

Organizational competence building and development: Contributions to operations management

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ABSTRACT

'Change' is the word that describes nowadays-socioeconomic environment. Change drivers are forcing a new organizational behavior, which is based on collective determinants of its performance. Based on these assumptions that change is the main context characteristic and performance is collectively defined, organizational learning plays a special role. The main objective of this paper is to comprehend organizational learning in a strategic context established by operations strategy, and focusing on organizational competences formation and development as elements that drive performance. A conceptual framework is developed and tested using information from experts' interviews and secondary data collected from an enterprise knowledge management process implementation research project.

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1. Introduction

Information revolution shrinks time and space dimensions, transforming real-time communication among geographically distant people and enterprises a present reality. As a result of this technological development, companies seek to improve their learning processes, enabling them to take advantage of these interactions for competence creation and development (Lee and Hong, 2002).

Structural changes caused by information technology development have made financial, commercial, and productive globalization possible, increasing the number of competitors that create a real global and international arena. This new context prompted a continuous flow of in-depth, and irreversible market changes, thus increasing complexity and uncertainty in internal and external organizational environments (Choi et al., 2006; Khalil and Wang, 2002).

Among these changes one can mention that product life cycle reduction and productive processes redesign are being demanded from companies new learning approaches, in which knowledge management plays a 'refreshing' oriented role toward products and processes (Camisón and Forés, 2011; Irani et al., 2009; Koners and Goffin, 2007; Fernandes et al., 2005; Govers, 2001).

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Knowledge management (KM) is a critical success factor for organizations operating globally. These organizations are emphasizing their KM capabilities for growing, retaining and mobilizing their organizational knowledge base (Gupta and Sharma, 2004). In this sense, KM comprises two main processes: creation, in which knowledge share, storage, transfer, and application take place; and commercialization, in which an invention, as a result from the creation process, turns into an innovation that is able to bring out results for the organization (Desouza and Awazu, 2006).

The development of a competitive strategy based on KM implies companies' cultural patterns review, by focusing on continuous learning and performance results, and organizational internal environment that favors new ideas generation is one of the key related questions (Yang, 2010; Halawi et al., 2006; Dawson, 2000). In this way, organizational learning represents a knowledge-oriented process, since it develops organizational competences, or it creates new capabilities (Camisón and Forés, 2011; Lustri et al., 2007; Merali, 2000).

For creating these new capabilities organizations should identify competences to be developed, their proper structuring process, based on their internal structure, their external environment and the resulted dynamic interaction between them (Yang et al., 2006; Berghman et al., 2006; Wang and Lo, 2003; Boog, 1991).

Organizational learning comes out as the result of this interactive process, and comprehends people, their relations, information sharing, experimentation, and knowledge diffusion, among other elements that are inherent to the organizational interaction process, especially in the operations management (OM) context.

Value chain models could be used as a first approach in understanding operations systems dynamics and their interactions through the entire operations network. In this way, Johansen and Riis (2003) stated that manufacturing vision is an integrative construct that links organizational resources to enterprise's mission. Capabilities and/or competences are constructs that mediate this relationship, that is, linking operations strategy to productive resources mobilization, that contribute to operations strategic vision building (Brown and Blackmon, 2005; Perona and Miragliotta, 2004; Manthou et al., 2004).

KM is a core competence for developing the strategic process and improving the operations systems of electric energy industry companies. Particularly for this paper, the knowledge base represented by power systems technologies and its mobilization through their operating systems is of crucial importance for a better and improved performance. In this sense, KM practices applied to organizational and individual levels could result in a superior performance (Edwards, 2008).

In general energy companies are capital-intensive enterprises that exploit a complex productive system, characterized by a technological based operation. Their workforce is formed by specialized professionals that continuously are integrating their expertise and know-how in the entire operation.

The Brazilian electrical energy industry based on big hydroelectric plants plays an important role for national economic

development infrastructure. According to 2010 National Energy Matrix Balance report, published by Energy Research Enterprise, electric energy represented in 2009, 15.2% of Brazilian energy source. Also, in 2009, hydroelectric plants produced 76% of the offered electrical energy (EPE—Energy Research Enterprise, 2010).

The findings presented in this paper aim for understanding concerning formation and development of organizational competences by means of organizational learning processes and operations strategy realization.

This paper portrays the development of a theoretical-conceptual framework for analyzing and representing organizational learning processes and their role on organizational competence formation and development, using for that purpose an operations strategy context.

2. Conceptual framework development

For Barney (1991), understanding interconnection between company resources and competitive advantage sustainability is thought to be a leading factor for strategy realization. His approach also classifies organizational resources as physical, human, and organizational, knowledge being part of the human ones.

Although knowledge is firstly approached as a human resource attribute that comes from personnel education, training and

Table 1
Synthesis of organizational learning theories.

Author	Focus	Comments
Nadler et al. (1992)	Obstacles and facilitators to the organizational learning	Acquire knowledge from one's own and other's experience, and modify the way of work.
Garvin (1993)	Learning through know-how and new ideas	Learning as a knowledge acquisition process, through information processing mechanisms, where new ideas are essential and may arise both from inside and outside the organization, as a result of experience, experimentation, learnt lessons, best-practices, and fast and efficient knowledge spread in the organization.
Ayas (1997)	Infrastructure and diversity	Learning capability related to infrastructure creation to comprise learning processes, and to knowledge, value and insight diversity.
Nonaka and Takeuchi (1997)	Learning through know-how and metaphorical language usage	Knowledge creation purely based on flexible and qualitative elements. Learning systems more from day-by-day experience and metaphorical language usage than from formal training programs. <i>Know-how</i> —solves specific problems based on existent premises. Establishes new premises, aiming to revoke the existent ones.
Dixon (1999)	Interrelation between individual and organizational learning dimensions	Intentional use of the learning process at individual, peer, and systemic levels, in order to keep driving the organization toward a satisfactory growth for the stockholders.
Cecez-Kecmanovic (2004)	Learning based on communicative competence and debate fostering culture	Learning focused on technical skills development and expertise, business and organizational understanding, communicative personal skills, communicative competence of the individuals, and culture that fosters open debate and social interaction processes, with new ideas and innovation.
Fleury and Fleury (2004)	Understanding of the organization's internal and external environments	Learning focused on the formulation of new cognitive maps that enable the internal and external environment understanding, and the establishment of new conducts that evince learning effectiveness.
Chen (2005)	Organizational memory as a learning resource	Organizational learning refers to the process through which an organization adjusts and/or continuously changes itself, improving and making use of its organizational knowledge resources, and straining to conform to internal and external environment changes and keep sustainable competitive advantage. Emphasis is on three points: <ul style="list-style-type: none"> – the organizational learning goal enables the organization to conform to internal and external environment changes; – the most important resource to make organizational learning happen is the stored knowledge (organizational memory); – learning is a continuing and non-stopping process.
Marsh and Stock (2006)	Knowledge interpretation ability positively influences innovation	Knowledge interpretation brings direct effects on innovation. Organizational efforts to interpret existent knowledge under the strategic context, with experience articulation and codification, positively influence the ability to apply the knowledge from new projects and the development of new products.
Fliaster Spiess (2008)	Learning based on social networks	The benefits from interpersonal and informal collaboration play a role beyond mere information regarding technology trends. Social networks in the organization may help to identify or reformulate problems, validate ideas and the course of an action, make the creative perspective possible, evince opportunities, and enable problems to be better distributed through work sharing.
Senge (2009)	The five organizational learning subjects	The company as a living organism, at which learning is due to people and comes mainly from their experience. The five learning subjects are Personal Control, Mental Frameworks, Shared Views, Team Learning, and Systemic Thinking. People with a higher level of maturity are more able to learn.

experience, it is also studied as an organizational strategic resource, according to the Resource Based View (RBV) theory (Paiva et al., 2008; Merali, 2000).

