

A theoretical review of knowledge management and teamworking in the organizations*

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Abstract. Human Resource Management relevance in Knowledge Management had been studied in the academic literature focuses mostly on recruitment, selection, wages and salaries and career development processes. We've found little publications taking in account the group of persons that generates, share and transfer that knowledge working in teams. The aim of this paper is to propose a framework that describes the relationship between knowledge management and teamworking, integrating proposals and to outline some considerations for further research.

Keywords: knowledge management, team work, human resources management

1 Introduction

As the literature shows, knowledge management (KM) is an important component for the maintenance of the organizations competitive advantage^[8, 10, 19, 24, 48]. Those KM programs should not be an isolated program supported by a particular individual, but should be regarded as an organizational initiative^[9]. For that, it must be consider the culture and the motivational practices as a successful keys. It seems that knowledge management without human resource management will not raise their objectives^[22, 23, 43].

On the other hand, human resources management (HRM) had been development since it was thought as an important matter within the organizations in the 80's, but begins to have relevance and be important for the strategic formulation and competitiveness. [3, 13, 16, 36]. If this is so and KM is important for the competitiveness too, the study of both disciplines is a growing actual matter.

Another research in the literature analyses the relevance of HRM in KM, focuses mostly on recruitment, selection, wages and salaries and career development processes in specific organizations^[11, 15, 34, 39, 42, 45, 50]. Oltra^[34] bases his research in why KM initiatives are not so effectives as it is hoped and how human resources practices affects them successfully. The proposal of Tare^[45] suggests that it's important not only to convince the organization for lay the foundation for the success of a KM project, but also to consider other things about personal management that sometimes are ignored. We also found some references from the psychologist point of view which study individual's and group's capabilities and competences treating knowledge as an additional element of it performance^[31].

Any other references focuses, on one hand to the individual as a knowledge generating in a personal way (knowledge worker)^[1, 18, 21, 26, 29, 41, 46] and on the other hand, to the group of individuals that generating,

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sharing and transmit this knowledge by teamworking^[12, 40]. This last matter related with KM has not so much references in the literature.

All those reflections mentioned above takes us to a probably fertile field for the study of the relationship among these disciplines. In this sense, we'll base on knowledge management frameworks that include a human resource variable, mostly specific, teamworking, in order to know what kind of relationship is between both disciplines.

2 Knowledge management (KM)

Considering that knowledge has been taken as one of the most valued resources in the actual society^[8, 20, 32, 33] and constitutes an important partner in the efficiency of the production and organizational methods in order to achieve the improvement of products and services^[48], it's necessary to research its management.

Some authors recommend checking the assumptions about information and knowledge because it tends to use the terms interchangeably^[19]. In the literature we can find references that make a distinction between what is knowledge and what is not. Some argues that information is data and knowledge allows people assign significance to the information^[47]; others coincide in that information must have relevance and purpose, but only is knowledge if it can be interpreted and become valuable for decision making^[8, 44]. In addition, information must consist in data and messages flow that are organized to describe a condition or special situation, while knowledge is concepts, beliefs, judgements, methodologies and know-how that have been processed by individuals previously^[32, 48].

Table 1. KM descriptive frameworks

Pillars framework (Karl Wiig, 1993)	It's about knowledge exploration and adaptation; estimation and evaluation of the knowledge value, the related activities and the leading activity in the KM.
Capabilities Framework (Leonard-Barton, 1995)	It considers activities and capacities. The referenced activities are: problems resolution on a shared and creative way; implementation and integration of new tools and methods; experimentation, adoption and absorption of technologies from organisation outsiders. About the capacities, it defines it like competitive advantage which was developed by the company during his own life and that can not be easily dropped.
Organizational KM Framework (Arthur Andersen and The American Productivity and Quality Center, 1996)	They identified six KM processes: creation, identification, collecting, adaptation, application and knowledge sharing. It identified also four boosters whom make easier the work of this processes: leadership, evaluation, culture and technology.
Intelligent Organization Framework (Choo, 1996)	The organisation uses the information in a strategic way to create and understand knowledge, and to take decisions. This model speak about "decision taking" like a process in which the organisation process information to resolve situation uncertainty moments.
Four KM Steps Framework (van der Spek and Spijkervet, 1997)	Establish four step: conceptualization, included research, classification and modelling of existent knowledge; reflexion (evaluation of conceptualized knowledge); action, when it makes better the acquired knowledge and the retrospection stage, in which they recognize the effect of the action step.

