# KNOWLEDGE MANAGEMENT PROCESS AND TECHNOLOGY CAPACITYIN A SOCIAL SCIENCES NETWORK RESEARCH

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**Abstract:** We understand KM (Knowledge Management) as a strategic process to promote, create and transform the competitive capacity in all kind of organization through diverse knowledge representations. Due to theory development of KM that it has been transform as an emerging discipline. That is closely linked with the telematic technology because it makes possible to operate the KM process.

If we observe a network research as an organizational complex system the capacity to appropriate, develop and to use technology allow breaks the disciplinary limits of its functional structure.

However, we observed the need to transform the disciplinary action scheme to develop that capacity, especially in Mexican researcher, teachers and students in the social sciences sphere. We had considerate that this transformation can be done by KM processes.

We explain the transformation process of action scheme based in the Constructivist Theory. We used the methodology perspective of the organizational complex systems for the construction of a KM conceptual model. The results of the empirical research showed us the technological capacity that had been develop when we introduced KM process in the functional structure of a research network of social sciences academics in Mexico City.

**Keywords:** Knowledge Management, telematic technology, organizational complex systems, constructivist theory, research network of social sciences.

## 1. Introduction

The emergent of the Information and Communication Technology (ICT) and its continuous evolution has brought as a resulted, several disturbances, or "critical moments" manifested by dysfunctional phenomena and sometimes problematic in the functional structure and complex of the social system. Essentially on social, cultural, economic and political processes in which such technology had been incorporated and its level of use or appropriation is a substantive role in the transformed functional structure.

Therefore, the international community recognizes the importance of the ICT in these phenomena, as well as the value and relevance that acquire the information and knowledge to identify, understand and consequently promote and affect various changes, hopefully aimed at ensuring social welfare. (ONU, 2003 and 2005; UNESCO, 2000)

In the current context, global and competitive, specifically the knowledge in its various explicit representations is intangible capital that fosters the creation of other tangible capitals (financial to) due to the addition of these two, gives the competition value to an organization. Thus, knowledge is considered a competitive resource for all types of organizations. (Toffler, 1990; Reich, 1991; Quin, 1992, Drucker, 1993; González Casanova, 2001 and 2004, and Jasso, 2004).

The administration sphere proposed to Knowledge Management (KM) as a strategic perspective aimed at promoting the creation and transformation of knowledge to create competitive organizational capacities. Its theoretical development has led it become an emerging discipline. (Wiig, 1997; Shariq, 1997; Mc Adán y McCreedy, 1999; Rowley, 2000).

From about 2002, we noted that various academic organizations in Mexico, have widely adopted KM to characterize and describe activities for the construction and transformation of

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various types of knowledge, in which is evident its operation through ICT, such examples are the on-line education and distance learning. (Carrillo, 2008: 26-34).

This is because their theoretical conception explains processes of the knowledge construction in organizational contexts beside of the formulation of models for its operational implementation. (Carrillo, 2008: 67-74)

This situation shows us one of "the areas of contemporary society that science and technology have transformed"GDF, 2010), specifically the academic context.

Caused by the phenomena of social transformation some of the challenges that science and technology must take are to ensure sustainable development, achieving the satisfaction of basic requirements and rising aspirations of the inhabitants of a region and ensure the availability of jobs facing technological changes, among others. Latin America and Caribbean are considered the most inequitable regions in the world, and for this reason it is requires a strong scientific and technological development to help counteract social inequality. This regions report the lowest levels of attention to science and technology. The few that exist is focused on minorities of the population. (GDF, 2010)

In general, we consider to explain, discuss and find solutions to the context described, requires "a solid education in science and technology to promote the participation of citizens in the democratic affairs of their nation and achieve a common good, worthy of a fair country "(GDF, 2010).

Particularly the developing of knowledge is required for the use, appropriation, research and technological development but in the actual situation we need to observe the interrelationships in the social system seen as a complex system to promote the interdisciplinary[1] work and furthermore generate knowledge in perspective of the action around the social phenomenon.

