3)** legitimizing of says/acts in terms of challenging cannons or states of the world **(3c)** Recognition of knower is linked to the setting of knowing standards of: **(3c1)** usefulness for physical acts, **(3c2)** intellectual beauty or duty for intellectual acts, **(3c3)** everyday sensemaking for constraining or habilitating behaviors, **(3c4)** canonical duty for committing to or legitimizing values

Approach of KBV of the Firm	[Theoretical Instances of OCK in the Organizational Capability]	Empirical Instances of Common Knowledge Types Found		
		Common Language[CL]	**Shared Meanings [SM]**	**Recognition of Knowers [RK]**
Grant's KBV of the Firm: Firms, as institutions for knowledge application have the fundamental task of integrating knowledge of many specialists into goods and services, and the key to do it efficiently is to minimize knowledge transfer through use of common knowledge. **Actors' governance:** Given the co-ownership of knowledge, interdependence among actors is part of organizational design.	**[1]** Directives (rules and procedures). **[2]** Plans (time regulated activities guided by tech, production and managers discretional decisions about sequencing and overlapping). **[3]** Organizational routines (patterns of interaction that integrates specialized knowledge without much communication through the sharing of grammars of action). **[4]** Organizational structure (modular team-based with fluid multiple role & simultaneous membership). **[5]** Capabilities architecture (product knowledge hierarchy). **[6]** Other (empirical founded instances not referenced in theoretical framework)	[CL 1 & SM 1] Long term gap between common language and normative shared values. (Lesson 1 , 13 & 35)	[SM 1] Meaning building initiatives are not free of debate, not only the meanings but also the kind of effort, time, and cost. (Lesson 1) [SM 5] Integration happens progressively with leadership and incentive dependence (Lesson 1) [SM 1] Economic and psychological incentives help adhering to the meanings of the normative values of the organizational culture. (Lesson 1) [SM 4] Difficult translation of known previous organizational structures into the existing o[ne. (Lesson 1) [SM 4] Non obvious short time benefits resist the following of organizational structure. (Lesson 1) [SM 1, 2 & 4] There is ineffective tension among priority of directives, plans, and organizational structure membership. (Lessons 2 & 10) [SM 1 & 5] Directional messages need to be persistent but also be adaptable to context (Lesson 3)	[RK 3 & 5] Knowledge (practices & standards) of non-participant members may be left out of organizational capacities and routines. (Lesson 2) [RK 1 &2] Trust on delivery presides economic & skill issues. (Lesson 3) [RK 3] Discovering other expectations and their limits are type of instances that triggers recognizing knowers. (Lesson 4) [RK 1 & 3] Trust propagation is a type of instance that triggers recognizing knowers. (Lesson 5

Table 46. Empirical Instances of Common Knowledge Types founded in Lessons Learned Case (Part 1 of 3).

Empirical Instances of Common Knowledge Types founded in Lessons the Learned Case 2/3

Approach of KBV of the Firm	[Theoretical Instances of OCK in the Organizational Capability]	*Integrated View of Individual Knowing*		
		Common Language [CL]	**Shared Meanings [SM]**	**Recognition of Knowers [RK]**
Grant's KBV of the Firm: Firms, as institutions for knowledge application have the fundamental task of integrating knowledge of many specialists into goods and services, and the key to do it efficiently is to minimize knowledge transfer through use of common knowledge. **Actors' governance:** Given the co-ownership of knowledge, interdependence among actors is part of organizational design.	**[1]** Directives (rules and procedures). **[2]** Plans (time regulated activities guided by production tech and managers discretional decisions about sequencing and overlapping) **[3]** Organizational routines (patterns of interaction that integrates specialized knowledge without much communication through the sharing of grammars of action). **[4]** Organizational structure (modular team-based with fluid multiple role & simultaneous membership). **[5]** Capabilities architecture (product knowledge hierarchy). **[6]** Other (empirical founded instances not referenced in theoretical framework)	[CL 2, SM 2 & RK 2] Either, not knowing, or own weakness awareness may enact distorted scope meanings for the same terms. (Lesson 15: S & H)	[SM 1] Normative values should be linked to incentives. (Lesson 6) [SM 5] Constructive trust-based work-related criticism as way of executing. (Lessons 7: C & 8: C) [SM 1 & 3] Managed communal support knowledge fund as a normative shared value. (Lesson 7: I, F) [SM 3, RK3] Management of members' unawareness or weaknesses portrays proactive intervention, reduces risk and improves quality (Lesson 7: R, Q, H) [SM 3 & 4] Sharing as a way of growing and incorporating members. (Lesson 7: Sh & G) [SM 2 & 4] There is a tension among priority of directives, plans 'goals, and organizational structure membership. (Lessons 9: S, 11: H) [SM 2] Administrative plans follow plausible patterns to characterize the future – *through aligned scope breakdown planning (Lesson 14)*. Research plans follow canon-based legitimization approaches for scope drafts that insinuate the future (Lesson 13 & 14) [SM 5] Product plans ask for alignment among specialized skills, team work, and organizational structure. (Lesson 14: G) [SM 2, CL 2 & RK 2] Either, not knowing, or own weakness awareness may enact distorted scope meaning for the same terms. (Lesson 15) [SM 2, 3 & 5] Specialist involvement in activities regarding knowledge out of his field (project planning and product management) may distract specialist from their goals. (Lessons 16, 17, 18, 19 & 20) [SM 4] Activities involving explicit knowledge may be centralized for efficiency reasons. (Lessons 16, 17, 18, 19 & 20)	[SM 3, RK3] Actions revealing members' unawareness or weaknesses are types of instances that trigger recognizing non-knowers (Lesson 7: R, Q, H) [RK 4] Exercising members' power is a type of instance that triggers recognizing knowers. (Lesson 9: G) [RK 3 & 5] Specialist's skilful execution is a type of instance that triggers recognizing knowers. (Lesson 9: G & S) [RK 3 & 5] Transition to product exploitation demands communication skills besides transfer of technology. (Lesson 9: Cm & I) [RK 5] Members-product cross referencing is a type of instance that triggers recognizing knowers. (Lesson 10) [RK 1, 3 & 5] Communicating effectively is a type of instance that triggers recognizing knowers. (Lesson 11: Cm) [RK 3] Collaboration un-hides existing knowledge. (Lesson 12) [RK 3] Collaboration triggers recognizing of knowers. (Lesson 12) [CL 2, SM 2 & RK 2] Either, not knowing, or own weakness awareness may enact distorted scope meanings for the same language terms. (Lesson 15)

Table 47. Empirical Instances of Common Knowledge Types founded in Lessons Learned Case (Part 2 of 3).

Empirical Instances of Common Knowledge Types founded in Lessons Learned Case 3/3

<table>
<tr><th rowspan="2">Approach of KBV of the Firm</th><th rowspan="2">[Theoretical Instances of OCK in the Organizational Capability]</th><th colspan="3">Integrated View of Individual Knowing</th></tr>
<tr><th>Common Language [CL]</th><th>Shared Meanings [SM]</th><th>Recognition of Knowers [RK]</th></tr>
<tr><td rowspan="6">Grant's KBV of the Firm:
Firms, as institutions for knowledge application have the fundamental task of integrating knowledge of many specialists into goods and services, and the key to do it efficiently is to minimize knowledge transfer through use of common knowledge.

Actors' governance:
Given the co-ownership of knowledge, interdependence among actors is part of organizational design.</td><td rowspan="6">[1] Directives (rules and procedures).
[2] Plans (time regulated activities guided by production tech and managers discretional decisions about sequencing and overlapping)
[3] Organizational routines (patterns of interaction that integrates specialized knowledge without much communication through the sharing of grammars of action).
[4] Organizational structure (modular team-based with fluid multiple role & simultaneous membership).
[5] Capabilities architecture (product knowledge hierarchy).
[6] Other (empirical founded instances not referenced in theoretical framework)</td><td></td><td>[SM 2 & 5] Specialist unawareness of certain planning and product management issues (cost, HHRR, stakeholders, & procurement) may affect the integration of his knowledge into plans and products. (Lessons 17, 18, 19, 20 & 21)</td><td rowspan="6">[RK 1, 2 & 4] Managers authority and success record may be able to set, initially, cost estimates. (Lessons 23 & 24)
[RK 1, 2] New members' success may be able to change initial set cost estimates, while refining goals and delivery time. (Lessons 23 & 24)
[RK 1, 3 & 4] Certain standards of knowing behavior (adaptable, collaborative, and foresighted) help the integration process. (Lessons 25, 26 & 27)
[RK 3] Discussing as a way of sharing meanings though plausible stories. (Lesson 32)
[RK 1 & 2] Recognizing setter of standards starts with those that have the best possibilities of being successful. (Lesson 35)</td></tr>
<tr><td colspan="2">[CL3, SM 3] Without pledged explicit standards/best practices, delivering satisfactory outcomes ask for non-replicable extraordinary efforts (Lesson 22: Q, I)</td></tr>
<tr><td>[CL 1, 2, 3,4, & 5] Operating tongue language proficiency affects pace of plans, routines, execution capability, social life, and integration process. (Lessons 20, 28, 29, 30 &, 31)</td><td>[SM 2 & 4] Long term and disjoint distance learning may trigger misalignment with goals and structure. (Lesson 26)</td></tr>
<tr><td colspan="2">[CL 1, SM 1] Telling canon-based legitimating stories may shape key long term meanings that define the organizational culture. (Lesson 33)</td></tr>
<tr><td></td><td>[SM 2] Goals may be set to challenge the outside world. (Lesson 34)
[SM 1 & 3] Norms based on the authority-trust knowing relationship eventually confronts the standards/best practices-compliance relationship. (Lesson 35)
[SM 1] Transcendent shared meanings may be the result of the aggregated enactment of deliveries of a plan. (Lesson 36)
[SM 1] Knowledge co-ownership shapes the discussion about benefits rights. (Lesson 36)</td></tr>
</table>

Table 48. Empirical Instances of Common Knowledge Types founded in Lessons Learned Case (Part 3 of 3).

Common Knowledge Types in Organizations in the Context of the Integrating Capability of KBV of the Firm – 1 of 2

	Common Knowledge Types		
	A. Common Language (CL)	**B. Shared Meanings (SM)**	**C. Recognition of Knower (RK)**
[1] Directives	**Knowledge Integration Tensions** 2. Bridging language terms to shared norms is a long term issue. [CL 1, SM 1] (Lessons 1, 13 & 35) 3. Key meanings of organizational culture are shaped by legitimating stories. [CL 1, SM 1] (Lesson 33) [CL 1, 2, 3, 4 & 5] (Lessons 20, 28, 29 &	3. Norms based on the authority-trust knowing relationship eventually confronts the standards/best practices-compliance relationship. (SM 1 & 3] (Lesson 35) 4. There is tension among priority of directives, plan´s goals, and organizational structure membership. [SM 1, 2 & 4] (Lessons 2: Sh, 9: S, 10: Sh & 11: H) **Logic of instrumentalization (Logic of Contrivance)** 1. Managed communal support knowledge instrumentalized as transaction fund that helps integration and financing. [SM 1 & 3] (Lesson 7: I, F) 2. Transcendent shared meanings emerged by the enactment of aggregated productive outcomes. [SM 1] (Lesson 36) 3. Economic and emotional incentives help adhering to the meanings of the normative values of the organizational culture. [SM 1] (Lessons 1 & 6) 4. Meaning sharing initiatives hold debates. [SM 1] (Lesson 1) 5. Knowledge co-ownership shapes residual rights. [SM 1] (Lesson 36)	**Initial Knower Recognition Process** 1. Trust on delivery presides economic & skill issues. [RK 1 & 2] (Lesson 3: S, Cm) 2. Manager's authority and success record may set, initially, planning estimates. [RK 1, 2 & 4] (Lessons 23: Cm & 24: Cm, C, T, S) 3. Recognizing setter of standards starts with those with best possibilities of being successful. [RK 1 & 2] (Lesson 35: S, T, R, C) 4. New members' success may allow changing initial planning estimates to refine cost, goals… [RK 1 & 2] (Lessons 23: C, T, S & 24: T) **Ongoing Knower Recognition Process** 1. Trust propagation is a type of instance that triggers recognizing knowers. [RK 1 & 3] (Lesson 5: Cm, Sh) 2. Certain knowing approaches (adaptable, collaborative, and foresighted) help integration. [RK 1, 3 & 4] (Lessons 25, 26 & 27) **Abilities by which Knowers are Recognized** 1. Communicating effectively is a type of instance that triggers recognizing knowers. [RK 1, 3 & 5] (Lessons 9: Cm, I & 11: Cm)
[2] Plans	**Knowledge Integration Tensions** 2. Not knowing or weakness awareness may enact different goal's scope for same language terms. [CL 2 , SM 2] (Lesson 15) 1. Operating language tongue proficiency is the number one knowledge integration rate-defining factor	3. There is tension among priority of directives, plans 'goals, and organizational structure membership. [SM 1, 2 & 4] (Lessons 2: Sh, 9: S, 10: Sh & 11: H) 4. There is tension between specialist unawareness of certain planning issues and the integration of his knowledge into plans. [SM 2, 5] (Lessons 17, 18, 19, 20 & 21) 5. Long term and disjoint distance learning may provoke goal and structure misalignments. [SM 2 & 4] (Lesson 26) **Logic of instrumentalization (Logic of Achievement)** 1. Exploitation plans plausibly characterize the future through aligned and broken down scopes. [SM2] (Lessons 13 & 14) 2. Exploration plans follow canon-based legitimization approaches through scope drafts that insinuate the future. [SM2] (Lessons 13 & 14)	**Initial Knower Recognition Process** 1. Trust on delivery presides economic & skill issues. [RK 1 & 2] (Lesson 3: S, Cm) 2. Manager's authority and success record may set, initially, planning estimates. [RK 1, 2 & 4] (Lessons 23: Cm & 24: Cm, C, T, S) 3. Recognizing setter of standards starts with those with best possibilities of being successful. [RK 1 & 2] (Lesson 35: S, T, R, C) 4. New members' success may allow changing initial planning estimates to refining cost, goals… [RK 1 & 2] (Lessons 23: C, T, S & 24: T) **Ongoing Knower Recognition Process** 5. Takes time to adjust and pledge to an organizational design. [RK 2, 4] (Lesson 1: G, H)

Table 49. Common Knowledge Types in Organizations in the Context of the Integrating Capability of KBV of the Firm – 1 of 2

Common Knowledge Types in Organizations in the Context of the Integrating Capability of KBV of the Firm – 2 of 2

	Common Knowledge Types		
	A. Common Language (CL)	**B. Shared Meanings (SM)**	**C. Recognition of Knowers (RK)**
[3] Routines	**Knowledge Integration Tensions** 2. Without pledged explicit standards/best practices, delivering satisfactory outcomes ask for non-replicable extraordinary efforts. CL 3 & SM 3] (Lesson 22)	3. Norms based on the authority-trust knowing relationship eventually confronts standards/best practices-compliance relationship. [SM 1 & 3] (Lesson 35) 4. There is tension between the decision of sharing resources and the opportunities of embracing new members and growing. [SM 3 & 4] (Lesson 7: Sh & G) 5. There is tension between specialist unawareness of certain product management issues and the integration of his knowledge into products. [SM 3 & 5] (Lessons 17, 18, 19, 20 & 21)	**Ongoing Knower Recognition Process** 1. Trust propagation is a type of instance that triggers recognizing knowers. [RK 1 & 3] (Lesson 5: Cm, Sh) 2. Certain knowing approaches (adaptable, collaborative and foresighted) help integration. [RK 1, 3 & 4] (Lessons 25, 26 & 27) 3. Plausible discussions help to share knowledge. [RK 3] (Lesson 32) 4. Collaboration un-hides existing knowledge. [RK 3] (Lessons 12) 5. Discovering other's expectations and their limits are type of instances that triggers recognizing knowers. [RK 3] (Lesson 4) 6. Knowledge (practices & standards) of non-participant members may be left out of organizational capabilities and routines. [RK 3 & 5] (Lesson 2)
		Logic of Instrumentalization (Logic of Achievement) 1. Managed communal support knowledge instrumentalized as transaction fund that helps integration and financing. [SM 1 & 3] (Lesson 7: I, F) 2. Management of members' unawareness or weaknesses is portrayed as proactive interventions that try to reduce risk and improve quality. [SM 3] (Lesson 7: R, Q, H)	**Abilities by which Knowers are Recognized** 1. Communicating effectively is a type of instance that triggers recognizing knowers. [RK 1, 3 & 5] (Lessons 9: Cm, I & 11: Cm) 2. Collaboration triggers recognizing of knowers. [RK 3] (Lesson 12) 3. Specialist's skillful execution is a type of instance that triggers recognizing knowers. [RK 3 & 5] (Lesson 9: G & S) 4. Actions revealing unawareness or weaknesses are types of instances that trigger recognizing non-knowers. [RK 3, SM 3] (Lesson 7: R, Q, H)
[4] Structure	**Knowledge Integration Tensions** 1. There is ineffective tension among priority of directives, plan´s goals, and organizational structure membership (closed). [SM 1, 2 & 4] (Lessons 2: Sh, 9: S, 10: Sh & 11: H) 2. Long term and disjoint distance learning may provoke goal and structure misalignments. [SM 2 & 4] (Lessons 9, 11 & 26: R, K & C) 3. There is tension between the decision of sharing resources and the opportunities of embracing new members and growing. [SM 3 & 4] (Lesson 7: Sh & G)		**Initial Knower Recognition Process** 1. Recognizing setter of standards starts with those with best possibilities of being successful. [RK 2] (Lesson 35: S, T, R, C) 2. Manager's authority and success record may set, initially, planning estimates. [RK 1, 2 & 4] (Lessons 23: Cm & 24: Cm, C, T, S)
		Logic of Instrumentalization (Logic of Achievement) 1. Difficult translation of known previous organizational structures into the existing one. [SM 4] (Lesson 1) 2. Non obvious short time benefits resist the pledging to organizational structure. [SM 4] (Lesson 1)	**Ongoing Knower Recognition Process** 1. It takes time to adjust and pledge to an organizational design. [RK 2, 4] (Lesson 1: G, H) 2. Certain knowing approaches (adaptable, collaborative and foresighted) help integration. [RK 1, 3 & 4] (Lessons 25, 26 & 27) **Abilities by which Knowers are Recognized** 1. Exercising members' power is a type of instance that triggers recognizing knowers. [RK 4] (Lesson 9: G)
[5] Architecture	**Knowledge Integration Tensions** 1. There is tension between specialist unawareness of certain product management issues and the integration of his knowledge into products. [SM 3 & 5] (Lessons 17, 18, 19, 20 & 21)		**Ongoing Knower Recognition Process** 1. Member-product cross referencing is a type of instance that triggers recognizing knowers. [RK 5] (Lesson 10) 2. Transition to product exploitation asks for communication skills besides technology transfer. [RK 5] (Lesson 9: C, I & 11) 3. Knowledge (practices & standards) of non-participant members may be left out of organizational capacities and routines. [RK 3 & 5] (Lesson 2)
		Logic of Instrumentalization (Logic of Achievement) 1. Integration happens progressively with leadership and incentive dependence [SM 5] (Lessons 1) 2. Persistent but contextually adaptable directives help integration. SM 1 & 5] (Lesson 3) 3. Constructive trust-based work-related criticism helps integration. [SM 1 & 5] (Lessons 7: C & 8: C)	**Abilities by which Knowers are Recognized** 1. Communicating effectively is a type of instance that triggers recognizing knowers. [RK 1, 3 & 5] (Lessons 9: Cm, I & 11: Cm) 2. Specialist's skillful execution is a type of instance that triggers recognizing knowers. [RK 3 & 5] (Lesson 9)

1. Operating language tongue proficiency is the number one knowledge integration rate-defining factor [CL 1, 2, 3, 4 & 5] (Lessons 20, 29, 29 & 31)

Table 50. Common Knowledge Types in Organizations in the Context of the Integrating Capability of KBV of the Firm – 2 of 2

However, we can notice, within those instances, that there are interactions among common knowledge types that do not fit the lineal relation between organizational tools (OT) and the efficiency of the knowledge integration capability (EKIC).