Taking this into account, there is not a general approximation about KM commonly accepted, so dispersed and divergent notions are in progress. Some focus on the management of explicit knowledge using technical focus (knowledge shared and transferred from information systems, using networks, etc). Others have directed to intellectual capital (structural capital, human capital); and another approximation, includes issues about relevant knowledge that effects the success of any organization. This is a complementary vision from the two below of knowledge management^[25, 44].

KM have been defined as an art in which information and intellectual assets are transformed in permanent value for the organization and its partners and clients ; as a process that using information technologies seeks a synergy combination between data and information treatment and the creative and innovative capacity of human beings in a complex groups of dynamic abilities and know how that are in a permanent change^[5, 14, 48]; and as a management tool focuses in determine, organized, leading, encourages and supervising practises and activities related with knowledge (intangible assets) important to reach the strategy and objectives planned that are valuables to the organization in the way to develop core competences and capacities^[37].

There are different frameworks that have helped to understand KM^[27, 37]. These frameworks have been identified as descriptive frameworks (characterizing a phenomena's nature) and prescriptive or specialized frameworks (that shows the methodology follow in KM). Tab. 1 and 2 shows some frameworks from the literature, following the classification mentioned above. Those frameworks have in common that characterizes knowledge asset that must be managed, identifies and explain the knowledge activities acting in KM and recognises the factors that affect it^[37].

Table 2. KM prescriptive frameworks

Intangible Assets Framework (Sveiby, 1997)	It assumes tree components as: external structures (relationship between clients, providers, trademarks, company image, etc.), internal structures as patents, concepts, frameworks, administrative systems and organizational culture and employees' competences that point out their skills.
Intellectual Capital Framework (Petrasch, 1996)	Involve tree types of organizational resources referring to intellectual capital: human capital (knowledge each person is able to create); organizational capital (knowledge that had been captures and institutionalized within the organization as culture , structures, processes) and the client capital that is the value perception the client have to make business with a goods and services provider.
Knowledge Creation Framework (Nonaka y Takeuchi, 1995)	It introduces two knowledge dimensions (tacit and explicit knowledge) and knowledge creation levels (individual, group, organizational or interorganizational). They Developer a four stages framework: socialization (conversion of tacit knowledge into explicit knowledge), externalization (knowledge linkage trough a dialogue or collective reflection) combination (originating during information processing) and the internalization (organizational knowledge)
Knowledge Transfer Framework (Szulanski, 1996)	It analyzing knowledge transfer barriers, pointed out the good practices. It identifies four stages in knowledge transfer: initiation, implementation, leverage and integration. These stages are affected by transfer ambiguity, lack of motivation or a false perception about irrelevant knowledge as a knowledge source; personal characteristics and context.
Knowledge Management Process Framework (KPMG, 1997).	Includes six phases: knowledge acquisition, indexation, filtration, relation, distribution and application and emphasises tree main factors as top management commitment, assumes KM implications and apply KM to all the organization. Implies working on individual, team and organizational levels as a hole. So it is important to consider structure, strategy, leadership, human resources management, communication and information system and culture.
Knowledge Management Participative Framework (Holsapple and Joshi, 1998).	It is about four phases: Acquisition: taking knowledge from outside the company and transform it in representations than can be use inside the organization. Selection: using organization own knowledge and present it in a right way. Internalization: Modifies organization knowledge assets to convert it in valuables activities. Use: manipulates existing knowledge to generate a new knowledge or the externalization of it.