However, "at this moment and at the national level, the country has lost a mayor part of talent to compete in the international arena" (GDF, 2010), it is called academic capitalism (González (Slaughter y Leslie, 1997; González Casanova, 2001), and the higher Education sector is characterized by a disciplinary orientation , "that is why it  needs a magnitude greater than the 14.681 researchers recognized by the National Research System (2007), for which is necessary to have more than twice of the 2,000 doctors in sciences that graduate each year". (GDF, 2010)

For these reasons is priority to promote the development of technological capabilities in researchers and teachers, in order to influence the transformation of the current situation in Mexico City and the country, considering this group as responsible for training students and new scientific professionals.

Therefore we have developed a research to explain and implement the KM processes to create technological capabilities with a complex and interdisciplinary[1] perspective. The hypothesis is that the KM and Telematics Technology[2] plays a key role in the creation of interdisciplinary action schemes to analyze and solve social phenomena because it makes possible to operate the KM process for the interaction between different disciplinary perspectives.

## 2. The Complex of Knowledge

We observed the research problem as a complex system therefore we based the study on the relation between the KM Conceptual Model that explain the links of three particular process, create, evaluate and communicate knowledge[3]; The theory of genetic epistemology[4] and

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[2] We understand Telematic Technology as a distance application of the ICT
[3] Consult Carrillo, 2008

constructivist [5] that explains a process of knowledge construction and the concept of the technological appropriation.[6]

## 2.1 The Km into a Research Network That Is Seen As an Organizational Complex System

The KM is a strategic process to promote, create and transform the competitive capacity in all kind of organization through diverse knowledge representations. Its theory basic was development in two periods: the first, between 1987 and 1996, described the environment that origin its. (Drucker, 1993; Senge, 1990; and Nonaka 1991) The process to knowledge organizational create is proposed by Nonaka y Takeuchi (1995). The characterization and classification of organizational knowledge are standardized as Intellectual Capital. Diverse definitions emerged, inclusive in other context like the academic. In this period the technology is an essential element.

The second period, between 1993 and 1998, is characterized by the formulation of different operation models. That helped to consolidate the KM theory. (Davenport *et al*., 1998; Ernt y Young, 1993; Caixa Sabadell, Sun Microsystems, Skandia y British Petroleum).[7]

That basic theory shows three central conceptions for the management function. Wiig (1997) described it as "material base", that take advanced of the computer, networks, data bases, etc. (Junnarkar y Brown 1997; Prasad 2000); "Evaluation and characterization of Intellectual Capital", that emphasizes activities to characterize and standardize the organizational capital, particularity human and structural (Blundell 1995, Bontis 1996 y 1997, Brooking 1996, Edvinsson y Malone 1997, Hudson 1993 y Miller 1996) and "knowledge and resource organizational integration" that explains, promotes and socializes knowledge from its transformation from tacit to explicit form. (Skime 1997, Nonaka 1991 y 1995, y Sveiby 1997).

The perspective precedent analyses the components partiality. However the complex organizational theory points out the implications of the interactions in the balance dynamics of the systems immersed in the unstable environment as the actual, global, competitive and international environment.

Therefore we proposed a Conceptual model that explains the KM operative process in an organization from a complex system perspective. The KM model integrates and explains three particulars process, ***to create, evaluate and to communicate knowledge***, and their relations through other three process that interdefinite them. The functional structure of the complex system was based in a telematic platform and we got noteworthy increase of the organizational competitive when we probe it. (Carrillo, 2008)

Actuality the KM is considered an emerging discipline due to its theoretical development. That is closely linked with the telematic technology because it makes possible to operate the KM process.

## 2.2 The Transformation of the Disciplinary Action Scheme Explained By the Genetic and Constructivist Theory

We based the study on the theory of genetic epistemology and constructivist (Piaget and Garcia, 2004) that explains a process of knowledge construction and describe its characteristics of reorganization and restructuration on its own, specifically from this process define the action scheme as:

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[4] Consult García, 2004

[5] Id.

[6] ^3 Id.