Letting rest the data helped.

In search of patterns that show a plausible way of seeing, the coded data lead to extending the scope of the secondary research question (*How are common knowledge types related to the knowledge integration capability?*), to ask for:

What if common knowledge types hold relationships among them (within the scope of knowledge integration)?

What if common knowledge relationships between types represent processes within knowing?

What if such relationships among common knowledge types hold a moderator role in the relation between OTs and EKIC?

To answer such questions, I explored the possibility of seeing the coded instances in terms of the whole set organizational tools, instead of seeing them separately (see Table 51). In such view, what originally looked like a draft of knowing processes, it became clear instances of them.

Coded data from lessons learned support a positive answer to such extended interpretation of the common knowledge types, as can be appreciated in the framing achieved in Table 51. Such table shows not only the 42 propositions moderating the relation between organizational tools with the efficiency of the knowledge integration, but the pattern that such propositions follow: knowing tensions, logic of contrivance, recognizing knowers at initial and ongoing stages, and abilities that characterize the recognizing of knowers.

Tools: [1] Directives [D] | [2] Plans [P] | [3] Routines [R] | [4] Structure [S] | [5] Architecture of Capability [A]

Efficiency of the Knowledge Integration Capability [EKIC]

Moderating Common Knowledge Types, Processes and Abilities

[CL] Common Language	[SM] Shared meanings	[RK] Recognition of Knowers
1.Organizational operating language tongue proficiency is the number one knowledge integration rate-defining factor. [Directives, Plans, Routines, Structure, Architecture]	**[KIT] Knowledge Integration Tensions** 2. Bridging language terms to shared norms is a long term issue. [Directives] 3. Key meanings of organizational culture are shaped by legitimating stories. [Directives] 4. Not knowing or weakness awareness may enact different goal's scope for same language terms. [Plans] 5. Without pledged explicit standards/best practices, delivering satisfactory outcomes ask for non-replicable extraordinary efforts. [Routines] 6. Norms based on the authority-trust knowing relationship eventually confronts standards/best practices-compliance relationship. [Directives, Routines] 7. There is a tension among priority of directives, plan´s goals, and organizational structure membership. [Directives, Plans, Structure] 8. There is tension between specialist unawareness of certain planning issues and the integration of his knowledge into plans. [Plans, Architecture] 9. Long term and disjoint distance learning may provoke goal and structure misalignments. [Plans, Structure] 10. There is tension between the decision of sharing resources and opportunities of embracing new members & growing. [Routines, Structure] 11. There is tension between specialist unawareness of certain product management issues and the integration of his knowledge into products. [Routines, Architecture] **[LoI] Logic of Instrumentalization** 12. Managed communal knowledge transaction fund helps integration and financing. [Directives, Routines] 13. Transcendent shared meanings emerged by the enactment of aggregated productive outcomes. [Directives] 14. Economic and emotional incentives help adhering to the meanings of the normative values of the organizational culture. [Directives] 15. Meaning sharing initiatives hold debates. [Directives] 16. Knowledge co-ownership shapes residual rights. [Directives] 17. Exploitation plans plausibly characterize the future through aligned and broken down scopes. [Plans] 18. Exploration plans follow canon-based legitimization approaches through scope drafts that insinuate the future. [Plans] 19. Management of members' unawareness or weaknesses is portrayed as proactive interventions that try to reduce risk and improve quality. [Routines] 20. Difficult translation of known previous organizational structures into the existing one. [Structure] 21. Non obvious short time benefits resist the pledging to organizational structure. [Structure] 22. Integration happens progressively with leadership and incentive dependence. [Architecture] 23. Persistent but contextually adaptable directives help integration. [Directives, Architecture] 24. Constructive trust-based work-related criticism helps integration. [Architecture]	**[IKPR] Initial Knower Recognition Process** 25. Manager's authority and success record may set, initially, planning estimates. [Directives, Plans, Structure] 26. Trust on delivery presides economic & skill issues. [Directives, Plans] 27. Recognizing setter of standards starts with those with best possibilities of being successful. [Directives, Plans] 28. New members' success may allow changing initial planning estimates to refine cost, goals… [Directives, Plans] **[OKPR] Ongoing Knower Recognition Process** 29. Trust propagation is a type of instance that triggers recognizing knowers. [Directives, Routines] 30. Certain knowing approaches (adaptable, collaborative, and foresighted) help integration. [Directives, Routines, Structure] 31. Plausible discussions help to share knowledge. [Routines] 32. Collaboration un-hides existing knowledge. [Routines] 33. Discovering other's expectations and their limits are type of instances that triggers recognizing knowers. [Routines] 34. It takes time to adjust and pledge to an organizational design. [Plans, Structure] 35. Member-product cross referencing is a type of instance that triggers recognizing knowers. [Architecture] 36. Transition to product exploitation asks for communication skills besides technology transfer. [Architecture] 37. Knowledge (practices & standards) of non-participant members may be left out of organizational capabilities and routines. [Routines, Architecture] **[AKR] Abilities by which Knowers are Recognized** 38. Communicating effectively is a type of instance that triggers recognizing knowers. [Directives, Routines, Architecture] 39. Specialist's skilful execution is a type of instance that triggers recognizing knowers. [Routines, Architecture] 40. Collaboration triggers recognizing of knowers. [Routines] 41. Exercising members' power is a type of instance that triggers recognizing knowers. [Structure] 42. Actions revealing unawareness or weaknesses are types of instances that trigger recognizing non-knowers. [Routines]

Table 51.Knowledge Integration Capability Model (KIC Model)

Following those emerged moderating roles of the common knowledge types and their mutual interactions allows for elaborating answers for the research questions, which are posited as follows:

Main research question: How is common knowledge in organizations (CKO) related to the knowledge integration capability (KIC)?

> *Answer:* CKO, seen as a set, moderates the relationship between (OTs) organizational tools (Directives, Plans, Routines, Structure, and Architecture) and the efficiency of the knowledge integration capability (EKIC).
>
> In this moderating role, CKO found instances fit into the knowing behaviors related to either the knowing integration tensions (KIT), or the logic of instrumentalization (LoI), or the initial knower recognition process (IKPR), or the ongoing knower recognition process (OKPR); all these findings are consistent with the integrated view of language, meanings and recognition of knowers (Table 32).

Secondary research questions 1: How is common language (CL) in organizations related to the knowledge integration capability (KIC)?

> *Answer (part a):* Common language (CL) participates in the moderation of the relationship between organizational tools (OTs) and the efficiency of knowledge integration capability (EKIC), such participation happens within the tensions of integrating knowing (KIT); and is represented by the proposition that goes as:
>
> [P1] Operating language tongue proficiency is the number one knowledge integration rate-defining factor. *Proposition applies to all OTs.*

Answer (part b): Common language (CL) and Shared meanings (SM) while shaping each other participate in the moderation of the relationship between organizational tools (OT) and the efficiency of knowledge integration capability (EKIC); such participation happens within the tensions of integrating knowing (KIT); and is represented by propositions that go as:

[P2] Bridging language terms to shared norms is a long-term issue. Proposition applies to the OT: Directives.

[P3] Key meanings of organizational culture are shaped by legitimating stories. Proposition applies to the OT: Directives.

[P4] Not knowing or weakness awareness may enact different goal's scope for same language terms. Proposition applies to the OT: Plans.

[P5] Without pledged explicit standards/best practices, delivering satisfactory outcomes ask for non-replicable extraordinary efforts. Proposition applies to the OT: Routines.

Secondary research questions 2: How are shared meanings in organizations related to the knowledge integration capability?

Answer (part a): Shared meanings (SM) participates in the moderation of the relationship between organizational tools (OT) and the efficiency of the knowledge integration capability (EKIC); such participation happens within the tensions of integrating knowing (KIT); and is represented by propositions that go as:

[P6] Norms based on the authority-trust knowing relationship eventually confronts standards/best practices-compliance relationship. Proposition applies to the OT: Directives, Routines.

[P7] There is tension among priority of directives, plan´s goals, and organizational structure membership. Proposition applies to the OT: Directives, Plans, Structure.

[P8] There is tension between specialist unawareness of certain planning issues and the integration of his knowledge into plans. Proposition applies to the OT: Plans, Architecture.

[P9] Long term and disjoint distance learning may provoke goal and structure misalignments. Proposition applies to the OT: Plans, Structure.

[P10] There is tension between the decision of sharing resources and the opportunities of embracing new members and growing. Proposition applies to the OT: Routines, Structure.

[P11] There is tension between specialist unawareness of certain product management issues and the integration of his knowledge into products. Proposition applies to the OT: Routines, Architecture.

Answer (part b): Shared meanings (SM) participates in the moderation of the relation between organizational tools (OT) and the efficiency of the knowledge integration capability (EKIC); such participation happens within the logic of instrumentalization [LoI] of organizational tools, and is represented by propositions which go as:

[P12] Managed communal knowledge transaction fund helps integration and financing. Proposition applies to the OT: Directives, Routines]

[P13] Transcendent shared meanings emerged by the enactment of aggregated productive outcomes. Proposition applies to the OT: Directives]

[P14] Economic and emotional incentives help adhering to the meanings of the normative values of the organizational culture. Proposition applies to the OT: Directives.

[P15] Meaning sharing initiatives hold debates. Proposition applies to the OT: Directives.

[P16] Knowledge co-ownership shapes residual rights. Proposition applies to the OT: Directives.

[P17] Exploitation plans plausibly characterize the future through aligned and broken down scopes. Proposition applies to the OT: Plans.

[P18] Exploration plans follow canon-based legitimization approaches through scope drafts that insinuate the future. Proposition applies to the OT: Plans.

[P19] Management of members' unawareness or weaknesses is portrayed as proactive interventions that try to reduce risk and improve quality. Proposition applies to the OT: Routines.

[P20] Difficult translation of known previous organizational structures into the existing one. Proposition applies to the OT: Structure.

[P21] Non obvious short time benefits resist the pledging to organizational structure. Proposition applies to the OT: Structure.

[P22] Integration happens progressively with leadership and incentive dependence. Proposition applies to the OT: Architecture.

[P23] Persistent but contextually adaptable directives help integration. Proposition applies to the OT: Directives, Architecture.

[P24] Constructive trust-based work-related criticism helps integration. Proposition applies to the OT: Architecture]

Secondary research questions 3: How is the recognition of individuals of knowers in organizations related to the knowledge integration capability?

Answer (part a): Recognition of knowers (RK) participates in the moderation of the relation between OTs and the efficiency knowledge integration capability (EKIC); such participation happens within the initial knower recognition process [IKPR]; and is represented by propositions that go as:

[P25] Manager's authority and success record may set, initially, planning estimates. Proposition applies to the OT: Directives, Plans, Structure.

[P26] Trust on delivery presides economic & skill issues. Proposition applies to the OT: Directives, Plans]

[P27] Recognizing setter of standards starts with those with best possibilities of being successful. Proposition applies to the OT: Directives, Plans.

[P28] New members' success may allow changing initial planning estimates to refine cost, goals… Proposition applies to the OT: Directives, Plans.

Answer (part b): Recognition of knowers (RK) participates in the moderation of the relation between OTs and the efficiency knowledge integration capability (EKIC); such participation happens within the ongoing knower recognition process [OKPR]; and is represented by propositions that go as:

[P29] Trust propagation is a type of instance that triggers recognizing knowers. Proposition applies to the OT: Directives, Routines.

[P30] Certain knowing approaches (adaptable, collaborative, and foresighted) help integration. Proposition applies to the OT: Directives, Routines.

[P31] Plausible discussions help to share knowledge. Proposition applies to the OT: Routines.

[P32] Collaboration un-hides existing knowledge. Proposition applies to the OT: Routines.

[P33] Discovering other's expectations and their limits are type of instances that triggers recognizing knowers. Proposition applies to the OT: Routines.

[P34] It takes time to adjust and pledge to an organizational design. Proposition applies to the OT: Plans, Structure.

[P35] Member-product cross referencing is a type of instance that triggers recognizing knowers. Proposition applies to the OT: Architecture.

[P36] Transition to product exploitation asks for communication skills besides technology transfer. Proposition applies to the OT: Architecture.

[P37] Knowledge (practices & standards) of non-participant members may be left out of organizational capabilities and routines. Proposition applies to the OT: Routines, Architecture.

Answer (part c): Abilities by which knowers are recognized [AKR] shape, both, the Initial Knower Recognition Process [IKPR], and the Ongoing Recognition Process [OKRP], and such shaping is represented by propositions that go as:

[P38] Communicating effectively is a type of instance that triggers recognizing knowers. Proposition applies to the OT: Directives, Routines, Architecture.

[P39] Specialist's skilful execution is a type of instance that triggers recognizing knowers. Proposition applies to the OT: Routines, Architecture.

[P40] Collaboration triggers recognizing of knowers. Proposition applies to the OT: Routines.

[P41] Exercising members' power is a type of instance that triggers recognizing knowers. Proposition applies to the OT: Structure.

[P42] Actions revealing unawareness or weaknesses are types of instances that trigger recognizing non-knowers. Proposition applies to the OT: Routines.

These 42 propositions could be summarized in the following five meta-propositions, which capture the essence of the emerged moderating role that common knowledge types hold in the relation between organizational tools [OT] and the efficiency of the knowledge integration capability [EKIC]:

1. Knowledge Integration Tension [KTI] Propositions

   1.1 KIT and CL: Common language [CL] moderates the relationship between organizational tools (Directives [D], Plans [P], Routines [R], Structure [S], Architecture [A]) and the efficiency of the knowledge integration capability [EKIC]; such moderating role holds a tension [KIT] characterized by the proposition 1, which posits that organizational operating language tongue proficiency is the number one rate-defining factor.

   1.2 KIT and CL-SM: Common Language [CL] and Shared Meanings [SM], while shaping each other, moderate the relationship between organizational tools

(Directives [D], Plans [P], Routines [R], Structure [S], Architecture [A]) and the efficiency of the knowledge integration capability [EKIC]; such moderating role holds a tension [KIT] characterized by propositions 2 to 5, which describe the tensions between discourse and enactment *within the same* organizational tool.

1.3 KIT and SM: Shared Meanings [SM] moderate the relationship between organizational tools (Directives [D], Plans [P], Routines [R], Structure [S], Architecture [A]) and the efficiency of the knowledge integration capability [EKIC]; such moderating role holds a tension [KIT] characterized by propositions 6 to 11; which describe the tensions of enactment *between different* organizational tools.

2. Logic of Instrumentation [LoI] Propositions

LoI and SM: Shared Meanings [SM] moderate the relationship between organizational tools (Directives [D], Plans [P], Routines [R], Structure [S], Architecture [A]) and the efficiency of the knowledge integration capability [EKIC]; such moderating role happens within the context of activities related to the logic of instrumentalization [LoI] characterized by propositions 12 to 24; which describe instances that goes from order recognition, through pattern generalization, to the its committed usage.

3. Initial Knower Recognition Process [IKPR] Propositions

IKPR and RK: Recognition of knowers [RK] moderates the relationship between certain organizational tools (Directives [D] and Plans [P]) and the efficiency of the knowledge integration capability [EKIC]; such moderating role happens within the context of activities related to the process of initially recognizing knowers [IKPR] characterized by propositions 25 to 28; which describe instances that follow the authority-trust relationship logic.

4. Ongoing Knower Recognition Process [OKPR] Propositions

   OKPR and RK: Recognition of knowers [RK] moderates the relationship between organizational tools (Directives [D], Plans [P], Routines [R], Structure [S], Architecture [A]) and the efficiency of the knowledge integration capability [EKIC]; such moderating role happens within the context of activities related to the ongoing process of recognizing knowers [OKPR] characterized by propositions 29 to 37; which describe instances that follow the successful restricting or habilitating sayings and acts.

5. Abilities by which Knowers are Recognized [AKR]

   AKR and IKPR/OKPR: Abilities by which knowers are recognized [AKR] shape, both, the Initial Knower Recognition Process [IKPR], and the Ongoing Recognition Process [OKRP] as described by propositions 38 to 42; which recognize knowers as linked to the setting of knowing standards.