In Tab. 3 we summarize other recent frameworks^[2, 28] that show the importance of identify the relevant knowledge source and the assumption of KM as an strategy that comes from the company and goes beyond it..

The frameworks described here, constitutes the context to facilitate the KM comprehension, showing their characteristic, elements and relationship between they^[20]. They may help help organizations in the implementation of programs that support the new knowledge parading' assumption as a main and very visible resource in the actual society.

Table 3. KM prescriptive frameworks

Rastogi (2000) framework	It assumes four stages: (I) identification and classified existing and available knowledge required for organizational strategy, including expert knowledge and employees competences. Storing existing acquired and created knowledge in knowledge repositories. (II) Share knowledge through an easy access and distribution to the users. (III) Knowledge application to decision making and problem solving. (IV) Creating new knowledge through R&D, learned lessons, creative thinking and innovation.
Integer KM framework (Beijerse, 2000).	Includes three main factors to encourage knowledge processes in organizations: strategy, structure and culture. Strategy matches with available and needed knowledge and the gap between them. Structure matches with the knowledge acquisition, development, and capture; and culture will determine how knowledge must be used and shared.
Knowledge Flow framework (Heisig, 2001)	It is composed by five processes (I) Identify important knowledge for organization strategy. (II) Create, that's means the capability to learn and communicate making linkages with different matters (III) Store to seek in a right way the information needed and allows employees to access and share their knowledge. (IV) Distribution by encourages a team spirit to that support knowledge sharing. (V) Application, creating new knowledge from existing and applied knowledge.
Building Blocks of Knowledge Management framework (Probst, Raub y Romhardt, 2002).	This framework assumes two knowledge cycles: (I) Internal Cycle that includes knowledge goals (identification, acquisition and development) and External Cycle related with KM evaluation (distribution, use and preservation)
Knowledge Cycle framework (Mc Elroy, 2002).	Knowledge exists after had been captured, codified and shared. Knowledge creation cycle in two major processes: (I) Knowledge production (individual and group learning, knowledge demand, codification and share) and Knowledge integration (diffusion, training, communication and share).

However, as literature says, the application of KM or associated frameworks, are frequently presented in business context, particularly in major companies^[17, 37], where the focus is targeted to how KM is installed and what kind of tools and methodologies are used to encourage it. On the other hand and unless common its publication, there are an extended cases that shows the great effort major companies, universities and research centers at all levels have carried out to develop. For example, excellent portals (or intranet) as knowledge supporters, so that people share what they know. Also there are publications that resumes a literature review where frameworks, terms, technologies and methodologies of KM are explained^[4, 16, 35]; but there is not references that make a depth study or establish a relationship between KM and other strategic resources of the organization, like for example, the human resources and their management^[38].

3 Team working

Considering human element in organizations in general, and particularly in business context, had a strong evolution from the Taylor's conception where people were only a factor that perform their functions according to economic incentive, to actual vision according to people is a major and strategic resource and like so, have an influence in the competitiveness^[4, 11, 30].

The economy based on knowledge is changing the view that companies performs their human resources practices. Technology advance, globalization and more specialised work force and awarded respecting time value and market forces, encourages organizations to do more with less^[6, 7, 49] making them redirect their strategies in a permanent way.

More organizations are responding to this fact with very new strategies like total quality programs, [49], lean production or involvement/ participation management programmes^[7, 40, 60, 63] in order to maximize, in those cases, their human capital and adapting to the market demands throughout a group of people that accomplish complex functions will be impossible to reach working alone^[4, 11, 49, 59]. However, even there are arguments that try to get into the human resource innovation^[65], they are not so extensive as other in many

other organization areas^[11, 67]. In this sense the nature of this change, as some author refers, [66, 68] can appreciate in Tab. 4:

Table 4. Organizational change nature

	From	To
Environment	Variable out knowable	Complex and changing
Strategic corporate design	An assembly of individual who execute instructions through structures and functions	A knowledge community that draws on the strength of a collective social mind
Boundaries	Fixed: the organization has an identity relationship with itself	Fluid: the organization is networked with various others at different times, for different purposes.
Managerial Focus	Functions	Processes
Authority/Power	Hierarchical position, command and control	Professional influence, communication, collegiality
Control of work	Vested n the supervisory process	Vested in the individual
Control of work outcomes	Remains with central management	Negotiated between supervisors and groups of knowledge workers.