The strategic management of knowledge, as well as its associated processes, i.e., organizational learning could contribute to capability formation and competence development that will result in companies' strategic vision realization (Laakso et al., 1998).

2.1. Organizational learning processes

Organizational learning demands rethinking organizational design and individuals' behavior change. Furthermore, it takes place after a knowledge acquisition process based on information processing mechanisms. In this sense, the organizational learning process stems from skills regarding five main tasks: systematic problem solving; new approaches for experimenting; learning from prior know-how; learning from others' know-how and best-practices; and knowledge diffusion in a fast and efficient way (Garvin, 1993).

Organizational learning requires individual learning processes through self-awareness, and mental frameworks based on explicit individual objectives. Besides that, it requires a group learning process with shared views and ideas, and systemic thinking that embodies the organization as a whole and links the individual and group learning processes (Den Hertog et al., 2010, Senge, 2009).

Dixon (1999) points out that learning may arise from investigation-oriented lessons, such as

- prior experiences interpretation of success or failure;
- establishment of causal links between actions and results and their effects on future actions;
- description of organizational changes and future probable performance demands;
- analysis of potentialities and limitations of strategic alternatives to organizations' structures, technologies, information systems, and 'empowerment' systems;
- description of conflicting views and interests that emerge from complexity and uncertainty conditions;
- portrayal of the wanted future and carrying out of the means through which it can be achieved;
- critical reflection of the organizational theories in use and restructuring of proposals;
- description and analysis of other organizations' know-how.

Formal training programs can be competitive advantage sources, however complementary, once people learn more from day-by-day experience from training itself (Nonaka and Takeuchi, 1997). According to Cortada and Woods (1999), communities of practice play a special role for developing a continuous flow of ideas, and constitute a place for creating, sharing and maintaining tacit knowledge.

Learning capability building requires infrastructure for supporting learning process at all organizational levels. In order to

enable learning capability, the preliminary requisite is the existence of differences concerning knowledge, skills, values, and insights among the involved actors (Ayas, 1997).

Some of the main approaches regarding organizational learning are presented in Table 1.

Fleury and Fleury (1997) reinforce the perceptions of authors presented in Table 1, stating that organizational learning process embraces technical and social aspects. Under the technical perspective, organizational learning refers to efficient information processing regarding organizational internal and external contexts. The social perspective brings up the ways people give meaning to their work experiences. That can be done through explicit sources, such as information, or tacit sources, through perception or 'sensitivity'. It means that, under this approach, learning stems from social relations.

Organizational learning is studied under several perspectives, with convergent insights to the concept of learning based on individual experience, experience exchange, and interrelations between people and groups in the organization, as well as the development of favorable organizational environments to learning practices, emphasizing behavioral elements.

2.2. Organizational capabilities and competences

Organizational competences are defined by a logic architecture that combines and interrelates resources; thus, firm performance is derived from competence level, that could sustain access to the most varied markets (Hamel and Prahalad, 1990). In this way, strategy performance is linked to the correct alignment between organizational competences and business strategy (Fleury and Fleury, 2003).

Mills et al. (2002) classifies organizational competence into categories, highlighting the importance of dynamic capabilities, as it can be seen in Table 2.

Frequently, the use of the words capabilities and competences occurs in an interchangeable way. The dynamic capability approach, however, is an exception, and determines competences and processes adaptation over time (Mills et al., 2002).

Competence should be defined through 'action' modes: mode I—cognitive flexibility to conceive alternative strategy paths; mode II—cognitive flexibility to conceive alternative management processes; mode III—coordination flexibility to identify, set up, and allocate resources; mode IV—resource flexibility to be used in different activities alternatives; and mode V—operation flexibility for mobilizing available resources according to individual skills and capabilities (Sanchez, 2004).

The concept 'capability' is more comprehensive than 'competence', since besides competences it includes strategy orientation and the connection between resources and skills (Zehir et al., 2006).

The term 'competence' is normally used in the strategic context, for achieving competitive advantage, and includes core competences, essential for business survival and company

Table 2
Competence categories.
Source: Mills et al. (2002).

Competence Categories	Description
Core competences	Higher competences and tasks, at corporate level, that are crucial for enterprises' survival and central for the strategy.
Distinctive competences	Competences and tasks that customers recognize as singular in comparison to competitors, and that promote competitive advantages.
Organizational or business unit competences	Key competences and tasks that are expected from each business unit. They are usually not many, from three to six.
Support competences	Valuable tasks to support a bunch of other tasks.
Dynamic capabilities or skills	Enterprise capability to conform its competences to time. It is directly linked to needed resources for changing.

differentiation from other competitors. Also, it covers distinctive competences, which yield the value perceived by customers, distinguishing the company in the competition context. Capabilities are the characterization of a superior business process, like supplier management or new product introduction in the market (Mills et al., 2003).

Capabilities are a complex coordination frame between resources and people, who learn from repetition (Grant, 1991). The dynamic capabilities could provide the choices regarding competence development that are influenced by prior choices. So, the company pathway is defined by decisions taken previously, and that allows the goals to be achieved and the available options to be determined (Teece et al., 1997).

Several authors emphasize the relationship between organizational learning and competence development, such as Drejer (2000, 2001) on integration between organizational and individual competences, which is mediated by a learning process; Sanchez (2004) on the search of a logical architecture to classify and explain competence formation; Rose et al. (2007) and Murray and Donegan (2003) on the establishment of cause and effect links; Spanos and Prastacos (2004) on socialization mechanisms study; Lee et al. (2005) and Hunter (2002) on learning result analysis and its effect on capability and performance formation; Turner and Keegan (2001) on governance analysis and its relations with organizational learning and competence development; and Chen and Wu (2007), Macpherson et al. (2003) and Hoogervorst et al. (2002) on competence definition as a result of learning processes.

One observes that there is a close relationship between organizational learning process and competence formation and development, this one being defined as its result. For this, establishing

context and processes for competence formation and development are necessary conditions for innovation in the whole system of value chains that defines organizations' operations network. Framing competence formation and development in operations function level could create useful insights for the entire value chain.

2.3. Operations strategy

Taking the context of OM, organizational learning constitute a day to day activity based on work experience and oriented to deliver a planned set of 'services'.

Slack et al. (2003) points out the importance of an operations based approach and process management view in organizations. The field of OM has a great impact on companies' costs and revenue, and seeks the improvement of products and services, and at the same time cost reduction, mainly through processes improvements. Following this management view, many organizational internal services, such as human resources management, have been focusing on performance levels, such as productivity and quality, among others. The interest in OM has arisen parallel to the interest in capability-based view as competitive strategy framework, and several other areas, besides this functional area, have focused on process and OM.