[7]  Véase http://gestiondelconocimiento.com/modelos.htm

an organized whole whose components define the individual action on the environment, in terms <u>motory</u>, sensory, perceptive, affective and <u>volitive</u>. Which organization, is the result of a dynamic process of interactions, differentiations and successive integrations in which the assimilation is developed and the accommodation of objects to action scheme" (Piaget and Garcia 204)

According to this, we considered that the transformation of action scheme as regards the conception of technology on researchers and teachers, initially framed in a disciplinary field, it would affect the necessary multidisciplinary relation to design, implement and facilitate process and functional structures to solve problems based on ICT during the investigation.

That is why the analyzed variables were: a) ***conception*** as an explicit representation of the action scheme, b) ***transformation*** of this as an explicit result of the dynamic process of assimilation and accommodation and c) ***participation*** as an explicit of action result of the restructured scheme

## 2.3. From the Conception of Use to Technological Appropriation

Currently, technologies are positioned as an innovation conducive it to teach and research, this is due to its usefulness to develop interactive virtual environments fundamental for the transformation of action schemes and therefore for the solution of problems. On this respect is important the different between use and technological appropriation. We understood technological use as the incorporation of a instrumental resource based on ICT, previously developed, inclusive in the commercial sector, to attend generalized needs for handling and access to data and information in any field, discipline or area of activity. Therefore to meet or to solve a real and particular need or a particular problem is necessary to raise the specific functional structure of a resource.

To understand and conceptualize from a multidisciplinary perspective the term of appropriation, we located from a perspective that links the social, organizational and technological of this concept:

A process by which social groups interact with cultural proposals, economic, organizational and -or- consumption, - among others- different to their own context, ascribing new meanings, uses and purposes that act as filters and allows to maintain their own horizon of understanding the world. (Neüman, 2008)

Otherwise

Knowledge implies a process of intellectual production where data are basic inputs, the information is the integration of data with a definite meaning and knowledge is the use of information from an individual to solve problems and make decisions. It is a human capacity that gives to the humans, elements to interact with the objective world (what surrounds it, with who it is, with its body), subjective (what think, feel, imagine and wish) and allows it to acquiring information, accumulate, store, structure and restructure it, select it and to apply it. Knowledge is social because it is valued and transmitted as something useful for everyone and it is indispensable to continue the collective life, so that knowledge becomes a high cultural value for its role in social interactions of individuals, for its power to guide the action and social order as it generates prediction, explanation and confidence, to know how to act in social life. (Infante and others, 2007)

It must produce an appropriation of the data by the individual, that when applied, recreated, reinvented enhances the learning and leads to a near knowledge related to it's life that help to know how to be, how to think and to know-how (Ander-Egg, 2001)

Therefore, the concept of appropriation that we proposed seen the TIC as a development for the purpose, that originates applications from the multidisciplinary perspectives for the treatment or solving of problems, on particular of social contexts. Place it in a proposal susceptible to new meanings, uses and purposes to facilitate keeping a horizon of understanding the world itself, while the information is understood as explicit representation of knowledge and virtual environments such as the explicit context of schema of action and means of interactions that make up a constructive process of specific knowledge. [3] [4]

## 3. Methodology

For the study, we considered that researchers, teachers and students, organized as a research network, need to transform the disciplinary action scheme to develop their capacity to appropriate, develop and to use technology but that allow breaks the disciplinary limits into their organizational functional structure, thus we proposed that this transformation can be done by KM processes If we observe a research network as an organizational complex system.

We had favored this transformation when we incorporated the KM process and the telematic technology. We considered to create, evaluate and to communicate as the functional process and the platform as the structural base of the organizational research network. For that we require them to design a telematics platform that support their functional structure and made explicit their disciplinary and individual models to analyze and solve a common problem.

## 4. Results

We have studied and observed a research network on social sciences of the Universidad Nacional Autonoma de México (UNAM), the group is composed of five researchers and five postgraduate students, specialists in the field of social movements and collective action, who interacted with a researcher and five undergraduate thesis writers, all Telematics Technology specialists. All were members of a university institutional project for the study of one social phenomenon, in special the social movements and collective action (Cadena, 2008).