Source: D. Hiltrop^[11] (1995), pp. 13.

These transition seems to encourage more collective working than those that were developed in an individual way, because, the terms used now are different: collective mind, flow, process, group of workers, etc that support what literature says about organizations that allows teamworking to reach their strategic objectives^[54, 63, 67].

We can find diverse definitions about teamworking in literature,, showing that it is a tool that assists organizational changes, give them flexibility, workers integration, work speed and innovation^[54, 63, 64, 67]. Nevertheless, not all researchers in this area agree with teamworking kindness, saying that this is not a magic potion because their contribution to the organization major goals will depend on the context and the human resources policies have their meanings, [54, 61, 63, 71] and they consider teamworking is more than a fashion and represent a powerful tool for organizations to manage their resources, it is not the definitive way because it needs time, commitment and a specific culture. Sometime these factors in most cases make difficult its implantation.

Well thought-out teamworking exists because a group of persons, and its definition may focus from two perspectives: the sociological one, individual centred and his work well-being (tasks execution improvement time and task conditions) or the organization paradigm that conceives teamworking as a management processes supporting tool and of improvement of the development of the organization. In this sense are very interest in very interesting work makes a review, not only about the sources of teamworking, but the concept evolution throughout time, from its postulation in early 50's to our time, so the organization vision of the concept^[54, 67]. According to Salas et al.^[63], teamworking characteristics are related with the member's skills, aptitudes and attitudes. This can be appreciated in Tab. 5.

Tranfield et al^[67] based on a literature review make a contribution to the teamworking definition, adding the use organizations make of different types of it, as those to support the self develop and flexibility in permanent work team (semi-autonomous or self directed teams); lean teams that are the core structure of companies that work with lean production processes and teams focused on projects, often used in consultancy. The final conclusion they reach pointed out that there is not consistency in the use of these different types of teamworking and that each organization uses them according to its own context.

4 Relationship between knowledge management and teamworking

Sapsed et al.^[40], realized a literature review where they found KM and teamworking as a source of competitiveness. Trough teamworking it is possible to establish a mechanism to coordinate the specialized knowledge of a certain quantity of individuals within an organization^[16, 56]; convert personal knowledge (tacit

Table 5. Teamworking characteristics

Characteristics	Meaning/comprised skills
Flexible and adaptive behaviors, cognitions and attitudes.	General team competencies (knowledge, skills, attitudes)
Feel free to provide and accept feedback based on monitoring behavior.	Mutual performance monitoring, constructive and timely feedback and shared situational awareness
Members being willing and able to back fellow members up during operations.	Back-up behavior (compensatory behavior) and adaptability
Teamwork involves clear and concise communication	Closed-loop communication
Co-ordination of collective interdependent action.	Co-ordination, shared mental models and interpersonal relations
Leadership skill that enables the direction, planning and co-ordination of activities	Development of shared problem models, clear direction, enabling performance environment, decision making/problem solving, maintaining team coherence
As all teams are not created equal, contextual factors as well as the task that is facing the team must be considered when deciding the importance of the various competencies needed within a particular team.	Importance of particular team competencies will vary by the nature of the team

Source: Salas et al^[63]. (2000), pp. 352.

knowledge) in explicit knowledge that then is embodied in new products, process and services^[32]. When teamworking is used, organizations can improve their deployment cycle in quality and efficiency in production, mostly if it is a complex one^[55].