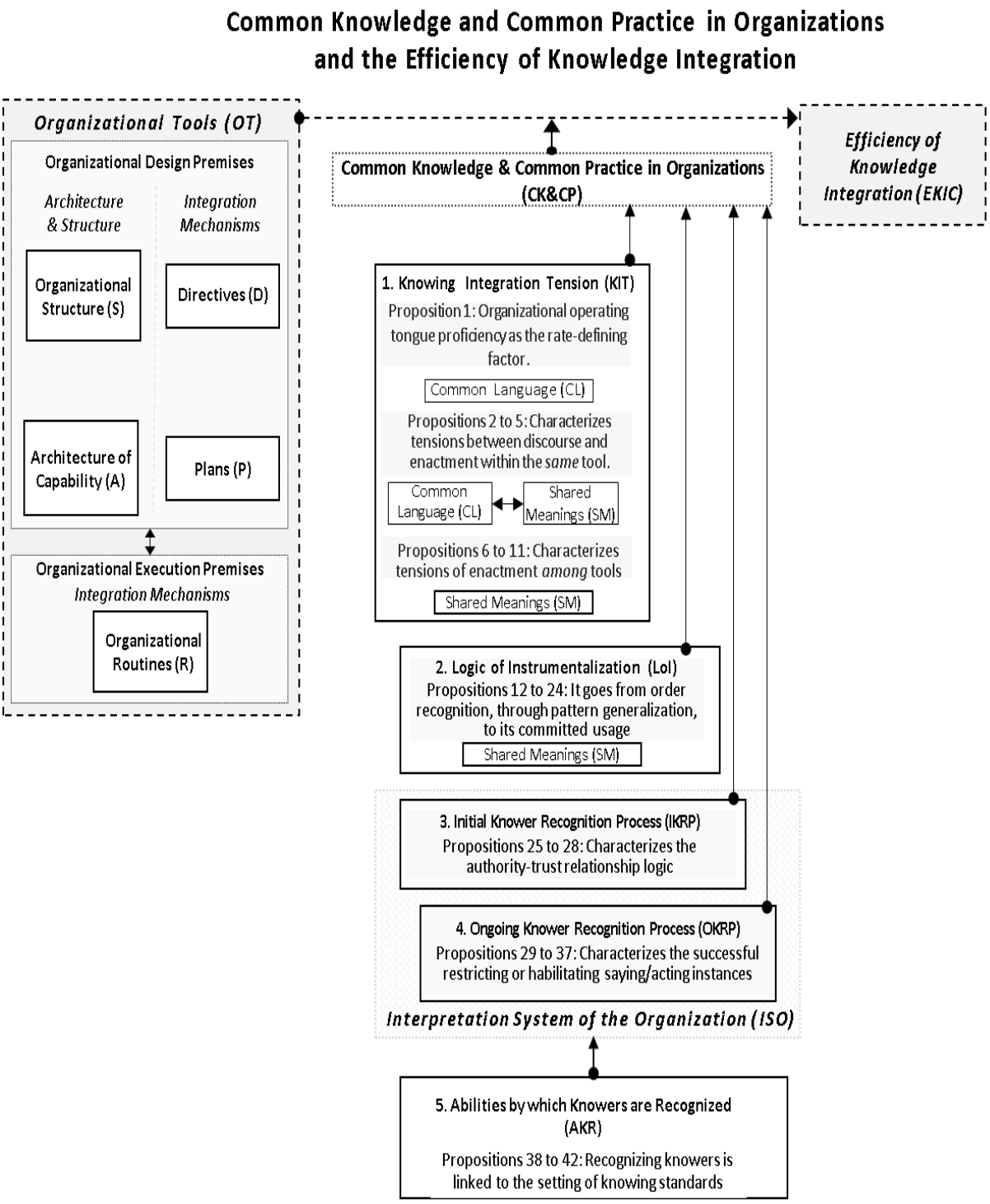

Figure 10. Common Knowledge and Common Practice in Organizations and the Efficiency of the Knowledge Integration Capability.

6.3 CONCLUSIONS

Empirical exploratory findings support Grant´s (1996a; b) propositions regarding the relationships between, the now understood as organizational tools (directives, plans, routines, structure, and architecture), and the efficiency of the knowledge integration capability (EKIC).

However, findings make clearer the understanding of common knowledge in organizations (CKO) as holding a moderating role between organizational tools (OT) and the efficiency of the knowledge integration capability (EKIC). Moreover, such moderating role redefines the original understanding of common knowledge, centered in common language (CL), shared meanings (SM) and recognition of knowers (RK).

In the emerged conception, these three constructs still play a key role in common knowledge but are supplemented within a processual understanding of knowing, revealed as a set of behaviors enacted through abilities; which are better understood, at organizational level, within the framework of common practice than common knowledge.

Forty two clustered propositions (see Table 51) revealed that common practice in organizations has to do more with the (1) Knowing Integration Tension, (2) Logic of Instrumentation, (3) Initial Knower Recognition Process, (4) Ongoing Knower Recognition Process, and (5) Abilities by which Knowers are Recognized.

The following paragraphs frame the scope and implications of such characterization of common practice in organizations and it also depicts its graphical representation

(Figure 10) within an extended version of the mapped propositions of Grant´s (1996a) KBV of the Firm.

(1) "Knowing Integration Tension" (KIT) clusters propositions that characterize organizational tools as time-dependent, narrative-dependent and inter-meaning-dependent. That is, knowledge integration efficiency asks for (a) operating language proficiency, (b) cultivating value-aligned organizational stories and (c) negotiating meanings among organizational tools, all that, to shape the knowing integration efficiency.

Knowledge integration tension (KIT) propositions are mostly related to usage of abilities that deal with the tension of legitimating directives, plans, routines, organizational structure and the architecture of the body of knowledge in organizations.

That is, order recognition and establishing, and canon appreciation and influencing are key knowing abilities that participate in the interplay characterized by the extremes "committing to existing canons" and "building and sharing new canons".

This integration tension is eventually resolved in terms of the private standards of intellectual beauty and the public standards of canonical duty that are brought to our attention by the organizational tools in play.

These findings fit with Carlile´s (2004) approach to boundary objects, in regards to the tension of going from the syntactic to the semantic level of knowing;

however, the way it is understood and explained here is closer to the managerial practice than the distance boundary object approach posited by Carlile..

In other words, what is common in organizations are not the organizational tools (directives, plans …) but the tension that characterize the enactment of such organizational tools in respect to own and organizational standards, as is the case of tension hold by the specialist due to his unawareness about certain issues of the planning process and the integration of his knowledge into the plan.

(2) "Logic of Instrumentation" (LoI) clusters 13 propositions that characterize the patterned flow of behaviors for enacting organizational tools. This logic, described originally by Polanyi (1958), now exemplified at organizational level, posits the recognition of patterns about enacting shared meanings as linked to the efficiency of knowledge integration, as is the case of patterns like managed communal knowledge funds, aggregated productive outcomes, economic and emotional incentives, detail planning, weakness awareness, or trust-based work-related criticism.

The above long list could have not meant much without the Individual Level Knowing framework and Organizational Capability framework. They achieve to focus patterning and generalizing in the context of organizational tools. That is, knowledge integration efficiency asks for not only perceptual, but also for emotional pattern recognizing abilities.

These findings are similar to Carlile´s (2004) when he describes the sharing of common grounds through general inherent categorized characteristics of a shared

object (modularity, abstraction, accommodation and standardization). If we conceive Carlile´s objects as organizational tools, them he is also proposing pre-categorized approaches for patterning and instrumentalizing.

However, the instrumentalization of objects here meets an additional criterion: *common knowledge is about what actors, who know about the other, jointly know about a particular situation.*

That is, here, tool´s contriving and usage is not an isolated act in organizations, but a joint enactment that asks for additional abilities like (a) iterating through vernacular language and artifacts, and (b) forming social workableness through approaches like non-disclosive intimacy, equivalent meanings, shared meanings, or satisficing naming (see knowing abilities in Table 30).

In few words, the flow of joint patterning, generalizing and enacting socially workable objects and behaviors corresponds to the practice counterpart of (*organizational*) genres of the knowledge-practice framework (Cook and Brown, 1999). This understanding of common knowing attends Bou, Bonet and Sauquet (2004a; b) comments about the limited description of practice that such framework offers.

Then again, common knowledge is not about organizational tools, but how organizational tools are contrived and applied it.

(3) "Initial Knower Recognition Process" (IKPR), and *(4)* "Ongoing Knower Recognition Process" (OKPR), cluster propositions that characterized the (a) authority-

trust relationship, (b) socially workable enactments, and the (c) canon-based legitimizing behaviors or discourses; which end-up triggering the recognition of knowers.

Recognizing knowers in organizations at initial stage (IKPR) follows the authority-trust relationship understood as the process in which (a) expert´s authority and success record shape standards of execution, (b) expert and novice trust on delivery competence operates before the evaluation of skills of the parties, (c) and novice successful execution allows for refining and setting new standards.

This is an approach that while considers the peripheral and participatory discourse of situated learning theory (Wenger & Lave, 1991), also hold the benefit of understanding it within an integrated and framed epistemology and in the context of organizational tools.

The ongoing stage for recognizing knowers (OKPR) is an evolution from the rules of the knowing engagement of two hierarchical parties. In OKPR, the enactment of successful restricting or habilitating sayings and acting in the organization seems to credit individuals as knowers. Examples of such enactments were found to be manifested as trusty, adaptable, collaborative, foresighted, communicative, discussing plausibly and discoverer of others expectations and limits.

The revealed IKPR and OKPR logic tells us that when we recognize an individual as a knower, we do not only recognize his knowing authority, but also recognize in him a part of the logic of the *interpretative system of the organization*.

Moreover, when in these activities the recognition of the quality of knower is related to the enactment of *habilitating* conditions (Weick, 1995), we identify that a part of the logic of the interpretation system has changed.

The linkage between recognized knowers and the enactment of the interpretative system of the organization is an approach that solves the risk of reification mentioned by Grant (1996a) and exemplified in Nelson and Winter´s (1982) conception of the firm, since the interpretative system refers no more to an abstract organizational object disconnected from members' participation, but a function of recognized human knowers.

Wenger´s (1998) CoP and its framing (Bozarth, 2008) emphasize participation and reification as tools for modulating institutionalization in organizations (Wenger, 1998, pp. 242-243). Such view is consistent with our conclusion about the recognition of knowers as the enactment of an interpretative system.

These findings hold the advantage that participation and reification here are understood within the logic in which knowers are recognized by their trust and as setter of standards through the instrumentalization objects and behaviors as organizational tools, which reflect on how value is created within the chosen capability (e.g. knowledge integrated into the productive practice).

This is a useful transformative reinterpretation of participation and reification that holds the possibility, given the now revealed framed IKPR and OKPR propositions, of being manageable (Wenger, 1998). An affirmation that contrasts with the unmanageability discourse of the CoPs (Bozarth, 2008).

Summarily, the relationship between organizational tools (OT) and the efficiency of the knowledge integration capability (EKIC) is moderated by the interpretation system of the organization, which emerges from the accumulated experiences of recognizing knowers, either as instances of the authority-trust relationship, enactment of social understandings, or the instrumentalization of organizational tools.

(5) Finally, "Abilities by which Knowers are Recognized" (AKR) clusters propositions linked to the practice of abilities that trigger the recognition of the individual as a knower, like (a) specialist skillful execution, (b) communicating effectively, (c) collaborating and (d) exercising of power. These abilities specialized our understanding, in organizational terms, of the more general abilities posited in the IKF (Tables 31 and 51). However, such set of abilities does not allow for conclusions, but for proposing further research.

Summarily, the logic of instrumentation, its knowing integration tension, and the knower recognition processes constitute, first, a tool-oriented operationalization of common knowledge in organizations for the efficient integration of knowledge; second, a know-who approach for understanding the organizational interpretative system; and third, an exemplar enactment of a epistemological framework that proposes to bridge knowledge and practice understandings from the perspective of the ability-based to symbol-base knowing continuum; in which possibilities of externalizing what is known are mainly given by the adequacy of the shared symbolization system hold.

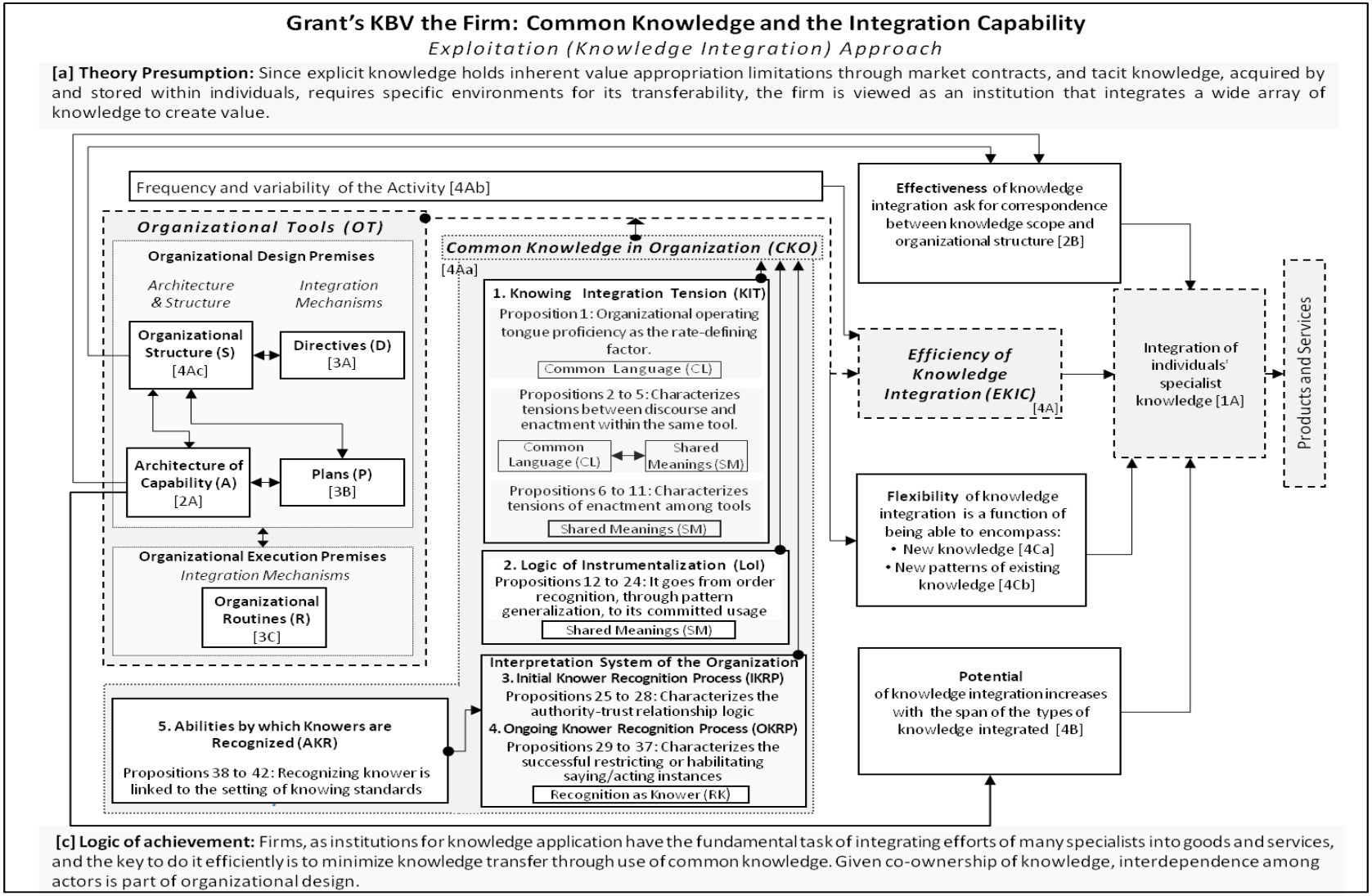

Figure 11. Grant´s KBV the Firm: Common Knowledge and the Knowledge Integration Capability.

6.4 CONTRIBUTION OF RESEARCH

6.4.1 Theoretical and Empirical Contributions

The intent to answer a focused research question in organizational studies, like *How is common knowledge in organizations related to the knowledge integration capability in Grant´s (1996a) KBV of the Firm?*, led to a re-reading of the theories of knowledge and the theories of the firm. The outcomes – frameworks – of such methodologically re-reading (Charmaz, 2000; Strauss & Corbin, 1998) are valuable contributions of this dissertation, even though they surged as an inevitable requisite within the research strategy.

Questions like [a] What does it trigger knowing?, [b] Which are the abilities that drive knowing?, [c1] Which is the role of language in knowing?, [c2] Which is the role of meanings in knowing?, [d1] Which are the principles or processes that guide knowing?, and [d2] What does it drive the recognition of the quality of knower? (Table 12) emerged from querying theories of the firm that conceive knowledge as the key factor in their logic of achievement goals and governing stakeholders.

The application of such framed questioning to re-read individual level knowing, sensemaking, and meaning theories (Polanyi, 1958; Bruner, 1990; Weick, 1995) confirmed Gourlay (2006) and Tsoukas (2003) critics about the misreading of the personal approach to knowing proposed by Polanyi, and posited, through methodological open and axial coding (Charmaz, 2000; Strauss & Corbin, 1998) that such extant theories

hold holistic, complementary and compatible views of knowing, which summarily is expressed as:

> *Knowing as the committed instrumentalization, or socially workable enactment, or legitimized enculturation of objects or behaviors, with greater or lesser shared and systematic symbolization, that when ineffective, it may either limit sharing, staying tacit, or trigger innovative behaviors.*

Together with this instrumental view of knowing, an integrated knowing framework (IKF) (Table 31) and an integrated view of language, shared meanings and recognition of knowers (Table 32) are proposed as a guideline for observing and talking about instances of knowing in organizational contexts, as it is suggested by Tsoukas (2003) and Gourlay (2006).

Our research question also demands clarity on the body of knowledge that sustains the organizational capability of a particular KBV of the firm (Grants´ (1996a). This dissertation could have attended such requirement independently of other theories of the firm; however that approach would have diminished its external validity (Yin, 2003a, p. 34), since the framing process could not be replicable for other theories of the firm.

The need to frame organizational capabilities was also motivated (a) by the abundant focused approaches on knowledge in organizations, but disconnected from the theories of the firm and (b) by the several extensively narrated knowledge-based theories of the firm that tacitly portray organizational capabilities.

The grounded theory-based (Strauss & Corbin, 1998) framing of organizational capabilities offers two research gap-filling outcomes: (a) a scheme for framing extant

theories of the firm (Table 33), and (b) six comparable framed theories of the firm (Tables 41-43).

Finally, common knowledge was argued as what actors, who know about the other; jointly know about a particular situation (Wilby, 2010), and common knowledge in organizations was argued as the domain of practices exercised within the framework of the theory in use by the members of the organization (Tsoukas and Vladimirou, 2001; Schutz, 1970; McCarthy, 1994; Argyris & Schön, 1974), to economize in communications (Arrow, 1974; Grant, 1996), recognize, reconcile and share goals (Brown & Duguid, 1991), replicate and protect key knowledge (Kogut & Zander, 1992), and ease coordination of actions (Nonaka, 1994; Thompson, 1967, Demsetz, 1991, Spender, 1989).

In the empirical side, the exploratory findings confirm the applicability of the Integrated Knowing Framework and the scheme for framing theories of the firm; revealing an instrumentalized way of seeing knowledge in organizations (organizational tools like directives, plans, structure, architecture and routines) and how certain aspects of the instrumentalization of such tools, recognized as common knowledge, moderate the efficiency of the integration of the knowledge of the specialist into the productive practice.