Both manufacture and service operations systems are based on processes, and the concept of process consists of observing 'flows' in relation to time and space. By this way, all productive systems can be understood as processes mobilized in operations networks (Enoki, 2006).

Strategic decisions can be organized according to business processes, as mentioned by Mills et al. (1995). As a result, the interdependence between different organizational functions and

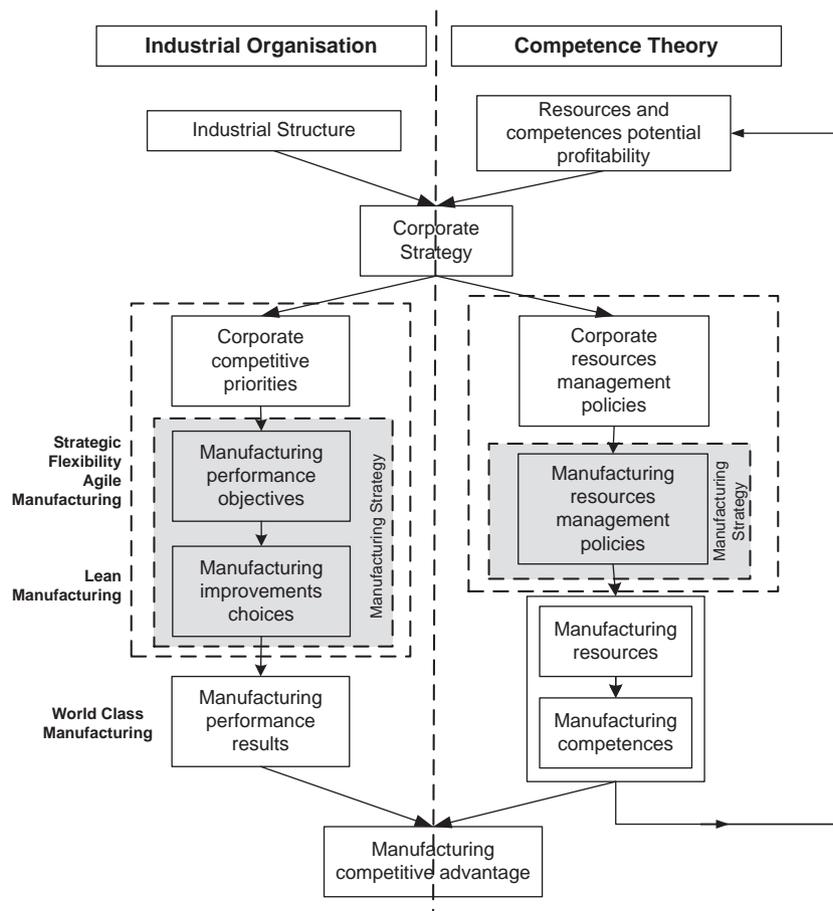


Fig. 1. Integrating industrial organization and competence theories through operations strategy.

different operations decisions could be considered by visualizing operations key-processes and tracing of the necessary actions to realize the business strategy.

System integration is a key process for strategy development, mainly for more complex cases. Outsourcing and end product high added value require system integration capabilities that could be seen as bottleneck for operations systems management (Pisano and Teece, 2007).

For Chandra and Kumar (2003), organizational integration drives us to social and technical issues that are sometimes conflicting at manufacturing enterprises. Technical issues refer to equipment, hardware data and information integration; social issues involve personnel integration through teamwork, knowledge creation and sharing, and decision processes.

With this in mind, organizational integration is allowed by common policies and action plans, and mainly by decision processes information sharing, so that such information comes out from a knowledge base that is common to all organization levels.

The production system framework emphasized in this paper refers to a dynamic manufacturing, which according to De Toni and Tonchia (2002), could be framed based on competences, capabilities and resource view theory and grounds in operations capability creation that in the future shall become important for company sustainability. Fig. 1 portrays how manufacturing strategic view is integrated to 'industrial organization' and 'competence, capabilities and resource based view' fields.

The operations strategy, present in the competence theory framework, focuses on resource management and production competences, which are managed as a potential source of competitive advantage derived from operations system. Under this perspective, operations strategy could establish a context for studying the relationship between organizational learning and competences formation and development (Paiva et al., 2008).

2.3.1. Manufacturing vision

Manufacturing vision (MV) is considered an integrative framework that links mission, objectives, and strategies in an industrial enterprise. Moreover, it pinpoints manufacturing system design recommendations. This framework enables the manufacturing system to conceive strategies that contribute to the companies' competitive development and sustainability (Johansen and Riis, 2003).

Table 3

Questions regarding the manufacturing vision development.
Source: Johansen and Riis (2003).

Question	Characteristics
<i>Experimental working method</i>	<ul style="list-style-type: none"> – Fearless experimentation aiming for an idealized future condition. – Facilitators' support in order to actively involve staff in the creative process (a mix of seminars and task forces). – Language: use of expressions like "Why not doing it...", "What would happen if...", "We could consider that...". – New ideas conception and exploration.
<i>Participation</i>	<ul style="list-style-type: none"> – Managers and employees' involvement since the initial stages of the process. – Underprivileged by the departmentalization. – Based on anticipation and wide acceptance of dramatic future changes. – Involvement of the whole company for the surveying of what needs changing, and the discussion and experimentation of future solutions (direction). – Communication/information: challenge representation with all organizational functions. – Emphasis on contributions' potential based on working experiences. – Operational level involvement for the understanding of the needs for changing and for the development of creative solutions.
<i>Manufacturing vision principles definition</i>	<ul style="list-style-type: none"> – The MV may target several parts of the manufacturing system and the interaction among the functions. – Process may often focus on the production unit, the plant responsible for the manufacturing of a specific product, or the suppliers. – In the most advanced stage, process development emphasizes one of the systems.

Manufacturing vision is developed through explicit capabilities factor exploitation that influence companies' competitive potential, and change capabilities orientation by the alignment to market requirements (Maslen and Platts, 1997).

Organizations that do not have a strategic view over their competitor's productions systems may lose market share and face high recovery cost due to the lack of alignment between manufacturing and corporate strategies (Hayes and Wheelwright, 1985). The manufacturing strategy requires the creation of organizational capabilities and competences, which will allow the company to make a competitive use in the future (Hayes and Pisano, 1994). In this sense, manufacturing vision development is, in many respects, an organizational learning process, since it prepares one's mind to new options and fosters new ideas development (Johansen and Riis, 2003).

OM learning consists of the analysis of daily operations, considering work processes and organizational activities that define companies' actions. Table 3 shows some questions regarding manufacturing vision development.

The characteristics of these three MV-related questions promote organizational learning through experimentation (exploring new ideas), participation (personnel involvement in the whole process), and principles definition (function interaction promotion).

Organizational competences related to OM, according to Lewis (2003), aim for operations strategic alignment with market targeting processes, resources and operations system processes, and result in companies' competitiveness and performance.

3. Research design

The developed research methodology is qualitative by nature, based on subjective and qualitative characteristics of the analyzed data.

The framework's development stages comprise framework guidelines proposition and delimitation based on literature review; framework refinement via semi-structured interviews with six experts from academic and industrial professional areas, and; framework test, according to secondary data analysis from a research project related to a corporate process of knowledge strategic management implantation, called 'Corporate Process of Knowledge Management' (CPKM).