The growing importance of complex systems and products we can find actually requires the integration of disparate technical and professional knowledge. These means that individuals cannot possibly absorb all the requisite knowledge domains for their team's activities^[40]. This has forced many organizations to use outsourcing. Teams with high cohesion tend to be more insular, closed to the knowledge and influences outside the team^[40]. Sometimes team knowledge is not more than the sum of their parts. When the team member's knowledge is similar or very close, teamworking is more efficient, because a tacit understanding is shared and there is less necessity of explanations or demonstrations. While where the knowledge base of the individuals is different, teamworking becomes slow and complicated^[40].

On the other hand, there is little literature that establishes metrics about KM and teamworking and their relationship. However, separately we can find research where they are measured and analyzed, as an isolated issues related to others, basically of economic type.

There are a variety of tools for the KM evaluation, diagnosis and results used generally in major companies. Public organizations, as the European Centre of Standardization has created a guide that concentrates the steps companies must follow if they want to have KM. That guide is based on a recommendations and questionnaire based on Heissig [57]. The American Productivity & Quality Centre (APQC) and Arthur Andersen developed the Knowledge Management Assessment Tool (KMAT) to help companies to evaluate which of their strengths and opportunities lays on KM. It measure the KM processes itself, the leadership, the culture and technology. On the other hand, Avestaran^[52] analyses the organizational issues that can mediate in KM process within universities. The analysis includes the organizational culture, leadership, organizational structure, human resources management and the system of information and communication.

Related to teamworking, Levi and Slem^[58] carried out a research using a 30 items questionnaire and leaded interviews where they evaluated workers' attitudes and beliefs about teamworking in a R&D areas. The questionnaire studied teamworking success, the factors that promote it (from the overall organizations and form human resources) and the ideas about self management. Wright and Edwards^[70] accomplished and study using quantitative and qualitative data (they made interviews to shop floor workers and specialized supervisors and a questionnaire that measured skills, job knowledge and effort) to know if teamworking functions and what were the reasons of its success. Winter and McCalla^[69] used Belbin's taxonomy to determine the individual'

skills respecting teamworking when working by projects. Generally most of the research in this area use team types to determine the relationships between job characteristics and the outputs in an teamworking environment.

It seems there is a potential research field. As we said before, some KM frameworks include teamworking as an important element. So Leonard-Barton^[22] framework assumes as an important activity to consider a knowledge based organization, share and creative problem solving; including as an organizational capacity, employees knowledge and skills as well as the human resource management system (incentives, training, recognition, etc). Nonaka and Takeguchi^[32] in their knowledge creation framework make a distinction between individual and group level in order to facilitate the conversion from tacit to explicit knowledge; and in one of the framework stages (externalization), it is necessary for the articulation of this knowledge throughout a collective reflection. And, Heisig^[57] framework outlines that to create knowledge it is necessary to share information, so a team is build it very important.

The linkages of these two concepts seem to be done by teamworking characteristic and KM frameworks considering as a processes/tools that supports organizations to obtain its goals. However, the relationship between both terms has been little approached in an explicit way and it seems that there is a general assumption that one is a part of a natural manifestation of the other. Based on this, this paper is aimed to look into the relationship between both tools, considering KM frameworks and teamworking characteristics. This relationship is shown in Fig. 1, that leaves from the conceptualization of KM made by several authors [22, 32, 57] and it's linked with the teamworking characteristics proposed by Salas et al.^[63].