The knowing integration tension, the logic for contriving tools, and the knower recognition processes were identified as the efficiency moderating knowing processes of the integration capability; processes in which, common language, shared meanings and the recognition of knowers revealed to be the corner stone of such processes.

In this knowing approach the accumulated instances of recognizing knowers is understood as the interpretive system of the organization, an understanding that removes the risk of reifying the organization as a knower (Grant, 1996a), and that lead to rethink in the organizational value of the "who knows what/how/who".

6.4.2 Contributions for Practice

Now is time to recall research motivations. As a businessperson, in the opening section, I stated a question that led to define the purpose and scope of this dissertation, which represents a practice-oriented instance of the academic research question, and that now is reproduced to validate the contribution to practice of this endeavor:

> *Why is it that, even though we advise everyone in the organization to take action according to a broadly shared specific directive, we frequently confront misalignments to it?*

Considering the exploratory findings, we are able to say that when instrumentalizing directives, as an organizational tool, to integrate knowledge of specialist into the productive practice, we could consider for efficiency reasons, a set of moderating factors that are related to the following questions:

1. Are members familiarized with the language used in directives? (KIT:CL)
2. Are members aware of meaning-based organizational stories that tell about previous instances of alignment to the values shared in directives? (KIT:CL-SM)
3. Are members open to shape, together with other members, the understandings rendered by the directives, in relation with other organizational tools, like plans or routines? (KIT:SM)

4. Are members, based on extant directives, recognizing order, patterning generalizations and committing to them in new situations related to the directives? (LoI:SM)
5. Are certain extant members invested with the authority and experience to serve as reference for the new member, in regards to issues of the directives? (IKPR:KR)
6. Are members enacting workable viable social understandings, with other members, in situations related to directives? (OKPR:KR)
7. Are members arguing, with other members, about the legitimacy of directives? (OKPR:KR)
8. Who are the recognized members that set the standard of how directives are enacted? (OKPR-IKPR: Interpretative system)
9. Are specialists prepared to show skillful executions in situations related to the directives? (AKR:OKPR)
10. Are members prepared to communicate effectively on the issues related to the directives? (AKR:OKPR)
11. Are members prepared to collaborate in situations related to the directives? (AKR:OKPR)
12. Are specialists prepared and invested with the authority to exercise power in the issues related to the directives? (AKR:OKPR)

This set of questions reflects the kind of knowledge management tools that could emerge from the proposed KIC model (Table 51). A similar format could be used for every organizational tool.

It should not go unnoticed how *common knowing* in organizations attends such diverse managerial issues, and how a plausible *knowing theory* helps to frame such variety of knowledge management of issues in an integrated way.

6.5 LIMITATIONS AND FUTURE RESEARCH

The proposed knowledge integration (KIC) model (Table 51) posits rich details about Grant´s (1996a; b) proposition related to the efficiency of the integration of knowledge [4A] into the productive practice (Figure 10).

However, it leaves as still pending the exploration of the propositions related to being able to encompass new knowledge [4Ca] and new patterns of existing knowledge [4Cb]. Grant narrates these two last propositions as also related to common knowledge (Figure 11).

Attending such research gap will open opportunities of discussing Grant´s KBV of the firm in terms of the combined exploitation-exploration approach, which is the view of an ambidextrous organization (Duncan, 1976; Tushman & O´Reilly, 1996), but departing from an holistic and framed knowledge view (Table 31 and 32) and a framed knowledge-based theory of the firm (Table 51 and Figure 11).

Within a more specific, but relevant issue, the idea of a recognized knower-based organizational interpretative system is an understanding that may fits into the Bou, Bonet and Sauquet´s (2004a; b) bundle of knowledge framework.

Bou et al. argue that organizational context plays as an active actor that shapes the composition of the bundle of knowledge, and the definition of the concept of expert (recognized knower in our terms); and described context with variables like structure, job characteristics, degree of labor intensity and customization, among others.

However, they also observed also instances of know-who that did fit into the knowledge taxonomy of the generative dance model (Cook &Brown, 1999), and

proposed to extend the framework with know-who type as tacit knowledge across the individual and collective dimensions, but without much discussing.

Bou´s et al. active role of organizational context and know-who knowledge type could be understood, together, within the idea of a recognized knower-based organizational interpretative system, and we may say that Bou´s contextual variables correspond to organizational tools, and that know-who corresponds to those acts through which knowers are recognized (for cases in which the interpretative system is shaped) and to those acts in which individual recognize knowers (for cases in which the interpretative system is used).

Such conjectures represent opportunities of future research that points to the integration of extant research works.

Finally, in this dissertation, as in any exploratory research work, its findings call for verification; and this is not an exception. The open invitation of following this line of research was clearly expressed by Grant (1996b):

> *While making some progress in integrating prior research on organizational learning and organizational resources and capabilities, much remains to be done at both the empirical and the theoretical level, especially in relation to understanding the organizational processes through which knowledge is integrated"* (p. 384).

This dissertation attended his call, and now, following his discourse, I posit a call for the verification of these framed theoretical and empirical findings.

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APPENDICES

APPENDIX 1: Program Knowledge Areas and Processes

Program Specific Knowledge Areas and Related Processes

Source: Adapted from The Standard for Program Management, 2nd. Edition & Project Management Body of Knowledge, 4th. Edition

Area	Related Processes
A. FINANCIAL MANAGAMENT	It includes all processes involved in identifying the program's financial sources and resources, integrating the budgets of the individual program components, developing the overall budget for the program, and controlling costs throughout the life cycle of both the component and program. 1. Establish program financial framework 2. Develop program financial plan 3. Estimate program costs 4. Budget program cost. 5. Monitor and control program financials
B. STAKEHOLDER MANAGEMENT	It identifies individuals and organizations whose interest may be affected by program outcomes, and how the program will affect them, and then develops a communication strategy to engage the affected stakeholders, manage their expectations and acceptance of the objectives of the program. 1. Plan program stakeholder management 2. identify program stakeholders 3. Engage program stakeholders 4. Manage program stakeholders expectations
C. GOVERNANCE	It ensures that decision-making and delivery management activities are focused on achieving program goals in a consistent manner, addressing appropriate risks, and fulfilling stakeholder requirements. 1. Plan and establish program governance structure 2. Plan for audits 3. Plan program quality 4. Approve component initiation 5. Provide governance oversight 6. Manage program benefits. 7. Monitor and control program changes 8. Approve component transition

APPENDIX 2: Program and Project Knowledge Knowledge Areas and Processes

Program and Project Knowledge Areas and Related Processes

Source: Adapted from The Standard for Program Management, 2nd. Edition & Project Management Body of Knowledge, 4th. Edition

Area	Related Processes
1. SCOPE MANAGEMENT	It includes the processes required to ensure that the project includes all the work required, and only the work required, to complete the project successfully. It is primarily concerned with defining and controlling what is and is not included in the project. 1. Collect requirements 2. Define scope 3. Create Work Breakdown Structure 4. Verify scope 5. Control scope
2. COST MANAGEMENT	It includes processes involved in estimating, budgeting, and controlling costs so that the project can be completed within the approved budget. 1. Estimate costs 2. Determinate budget 3. Control costs
3. TIME MANAGEMENT	It includes processes required to accomplish timely completion of the project. 1. Define activities 2. Sequence activities 3. Estimate activity resources 4. Estimate Activity Durations 5. Develop schedule 6. Control schedule

Program and Project Knowledge Areas and Related Processes

Source: Adapted from The Standard for Program Management, 2nd. Edition & Project Management Body of Knowledge, 4th. Edition

Area	Related Processes
4. RISK MANAGEMENT	It includes processes of conducting risk management planning, identification, analysis, response planning, and monitoring and control on a project. 1. Plan risk management 2. Identify risks 3. Perform qualitative risk analysis 4. Perform quantitative risk analysis 5. Plan risk responses 6. Monitor and control risks
5. QUALITY MANAGEMENT	It includes processes of conducting risk management planning, identification, analysis, response planning, and monitoring and control on a project. 1. Plan the quality 2. Perform quality assurance 3. Perform quality control
6. PROCUREMENT MANAGEMENT	Includes the processes necessary to purchase or acquire products, services, or results needed from outside the project team, and to administer any contract issued by an outside organization (the buyer) that is acquiring the project from the performing organization (the seller). 1. Plan procurements 2. Conduct procurements 3. Administer procurements 4. Close procurements

Program and Project Knowledge Areas and Related Processes

Source: Adapted from The Standard for Program Management, 2nd. Edition & Project Management Body of Knowledge, 4th. Edition

Area	Related Processes
7. HR MANGEMENT	It includes the processes that organize, manage, and lead the project team. 1. Develop human resource plan 2. Acquire project team 3. Develop project team 4. Manage project team
8. COMMUNICATIONS MANGEMENT	It includes processes required to ensure timely and appropriate generation, collection, distribution, storage, retrieval, and ultimate disposition of project information. 1. Identify stakeholders 2. Plan communications 3. Distribute information 4. Manage stakeholder expectation 5. Report performance
9. INTEGRATION MANGEMENT	It includes the processes and activities needed to identify, define, combine, unify, and coordinate the various processes and program management activities within the PM Processes Groups. 1. Develop project charter 2. Develop project management plan 3. Direct and manage project execution 4. Monitor and control project work 5. Perform integrated change control 6. Close project or phase

APPENDIX 3: Introductory Message for the Surveys

September 2008

Dear Colleague:

As you surely know, the Program IUC VLIR ESPOL will come to an end in March 2009, after 10 years of execution.

Given the importance and impact of this long lasting and wide spectrum program, ESPOL has initiated a methodological process to register the lessons learned during its management. This endeavor seeks to increase intangible assets for all stakeholders, in consistency with the Knowledge Society´s principles that our institutions promote.

Lessons learned constitute an important element of the knowledge management efforts of this program and intents to be useful for the impact analysis of the delineated Belgian and Ecuadorian program policies as well as point of reference for the continuous development of the scientific and academic capacity of ESPOL.

This project collects stories from people that were involved in one or another way in the Program. We ask for your collaboration to identify those relevant stories from which lessons could be drawn.

The asked collaboration, for this first stage, is to answer the attached questionnaire from the role you had with the Program; this information will help to build a faithful evidence of the Program's successes and shortcomings.

Thanks in advance for your time and valuable collaboration on this project.

Kindly regards,

Magda Vincx, Sergio Flores and William V. Loyola

APPENDIX 4: Scholarship Holder Survey

LESSONS LEARNED SURVEY - VLIR-ESPOL PROGRAM

Scholarship Holder Survey

Rev. 1.8, 25/7/2008

Project Name:	**Externalization of lessons learned during the Cooperation Program ESPOL-VLIR**
Date (DD/MM/YYYY):	25/07/2008

This survey will help to identify those relevant stories from which lessons could be drawn

- *This survey is part of the intangible assets formalization exercise so that they (the intangible assets) could be considered in future programs or projects of cooperation*
- *Here, those who have participated in the Program or in any of its projects, or those who have been users of the services / products (deliveries) of the program are invited to participate*
- *This specific version of the survey is oriented to the Scholarship Holders*

1. Lessons Learned Survey - VLIR-ESPOL Program: Scholarship Holder Group

1.1	Lessons Learned	Yes	No	N/A	Impact				
					Low				*High*
					1	2	3	4	5
*Mark with an **X** your answer in the appropriate cell:* ***Yes** = You agree with the statement (In this case you are ask to quantify its **impact** in relation with your project)* ***No** = You disagree with the statement* ***N/A** = The statement does not apply to the project where you participated* ***Impact** = The extent to which this statement has an impact in the project where you participated*									
Statements to quantify:									
1.	The original goals and commitments resulting from your scholarship where clearly established								
2.	Your studies support the objectives of the Project that sustained its scholarship								
3.	The scholarship selection process was opened and with well-known rules								
4.	Since you started to study, the length of time of your studies was clearly defined								
5.	The length of time projected for your studies was fulfilled								
6.	The relation with your Academic Advisor was fluid and relevant for the fulfillment of your studies								
7.	Periodic reports related to your studies were deliver to the Project that sustained your scholarship								
8.	Project administrators related to your scholarship pay suitable attention and time to the subjects derived from your studies								
9.	Other functional and departmental areas of the ESPOL had a collaborative attitude of with the fulfillment of your studies								

1. Lessons Learned Survey - VLIR-ESPOL Program: Scholarship Holder Group										
1.1	Lessons Learned	Yes	No	N/A	Impact					
					Low				High	
					1	2	3	4	5	
*Mark with an **X** your answer in the appropriate cell:* ***Yes** = You agree with the statement (In this case you are ask to quantify its **impact** in relation with your project)* ***No** = You disagree with the statement* ***N/A** = The statement does not apply to the project where you participated* ***Impact** = The extent to which this statement has an impact in the project where you participated*										
10.	Belgian institutions had collaboration attitude with the fulfillment of your studies									
11.	The mission of the Program "Improve ESPOL academic excellence by developing a sustainable research" was accomplished									

1. Lessons Learned Survey - VLIR-ESPOL Program: Scholarship Holder Group	
1.2 Questions to comment	
1. Which was a key element (weakness or threat) that put in danger the success of your studies?	
2. What did work well - and what did not - for the fulfillment of your studies?	
3. What circumstances that were not anticipated affected the accomplishment of your studies?	
4. Do you consider that the modality of your studies - programming of places and durations - was appropriate? If your answer is negative, how would you improve it?	
5. Do the committed economic resources for your studies were available so that they did not affect the fulfillment of your objectives? If the answer is negative, please comment the reasons for the delays	
6. ¿Was the dedication to the Project a full-time assignment during your studies? If the answer is negative, please comment	
7. Can you mention some element of the international surroundings - as languages, laws, schedules, etc. - that has affected positively or negatively the success of your studies?	
8. Can you mention some cultural difference - as ethics, customs, vital spaces, etc. - that have affected positively or negatively your studies?	

1. Lessons Learned Survey - VLIR-ESPOL Program: Scholarship Holder Group	
1.2 Questions to comment	
9. When assessing your studies, do you justify the personal and institutional invested efforts?	
1.3 Personal stories related to the Program or Project:	
If you have an experience or a story to share related to management of this program or project in which you participated and you think it is useful to comment it and to try to rescue learning from it, please write down a phrase with the central idea of your experience or story	

2. Personal data:		
Name	**Project**	**e-mail**

APPENDIX 5: Project Survey

LESSONS LEARNED SURVEY - VLIR-ESPOL PROGRAM

Project Survey

Rev. 1.8, 25/7/2008

Project Name:	**Externalization of lessons learned during the Cooperation Program ESPOL-VLIR**
Date (DD/MM/AAAA):	25/07/2008

This survey will help to identify those relevant stories from which lessons could be drawn

- *This survey is part of the intangible assets formalization exercise so that they (the intangible assets) could be considered in future programs or projects of cooperation*
- *Here, those who have participated in the Program or in any of its projects, or those who have been users of the services / products (deliveries) of the program are invited to participate*
- *This specific version of the survey is oriented to Project Members*

1. Personal data:						
Name	**Project**	**e-mail**				
Mark the context of your answers with and (X): ***Section 2 statements are related to the specific project or activity where you have an active participation***		**Project**		**or**	**Activity**	

2. Lessons Learned Survey - VLIR-ESPOL Program: Project Members										
2.1	**Lessons learned by knowledge area (PMI®)**	**Yes**	**No**	**N/A**	**Impact**					
					Low				***High***	
					1	**2**	**3**	**4**	**5**	
*Mark with an **X** your answer in the appropriate cell:* ***Yes** = You agree with the statement (In this case you are ask to quantify its **impact** in relation with your project)* ***No** = You disagree with the statement* ***N/A** = The statement does not apply to the project where you participated* ***Impact** = The extent to which this statement has an impact in the project where you participated*										
Statements to quantify - Knowledge Area: Integration										
12.	Since the beginning, the objectives of the Project or activity in which you participated were specific, measurable, agreed, realistic and time-bound (SMART characteristics)									
13.	Now at the end of the Project or activity in which you participated, you consider that the initially assigned metrics to measure objectives accomplishment were appropriate									
14.	The program counted with relevant, established and known policies to manage the Project or activity where you participated									

2. Lessons Learned Survey - VLIR-ESPOL Program: Project Members										
2.1	**Lessons learned by knowledge area (PMI®)**	**Yes**	**No**	**N/A**	**Impact**					
					Low				***High***	
					1	**2**	**3**	**4**	**5**	
*Mark with an **X** your answer in the appropriate cell:* ***Yes** = You agree with the statement (In this case you are ask to quantify its **impact** in relation with your project)* ***No** = You disagree with the statement* ***N/A** = The statement does not apply to the project where you participated* ***Impact** = The extent to which this statement has an impact in the project where you participated*										
15.	The Project or activity in which you participated counted with appropriate documented and structured plans and chronograms									
16.	Policies changes related to the Project or activity in which you participated were of manageable frequency and magnitude									
17.	Scope, time, cost and quality baselines were handled appropriately and they were changed only through a formal approval process									
18.	The Project or activity coordinator had an effective relation with the administration of the Program									
19.	The Project or activity members worked effectively with organizations that are external to the Program									
20.	Program administration appropriately responded to changes of Project or activity resource requirements									
21.	La misión del Programa de "*mejorar la excelencia académica de la ESPOL mediante el desarrollo de una investigación sustentable*" fue cumplida									
Statements to quantify - Knowledge Area: Scope, Cost, Time and Quality										
22.	The Project or activity initial costs and duration were appropriate, according to a later evaluation									
23.	The Project or activity objectives were reached									
24.	The project or activity success requirements were appropriately participated									
25.	Specifications of the project or activity deliveries were appropriately participated to you									
26.	The Project or activity accomplished the original established objectives									
27.	The user of the Project or activity delivery were satisfied with the outcome									
28.	The Project or activity chronogram included all the activities El cronograma del Proyecto o actividad en que usted participó incluyó todas las tareas									
29.	The tasks of the Project or activity were properly defined									