3.1. Variables definition

Variables delimitation was performed, initially, in the theoretical construction by defining and delimiting the involved elements, and then refined by experts' interviews. After that, the collected data from CPKM research project was used to populate the developed framework, testing its structure and illustrating its application. Cognitive maps were used to explain the studied company learning process and the resulted competences.

The framework refinement stage included semi-structured interviews with six professionals from academy and industry. Two out of the six interviewed professionals work as researchers for the organization where CPKM initiative is being developed, and are directly involved with the project.

The test stage was framed according to the analysis of secondary data from CPKM research project. The analyzed data is originally formed by 342 surveys, applied to 6 organizational units between February and July 2007, according to the company's organizational chart: Management Board (MB); Coordination Board (CB); Finance Board (FB); General Board (GB); Juridical Board (JB); and Technical Board (TB), and aiming to diagnose adopted KM practices.

Out of the 342 surveys answered, 47 were selected, making use of the following criteria: Discard of incomplete or inconsistent answers; Concealment of columns corresponding to non-applicable answer fields; Simple search by key-word: knowledge, learning, competence, information, process, operation/operations; discard of answers whose identified actions would not bring meaningful contributions to organizational learning; and Discard of similar answers.

The analysis of the selected surveys was performed by making use of the cognitive mapping technique, so that one map was conceived for each organizational unit survey.

3.2. Cognitive maps

The main goal of cognitive maps in this paper is to provide the framework test stage, and identify learning patterns and connections. Cognitive maps are used for structuring, analyzing, and understanding the meanings of written or verbal narratives that are present in survey answers (Collins and Hussey, 2009).

The term cognitive map refers to mental models external representations and it is defined as a conceptual map. Cognitive mapping provides a simplified meaningful reasoning, used for communication purposes. Cognitive maps are used in disciplines as system dynamics; business management science; learning environments; learning and instruction; and development of expert systems (Kolkman et al., 2005).

A typical method used to establish reliability of the cognitive mapping procedure is to achieve a consensus among multiple raters for all stages of cognitive mapping procedure (Nadkarni and Shenoy, 2001).

Initially, for constructing a cognitive map, it is required to define a focal question or statement. In this research the main theme is 'Organizational Competences'. This label delimits the cognitive map scope and animates the causal links representation (Ensslin et al., 2001).

Collins and Hussey (2009) propose three stages for cognitive map construction:

1. The problem narrative is divided into sentences, that are treated as distinct concepts that are reconnected to represent the narrative in a graphic format.
2. Sentence pairs can be joined in a single concept in which one sentence provides meaningful contrast to the other, and the meaning is maintained through the contrast.
3. Distinct sentences are linked to form a hierarchy of objective meanings; basically, explanations that lead to consequences,

including decisions regarding the status of a concept toward the other. There are several defined categories and levels in a hierarchy of notions that help the user to take such decisions.

The use of the cognitive mapping method is justified by allowing the integrity maintenance and original data property, preventing sentence or word abbreviations. As stated by Collins and Hussey (2009), the research focuses on subjective and qualitative data, toward a phenomenological paradigm, though partially working on the analysis of a considerably large data collection sample. These characteristics justify the analyses grounded in non-quantitative methods, by making use of the cognitive mapping technique.

3.3. Research procedures

In order to collect the necessary information for framework refinement, six experts were interviewed; three of them are academic professionals and the other three are industry professionals, whose activities are linked to KM. The interviews were conducted between July and August 2007, and lasted for one hour and a half with each expert.

For the refinement stage, secondary data proceeding from CPKM were analyzed, taking as priority the identification of relevant information for organizational learning topics.

4. Research results

Basically research results are found in experts contribution and a case study that create conditions for framework refinement and test.

4.1. Framework refinement

The experts interviews were conducted based on a pre-defined script, in a semi-structured way, and enabled to understand the framework constitutive elements and their relationships.

Industry Professional 1 has MSc degree in Economy and Public Administration and a BSc in Civil Engineering, and has been working for the studied company for the last 18 years and recently acting as Organizational Development Program Manager.

Industry Professional 2 has an MBA in Business Management and a BSc degree in Civil Engineering; he has been working for the studied company for the last three years and previously he worked at least 15 years in infrastructure based companies.

Industry Professional 3 has a PhD and MSc degrees in Industrial Engineering and a BSc in Industrial Chemistry, and has developed a career in public companies that are responsible for developing technologies for electrical energy industry in the last 25 years.

Academic 1 has a PhD and MSc degrees in Business Administration, and has been researching KM strategy models for the last 10 years.

Academic 2 has a PhD and MSc degrees in Business Administration, and has been researching KM strategy, 'Innovative Organizational' and new KM models for the last 15 years.

Academic 3 has a PhD degree in Industrial Engineering, MSc degree in Electrical Engineering and BSc in Electrical Engineering. He is researching 'Performance Measurement Systems' applied to operations strategy, knowledge management strategy and sustainable operations, and has worked for 20 years as a professor.

Table 4 brings out a synthesis of contributions and discussions from the interviews with the six listed KM experts.

Fig. 2 represents the theoretical-conceptual framework after the refinement process. It is important to observe that this framework combines theoretical construction based on literature review (Section 2) and expert interviews refinement.

Table 4
Synthesis of interviews contributions.
Source: authors.

Interviewee	Focus	Contributions
Professional 1	Organizational knowledge retention, training	Emphasis on critical knowledge codification and retention for the organization, involving encouragement initiatives to explicitness, documentation, and knowledge spread. Relevance of training-based developed capabilities for the carrying out of organizational functions.
Professional 2	Organizational knowledge retention, communities of practice	Emphasis on critical knowledge codification and retention for the organization. Practice of communities' relevance approach as a way to promote organizational learning and knowledge development.
Professional 3	Management competences, holistic view	Highlight of the importance of management competence creation as a way to contribute to the effective knowledge management through staff management. Visualization of the organizational context in a systemic way, allowing the identification of elements that are favorable to the organizational learning.
Academic 1	Knowledge as organizational resource	Relevance for assuming the tenet of knowledge as an organizational resource and the organizational culture as one of the organizational learning determiners.
Academic 2	Knowledge creation and conversion processes	Highlight of the exploration of interrelations between the framework elements by using as reference knowledge creation and conversion concepts and processes, as discussed by Nonaka and Takeuchi (1997), that comprehend knowledge development at the company by proposing the knowledge spiral model.
Academic 3	Causal–logical interrelationship identification between the elements framework	Importance of establishing links that indicate the causal–logical relation between the framework elements, in order to better understand the organizational learning process and the competence formation dynamic during the organizational learning process.