The research was conducted at three levels of analysis and interpretation. The first consisted of revision of the basic empirical material to study, according to prior experiences, the link between the two thematic and disciplinary areas-of-interest, that is, technology appropriation and the study of collective action and social movements, especially the experiences documented by social researchers in the history of the institutional project, in order to study the design of such a relationship within the theoretical and methodological research group observed.

For the second level, which resulted from the previous descriptive analysis, we studied the ***conception, transformation and participation*** in the changes of conception of technology that are explicit en the telematic platform and the consequent involvement of social scientists in the multidisciplinary process of research while they create, evaluate and communicate knowledge, that is ***while the organization are functioning with KM process***. We are assessing the characteristics of researchers within the research group and study results comparatively in the three moments described in Figure 1 using some indicators as Recognition, Approach, Attitude Satisfaction or Motivation.

During the first moment, denominated *Initiation*, we observed some characteristics of the study group prior to the design and development of the telematics platform. In the second moment, called *Transformation*, we requested the participation of the research group in the conceptual design of the appropriation process technology, specifically, a telematics platform. Because this is conducted in parallel with the development of this platform, it is considered the instrumental resource that allows us to research specifically the evolutionary and dynamic

process of transformation of the conception of technology experienced by the group. Finally, the third moment, that is, *Results*, permitted us to verify the research hypothesis in a comparative manner in order to observe the difference between levels of use or technological appropriation and multidisciplinary participation, as well as multidisciplinary participation, in that the telematics platform developed was made up of 1) a research tool for the group observed, to the degree that is an explicit representation of knowledge, that it is composed of the fundamental concepts, classification criteria, and the research method required for such a group, and 2) it is the basis of the functional structure in that it is a facilitator for communication of, access to, and storage of explicit knowledge generated by the research group, among other functions. (Figures 2 and 3)