2. Lessons Learned Survey - VLIR-ESPOL Program: Project Members										
2.1	**Lessons learned by knowledge area (PMI®)**	**Yes**	**No**	**N/A**	**Impact**					
					Low				***High***	
					1	**2**	**3**	**4**	**5**	
*Mark with an **X** your answer in the appropriate cell:* ***Yes** = You agree with the statement (In this case you are ask to quantify its **impact** in relation with your project)* ***No** = You disagree with the statement* ***N/A** = The statement does not apply to the project where you participated* ***Impact** = The extent to which this statement has an impact in the project where you participated*										
30.	The outcomes were obtained within the programmed term									
31.	The outcomes were obtained within the programmed budget									
32.	The Project or activity counted with appropriate quality control									
Statements to quantify - Knowledge Areas: Risks, Communications, Human Talent and Acquisitions										
33.	The initial assumptions of the Project or activity were fulfilled									
34.	If an external factor jeopardize the accomplishment of the Project or activity goals, this factor could been foreseen in advance									
35.	The Project or activity delivered periodic and reliable progress information compared to a baseline									
36.	All stakeholders of the project or activity were satisfied with the information that they received									
37.	Program administrators pay suitable attention and time to the subjects derived from the Project or activity									
38.	Other functional and departmental areas of your institution had a collaborative attitude									
39.	Policies of other areas or programs of your institution were not in conflict with this Program									
40.	Acquisitions (proposal requests, contracts with suppliers) were well managed (SOUTH PROJECTS)									
41.	Suppliers delivered products or services of appropriate quality, on time and within the agreed budget (SOUTH PROJECTS)									
42.	Human resources were not overloaded with responsibilities and activities									
43.	Responsibilities were clearly defined and diffused									
44.	Project or activity members were appropriately organized and guided									
45.	The competence and experience of the members of the Project or activity were the suitable ones									
46.	Project or activity members worked effectively toward the goals									

2. Lessons Learned Survey - VLIR-ESPOL Program: Project Members										
2.1	**Lessons learned by knowledge area (PMI®)**	**Yes**	**No**	**N/A**	**Impact**					
					Low				***High***	
					1	**2**	**3**	**4**	**5**	
*Mark with an **X** your answer in the appropriate cell:* ***Yes** = You agree with the statement (In this case you are ask to quantify its **impact** in relation with your project)* ***No** = You disagree with the statement* ***N/A** = The statement does not apply to the project where you participated* ***Impact** = The extent to which this statement has an impact in the project where you participated*										
47.	Good communication existed among the members of the Project or activity									

2. Lessons Learned Survey - VLIR-ESPOL Program: Project Members	
2.2 Questions to comment:	
10. Which was a key element (strength or opportunity) that allows the success of your Project or activity?	
11. Which was a key element (weakness or threat) that put in danger the success of your Project or activity?	
12. What did work well - and what did not – during this Project or activity?	
13. What circumstances that were not anticipated affected the execution of the Project or activity?	
14. Were the objectives of the Project or activity achieved? If the answer is negative, what changes are needed to do well in other Projects in the future?	
15. Could you mention any additional achievement, product of the Project or activity that was not among the original objectives?	
16. Can you mention some additional result that could have been obtained from the Project or activity, with little or no additional effort, although it was not among its original objectives?	
17. Can you mention some element of the international surroundings - as they can be it languages, laws, schedules, etc. - that has affected positively or negatively the Project or activity?	

2. Lessons Learned Survey - VLIR-ESPOL Program: Project Members	
2.2 Questions to comment:	
18. Can mention some cultural difference - as they can be it ethical, customs, vital spaces, etc. between people of different countries that have affected positive or negatively the Project or activity?	
2.3 Personal stories related to the Program or Project:	
If you have an experience or a story to share related to the management of this program or project in which you participated and you think it is useful to comment it and to try to rescue learning from it, please write down a phrase with the central idea of your experience or story	

APPENDIX 6: Program Survey

LESSONS LEARNED SURVEY - VLIR-ESPOL PROGRAM

Program Survey

Rev. 1.8, 25/7/2008

Project Name:	**Externalization of lessons learned during the Cooperation Program ESPOL-VLIR**
Date (DD/MM/AAAA):	25/07/2008

This survey will help to identify those relevant stories from which lessons could be drawn

- *This survey is part of the intangible assets formalization exercise so that they (the intangible assets) could be considered in future programs or projects of cooperation*
- *Here, those who have participated in the Program or in any of its projects, or those who have been users of the services / products (deliveries) of the program are invited to participate*
- *This specific version of the survey is oriented to the Program Administrators*

1. Lessons Learned Survey - VLIR-ESPOL Program: Program Administrators									
1.1	**Lessons learned**	**Yes**	**No**	**N/A**	**Impact**				
					Low				***High***
					1	**2**	**3**	**4**	**5**
*Mark with an **X** your answer in the appropriate cell:* ***Yes** = You agree with the statement (In this case you are ask to quantify its impact **on** the Program in general)* ***No** = You disagree with the statement* ***N/A** = The statement does not apply to the project where you participated* ***Impact** = The extent to which of what is stated has an impact to the Program in general*									
Declarations to quantify									
48.	The mission of the Program "Improve ESPOL academic excellence by developing a sustainable research" was accomplished								
49.	The mission of this program was aligned with ESPOL's strategic direction								
50.	Since the beginning, the objectives of the Projects of the Program were specific, measurable, agreed, realistic and time-bound (SMART characteristics)								
51.	Now at the end of the Projects of the Program, you believe that the initially assigned metrics to measure objectives accomplishment were appropriate								
52.	Throughout your participation, the Program counted with relevant, established and known policies to manage the Projects								
53.	The set of selected Projects was the appropriate to accomplish the mission of the Program								
54.	The Projects of the Program counted with appropriate documented and structured plans and chronograms								

1. Lessons Learned Survey - VLIR-ESPOL Program: Program Administrators										
1.1	Lessons learned	Yes	No	N/A	Impact					
					Low				*High*	
					1	2	3	4	5	
*Mark with an **X** your answer in the appropriate cell:* ***Yes** = You agree with the statement (In this case you are ask to quantify its impact **on** the Program in general)* ***No** = You disagree with the statement* ***N/A** = The statement does not apply to the project where you participated* ***Impact** = The extent to which of what is stated has an impact to the Program in general*										
55.	Program policies changes were of manageable frequency and magnitude									
56.	The resources committed to the Projects were opportunely delivered									
57.	Program changes were effectively managed									
58.	Changes and adjustments to the Projects were decided with the approval of the Program administrator									
59.	The Program success requirements were clearly documented									
60.	The Projects delivered periodic and reliable progress information compared to a baseline									
61.	All stakeholders of the Program were satisfied with the information that they received									
62.	Policies of other areas or programs of your institution were not in conflict with this Program									
63.	Acquisitions (proposal requests, contracts with suppliers) were well managed (SOUTH PROGRAM)									
64.	Suppliers delivered products or services of appropriate quality, on time and within the agreed budget (SOUTH PROGRAM)									
65.	Human resources were not overloaded with responsibilities and activities (SOUTH PROGRAM)									
66.	Responsibilities were clearly defined and diffused									
67.	The competence and experience of the work group (steering committee) were the suitable ones									
68.	Members of the Program (steering committee) worked effectively toward the goals									
69.	Good communication within the work group existed (steering committee)									

1. Lessons Learned Survey - VLIR-ESPOL Program: Program Administrators	
1.2 Open questions:	
19. Which was a key element (strength or opportunity) that allows ESPOL to attain this Agreement of Cooperation?	

1. Lessons Learned Survey - VLIR-ESPOL Program: Program Administrators	
1.2 Open questions:	
20. Which was a key element (weakness or threat) that jeopardized the attainment of the Agreement of Cooperation?	
21. Which was a key element (weakness or threat) that jeopardized the attainment of the Program goals?	
22. Which achievements do you consider are the most significant of the program? And what factors can be linked to them?	
23. Which are the most significant shortcomings of this program? And how could they be resolved in the future?	
24. Do you think that there was something that is was not done during the program; however, it should have been done?	
25. What circumstances that were not anticipated affected the execution of the Program?	
26. Were the objectives of the Program achieved? If the answer is negative, what changes are needed to do well in other Programs in the future?	
27. Do you think that the overall outcome of the program is greater than the sum of the results of the projects? If so, please comment	
28. Could you mention any additional achievement, product of the Program and that was not among the original goals?	
29. Can you mention some additional result that could have been obtained from the Program, with little or no additional effort, although it was not among its original goals?	
30. Can you mention some element of the international surroundings - as they can be it languages, laws, schedules, etc. - that has affected positively or negatively the Program?	
31. Can mention some cultural difference - as they can be it ethical, customs, vital spaces, etc. between people of different countries that have affected positive or negatively the Program?	

1. Lessons Learned Survey - VLIR-ESPOL Program: Program Administrators	
1.2 Open questions:	
32. Do you consider that the study modality of the scholarship holder - programming of places and durations - was appropriate? If your answer is negative, how would you improve it?	
33. Can you mention situations related to the administration of scholarships that merit considerations in future decisions?	
34. When finalizing the Program, how do you evaluate the capacity of ESPOL to manage sustainable research?	
1.3 Historias personales acerca del Programa o Proyecto:	
If you have an experience or a story to share related to the management of this program and you think it is useful to comment it and to try to rescue learning from it, please write down a phrase with the central idea of your experience or story	

2. Personal data:		
Name	**Institution**	**e-mail**

APPENDIX 7: Interview Protocols

VLIR – ESPOL COOPERATION PROGRAM
Lessons learned case

Interview Protocol

MAGDA VINCX
Flemish Coordinator
Interviewed: Sep-30-2008 and Jan-14-2009

1. Was the mission of this program aligned with your Institution strategic direction?
2. You said that at the beginning you found a group of about 5 very ambitious and very driven scientists who really were looking for international collaboration in their own field of research. How do you see the ESPOL now ?
3. ¿Would you comment about the sustainability of a research culture at ESPOL?
4. In terms of research sustainability, what do you think about the teacher´s and the researcher´s carrier path?
5. Would you say anything about the scholarship selection process?
6. Is the English language a relevant issue?
7. Would you comment about the planning and organization of the Program ?
8. From the perspective of lessons learned, what would be your advise to a new Program Director?

VLIR – ESPOL COOPERATION PROGRAM
Lessons learned case

Interview Protocol

GAUDENCIO ZURITA
Non-participant Colleague
ESPOL Statistics Research Center Director
Interviewed: Dec-4-2008

1. Could you tell us a story that demonstrates that at the end of the Programme ESPOL had improved its ability to manage sustainable research (the mission of the program)?
2. Do you remember cases that reveal significant deficiencies in the management of this program? How should they have been resolved?
3. Do you remember having talked about any competence that ESPOL should develop through this program, which was, however, not included?
4. Could you mention a situation that put you in touch with a significant achievement of this program? What can you attribute this achievement to?
5. Could you mention any situation related to the scholarship management that deserves considerations in future decisions?
6. Would you like to make a final comment?

VLIR – ESPOL COOPERATION PROGRAM
Lessons learned case

Interview Protocol

ENRIQUE PELÁEZ
Local Promoter - Component 2: Education and Innovation
Interviewed: Dec-16-2008

1. Do you recall a story that expresses the impact that being able to rely on an adequate network of contacts had on the decision that defined ESPOL as a partner in the Cooperation Agreement with the VLIR?
2. Do you directly know of any story that demonstrates that ESPOL, through this program, has begun to develop a research culture?
3. Can you tell us how the management meetings, normally bitter and unsociable in our culture, were carried out in a collaborative, friendly and respectful way in this program? What do you think was the key element in the creation of an environment with these characteristics?
4. What do you consider to be the most significant deficiencies of this program, and how could they have been overcome?
5. The lack of engagement with the society was a clear objection of the Belgian counterpart. Would you tell a story that reflects how, at the end of the cooperation program and without being an explicit objective of the same, the ESPOL is in a better position than 10 years ago, in regards to the link with the community?
6. Do you consider that the adoption of standards for project and program management could improve the results of future program? If so, how would those improvements reveal?

VLIR – ESPOL COOPERATION PROGRAM
Lessons learned case

Interview Protocol

VIRGINIA LASIO
Local Promoter - Component 7: Entrepreneurs
Interviewed: Dec-12-2008

1. Do you think that the adoption of management standards for programs and projects could improve the results of future programs? If that's the case, how do you think these improvements would become evident?
2. Do you recall a story relating to how the lack of commitment of a team member put the achievement of the Program goals or one of the components at risk?
3. Can you tell us about an experience relating to how the uncertainty over the Human Resource Policy in ESPOL was able to affect the administration of scholarships and/or the selection of PhD students?
4. Do you directly know of any story that demonstrates that ESPOL, through this program, has begun to develop a research culture?
5. What is your opinion about the quality of the doctoral studies?

VLIR – ESPOL COOPERATION PROGRAM
Lessons learned case

Interview Protocol

PAÚL HERRERA
PhD Scholarship Holder - Component 4: Environment
Interviewed: Dec-4-2008

1. Can you remember during the selection process of scholarship holders a story about nonconformity in it?
2. Could you tell us how the failure to meet the study deadlines affected your personal life? What caused the extension of the duration of your studies?
3. Can you mention any relevant achievement, product of the project or activity, which was not among the original goals?

VLIR – ESPOL COOPERATION PROGRAM
Lessons learned case

Interview Protocol

VERÓNICA MACÍAS
Local Researcher - Component 8, Subcomponent: Software Engineering

1. You mention that the initial cost estimates for this project were inappropriate. Do you remember the way in which these sub-estimations began to show and how it affected your work? Do you remember having discussed with someone about it?
2. You've expressed that in your project the responsibilities were not very well defined from the outset.
3. Can you tell a story that reflects the way in which the inadequate profile of abilities and experience of the staff in the project affected the results of the project?
4. Do you recall any experience related to the support, or lack of it, for your project given by the industries that could have benefited from the results?
5. How do you think that it could have been improved the results of your project in this program?

VLIR – ESPOL COOPERATION PROGRAM
Lessons learned case

Interview Protocol

BONNY BAYOT
Local Promoter
Component 5: Aquaculture
Interviewed: Dec-10-2008

1. You've expressed that in your project the responsibilities were not very well defined from the outset.
2. Tell us about how the White Spot epidemic affected the shrimp industry and the reactions of your project staff in the face of the magnitude of the problem.
3. Could you tell any story that frame the difficulties encountered to select suitable PhD candidates?
4. Do you think that cooperation program was disclosed properly?

VLIR – ESPOL COOPERATION PROGRAM
Lessons learned case

Interview Protocol

MARTIN VALCKE
PhD Promoter
Component 2: Education and Innovation
Interviewed: Oct-01-2008

1. Could you comment the case of your PhD student?
2. Would you comment about the planning and organization of the Project?

VLIR – ESPOL COOPERATION PROGRAM
Lessons learned case

Interview Protocol

CARLOS MONSALVE
Local Promoter
Component 8: Software, Robotics and Telecommunications
Interviewed: Dec-23-2008

1. Do you recall a story that reflects how some stakeholders were not satisfied with the information they received from the Program?
2. Could you tell us how the overburdening of the staff with responsibilities/activities affected the program or one of its Components?
3. You said in the survey that, within the polytechnic community, a greater effort could have been made to link the program with other actors. Could you tell us about an event where you recall how the polytechnic community distanced itself (from the project)? How could the two have been brought together?
4. The knowledge Park will integrate results from 6 of the 8 current components. This was not among the original objectives of the program. Do you remember the circumstances when this idea was born?
5. You suggest in the survey to: "... large multidisciplinary projects in which required activities of at least five of the components (of related areas) ..." could have improved even more upon the already notable achievements of the program. Would you extend it?
6. Which considerations should be taken into account in the future with regards to the contracting of scholarship holders? What's more, could you suggest an institutional response to ensure them appropriate and appealing conditions to be reintegrated academically (into ESPOL) on completing the scholarship?

VLIR – ESPOL COOPERATION PROGRAM
Lessons learned case

Interview Protocol

SERGIO FLORES
Local Program Coordinator
Interviewed: Dec-22-2008 and Jan-14-2009

1. Do you know directly any story, which sets evidenced that the ESPOL, through this program, has begun to develop a research culture?
2. The follow-up of the activities and performance of the scholarship holders in Belgium was incomplete. Can you tell a story that reveals the effects this problem has on the program or its components? How this should be monitored in future programs?
3. Remember any case in which the goals were at risk because a quality baseline was not initially planned?
4. The lack of linkage with the community was a clear objection of the Belgian counterpart during the allocation of cooperation to the ESPOL. However, we have gathered stories that reflect the limited disposition of private-sector - especially Guayaquil - to cooperate in research initiatives. How could this collaboration be improved?
5. Do you remember stories that reflects how the lack of command of the English language of the scholarship holders became a more frequent problem than the initially expected?
6. What considerations should be taken in the future in relation to the scholarship holder contractual relationship?

VLIR – ESPOL COOPERATION PROGRAM
Lessons learned case

Interview Protocol

DANIEL OCHOA
PhD Scholarship Holder
Component 8, Subcomponent: Robotics and Vision
Interviewed: Dec-18-2008

1. As a scholarship holder, by the interdisciplinary nature of your research, you should interact with other groups. Do you have any story that expresses the level of collaboration found in those groups?
2. Can you tell a personal story about how excess activities and responsibilities in your Component affected the advancement of your doctoral studies?
3. In the subcomponent, can you recall any story that reflects the effect of having initially underestimated deadlines, activities, and quality? Do you remember how shocking was the overload for the human resources?
4. Please comment about the lack of human talent retention.

VLIR – ESPOL COOPERATION PROGRAM
Lessons learned case

Interview Protocol

DOMINIQUE VAN DER STRAETEN
PhD Promoter
COMPONENT 3: Biotecnología
Interviewed: Sep-30-2008

1. Would you tell a story related to administrative issues of the Program ?
2. Would you comment on your experiences with ESPOL and initiatives that can help on the sustainability of research at ESPOL?
3. Is the English language a relevant issue?

VLIR – ESPOL COOPERATION PROGRAM
Lessons learned case

Interview Protocol

FERNANDO MORANTE
Researcher - Component 6: Application of Non-metallic Materials
Interviewed: Dec-4-2008

1. Can you comment on the achievement of the objective of your component or project in a succinct way?
2. Can you mention something about the cost estimates and duration of this project?
3. Can you tell a story that reveals the efforts made by the project team to achieve the objectives despite the restrictions?
4. Do you recall a situation in which the inefficient handling of acquisitions has significantly affected the management of this project?
5. Please comment about the lack of human talent retention.

VLIR – ESPOL COOPERATION PROGRAM
Lessons learned case

Interview Protocol

ESTHER PERALTA
Local Promoter - Component 3: Biotechnology
Interviewed: Dec-18-2008

1. Do you directly know of any story that demonstrates that, through this program, a research culture has begun to be developed in ESPOL?
2. What considerations should be made in the future with respect to the contracts with the scholarship holders?