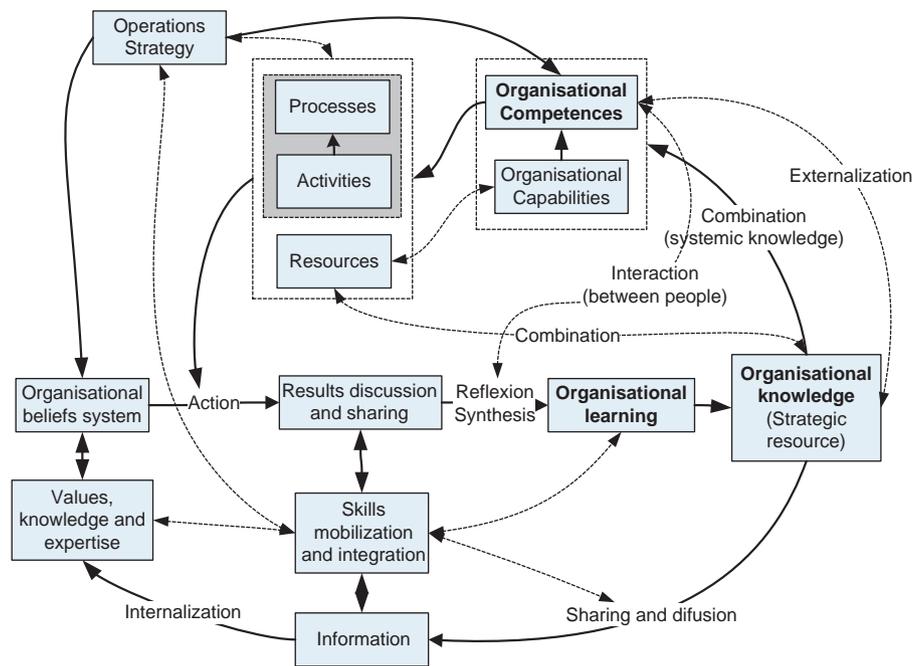


Fig. 2. The refined conceptual framework.

Once one has the refined framework, one can thus test it via data collected from the CPKM research project.

4.2. Case analysis

The organization under analysis is a big plant of electric power generation industry controlled by public sector in Brazil.

This section aims to test the framework so as to verify its applicability, and is based on the analogy between the elements and interrelationships present in the framework and cognitive maps, in order to identify the common elements and divergences that allow the framework improvement and the development organizational design recommendations for organizational competence and organizational learning management.

In order to apply a coding procedure, all the surveys were numbered from 001 to 342, and the resulting cognitive maps were identified with two letters and three numbers. The two letters

represent the organizational unit or board acronym, of which the interviewee is part, and the three numbers represent the survey sequential order. For instance, the survey code MB263, in which MB means that the survey was answered by a MB member and 263 corresponds to the survey sequential number of survey answered.

MB cognitive map's main focus is competence mapping, so employed as to identify competences that are not being potentially explored. Furthermore, it targets individual competence gaps identification that may influence organizational competences development, and also could be used for proposing corporate educational programs.

The results are shared and discussed with the 'Human Resources Superintendence' at MB, aiming to generate contributions for identifying required competences that serve as subsidy to the structuring of corporate educational programs. These programs are focused on the organizational competence development in MB, generating company's policies for human resource management and performance management at organizational

and individual levels. Fig. 3 illustrates MB actions in mapping process and competences that contribute to identify contextual factors for organizational competences development.

Fig. 4 evinces that the CB main orientation is on capture, organization, systematization, and availability of strategic technical and scientific information for the organization by making use of specific computerized systems, in order to construct the organizational knowledge base.

Fig. 5 frames the identification of occurring processes and competences required for FB, providing necessary information to structure training programs based on competence gaps.

Fig. 6 points out some technical process for embodying KM base on GB, involving Business Plan and resources requirements to provide an integrative strategic framework, necessities for managing and developing competences at organizational and individual levels.

Fig. 7 highlights the importance of individual competences and knowledge for running activities in JB area, including the partnership with HR and others related areas.

TB cognitive maps, as shown in Fig. 8, detach the importance of information management related actions prevailing caption, record, organization, recovery, and availability, so as to capture

the critical tacit knowledge for the technical functions improved performance. These pieces of information aim to disseminate the essential knowledge for specific technical competences development at the organizational unit, since these may contribute to competence management as a strategic resource.

Once data illustrated the refined framework, results can be synthesized and detailed in a framework final proposition.

5. Developing the framework

Common elements could be identified between the refined theoretical framework and the studied cognitive maps learning patterns. As one can see from Table 5, there are actions and key-aspects that are present in more than one organizational unit, such as formal training programs developed according to required competences, and aiming to fulfill technical and strategic gaps as a way to align competence development to strategy at corporate and other business and functional levels.

The test allowed the identification of common elements between the refined framework and secondary data analyzed,

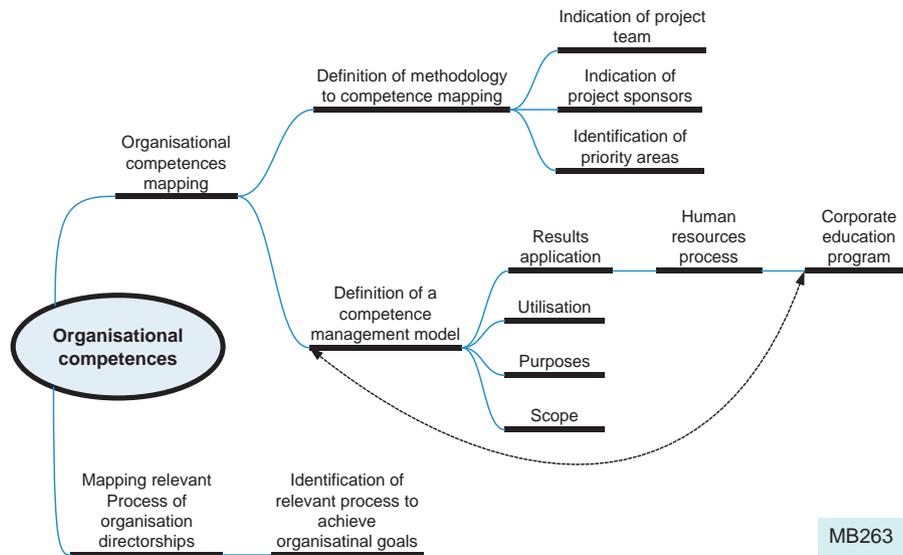


Fig. 3. Management Board (MB263 Map).

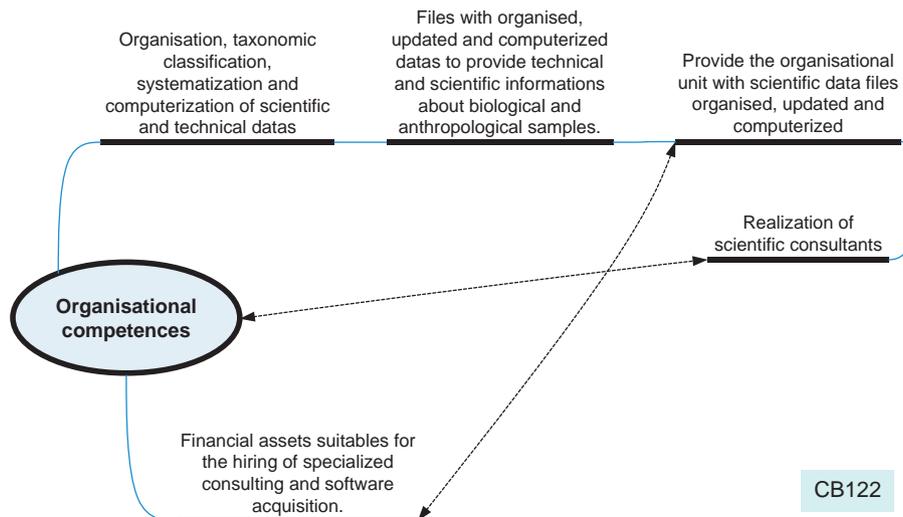


Fig. 4. Coordination Board (CB122 Map).