**Figure 1:** Research Group Characterization

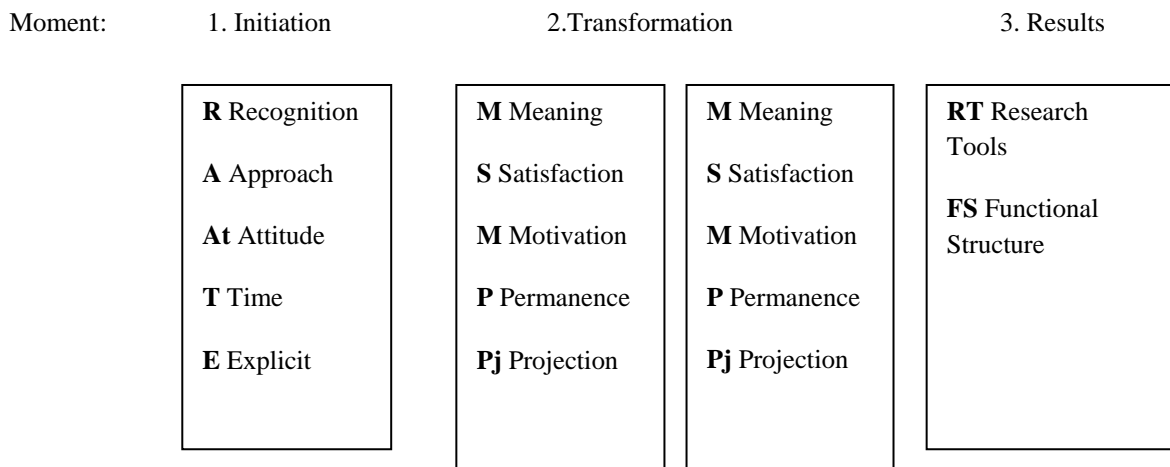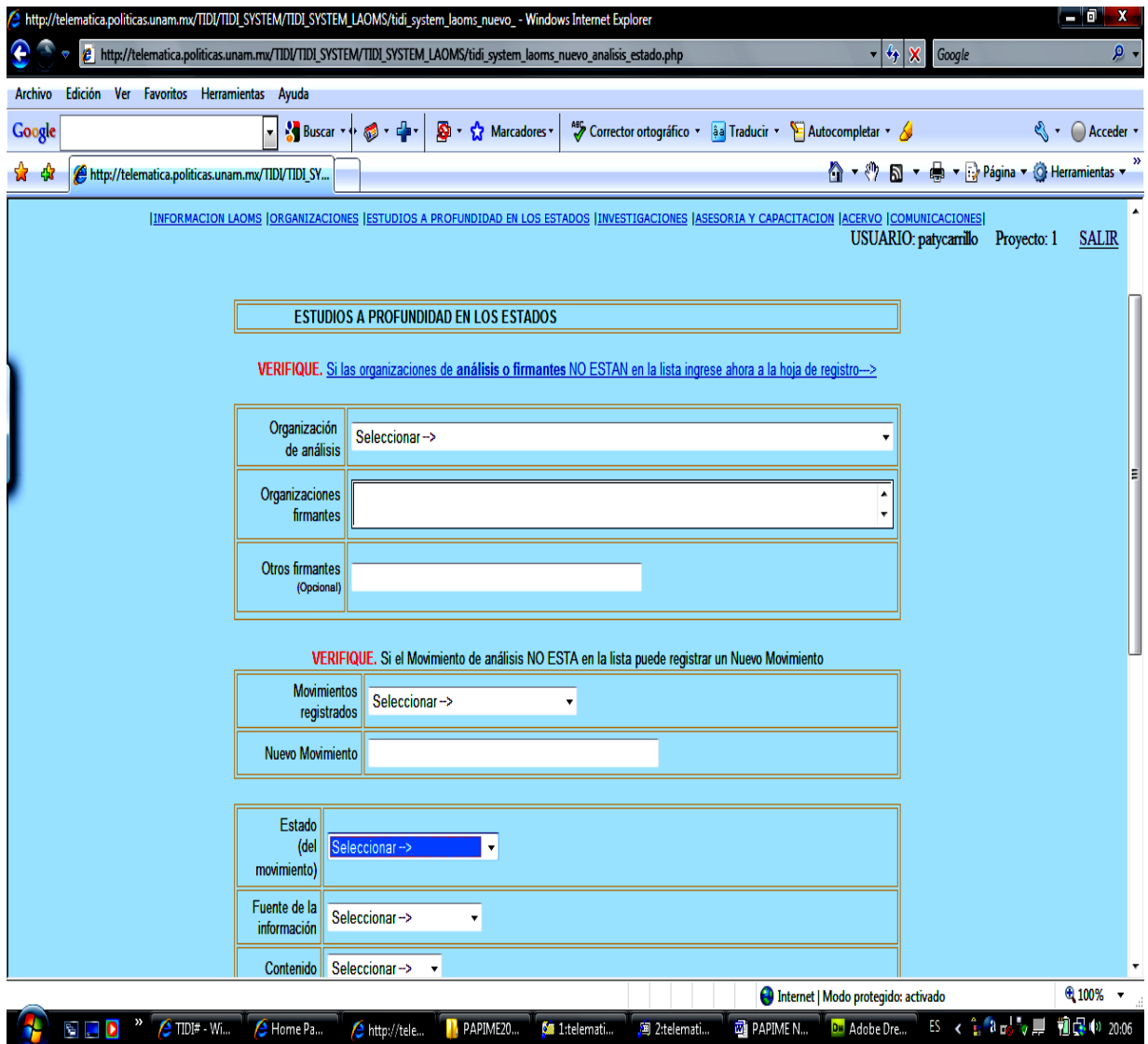| Moment: | 1. Initiation | 2.Transformation | | 3. Results |
|---|---|---|---|---|
| | **R** Recognition | **M** Meaning | **M** Meaning | **RT** Research Tools |
| | **A** Approach | **S** Satisfaction | **S** Satisfaction | |
| | **At** Attitude | **M** Motivation | **M** Motivation | **FS** Functional Structure |
| | **T** Time | **P** Permanence | **P** Permanence | |
| | **E** Explicit | **Pj** Projection | **Pj** Projection | |

**Figure 2:** Telematics platform TIDI/LAOMS

Research tool for the group observed - Explicit representation of knowledge

(fundamental concepts, classification criteria, and  research method)



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**Figure 3:** Telematics platform TIDI/LAOMS