VLIR – ESPOL COOPERATION PROGRAM
Lessons learned case

Interview Protocol

SERGE HOSTE
Flemish Coordinator
Interviewed: Jan-14-2009

1. What key element (weakness or threat) put in risk the attainment of the Program goals?
2. What are the most significant achievements of this Program? and Which factors caused them?
3. Would you include an intellectual property management element in a new Program?
4. Is the English language a relevant issue?
5. Is there any other element that this Program should have considered?

VLIR – ESPOL COOPERATION PROGRAM
Lessons learned case

Interview Protocol

JORGE CALDERÓN
Former Local Coordinator and Local Promoter
Component 1: Strengthening of Research
Interviewed: Dec-3-2008 and Jan-12-2009

1. Considering personal contact as a key element for the attainment of the Cooperation Agreement, can you recall the background to that personal relationship and how that made the agreement viable?
2. What was the debate like to overcome the reservations of the Belgian counterpart during the discussions over the Agreement?
3. What particular situation do you recall that demonstrates a research culture in ESPOL as a result of this program?
4. Which are the reasons for the consistent Dean support this program?
5. Do you remember an event that confirms the marginal influence of this program to the undergraduate studies and the limited institutionalization of research at that level of studies?
6. Do you have any stories to tell about the consequences of an inappropriate selection process of the scholarship holders?
7. What do you think of the Sandwich Studies Modality?

APPENDIX 8: Interviews' transcript related to lessons learned

1. A Flemish historical and critical view of the programme

(…) in 1999 the Flemish universities (VLIR) had (already) taken the strategic decision to go for a collaboration with southern countries within the development of international programs (IUC), and Ecuador was one of the countries chosen, and, within Ecuador, ESPOL was decided as being the best partner for that period.

(…) it was not easy for us to find the right scientific topics in this kind of collaborative program, especially since IUC Programs (…) are (…) demand-driven.

That means that ESPOL has (…) well-defined strategic questions about scientific aspects and we were looking for the right Flemish partners. (…) in the search (…) we had to go and look for more individual research-orientated laboratories.

We did that; we succeeded in it, but it means that at a general institutional level on the Flemish side (…) the impact was rather low at the start of the program.

In the beginning, it was mainly individually-driven, although backed up with the strategic plan of ESPOL. In the first phase of the Programme (…) *I had witnessed six individual projects*.

We developed a certain scenario, a certain model of collaboration between the north and south, with the vision of the north. (…) The vision of the north has taken into account the models of activity in the northern universities.

When you come here, you work with other models of activities. You have other management boards, you have another university structure. And it's not straight forward to translate simply the one situation to the other. To be honest (…) the first two or three years there were a lot of things which stunned me, which I was not feeling comfortable with, which I had questions and doubts about (…)

(…) today, I realize that I understand much better why things had to change a bit during the running of the program. And, perhaps, we could have been a little bit more efficient, if we had known, if I had known (…) I knew it from the paper, I knew it from the management notes, but I didn't (…) feel how it really operates …

I think there were very, very few people within the ESPOL (…), that when we were talking about research (…), were aware of those items which are very necessary for a research culture. And, I think, this is the kind of attitude that we were trying to develop within the Programme …

Perhaps, an important story here, it is the story about biotechnology (…). From the beginning ESPOL was very ambitious about the new biotechnology program, which is now implemented through the CIBE center. But in the beginning, (…) research capacity to build upon, (…) was nothing. There were no trained people; there were no available logistics, no instruments. So, ESPOL thought: OK, we have the money, we will do the investment, we will create new labs, and then the culture is there.

Certainly for the sustainability of the program, a lot of effort should go also into the incentives (…) to be sure that all the people involved – project managers, researchers, teachers, whatever – should have the appropriate incentives

simply to maintain the same drive for the continuation of the spirit that has been grown, partly thanks to the VLIR program.

2. An outsider‘s reservations and expectations

More than stories, because I wasn’t a person that was very closely involved with the Programme (…) I have, rather, opinions about it.

Although it’s clear that the area where (…) I am and the area around me have not been greatly influenced by the program, I think that in general, ESPOL has received (…) an improvement on the academic side, especially in human resources and (…) that’s the legacy that this Programme has left behind for the years to come.

(..) I remember having talked about (…) and having expressed (…) my point of view with respect to it, because I had a few reservations, but I don’t at all remember a notable story in favor or against the Program.

In the first phase, the VLIR (VLIR – ESPOL) Programme was little-known and therefore democracy was not the most well known characteristic to take advantage of it. In the second phase, (…) it was more widely-known about and there were more expectations.

However, the VLIR (VLIR – ESPOL) Programme has always been seen, at least in the circles in which I move, as a slightly closed program, which not everyone has access to. I wouldn’t say that that was my perception, maybe because I’ve had the opportunity to talk to the leaders or those that were running the Programme and I understand that it’s not like that, but that’s the perception that I found.

I couldn’t point to, for example, any discrimination among the given rules (…) and the opportunity (for scholarships) was given to those who complied with those conditions, and they had them compete so that they could be chosen. In other words, in the classic polytechnic style which we use to make sure the best wins (…) that type of incentive.

The Programme didn’t cover what it should have covered in the basic sciences. Mathematics, physics and chemistry were not touched by this Programme (…) In general, we here in ESPOL – not because of the VLIR program, but because of what we’re like n ESPOL – always direct the best resources towards the engineering degrees, and we don’t empower the basic sciences, and in general I’ve made those observations.

It’s also possible that that’s not only the fault of those that ran the programs or those that set out the rules of the program, but that those that had access to part of (…) the basic sciences didn’t apply effectively at the very least to get priority on the program, but priorities, (…) quotas (…) or it could be premeditated discrimination, not in terms of doing damage, but that the priority is this.

ESPOL is applying for international accreditation in the United States (…) and over there are the VLIR scholarships that have been affected (…) by this Programme (…) and in general they have been my students, and I’ve noticed that it’s a valuable experience and an experience that has improved them very much. (…) It hasn’t met the doctoral expectation that I had, but, nonetheless, I do feel that this experience has greatly improved them.

I think that the PhD studies (…) has to be carried out completely by (…) an on-site, experienced researcher, not here and there.

(…) It could be that I have the United States culture. There, you have to stick to a dissertation during which what you are doing is very closely monitored.

It's possible that the Internet and the Web and all that have changed things. (…) Or maybe I'm prejudiced in my area – I'm a mathematician (…) - where you have to be extremely close to your director; it doesn't matter how brilliant he is.

It seems to me that when they share out responsibilities, with respect to the graduation of people, someone loses out and it appears to me that it's the education of the individual.

It's not necessary to associate a PhD student with a wise man, but think of him as a knowledge generator; and I don't see much influence from the Programme in this respect.

I'd like to feel the influence of 20, 30 PhDs (…) and I don't feel that. I can feel it in the teaching staff, (…) where the presence of a doctor should be felt (…) It's in the research and we still haven't managed to get completely off the ground.

3. The beginnings 1: Building trusty networks

There is a story that goes back to 1991 when this experience began (…) with the Belgians.

(…) CENAIM (The National Aquaculture and Marine Research Center) was having serious problems. It had a multimillion dollar infrastructure, donated by the Japanese Government, but we had neither the human resources nor the money to run it …

(…) We had to draw up some kind of strategy to (…) start to deliver the results of applied research. (…) One of the strategies was to explore the possibility of international collaboration.

(…) I met Patrick Sorgeloos (at that moment he was the Director of the Aquaculture Laboratory at the Ghent University and with him we began to carry out small projects …

Over the course of time, I continued to learn something …

(…) When it comes to international collaboration, there is no lack of human resources because experts or foreigners can always come and take part (…) and there is no shortage of financial resources (…) The important thing is the trust that (…) you can gain as a local counterpart …

(…) The big problem with international collaboration is that money is invested and it disappears or the results are not as expected. (…) If you can (…) deliver results and you take the work seriously. (…) More and more opportunities for projects arise …

(…) We learned that quickly in CENAIM.

(…) In 1993, the Belgian Development Minister came on a visit to Ecuador, and, through those contacts at the embassy as well as in the Belgian Universities, I managed to get him to put "a visit to CENAIM" in his diary, and he went to San Pedro de Manglaralto, and there (…) he commented that he had an idea to create a support program for Centers of Excellence around the world, and (…) he proposed that CENAIM could be one of those centers. (…)

So in the following years, I worked with the (Belgian) Development Minister to try to get this Programme off the ground, but (…) it's a political ministry (…) and the policy changed …

Finally, when the Programme was approved, it was only for universities and CENAIM had changed its status from that of a center of ESPOL to an independent nonprofit organization, so, CENAIM couldn't apply for those funds anymore …

(…) But I had already set up a network of contacts (…) in Belgium (…) and Patrick Sorgeloos and I decided that (…) if CENAIM couldn't benefit, ESPOL could …

(…) We had to get others involved, turn to people that I didn't know in Belgium, but based on friendships … ; I met Madga Vincx (Belgian Programme Coordinator) (…) and that's how it all got off the ground …

4. The beginnings 2: Identifying expectations of "the stakeholder"

The VLIR Programme (…) is an inter-university program, whose purpose is to help universities in developing countries. (…) The idea (…) is to help universities that are "in a bad way" (…) so that the qualitative leap forward (…)made as a result of the Programme is relevant to them …

(…) It was an open contest. VLIR or the Belgian Government selects a country and then the universities compete …

(…) Three universities entered this contest initially: The National Polytechnic, the University of Cuenca and us. The National Polytechnic was eliminated very quickly …

(…) Cuenca lobbied very aggressively in Belgium. (…) They were connected to Louvain University. (…) There was a lot of pressure …

(…)The pressure from Cuenca (University of Cuenca) was to have (…) two programs in one, (…) and VLIR argued (…) that Cuenca had much more extensive coverage in the fields of knowledge, (…) that we were basically an engineering school with little connection to social issues. They couldn't find any evidence of how ESPOL was directly connected to the community. (…) We had many connections with industry, to the productive sectors.

(…) According to those arguments, we ran the risk of being left out.

(…) Whilst visiting Belgium, on an exploratory visit (…), I talked to the Rector of ESPOL (Victor Bastidas). (…) He was clear: "We're going it alone!" (…) We took the risk of being left out. That's the position we maintained.

(…) Years later, I found myself in a meeting in Bangkok with the then director of VLIR. (…) At an informal lunch, He said to me, (…) "The *bet* we made to ESPOL was worth it."

(…) That's to say, it wasn't a black and white decision on paper. (…) I asked him why (*why a bet?)* ...

(…) The risk was to invest in a university where the benefits could not have been very clear, given that it already had doctors, (…) it already had infrastructure …

5. From exploiting to extending the trusty network

When the VLIR made the announcement, Madga (Vincx) and Patrick Sorgeloos (…) were designated and formed part of the team that came to ESPOL to investigate and put down certain things in black and white with respect to a possible proposal.

(…) I had already met Patrick in one or two meetings, but we weren't friends. I didn't know them. It was Jorge (Calderón) that they knew.

When I was called to the meeting, it was necessary to respond to concrete questions (…) Why did we think that ESPOL should be the winning institution (…) in this project? (…) One of the things we said was (…) the onsite technological capacity that ESPOL had at that moment and that it meant advantages from the point of view, not only of the institution, but also the region.

(…) The lists of researchers (…) the references (…) came to light (…) with the theme of education (…) with the backbone and (…) the libraries (…)

(…) ESPOL was asked why ESPOL was for the elite. They were engineering degrees, hard science programs, and they questioned the fact that we didn't have any community projects (…)

(…) But in reality (…) in the region and in the United States we could demonstrate the many things that we had achieved.

(…) Jorge Calderón, who was well-known for these connections with the European Community, was invaluable (…) for the credibility, for the fact that (with) him at the helm of CENAIM (National Center of Aquaculture and Marine Research) things had already been achieved along with Patrick; (…) and ESPOL had already worked with Magda. (…)

(…) It was important in the sense that they allowed us to put forward ideas (and) these reservations, which were direct and concrete, simplify the proposal (…) combine things that we were doing abroad (…) that could be linked to the goal of the VLIR.

(…) when we were going to defend the project proposal, (…) ESPOL had to go to Belgium (…) sell its ideas (…) and see which of the Belgian universities would buy (…); then these teachers, with whom we had had previous contact and (…) who knew ESPOL and (…) Jorge (…) viewed those informal conversations as not quite so stressful as they could have been had we been unknown to them (…)

(…) Once people had gotten to know us, these networks (…) were extended and have led to (…) the opening up of other opportunities and horizons in a spectacular way.

(…) We were seen as the people from the south (…) so that we should support them to develop something. Today, we're colleagues (…) we're equals; we participate together to form proposals, no longer within the VLIR, but within

the European Community. (…) The messages that (…) reach them from different sides are that they are good at what they do, do what they say they will, they are at the forefront in these things (…)

6. A look to the institutional culture

(…) the culture (…) that publishing is good, that publishing means a direct benefit to your pocket, that (…) means prestige; (…) it wasn't an everyday thing.

(…) the demand for publications, the demand for journals, and the demand for network access to databases (…) is concrete evidence that the research culture has another connotation (…)

(…) the demand for research assistants, the arguments to incorporate the category of researcher into the rankings of the institution didn't exist ten years ago either.

(…) Now (…) the graduates, the students know that if they go to a congress and present something, it brings prestige (…)

(…) If you look at how many journals (…) today publish papers from the VLIR students, (…) only with respect to Component 2 (Education and Innovation) (…) Two PhDs have published 9 articles in 9 different type A1 journals (…) A1 tells you the scientific rigor (…) You can't publish low quality content in the journals with referee.

(…) In probably all the academic departments, there are research groups. In the Electronics faculty, there is more than one. (…) In the Mechanics faculty (…) a Nanotechnology center (…) and in the institutes as well (…) these departments come looking for the incorporation of PhDs with a lot of enthusiasm. (…)

(…) Look at the hallways, people are talking about (…) projects (…) proposals and about (…) publications. Has this reached the classroom? I think so (…)

(…) If you look at the trend (…) in the number of publications (…), approved proposals, (…) of the economic resources generated by the projects, you get the idea that this culture is different. We can talk about an ESPOL before VLIR and an ESPOL after VLIR.

(…) The most important things, I think, are two things (…) that are being discussed today and are part of the institutional strategy. One is the "Parque del Conocimiento" (Knowledge Park), a cluster of research centers, (…) and the other is the institutional strategy to turn ESPOL into a research university. You can't talk about something like that if you don't have a base (…) to launch from (…)

7. "Sharing" an approach to governance and management

(…) The first Monday of every month (…) we talked basically about problems (…) continuously and with perseverance.

(…) we weren't used to being criticized or being told: "you won't achieve your objective successfully with what you're doing because (…) that's affecting us and it's affecting you (…) What we said that we were going to be able to do is not going to be possible, (…) look at where you are in the process and look at what you're missing."

(…) During the meetings, there was a lot of tension in terms of the criticism, but (…) the meetings ended and we continued with our everyday lives as friends …

(…) When (…) you travel and share (…) moments with your team, you develop (…) that level of trust that you don't normally develop just with meetings.

(…) and we noticed (…) each other's weaknesses; (…) we understood each person's Achilles heel and we knew where it was necessary to support him/her (…) and a lot of the time, we made advances.

(…) it's important to get to know yourself. (…) You have to know where (…) your weaknesses lie.

(…) you don't take anything for granted, but you understand where your colleagues are in the project and where they're heading, and thus what needs to be done to support them …

Why this about the weaknesses? (…) Why can we compensate (for weaknesses)?

Because decisions are taken (…) as a team. (…) That makes you take the attitude of first taking a look before not doing an activity, planning well (…) before proposing something to the group, because we knew that the funds would enter into the communal kitty and we all had the equal opportunity to propose activities if there was an activity that had not been carried out.

(…) There was another type of activity which was carried out and even so (…) there were weaknesses and it was then that as a team we began to reflect. (…) What is it that the team can do? I know! Let's talk to the promoter. I know! (…) I can lend you the money so you can carry it out (…) and next year in the project (…) you can pay it back. I know! (…) I can buy you this equipment because I'm not going to spend it this year …

(…) It was the VLIR project and the strength of the project was the strength of everyone …

(…) Incorporating new groups into this stream of activity (…) isn't so easy. (…) When the project was launched for the first four years (…) we knew the conditions for the second phase: (…) if we were successful, it was possible that this could be extended for another six years. (…) We achieved that!

(…) the most logical thing was to continue (…) but the group took the decision to reduce 50% of the funds, that's to say, do more things in six years, but with half of what you had in the first phase and give opportunity (…) to other groups. (…) All the departments, without exception, had an equal opportunity to participate. (…) They entered and formed part of the networks of contacts and …

8. Peer review - A way of living … the culture

(…) The ability to carry out research is part of the culture, and that reflects more (…) your level of access to technology (…) your level of knowledge …

(…) Many may refer to that (as research culture), but that generally isn't difficult to introduce into an institution like ours, which already has a certain historical legacy in academic excellence, in technical rigor …

(…) We have a natural ability to criticize. Everyone criticizes, but no one wants to be criticized, and the consensus in the academic centers is more or less: don't criticize me and I won't criticize you; you are the (…) owner of this

knowledge and the rest of us will listen without criticizing to avoid being criticized ourselves when the moment come.

(…) That's a serious problem when (…) you try to establish a scientific culture …

(…) Science is based precisely on having the knowledge that you are developing considered by your colleagues, who analyze it critically and comment on it publicly. That doesn't exist in Ecuador and it didn't (…) exist in ESPOL, …

(…) When we began our periodical meetings, one of the things that we were trying to do was to evaluate your work, among your peers, (…) you present there what you've done (…) and we constructively criticize (…) the scientific rigor (…) the methodologies (…) and even the administrative (activities).

9. Let's replicate management - Let's refine policies

When we presented the proposals to VLIR, they had an open proposal presentation format. Each person presented the project as best they knew how, and that was it.

When (…) they had already chosen the projects that they were going to fund, it turned out that VLIR decided to adopt the BID methodology to represent the projects, basically understood to be the Logical Framework Approach.

(…) The person who supervised the Junior Enterprise voluntarily, (…) Denise Rodriguez, was a VLIR project Masters scholarship holder. (…) Now she's doing her doctorate, but not within the project.

(…) I don't think we've managed to (…) consolidate it sufficiently either and in the faculty I don't know if they've seen the potential of it, as if we haven't managed to transmit that either. (…) When I write the last report, I'll have to put it down as (…) probably not very sustainable.