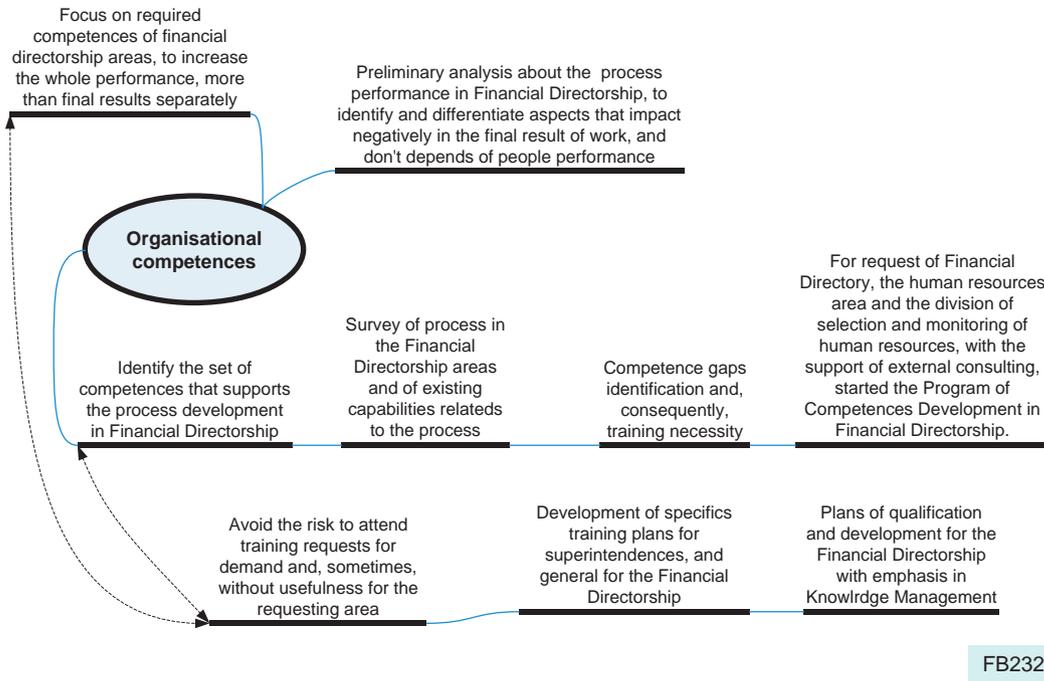


Fig. 5. Finance Board (FB232 Map).

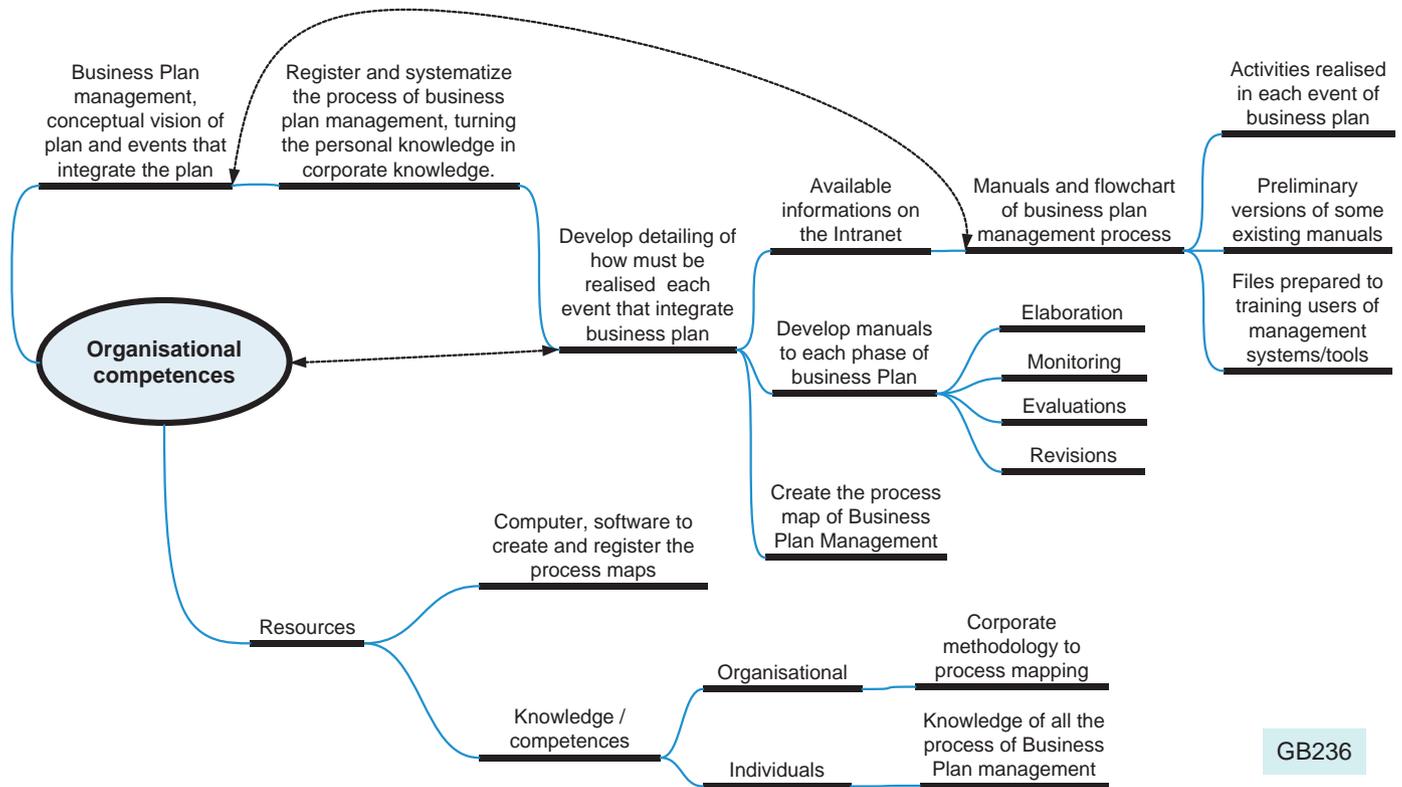


Fig. 6. General Board (GB236 Map).

which are in fact part of the organizational competence learning and formation process, such as

- *Organizational competences and training*: competence mapping for gaps identification between functional requirements and existent competences. Assessment of existent and non-used competences to improve human resources allocation and training.
- *Organizational learning*: implantation of a structured corporate education program to fulfill the gaps from existent competences and “make use” of organization experts’ knowledge.
- *Organizational knowledge as strategic resource*: actions related to strategic knowledge retention were pointed out covering planning, programming, and operations processes and activities. This critical knowledge is directly related to technical and managerial problem solution. Technical trainee programs aim



Fig. 7. Juridical Board (JB100 Map).