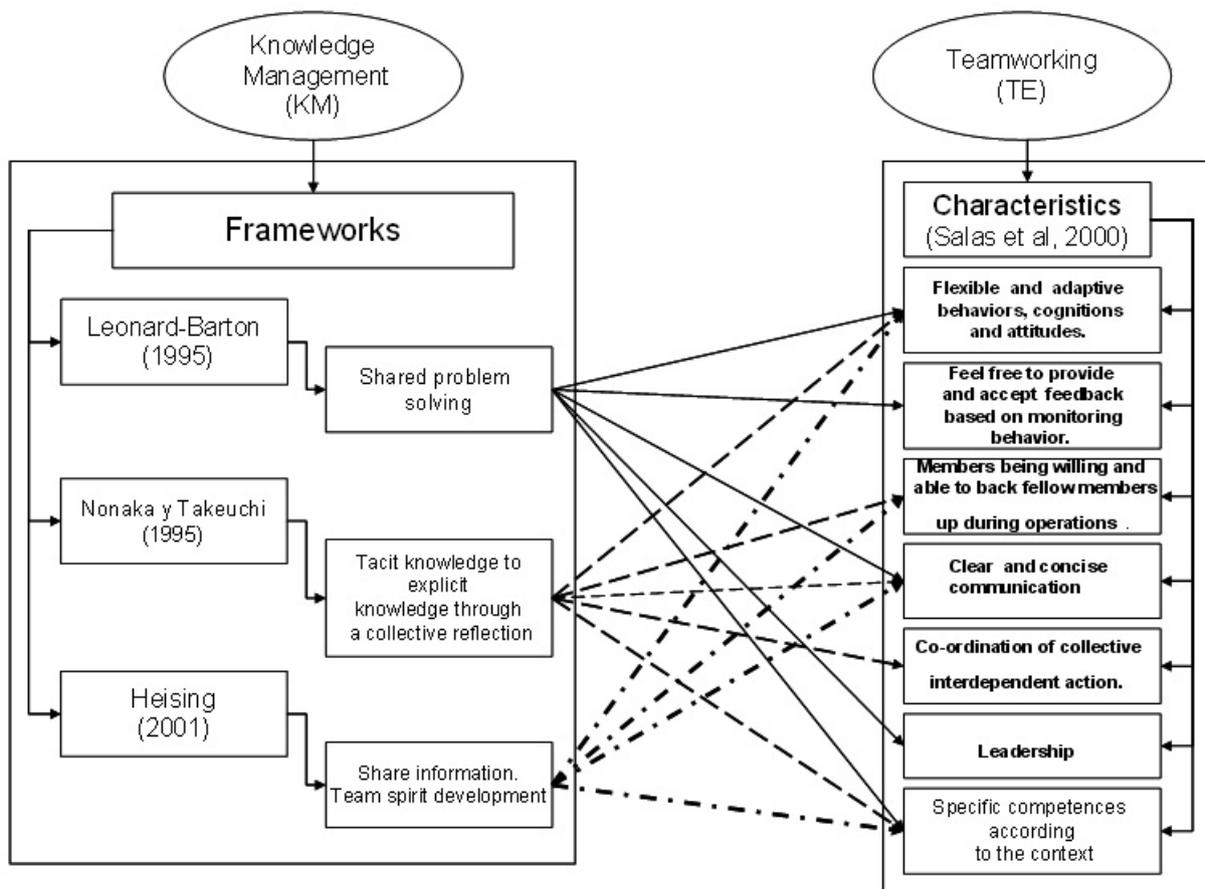


Fig. 1. Linkages of KM and teamwork framework

One way to knowledge transfer is trough share problem solving^[22], but individual differences as specialization, cognitive style and preferred tools and methods may states as a barriers to problem solving or as a big opportunity to encourages creativity, so at the same time it can provide a new knowledge. Attempting

to this, the relationship with teamworking characteristics may be explained from the perspective of diverse knowledge and the team skills, methods and tools, in which it's necessary to favour a context that encourage people to accept different points of view, even if it is not agreement, without favouring the division of the group.

The specialization and the different cognitive styles found in a team need a strong leadership able to mediate over the interactions between opposites, not only to diminish the tension, but to lead the energies to make collaboration between specialities. For if we present the framework, and outlines that a team where problems are solve in a share way, there may exist the following characteristics:

- Specific competences, according to context
- Visible leadership that encourages a positive interaction environment
- Clear communication
- Adaptable and flexible attitudes and behaviours.