As the scholarships holders were selected, it isn't possible to offer them anything. If it is a teacher with appointment ("nombramiento"), of course, they maintain their appointment, they maintain their salary while carrying out their PhD studies. But if it is a contracted teacher, they can't teach while they are studying their doctorate. That's to say, they don't have any resources while they are studying.

(…) As a result of this (…) the same VLIR project, through its General Coordinator Madga Vincx, asked us that those scholarship holders that were teachers without appointment in ESPOL (…) be paid from project funds (…) a monthly sum (…) of 500 dollars as a help (…) for the eight months that the scholarship holder was in Ecuador, (…) so that they would have something with which to maintain themselves.

(…) The university (…) doesn't guarantee (job) reintegration, but demands that the scholarship holder be available on his/her return and that has created a certain uncertainty that could have affected the application of some people.

(…) The reintegration of the scholarship holders hasn't taken place automatically. It has been necessary for the promoters and teachers to lobby (…) until the best have ended up locating themselves in one of the faculties.

It's difficult for someone who hasn't any previous research experience to have assured success on a European doctorate program in general, not only in Belgium, and there maybe we made the mistake of being too optimistic

because they even mentioned that some candidates could need to do a so-called pre-doctoral program and some of the promoters considered it not to be necessary, that the person was going to perform satisfactorily, and that wasn't always the case.

The work is also completely independent. (…) The person starts by presenting his/her proposal. (…) They presume that you can prepare a research proposal. (…) The training is completely individual (…) and not all the candidates are prepared for that.

(…) In the case of Edgar (Izquierdo – VLIR Scholarship holder), his previous education had a big influence. (…) He had done a Masters in the United States and had acquired research skills.

(…) We are trying, now that the project is over, to see how to generate applications so that other people can participate with the agreements that exist between Belgium and Senacyt or between ESPOL and the Ghent University (…) There they ask that the initiatives be taken by people that haven't participated in these (VLIR) projects. The topics can be continued, but not by the same people. That is interesting.

There have been funds within the VLIR project – competitive funds and seed funds – so that undergraduate theses can be done. (…) Some students (…) have been seen to be motivated because they know that the tutor is in the VLIR Project or because they participate in a research center (…) like those from the robotics center. (…) They have competed for those funds and they have been put into contact with the research centers. So, (…) there has been a way to keep on forming this (research) culture. I think that in this sense there has been an impact.

10. Do you travel and eat well in the ESPOL-VLIR program?

(…) Whilst tendering for the second phase (of the ESPOL-VLIR Program), (…) one day I was in the rectorate and an ex-student of mine who works for ESPOL greeted me and said (…) "You're going to be part of the group that uses the money to travel and hold meetings where they eat a lot!"

(…) After that, one day, (…) being part of the VLIR project (…) a survey was organized to see what people in ESPOL thought of the project and they went to my faculty, (…) and there, in the bar, they were interviewing a colleague of mine, and (…) it was impossible not to hear his responses and he didn't express good opinions about the project.

(…) When the results of the survey were released (…), there was evidence that for **(..)** a large group of people in ESPOL, the VLIR project was something at least unknown (…) *They said that they didn't know about the VLIR project!* … anyway (…) some of the comments weren't very good and obviously, there were also groups, which didn't make up more than 20-30% of the people, that said that there had been positive results.

So having been inside (…) and also outside the project, I can see the two sides and I think that (…) the project has had very positive results for ESPOL and it's a shame that not everyone has been able to see it like that (…)

(…) In the second phase of the Project, I think, a greater effort was made than in the first, (…) they allowed new projects to enter the Programme and that was good.

After that, the concept of the Seed projects, contestable funds was launched, (…) and with that a large number of people came on board

(…) but despite this, I think that they could have done a bit more. (…) Maybe, organize a few open forums, visit the academic departments, make an effort to approach them and organize a kind of round table, (…) listen to them and say, "How do you think that, if you wanted to join the project, it would be easier for you? What do you think has prevented you from joining?"

That's to say, demonstrate a bit more openness. I'm not saying that there hasn't been any, (…) but for some it hasn't been like that.

11. Difficulties on sharing what you do not know or have

(…) two things that I think (…) were weak.

(…) We're not good at (…) doing publicity …

(…) You ask the students about things that are happening on the project and they don't know, unless they are involved in some way …

(…) I'm not just talking about ESPOL; I'm talking about at national level, at regional level. We ought to have better publicity options.

It's a project that ESPOL won for the whole of Ecuador because universities from all over competed. So, the country should know that.

And the other thing that I think I would do differently is the selection of the PhD scholarship holders …

I think that we showed weaknesses there. In fact, we have failures, we have students (…) that simply dropped out (…) and there are others that took a lot of time. (…) In fact, some still haven't finished after seven years.

I think that the selection process wasn't the most appropriate. We made an effort. We changed the method twice (…) I don't think we did that very well …

(…) It's true that the reintegration (into the ESPOL workforce) could be part (…) of the problem (…). The reintegration of the PhD students hasn't been very smooth …

12. Research scope: It's not always crystal clear, on occasion it has a White Spot

At the given moment (…) they said to me, this is the goal: *Make a warning system for shrimp diseases found on farms in Ecuador*.

They were the years of an epidemic, the biggest experienced by the shrimp farming systems in Ecuador, the White Spot Everyone was in a state of confusion. The industry went bankrupt. Many people lost their jobs as a consequence of the crisis …

(…) We have to make a warning system for epidemics, but we have been hit by an epidemic (…) a rather strange situation.

(…) It sounded complicated. I didn't have a clue how to do it. (…) I didn't have the knowledge at that moment …

I lived (…) not only, (…) the case of Warning System that was part Component 4, (...) I also witnessed (…) that (…) much of (…) the efforts of the Aquaculture Component, Component 5, were directed towards trying to dig into the problem a bit, to find techniques that could reduce the impact (of the White Spot) …

(…) We didn't know at which moments it was having more of an impact (…) We didn't know what point we were going to reach, we didn't know …

Sometime later ...

We were in CENAIM (The National Center of Aquaculture and Marine Research), with the then Director Dr. Calderón, (and) with Stanislaus Sonnenholzner, who is now the Scientific Coordinator of CENAIM, trying to see how we could overcome the problems …

First of all, we headed in the wrong direction. We tried to make a warning system based on periodical samples of the environmental conditions, (…) the state of health of the shrimp; but we didn't get anywhere because what we got was a snapshot, (and) the following day the situation could change.

The knowledge from other countries didn't help us because there wasn't anything similar, (…) (but we knew that) in every warning system, the key is the combination of conditions that raise the alarm.

So, I recall (…) one of Dr. Calderón's ideas … Why not the production data? (…) If production is going down, that indicates that something is wrong in biological terms. (…) After having that idea, the warning system (SAEMA www.saema.espol.edu.ec) took another turn …

Note: SAEMA is a Project of the Component 4 and Bonny Bayot was a researcher of this project at that time.

13. Research planning – Tension between norms and creativity

The planning and organization (…) was very well thought out in the beginning of the Programme (…) Everything was properly planned, put on paper, put in nice schemes and it was very easy to take a look back at those schemes year after year to see what the way forward was.

The management structure of the Programme is perfect. Doing research with this kind of structure is (…) difficult …

When planning research, you should have a scenario, but it should be adjustable at relevant times when you decide that the results were not as you thought they would have been. It should be possible to go, to take some sideways which are relevant.

For some activities I have seen here, the people simply listed at the end of the year: "achieved, achieved, achieved, accomplished". (…) But for research, this is not the way an audit needs to be going …

(…) You have a management plan (…) and you have a research plan. (…) the management plan can be less flexible than the research plan, (…) the research plan should be content–driven, not deliverable-driven.

It's a bit of *a different kind* of approach; and the second one is the most difficult one.

(…) They are two different things and some of the people here still have to learn that. (…)

You have to put some creative ideas; you have to put some effort in trying to divide from your original plan, not too much because you will have some results at the end, but it's not like an eventual list of activities.

Research is to be creative, to be original, to come up with new things, things that you did not know five years ago, but perhaps you do know nowadays.

That's a tricky thing. So management planning, strict formats – perfect. Research – it should be more flexible.

14. More and better

… (…) The CIBE (Center for Biotechnological Research in Ecuador) was established with the support of the VLIR and (…) from previous work; (…) and (…) as a university importance was given to research, …

(…) As a research center I think that (…) in ten years a larger number of PhDs or masters could have been set up; the depth and quality of postgraduate courses could have been improved on. (…) Specializations, such as plant pathology, weren`t sufficiently exploited. (…) It would have been good to train bacteriologists, virologists etc. who are also necessary for the banana (Ecuadorian plantations) …

(…) A lot of experience was gained by working as a team (…) The people are better prepared to do research, to tackle new projects, search for funding, (…); which can be seen with the projects that have been obtain over all these years.

(…) What`s worth looking at are the things that didn`t work out sufficiently well to be repeated, especially those that relate to the management of research.

And I would make one request, since the VLIR couldn`t finish with a doctorate program, that priority is given to that, at least in our specialization in biotechnology, together with agronomy. We`re in great need of that.

15. Variations and Differences: Weaknesses, therefore Threats

… (Threats?): the variation in the scientific level of the participants, and, perhaps, the differences in exposure to international criticism …

(…) The fact that some partners were chosen without perhaps checking that level was a potential weakness from the beginning.

Most of them adjusted; some of them grew faster; some of them adjusted only a little bit. Like always in selection, some of them afterwards might not have been selected, if we had known what would be the outcome. (…)

I came into the project only during the second phase. That should be clear. So, the first phase I never saw it. When I came here (at the beginning of the second phase), I was thinking about having a Research Council that somehow regulates research and allocation of funds. I was wrong.

(…) The Research Council was involved in the production of kinds of internal papers, that were not distributed internationally, which were not subjected to international criticism, which were not selected for their absolute qualities. But some of the papers, in this journal, could easily have stood the test of something like that, and so on. It (this case) exemplifies that the groups who were involved, and even the Research Council, were perhaps not so

aware of the possibilities of having their work controlled or evaluated by external forces. It doesn't cost anything. It is an automatic system which is world-wide and very well established.

(…) So, it shows that the experience of some groups was not that large that: they decided to go outside immediately? No, they went to this local paper.

(…) So the interaction with the outside world is perhaps something that was less strongly developed here in the beginning than it is now, (…) there were no internationally acceptable publications, or very few, perhaps in CENAIM a few, but most of the participating groups had none. And now they have one, two, three … Some have more than others.

16. We learned to do research … and also to manage – Part 1

Even (…) the assistants that were contracted for the research projects in the long term ended up getting involved in the administrative tasks because (…) unfortunately in this institution (…) if you're not pushing things along, things don't get done at the same rate as when someone stops pushing.

So, the assistant has to get involved in (getting to know) how the purchasing process works …

(…) There have been activities that, perhaps, in a project such as this not the whole team should get involved in (…)

(…) It has demanded that the people that are working in the Programme also develop certain kinds of administrative skills …

17. Snapshots of costs, RRHH, and stakeholders at sub-component level

About Costs:

The underestimation of the costs was evident practically from the first year. We needed (…) the Software Engineering Laboratory and (…) the costs that had been set (…) were much less than it actually cost us (…) Additionally, the calculation had been made to buy equipment for the laboratory, but not for the personnel …

(…) what we did was to unite our laboratory (…) with a multimedia laboratory that already existed (…) and over time we continued (…) acquiring more computers for this laboratory.

About Human Resources:

Initially, (…) we didn't have a manual that said: these are the responsibilities (…). It was like: OK, it's supposed that the co-promoter carries the administrative responsibility and the researcher does (…) research (…). But in reality, (…) the researcher (…) was involved with parts of the administration and the co-promoter was involved with parts of the research …

(…) As researcher, (..) it was also necessary to go and carry out the surveys … (…) If the planning had been done correctly, that would have been an assistant or student.

(…) I had really worked as a developer, never as a staff administrator. (…) We worked with students who were doing their thesis and then they moved away from the project and (…) that was a big problem to meet (…) the final objectives which were to make a larger Software Engineering research group.

About Stakeholders:

(…) We drew up a metric framework. We carried out an initial survey (…) to determine the state of the art (…) (and) we needed (…) a sample …

(…) The companies in general didn't want to support us. (…) We approached various companies in Guayaquil, but they said that they simply had no time for that. So we had to travel to Quito where (…) we realized that there were more openings (…). Finally, we had to direct ourselves towards Quito, where fourteen companies agreed to work …

(…) The companies in Guayaquil see ESPOL as a competitor because ESPOL has worked on (software) development projects with the government. When a state company (like ESPOL) offers its services to the government, there is no need to make a tender (compete). They (the companies) saw it as a disloyal competition between what ESPOL does and what they do. They were scared of revealing their information. They didn't see it as if we wanted to help.

18. We learned to do research … and also to manage – Part 2

(…) If we had problems, it was with the issue of imports (…) There is a kind of lack of coordination. (…) I brought some small pieces of equipment (…) (and) we found out one day that we had to pay 500 dollars in tax, five hundred dollars that wasn't in anyone's budget (…) because ESPOL supposedly doesn't have to pay taxes …

(…) In the end, there was a kind of dispute between the CTT (Center for the Transference of Technologies) and Supplies (…) one month went by. I had to talk to the Head of Customs, explain to him the situation. They reduced the taxes (…) I paid the taxes …

(…) That caused me a lot of problems (…) because my trip (…) was the last one, so I had to concentrate on preparing everything (…) and I spent that month going to the Customs District, talking to the Officer (…) to try and prevent them from charging us all those taxes. I ended up learning how customs works, but that wasn't really what I was interested in learning and something I had to invest a lot of time in.

We were a subcomponent that had several very ambitious goals: to create a center.

(…) for a great part of the first few years, it was necessary to invest in building the infrastructure of the center, and during that period everyone had to collaborate, …

(…) We ourselves made a telephone exchange with software. Then, it took time to investigate, test, our laboratory networks with the aim of not having any problems, for example, with viruses. I even had to supervise the air conditioning, the cracks in the walls (…) a series of things so that finally when they hand over the facilities to us we can say, this is OK …

(…) On the other hand, we also had the challenge that what we were doing was quite new; it's not something they teach to undergraduates. (…) So, we had to promote it. (…) We took part in fairs (…) to generate interest amongst

the students so that they would take the courses that we were promoting, (…) but it's not that simple. We had to take the equipment, do live demonstrations so that the people could actually see what it was about; (…) give interviews …

(…) In the case of my particular research, they were periods in which you really couldn't do anything of significance because usually people who do research need to spend several days thinking. (…) It's a bit problematic when those types of situations occurred because (…) the train of thought got cut short. (…) I don't know the cognitive process of others; in my case, (…) it ´s to keep developing an idea, it's to continue constructing it, finish the experiment. It's not something that you feel one day and you get a revelation and the idea appears.

19. A very sad procurement story

First time, when I went to CIBE (Ecuadorian Biotechnology Research Center), I found that the library was, to my understanding, virtually empty. There were just very few books and I found that this was quite striking because I really believe that in the training of young scientists, it's extremely important that they have access to a good library, a rich library, with a lot of books, with a lot of journals, and especially, of course, when good science is to be done, then they need recent journals. (…)

In order to help, I contacted the American Society of Plant Biologists. I wrote a very nice long letter to them asking them whether they could make a gift to ESPOL. I explained to them that I had been teaching at ESPOL. I explained to them that I had seen a good potential of young students that could grow into good scientists in the future. I explained to them the whole situation of the CIBE and the collaboration that we have between Ghent University and ESPOL. And I got a very positive reply from them. As a matter of fact, they offered a whole set of free books, which were not only basic biology books, but also agriculturally-related. And they also offered free subscriptions for their major journals – Plant Cell and Plant Physiology (…)

Now, unfortunately, something went wrong because the package was actually arriving in Guayaquil, but, somehow, at customs, they were asking, I suppose, for quite some money, for the package to be actually delivered to ESPOL. And as far as I understood from Dr. Maribona at the time, this package never arrived and they actually even mentioned that they would destroy the whole package at customs! And I found this very, very sad (…)

The people from ASPB were warned. So, somehow, they got a message from the Ecuadorian customs that the package that they had been sending could not be delivered to the address because the fees were not paid.

So this is a very sad story, I think, because the students could really have benefited quite nicely from this. (…)

The administration has to be arranged in such a way that such things cannot happen, that there is an immediate follow-up for such problems, administrative problems.

20. We should have been more ambitious

(…) We have published in national and international magazines. (…) I'm finishing a book about zeolites (…) on the coast (of Ecuador). The research part has been completed …

(…) with what we've achieved, we've only reached the point of finishing another piece of research, of having knowledge (…) We should have taken a step further (…) The research shouldn't be limited to paper (…) There should be a product that comes out of it and that's something that, at least in our component, hasn't been achieved.

That's the part that we still owe (…)

(…) I think that with respect to the cost (estimates), it wasn't appropriate, but with respect to the time, I think that the time it has taken us to do the research is OK.

(…) Buying equipment is a pending issue. (…) The budget that we managed (…) didn't permit us to buy equipment (…) and with what we had (the equipment) it wasn't possible to carry it out (the research).

So, much of the analysis (…) had to be done abroad, that's to say, in Belgium, in some cases (…) in Spain.

It's true, we lacked funds. (…) We have had some problems; (…) we've given a lot of priority to administrative expenditure, more than to technical expenditure.

(…) We have talked about it. (…) It seems that the information didn't trigger the right people. (…)

Some matters (…) in fact, I argued over them with the Belgian promoter and he was aware of the things that were happening (…), but he didn't manage the financial side, but he did make some important suggestions, some were addressed, others not …

(…) Despite the fact that there have been some restrictions, (…) we've been able to handle the project in such a way as to achieve the objectives.

(…) We've put into practice internal projects in ESPOL and external projects. (…) (For example) I'm already finishing a project (…) financed by CONESUP (The National Higher Education Council – Ecuador) related to the topic of zeolites; (…) A large part of these resources served as a support for the component, …

(…) We've always tried to make a success of things (…) In the case of sample analysis, (…) we've sent several analyses to Argentina, others to Brazil. We've made contacts. (…) We've not been paralyzed by adverse conditions …

(…) The promoter of our component had to make contact with (…) customs or (…) Belgium so that the samples could get through. If a student or some of the members were traveling to Spain, for example, we sent them samples so that they could analyze them there or if someone traveled to Argentina or Brazil (…) That way we kept on resolving the problems …

(…) I think that it should have been planned (…) that getting items through customs was going to take some time. All that should have been taken into consideration.

I think that the Programme should have organized some training in the English language (…) and not only at component level, but the whole program. I think that was a serious, serious mistake (…)

There were some very good scholarship holders with (…) the profile of researchers and they were left out in some cases due to the question of the language.