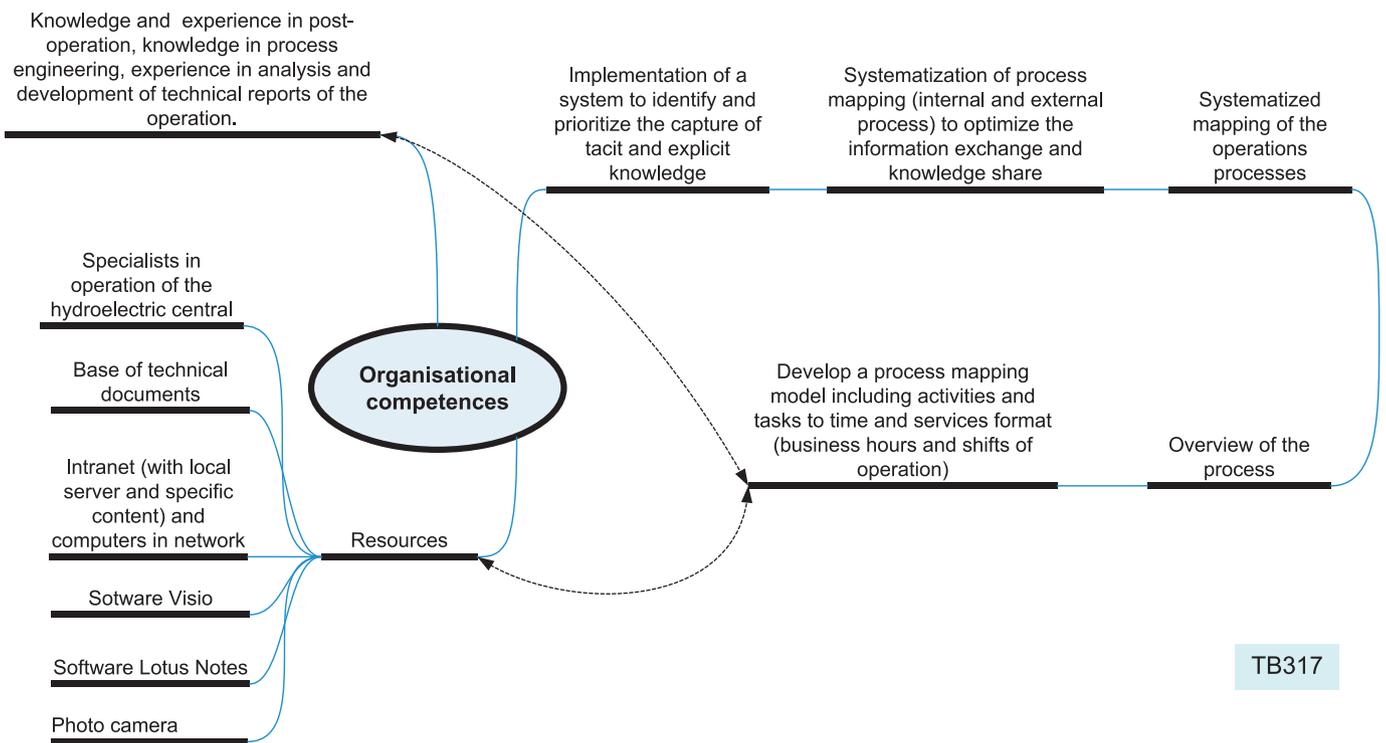


Fig. 8. Technical Board (TB317 Map).

for sharing and retention of knowledge from the most experienced specialists. Research and development partnerships with universities target innovation and process improvement.

- *Processes, activities, and resources:* technical and managerial processes mapping that are relevant to organizational goals and to streamline the organizational unit processes, contributing to a systemic view. Knowledge resources capture is by means of specialized staff allocation. Such staff is supposed to have technical knowledge on database technologies, and information and communication technology structure.
- *Information and knowledge dissemination and sharing:* information management via collaborative computing environments for learning and storage of strategic information. Capture, organization, classification, systematization, maintenance, update, and availability of strategic technical and managerial information for organization operation improvement.
- *Operations strategy:* performance management systems implementations are part of the organization's operations strategy. That is

done in an integrated way and as a support to human resources management. Further, the succession plans, structured for strategic technical knowledge retention, just like the trainee programs, are also part of this strategy.

The relationship map generated after the framework test, presented in Fig. 9, shows the interrelations between the elements verified, where the continuous line links are established interrelations and the dotted line links represent interrelations that require deeper study.

Organizational learning requires initiatives regarding sharing and dissemination of organization critical knowledge, involving elements such as

- Understanding and developing a resource based view for operations strategy.

Table 5

Variables and relations defined by the framework test.

Source: authors.

Variables and interrelationships with the <i>framework</i>	Learning related aspects identified during data analysis	Organizational units
Organizational competences and capabilities	Competence mapping, identification of talents and competence gaps.	MB/FB/TB
	Spread the existent competences among the organizational units (talent bank).	MB
	Organizational competence mapping and assessment of existing and non-used competences.	MB/FB/JB
Organizational learning	Competence management streamlining.	CB/JB
	Hiring of trainees based on each area need for competences.	TB
	Corporate Education Program Implantation.	MB
	Training of board members based on the function requirements (competence management).	JB
	Structured training plans so as to fulfill gaps and develop specific technical and managerial competences.	FB
Organizational knowledge (strategic resource)	Continuing learning based on functional control, decision criteria, organizational awareness, and communication with areas and suppliers.	FB
	Competence formation through the development of strategic processes for the unit and/or organization.	MB/FB
	Knowledge about HR organization, planning, and performance assessment.	MB
	HR Strategic Management implantation and alignment of the corporate competence requisites with the organizational strategy.	MB
	Disseminate specific knowledge on Entrepreneurial Plan management from the managerial to the corporate level.	GB
	Organizational Knowledge Management implantation.	JB
	<i>Trainee Program</i> .	TB
	Partnership with universities for the carrying-out of researches assessed by academic and organizational specialists, and generation of usable knowledge for the organization.	TB
	Retention of strategic technical knowledge involving activities and processes regarding planning, programming and operation, and the knowledge related to technical and managerial problem solution.	TB
	Processes, activities and resources	Development of internal policies regarding information availability.
Mobilization and sensitization of managers for the need of individual competence development and the understanding of the competence value in order to achieve the organizational goals.		MB
Mapping of relevant technical and managerial processes for achieving the organizational goals and streamlining the organizational unit processes (systemic view).		MB/GB/JB/TB
Information management competences.		CB/JB
Human resources that are specialized in technical knowledge on database technologies and information and communication technology structure.		MB/FB, GB/JB/TB
Computer systems for strategic, historical, and technical data storage.		TB
Information management through learning oriented collaborative computing environments and strategic information storage. Capture, organization, classification, systematization, maintenance, update, and availability of data and technical and managerial information that are strategic for the organization.		CB/, GB/JB/TB
Dissemination and sharing of information and knowledge/result sharing and discussion/integration of skills	Development of regulations for the availability of internal and external information.	CB
	Formulation of encouragement policies for information sharing and dissemination (tacit knowledge of people).	JB/TB
	Job rotation actions among workstations.	FB/JB/TB
	Encouragement so that employees who attain key-knowledge take part in seminars, lectures, meetings, and debates.	FB
	Assignment of senior professionals for training the fresh ones.	MB/FB
	Technical knowledge management—Implantation and maintenance of integrated processes for technical problems solving.	GB
	Support for lectures, workshops, debates, and other internal and/or external events.	JB/TB
	Implantation of performance management systems for supporting the human resource management.	MB
	Update, standardization, and centralized availability of organization and technical information.	TB
	Structured succession plans for retention of organizational strategic technical knowledge.	TB
Staff continuous technical training.	TB	
Operational strategy		