Research tool for the group observed - Explicit representation of knowledge

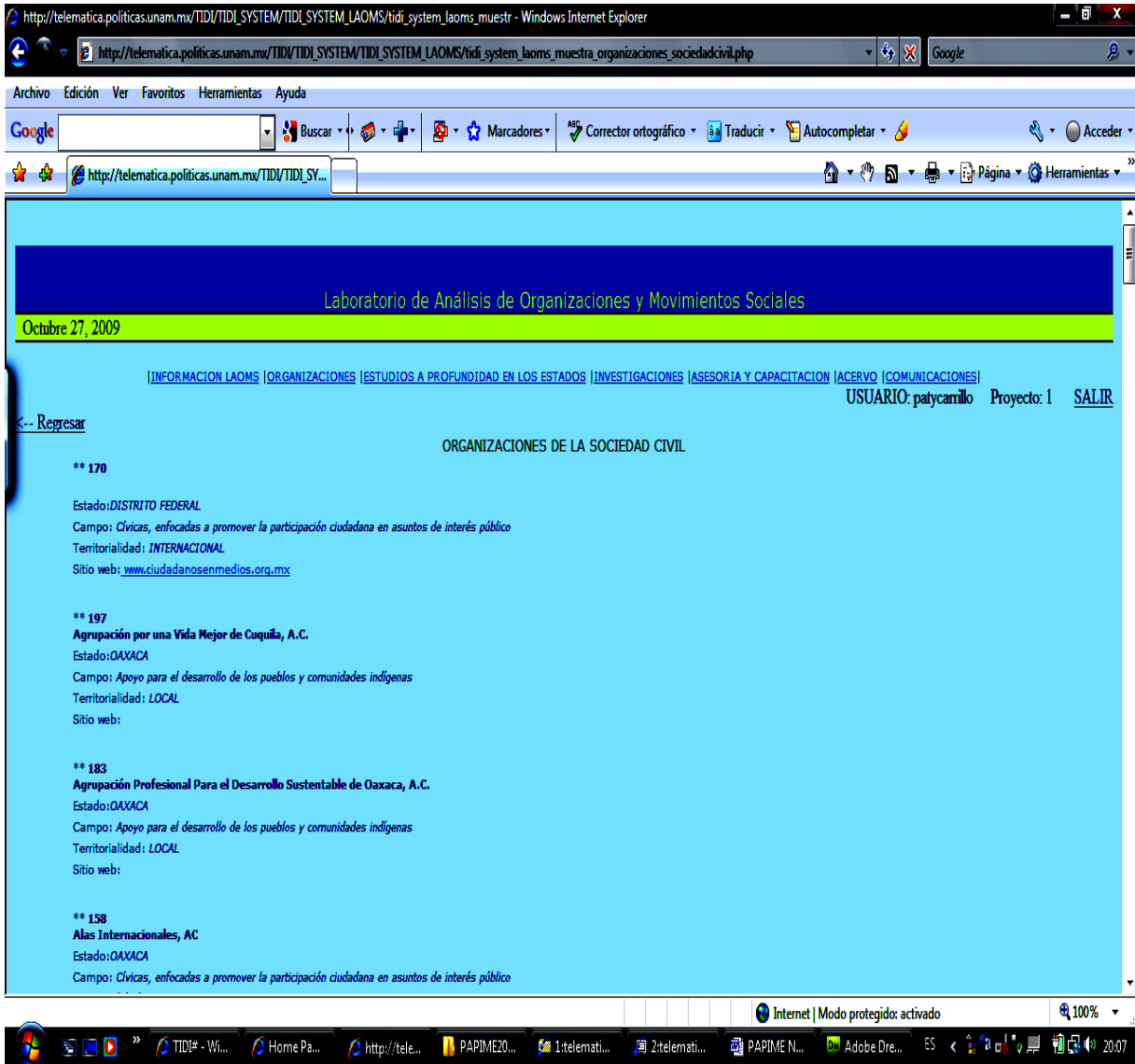(fundamental concepts, classification criteria, and research method)



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## 4.1 The Use of "Traditional" Methods and Research Tools in Social Research

While aspects relating to the operation of methods and research tools did not comprise one of our research variables, it is relevant because shows us the importance of the KM process for increase and diversify the knowledge creation in organizational contexts. In this case, the KM was useful for characterize current social research in the field of social movements and collective action in what refers to the integration of technology when we require them to design a telematic platform for make explicit their disciplinary and individual models to analyze and solve a common problem.