I did my doctorate in Spain. The problem was when I went to Belgium. (…) Things didn't flow due to the language.

21. Do we need to keep the research assistants?

(…) Retaining (…) our assistants, (…) students that had already spent a couple of years with us, who hadn't just taken the processing courses, but already had some practical experience, but as in the majority of cases, it reaches the point where (…) they are about to graduate (…) (and) they look for a bigger income (and) they have their plans …

(…) With all the work that was done in the first few years (assembling) the infrastructure, (…) it was very complicated to put together an offer, (…) say we're offering you this (…) so that you continue to work with us.

(…) so we lost some good assistants who could have done a masters and continue to collaborate with us …

22. We Learned to do Research … and also to Manage – An Alternative

(…) The deadlines were always met. It was necessary to make a greater effort, but they were always met.

(…) In the case of the quality, (…) it was managed quite well in the sense that we could always hand over what had been promised. For example, our publications increased in quality. At the beginning, they were (diffused) in local events, and they ended up in "journals" …

(…) Other centers have already implemented ISO 9000. They have well-defined processes. (…) It's possible to think that we shouldn't yet be at that stage because (those) centers (…) have twice the time of existence than us.

But, I do think that somehow at the beginning, we should have tried to implement a simplified version (of ISO 9000); because after a while the organization becomes a bit chaotic and (…) everyone does a little bit of everything and time is wasted and human resources are wasted.

23. Frozen for the commitment: tension among scope, cost and time

(…) The idea that you're going to enter, (…) I call it "a freezer", (…) that you're going to commit yourself to doing research, (…) and part of that freezer is the financial side, which is a personal topic.

(…) Almost everyone that was involved as scholarship holder in this Programme came (…) working with a certain level of income. You present your proposal and from the outset you know that the proposal implies a significant reduction in your income and (…) you make an investment for the future (…) because what you receive is going to be a lot more.

(…) It's an institution that's placing a bet, that's putting you in a position of importance. It's investing a quantity of resources and you're not contributing anything at that moment, at least not at the beginning of the program.

(…) I knew that if I dedicated myself to this, I couldn't teach the same number of classes; I couldn't commit myself doing any consultancy work (…). For me, it was relatively simple because I was single so it didn't cause a big problem, but for other people in the group that were scholarship holders, it was a very tough decision.

(…) The Programme (…) at the beginning didn't make those things very clear. It didn't make it very clear, in the sense that (…) how much (…) the scholarship which we would receive at the start was going to be for (…), how

much we would receive once we were over there (abroad), if we were going to receive the two (financial allowances) at the same time. That part (…) wasn't clear at the start and it became clearer a bit more later on.

(…) but we are part (…) of that as well. So, we also also took the decision. I would say that it wasn't a major inconvenience.

(…) Basically, I took more time than I should have done. It was a four-year program (…). I finished in four years and ten months; it wasn't (…) such a big extension.

I put it down to the fact that during my stays in Ecuador, given it was a "sandwich" program, I couldn't put myself 100% into the freezer.

I had to do other things, things that ESPOL itself demanded of me, such as manage a project (…) and also in part the financial side which doesn't stop being important. I taught classes (…) to make ends meet (…).

Now putting things in perspective, I can say that all the things I did that would seem to be extra curricular (…) were in fact part of the Programme and they taught me lessons and abilities that would justify the extension.

(…) I remember (…) asking (…) if I could teach classes (…) (that) at the beginning, it was not taken into consideration (…). I think that to continue to be in contact with students is important in the training that we had as researchers (…). It was time-consuming (…) but it was part of the process.

24. More tension in the scholarship holder commitment

(…) When we interviewed them in the selection committee, we were upfront (…). We asked them: how much would you need to live and be a student for all these years? And they suggested a figure. We made the agreements with ESPOL based upon those figures.

From my personal experience as a scholarship holder for eight years abroad, these were luxury scholarships. I was a scholarship holder under far more restrictive economic conditions. During my period of study, it was clear: the student is a slave of his academic studies. He works just to pay the apartment, the telephone and to eat. But here in Belgium, they received large salaries (…) with the "sandwich" system they came and went from the country. When I left, I spent five years abroad without returning to Ecuador (…) because I couldn't afford the airfare.

So, (…) I think that some of them thought themselves important at some point and their demands increased, forgetting what had been decided at the interview, (…) with the abilities that they acquired and the opportunities that came up …

(…) Many of them extended their studies more than was necessary according to their plan. So, that, I can understand, brought them other types of inconvenience; (…) It was planned for them to take a maximum of four years. Many took more than six. So, outside this scheme, any financial plan collapses …

25. Sandwich studies: a "glocal" approach

(…) In Belgium, you open a freezer and take out the reactive material. Here you have to think about it four months beforehand, what you need the reactive material for and ask for it in advance. It's a different approach …

(…) So, sending a student out for four or five years to do a doctorate so that later he comes back and begins to complain that nothing works, that he can't do science because he's used to a different culture, *that's a mistake!*

(…) The sandwich system teaches them where ESPOL is at. They are in Ecuador and here things have to be thought of in advance if you want to make them work; because nothing is just round the corner. …

(…) It's more convenient if you see the two worlds.

(…) Do not come just used to the European system to complain about the local bureaucracy and inefficiency.

26. Sandwich Studies: A "Community of Practice" Approach

I think that such long, and to some extent disjointed, stays means: that you lose people, that there are people that don`t come back, or people who really don`t achieve their objectives, or people who, when they come back here, are not completely accustomed to the conditions we have . (…)

(…) How much would we have gained if Efrén and Oscar were in a "sandwich" type of doctoral program? A bit of time here, a bit of time there. Our youngest students, here, would have advanced more because what they were learning over there, they would bring over here. They would see our needs and also participate with us, even though they were no longer here; (…) They could go back again to work knowing what we needed and could look for and suggest ideas and send work methodologies because they know what was lacking here.

(…) There is a need for an entailment and that they somehow form part of our *community of work* …

27. Sandwich studies: a "flexible control" approach

The Sandwich scheme has two key parts:

(…) The area of research is related to what we are working on (…) here …

(…) And, secondly, there is quite a close relationship among the Belgian promoter, the thesis director and our promoters …

(…) Now, in certain areas, at a given moment, it could be that (…) the student is required to attend continually to carry out the experiments (…) So, it's necessary to be sufficiently flexible to (…) make it possible; that's to say, it's not a black and white question.

(…) we've had to do it a number of times and it's worked well (…) One (…) should seek the mechanisms not to say "everything is sandwich and there is nothing more that can be done".

28. Please send more PhD students, as long as …

Initially, when I was asked to play the role of a supervisor for a PhD, it wasn't clear to me what my responsibilities and roles were. So, the first year it was rather a loose collaboration with the PhD student Katherine Chiluiza, but once this was set out in a clear way by Enrique Peláez, then it really went smoothly and it was a very nice, close collaboration.

I have to say that this collaboration was really promoted by her very high level of English; so she could communicate and write in English at a very high level. She also had a very good Masters degree from the U.S., so we could jump, in fact, ride on the right wagon so the train got rolling.

(…) we had a very good close collaboration, even to the extent that after a trip for a holiday to Ecuador, I came home and I found this email with big questions and really a panic situation of Katherine … that again, in fact, I jumped on a plane the next day and went back to Ecuador for a three day stay in a hotel to run through all the problems – to solve them.

Also the relationship with the department went smoothly. She integrated very well in Flanders. And that's another issue – her willingness, in fact, to be on a team also at the international level. She wanted to learn; she wanted to be also in Flanders to get acquainted with the right skills: academic English, research skills and the literature.

So, I am very happy about it and I would say next time, immediately I would take a second PhD in the Program.

29. English proficiency optimizes not only lab interactions but also social life

(…) The step to go, leave your home, leave your family, your friends, is in any case not such an easy step. For many people, it's probably a very difficult step.

(…) When I was leaving the first time, I was in England for a while, right after I finished my first masters here in Belgium, and then I went to the United States for the first part of my PhD, and I must say that, of course, for myself, the experience was that in the beginning, you feel a little uneasy, but, of course, if you can communicate with people, you can easily make new friends. And that's a very important basis for feeling at home when you are abroad.

I believe that it's very important prior to leaving for another country where the main language is not Spanish, that students should really get the opportunity to get good training at home to improve their English proficiency; so that when they arrive they can immediately have very fluent communication with people in the new lab, and, of course, this optimizes not only their social life, but especially also the interactions in the lab where they are studying their PhD.

30. English Language -More planning is required

On the one hand, we've seen (…) the moment at which the scholarship holder has set out his ideas and the thesis director, realizing that his knowledge of the language isn't very good, hasn't felt like continuing with the topic, seeing the difficulties to come in the future, (…) basically, not to get into all the problems of trying to read a thesis or some articles that are very difficult to understand given the way the student expresses himself …

It has also happened to others, on the other hand, that despite this being an obstacle, (…) they have made a much greater effort than perhaps they should have. One of them (…) met every week with the (…) scholarship holder to see how she was getting on, but basically more (...) to try to correct her English. Obviously, you can do that once, twice, but you can't do it forever, because (…) the thesis director is a very busy person and feels that (…) he or she is a language checker …

So that constitutes a (…) problem that (…) has been serious in some cases …

I think that the issue of the scholarship holders must be more planned. (…) The institution (…) should say (…) next year we're going to send this number of scholars in these areas, (…) say, this scholar will go after a year, once he has improved his level of English …

(…) That doesn't usually happen. We worked in the opposite way. There are scholarships on the one hand … we looked for someone to participate …

31. The number one rate-defining factor

It's the number one issue, really. I'm sorry to say, it is the number one rate-defining step in doing anything. "Rate-defining" means it determines the speed at which things can happen.

(…) I have a student, who's from an Asian country, who is extremely poor in English and it has taken me and her many, many hours in trying to assess and to understand basic human interaction skills in different parts of the world, which I think would be exchangeable in a few minutes if you could speak at the normal rate. But if you have to explain terms like "methodology", or (…) "throughput", (…) or – simple things like that (…) you don't arrive at the stage where this is only a tool for doing scientific research and so it's a waste of time. I'm sorry, it's a waste. (…) In normal operations, it's so important that we should not have to worry about that.

(…) Mechanisms for selection? Certainly. Even, if it is necessary, a VLIR project like this could take care of improving the language of people. Why not? We've done that on other projects. We've organized English courses for people that went abroad (…) It's not as bad as it could be in Ecuador, I must say that, honestly. (…) But it's still something that you should not overlook. (…) It did not have a major impact because on average it was reasonable, but in some cases it can be absolutely devastating for a project, and it should not be like that. It's too expensive …

32. Get together and learn to discuss

I taught the courses of molecular plant physiology twice to the students at ESPOL, and it was a very nice experience, I must say. I believe that the students probably remember me as one of those professors that really likes to teach, five hours a day, if necessary, … Now, when I was there, I remember that I was suggesting two things.

Number one was to hold scientific discussions on a very regular basis – a weekly basis – where students and postdoctoral co-workers are presenting their work using small PowerPoint presentations, bringing the plates, if, for instance, they've been growing some plantlets, on tissue culture plates, bringing them along, showing them to their colleagues to discuss the results that they obtained.

I believe that it's very good and it's really part of their training to become good scientists because it's not only a matter of being able to design and perform the experiments, but also to convey the message, … to share the results with other people, with other scientists.

(…) and on top of that (…) I made the suggestion to run journal clubs also on a weekly basis.

Of course, in order to run journal clubs that are really significant and up-to-date, you also need access to the recent issues of journals, major journals in the research area. So, I suggested to them to appoint on a weekly basis, another

student to prepare the paper and to present the findings in that paper to their fellow students and to their fellow lab members.

(…) I believe that it's an enormous stimulus for students if they see what other people do: they read on a regular basis, they get ideas for their own research and also they learn to discuss about science with their fellow lab members; …

(It) is stimulatory because then they feel involved also in each other's work and they will start to discuss on a much more regular basis about what they are finding and how they could actually proceed in the future.

33. We need *x* PhDs, ¿do we send *x / (1 – f1 - f2 – f3)* scholarship holders to study?

(…) It's inevitable that, if the scholarship holder is good, opportunities will present themselves for him in another country and that it will cross his mind not to return. So, I think that the problem isn't so much about how to write the contract with relation to the scholarship holder's needs, I think that's very good, but what to do in the case that the scholarship holder says: "I'm not coming back."

(…) There were moments in the history of ESPOL where, to all intents and purposes, the scholarship holder said they would not return and nothing happened. Obviously, that sets a bad precedent because the next scholarship holder …

(…) I know of the experience of a sandwich scholarship holder (…). He had to come and go, nine months here and three months there. Suddenly, in his first month there in Belgium, he sends a letter saying that he's going to stay there for the long run, doing his doctorate. He was told "No", that he should return, but it wasn't possible. What happened was that they suspended his financial support (…)

The economic hardship that he feels is in the sense that he stopped receiving financial support, nothing more, but, maybe, he was able to cope with that.

Now, as far as I can see, they've gone back to the idea that if the scholarship holder doesn't return, he at least has to pay. So, I don't know if it's worth being a bit stricter there.

And definitely make it (…) much more attractive for the scholarship holder to return to ESPOL. I think that very important steps have been made. (…) The most likely thing is that laboratories can be found in certain areas where they can work. The conditions are improving, but on this issue there is more work to be done. (…)

(…) One day, I spoke to the Rector of the UTPL (Universidad Técnica Particular de Loja) about this. They are training, I think, almost two hundred people on doctorate programs abroad. So I said to him: why so many? (…). He (the rector) told me:

(…) "You can't avoid human nature. Of those two hundred, there is a high percentage that don't finish (f1 =0.33). There's another percentage that decide never to return (f2=0.13). There is another percentage that come back, but equally decide not to work with you anymore (f3=0.14). And despite doing as much as you can possibly do, you get the money back, but not the doctor and, at the end of the day, what you want is the doctor. You're not interested in

having more money, you've waste time. I submitted my percentages, based on experience, and say I need x number of doctors. Let's say, eighty. If I need eighty doctors, I can't send eighty, I have to send two hundred."

So, maybe in this area, ESPOL (with an enigmatic smile) also has to put forward those numbers and say, OK, I need two hundred doctors; let's send five hundred.

* Values assigned to f1, f2 and f3 are fictitious

34. Multidisciplinary projects to solve national problems

In the second phase of the VLIR Project, there were funds to compete for. Any individual in ESPOL could compete.

But, the majority of those projects, if not all, have been individual projects, of the Seed type, or support for theses that are seen to have a good level of research, and it's true that sometimes (…) there were projects that naturally related to more than one component.

Nevertheless, (…) I think it would have been a good idea (…) to put aside a certain amount of money for project proposals that necessarily combined more than three components. That's to say (…) a research project where the scientific contribution of different branches of knowledge is required, where (…) the problem that has to be solved demands (…) multiple disciplines.

So, I think that it would have been good because, as a result of that, an ESPOL research program could have been created that joins different centers and that (…) presents (...) a proposal to resolve a national problem, …

35. Research Council – A more deductive approach

(I think that) … the way in which decisions to select strategic subjects or research teams are selected and the way in which funding is allocated (…) it could be a little bit more a deductive process, a relational process to society, …

I think that, from that point of view, the running of a university which wants to invest a lot of money and go very high, wants to be the best for technological development, it should also take responsibility for selecting and attributing the money to those racehorses that will really provide the best possibilities. So (…) , selecting what kind of problems we want to answer (we can't answer all of them). What can we answer with the groups we have? Who should be helped? Who should, perhaps, be allowed to continue and see if he proves himself worth? (…) I think this is in part the responsibility of the Research Council, which could, perhaps, suggest to the Rector certain priorities (…)

It might also be that … all of a sudden you give a lot of money to a group, and what happens after two or three years? Was that worthwhile? Was that well-spent? Was it not well-spent? Even if it was not well-spent, can we use this knowledge to improve or to change things in the future? Or are we going to continue to …? It's a big responsibility to distribute that without any feedback, without an international mirror, (…) or without any commitment from industry or things like that. So it's a very big role I think that the Research Council could play and increasingly important in the near future.

36. Sustaining dreams and opportunities

I think the most significant achievement of the Programme is that some people here were allowed to express their enthusiasm and realize part of the ideas they had. And this is something that I'm only realizing clearly today (…) that this had a very strong effect on the environment, (…)

(…) Although *only a few people,* eight components, were allowed to (…) shape their dreams (and) received money to do that; (…) *a lot of people* around have seen this, have felt this happening, "What is this? What is happening there? Why are they chosen and why are we not? How can we go in the same direction too?"

(…) Having research papers in internationally recognized journals (…) is important for the researchers themselves and so I'm sure that this has been very significant. But, perhaps, even more, that other people in ESPOL have heard about it, have felt it. The Rector has felt something happening. The students, some students, may have had the feeling that something was happening and have seen some differences.

I've just come from the Chemistry Department, which has not been involved, but why would I have contact with the Chemistry Department if the VLIR project was not there? So there are a lot of additional benefits that have not been part of the deliverables of the project. And I think for the institution it's very important. (…)

Whether it's sustainable or not, I don't know. It's certainly an evolution. … I don't think it's sustainable as it is now. (…)

It is absolutely an evolution. So what made this possible? The very simple answer is money, of course, money made this possible. (…) Here, you can still very quickly develop and do something as we have seen in ten years; which on a scientific level is relatively fast. (…)

On the question of sustainability, I think this is a whole big problem, (…) I think that sustainability is inevitably something that you start to feel when resources run out. And in the beginning of the project nobody worries about sustainability. And now it starts to become a very serious issue, not only because the money's running out of the VLIR project, money can also run out in several other aspects of Ecuador at the moment, (…)

The sustainability has more to do with, of course, finding funds elsewhere, but also in generating mechanisms that can grow in the financing methodologies, generating mechanisms, for instance, by using intellectual property rights to inject money back into the centers, to inject money back into the university.

(…) I don't know exactly what the Ecuadorian law is, but I think that the intellectual property belongs to the university, and not to the person who did it. It may seem strange, but it is this institution that made it possible. After all, it's because there were programs like the VLIR; it's because there were a lot of activities; it's because there was schooling, that these people were in the circumstance good enough to generate this knowledge and this added value. Some of the added value should go back because it was invested in them. And this is one of the mechanisms that can sustain, that can increase sustainability.

(…) Of course, a university is a science and knowledge machine, and should be paid for that by its government. (…) But growing, if we want to grow, we can (…) employ the benefits of this knowledge. It's the knowledge of the university …