- Manufacturing vision (operations) development to link mission, objectives, and strategy.
- Organization hierarchical levels commitment concerning learning process importance for capabilities and organizational competences development.
- Identification, capture, and dissemination of organization critical or strategic knowledge, so that it can be used for generating core competences.
- Awareness and/or training of critical knowledge owners, considering that it is properly depicted.
- Dissemination of the depicted organizational knowledge, so that it can contribute to competence formation and learning.
- Individuals and groups commitment to critical and strategic knowledge internalization, focusing on knowledge mobilization for organization value creation.

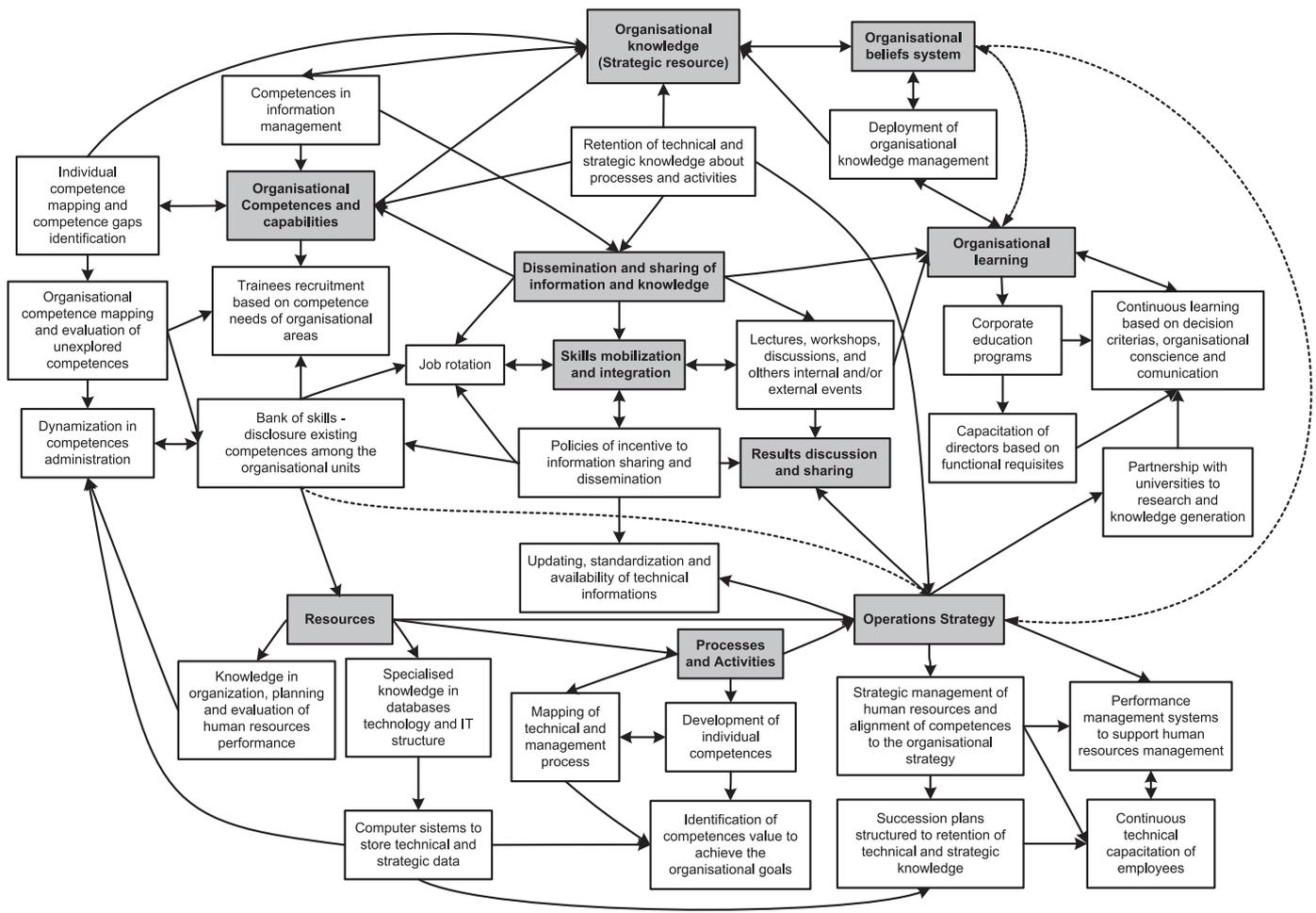


Fig. 9. Relationships map.

– Learning networks building between individuals and groups, in which ideas and experiences can be shared so as to point out the ‘best practices’.

The conceptual framework hereby developed is considered tested and improved the understanding of the structure of interconnected relations between learning and competences variables.

Nevertheless the importance of deeper insight and research scope widening is highlighted, in order to identify, explain, and interrelate the other variables involved, including behavior related ones that are related to the organizational culture.

6. Conclusion

Organizational competences’ relevance for resources mobilization and organizational strategic goal fulfillment is common sense among the authors that was used to constructed theoretical base. Also, such competences’ management demands basic understanding regarding the organizational culture, the process systemic view, and particularly, the organizational learning process.

This study allowed the identification and establishment of occurring process interconnections, as well as interfaces among the elements, the entailment of organizational learning initiatives and practices with the competences development.

In this sense, the research results contribute to a better understanding of organizational learning processes’ role and its relation to competence formation and development, mainly

concerning value as applicable knowledge. Such process is conceived at operations level by linking different areas and functions in the organization. With this in mind, the research contributes to OM area, since it applies organizational learning and competence theories and models, and evinces the involved elements and their interrelations and interfaces in OM based approach.

The developed study has an exploratory perspective and requires improvement in terms of test, regarding two perspectives: cause and effect relations in-depth study, as well as the establishment of a strategy for its validation or generalization; there is a conceptual obstacle that is established between the academic world and the practice world at organizations, and such obstacle must be overcome through concepts and methodologies and models’ operationalization, for justifying its application and usefulness.

The framework refinement and test enabled the process comprehension and representation. Due to the research limitations, however, future studies are proposed based on research scope deepening and widening. The research deepening can be enhanced through interviews with a bigger amount of specialists, framework testing in multiple case studies, and inclusion of quantitative analysis methods as a complement to the qualitative analysis so as to inquire into usability, feasibility, and utility matters.

Regarding the research scope widening, the enquiry into organizational culture elements is suggested. As examples of these elements, one can mention the obstacle related factors and organizational learning facilitators, including organizational and individual behavior aspects, that influence the learning

process and competence formation. Moreover, bearing in mind operations strategic management, the development of performance indicators is proposed in order to evince the effective contribution of developed competences to operations strategy results.

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