Another part of the linkage we want to outline between KM and teamworking is Nonaka and Takeguchi knowledge creation framework^[32]. As we stated previously, to this author, knowledge is a dynamic element that is created trough social interactions between people and organization^[62]; and it is the collective reflection what facilitates knowledge, in it beginnings tacit becomes into explicit form supporting it transfer. The circle of knowledge creation proposed has four steps and according with Nonaka and Takeguchi^[32] three of those have been studied from different organizational theory perspectives: socialization from group process theory; combination, from organization culture and internalization from organizational learning. However, externalization has been little approached. In fact in this step, knowledge conversion (new explicit knowledge creation from existing tacit knowledge) is activated trough dialogue or collective reflection, because during people interaction process it may have perception and understanding differences. Likewise, the individualism is transcending to stables a commitment more general, making part of a group. The sum of particular intentions is now part of the team mind^[62]. Knowledge needs a context to be created, shared and used. Schermerhum et al.^[64] argues that teamworking occurs when team members work together using their knowledge and skills to reach certain goals. So it may be said that those people, working together share a context where they interact to accomplish their goals, so our framework outlines that the following elements may be established:

- Adaptable and flexible attitudes and behaviors.
- Support to the team members during task development.
- Clear communication
- Interdependent coordination
- Specific competences, according to the interaction context

The European guide to good practices in KM^[51] picks Heisig's knowledge flows framework^[57] that is formed by five main knowledge activities that must be aligned or integrated into the organization process and activities. The activities the framework refers are about knowledge identification, new knowledge creation, knowledge store, share and use. Each of this stages have to be balanced according with the organization specifications, so they cannot be treated on an isolated way or by pair of activities.

New knowledge creation can exist at individual or group level (team) and it must be a social interaction result and it has to be integrated within the organization supported by other activities like sorting, organization, categorization, updating and be flexible to modify the knowledge companies has attending to the in- or- out circumstances.

For our research, the step we analyzed is referred to knowledge exchange. When knowledge is shared by artifacts, it is name stock focus. But the major part of knowledge may be transfered from person to person by collaboration^[57]. This point of view may be supported by tools and methodologies that facilitate the knowledge transfer, like intranets/data bases, etc, but if it is not a personal bias to accept knowledge from others, it will be difficult to use/re-use. This may mean that some personal competences are required for knowledge exchange. So these flow focus support our framework in sense of people that interact with others to knowledge transfer have a bias to

- Adaptable and flexible attitudes and behaviors.
- Support to the team members during task development
- Clear communication

- Specific competences, according to the interaction context

The linkages we pretend to study are not only a way to establish the relationship between these KM frameworks and teamworking characteristics, but also they allow making a link between the frameworks itself. On one hand those have a common component and it is the consideration of people as a main element to knowledge creation and share; and on the other hand, they consider the collective element (people interaction, share information, collective reflection, share solutions, etc) that support KM.

5 Conclusions and future work

The literature points out the difference between knowledge information: management does not exist out of individuals and it is not information when it is interpreted and contextualized. That's why we assume that it is not the same knowledge management and information management.

In fact, one of the key elements to jump from information management to knowledge management is the adoption of teamworking, that may support the transfer and sharing of organization valuable knowledge, because its members have specific competences according to the context; they communicate each other in a clear and concise way; they behavior and attitudes are adaptable and flexible; they coordinate each other in an interdependent way and they support each other during they tasks. All those with the potency of a visible leadership that encourages a positive interaction context.

However we've not found an empirical study that analyzes the relationship between KM and teamworking that allow us answering to the question: how does teamworking be done by knowledge management instead of just information flow? This paper attempts to open new research lines for the empirical validation of the proposed framework. In this sense, we would like to continue with case studies that allow us to establish a guide to organizations which want to understand and apply a real knowledge management.

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