We considerate this characterization and design as results of research, because we could knew a possible mismatch between the level of technological capacity of the largest sector of

study in this discipline in comparison with the level necessary for impact the developing countries, to promote knowledge acquisition and construction, as well as its dissemination and outreach, due to that it breaks down the boundaries of research and addresses the need to implement functional processes for facilitating scientific research. (Figure 4)

In contrast, the result of the third stage, described in Figure 6, aids us in demonstrating the usefulness of the transformation, described in Figure 5, regarding what is observed during the second stage of the study in terms of design of technological appropriation and its relevance to research, in that the latter materializes in a telematics platform, being a particular context of meaning and of explicit representation of knowledge created during the KM process, directed, in this case, toward the study of movements and collective action.

**Figure 4:** Research Group Characterization
Moment 1. Initiation

| Questions | | NO | AVERAGE | YES |
|---|---|---|---|---|
| Do you recognize TT and propose the need for adopting TT in your project? | R | 9 | 0 | 0 |
| For your research, do you access and use other technological resources in addition to the computer, the Internet, and the telephone? | A | 7 | * | 3 |
| Do you conduct dialogues with, or do you use, the terminology of the technological field? | At | 0 | 9 | 0 |
| Do you program and have exclusive time available for the process of technology appropriation? | T | 0 | 9 | 0 |
| Do you have explicit knowledge? (e.g., definitions and classification criteria) | E | 9 | 0 | 0 |

**Figure 5:** Research Group Characterization Moment 2. Transformation

| Define technology and ownership. Do you recognize it as a system? |
|---|
| Does the platform meet your needs for research and functional structure? |
| Do you enjoy and wish to engage in other appropriations? |
| Is the platform part of your research (functional structure)? |
| Do you recognize and assign future applications to the current platform? |

|  | NO | AVERAGE* | YES** |
|---|---|---|---|
| C | 9 | 0 | 0 |
| S | 7 | *** | 2 |
| M | 0 | 9 | 0 |
| P | 0 | 9 | 0 |
| Pj | 9 | 0 | 0 |

 *USE

**APPROPRIATION

***NOT APPLICABLE

**Figure 6:** Research Group Characterization  Moment 3. Results*

| Define technology and ownership; do you recognize it as a system? |
|---|
| Does the platform meet your research and functional structure needs? |
| Do you enjoy this and want to make other contributions? |
| Is the platform part of your research ? (functional structure) |
| Do you recognize and assign future applications to the current platform? |

|  | NO | AVERAGE | YES* |
|---|---|---|---|
| C | 0 | 0 | 9 |
| S | 0 | * | 9 |
| M | 0 | 0 | 9 |
| P | 0 | 0 | 9 |
| Pj | 0 | 0 | 9 |

*APPROPRIATION:
"The platform is very useful to communicate with us, to work remotely, to communicate with the outside, to create and access databases.
It forces you to think more accurately and operationally. All theoretical and analytical categories should be put into words.
The platform makes you organize the project in terms of the platform itself, because it facilitates many things and can see the part and the whole."

The world today, from the vantage point of several fields, has observed the impact of the emergence of ICT. Specifically in the academic organizations, these profoundly alter the division and coordination of intellectual work, because its employment transcends the frontiers of research. Thus, this effect is considered a new scientific revolution.

In this scenario the academics organizations require rethink traditional ways of operating and, in general, to transform activities directed toward the creation of knowledge, and especially emphasizes the underlying need to transform the conception and the creation of their own capacities for the use of telematic technology.

The issues presented here provide empirical evidence of the profit to KM process for attend this need and simultaneously shows the usefulness of telematic platforms for satisfaction it. We additionally observe these platforms to be the intellectual capital of an academic institution in that they become a methodological-instrumental resource and an academic research product, main aims of the KM.

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