Relations Between Social Capital and Use of ICT; A Social Network Analysis Approach

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ABSTRACT

This article explores the relationship between social capital in a professional network and ICT use. It aims to understand the context in which the main ICT networks are used and show how they are conditioned by the social capital of an individual within his professional network. To do so, different measures from the Social Network Analysis are used. An exploratory study on a group of 199 students is presented. The studied Computer Mediated Communication (CMC) media are electronic mail, telephone, Skype and Facebook. The current results show the important position of an actor in the networks of exchanges. The results also show that ICT uses have different contexts involving different degrees of confidence in the network. Email is shown to be influenced by trust centrality and centrality at work while telephone is more influenced by influence centrality. We conclude on the prospects for future research.

Keywords: Social Capital, ICT Use, Computer Mediated Communication, Social Network Analysis, Centrality, Structural Equation Models.

INTRODUCTION

Does our relational network have a value? That is the question that the theory of social capital proposes to treat. This theory considers that relationships established within a social network (physical and/or virtual) bring resources.

In the Information System's point of view, the concept of relations can be considered as information exchanges. Can the Computer Mediated Communication Medias, used by members of a community, translate those relations? In other words, is the use of information and communication technologies such as electronic mail, telephones and tools like Skype/MSN and Facebook influenced by the social capital of the actors? This question will be treated by this article.

The problem of organizational communication is a multidimensional phenomenon. . A great number of studies focus on some of the aspects, yet a study of all aspects of communication does not exist. For instance, in the area of Information Systems, the relationship between technologies and usage has often been studied (De Vaujany, 2000; Desanctis et Poole, 1994; Josserand, 2001; Kalika, 2000, Kalika, 2002 p. 221-236; Limayem et al, 1997; Rowe et Beal, 1998; Rowe 2002; Yates et al, 1992; Bergeron et al, 1995; Boukef et Kalika, 2000; Crawford, 1982…). Theories and research models have been proposed to understand this question (Davis, 1989; Venkatesh et al., 2003; Fishbein et Ajzen, 1975; Ajzen, 1991; Rogers, 1995…). Other authors have been interested in the nature of the relationships (Lasswell, 1973, p. 699). They focused on the sender and the receiver or on both of them (Watzlawick et al., 1967; Moreno 1970; Short et al, 1976).

Currently, knowledge about relationships between ICT and social capital is insufficient (Yang et al. 2009, p.184). Researches on ICT usage are numerous. Nevertheless, those which consider both, the network of exchanges and the actor's position within the network, are scarce. Sociological approaches, such as social network and social capital, aim to fill this gap and that will be this research's perspective.

This article is about social capital within a professional network and ICT usage. It is a study in progress, which aims to provide answers to the different contexts in which the main current communication Medias are used, and to show to what extent the social capital in a professional area affects the use of electronic media. We assume that the social capital of an individual affects his use of various electronic communication media.

This article is built on five parts. The first two Parts present theories used in the research model, concerning ICT use and the concept of social capital. The research model is then presented in Part Three. In the fourth part, the methodology used is described, as well as its treatment. The results are presented in Part V and discussed in the last part before the conclusion.

THE USES OF ICT

Several studies seek to identify technical, economical, sociological, psychological, and other factors that influence the use of electronic media. Some seek to explain the innovation adoption and use of ICT. Among the theories and famous models are the Model of Technology Acceptance (TAM) (Davis, 1989), the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003), the Theory of

Reasoned Action (TRA) (Fishbein et Ajzen, 1975), the Theory of Planned Behavior (PBT) (Ajzen, 1991), and the Theory of Diffusion of Innovations (DOI) (Rogers, 1995).

If we define each of these theories by specifying the variables they use (dependent variables and independent variables), they take little account of the relational aspects associated with the network (see * in table below). In the Utaut model, acceptance and use of technology are explained by several variables: the expected performance, the effort, social influence and facilitating conditions, gender, age, experience and willingness to use (Venkatesh et al., 2003, p. 447). In this model, social influence is the degree of an individual's perception of the fact that people who are important to him feel that he should use the new system (Venkatesh et al., 2003, p. 451). The relational aspect is translated here by the opinion of other people about each other. In the Theory of Reasoned Action (TRA), the behavior of an individual is conditioned by his intention to perform a particular action, which is determined by the attitude of the person toward the action and the " subjective norm". The subjective norm represents the idea that the most important people according to the individual believe that the individual should (or should not) perform the action. The relational aspect is also reflected here through the eyes of others on the individual behavior. Similarly, in the TPB, the idea of subjective norm is taken, corresponding to the received opinions of others. The individual is motivated to conform by to the expectations of others. If these researches refer to the relational aspects (Rai et al., 2009), they do not explicitly take into account the concept of social capital (Yang et al. 2009, p.191). Moreover, most of them include uses of those tools in a non-differentiated way but in fact, uses overlap, as Kalika et al. (2005) shows us with the "Cream slice" effect.

Theories and models	Dependent Variables	Independent Variables
Technology Acceptance Model) (**TAM**) (Davis, 1989)	*Behavioral intention to use*	*Perceived usefulness*
	System usage	*Perceived ease of use*
Unified Theory of Acceptance and Use of Technology (**UTAUT**) (Venkatesh et al. 2003)	*Behavioral Intention*	*Performance Expectancy*
	Usage Behavior	*Effort Expectancy*
		Social Influence
		Facilitating Conditions
		Gender
		Age
		Experience
		Voluntariness of Use
Theory of Reasoned Action (**TRA**) (Fishbein et Ajzen, 1975)	*Behavioral Intention*	*Attitude Toward Behavior*
	Behavior	***Subjective Norm***
Theory of Planned Behavior (**TPB**) (Ajzen, 1991)	*Behavioral Intention*	*Attitude Toward Behavior*
	Behavior	***Subjective Norm***
		Perceived Behavioral Control
Diffusion of Innovations (**DOI**) (Rogers, 1995)	*Implementation Success or Technology Adoption*	*Compatibility of Technology*
		Complexity of Technology
		Relative Advantage (Perceived Need for Technology)

Table 1 : Taking into account the relational aspects in the theories about the uses of ICT

We can also refer to the theories and authors closer to sociology. These authors present models where there are reciprocal and recursive relationships between the media and the communication, based on theories such as the structuring theory (Giddens, 1988) and the gender theory (Contractor et Eisenberg, 1990 ; DeSanctis et Poole, 1994 ; Yates et Orlikowski, 1992, 2002…). In the case of the structuring theory, the important

part is the emergence of a system of rules that constrains and facilitates social interaction. In the gender theory, the focus is on the development of social "standards" of communication (content of communications) to structure the interactions. However, these theories do not include relational conditions related to usage.

This problem becomes all the more acute in communication technologies. This research aims to fill this gap. It proposes the integration of social relationships to the measure of uses.

The problem here is in terms of the network of exchanges structure, promoting the use of a media. The work is based on the Social Networks Analysis.

The Social Networks Analysis

The Social Network Analysis (or SNA) is an approach that considers society as a system of actors - individuals, groups, organizations - linked by a number of relationships. These relationships can be of several types and the analysis consists of investigating about the presence (or absence) of these relations (Tichy, 1981; Brass and Burkart, 1992).

A social network represents a set of nodes (individuals, organizations) linked by a set of social relationships (friendships, transfer of funds ...) (Laumann and Pappi., 1976, Lazega, 1998). The network analysis includes a description of the relationships' structure and configuration, as well as an identification of their causes and their consequences (Tichy, 1981; Laumann and Pappi, 1976; Nohria, 1992). The social network perspective can be used as an alternative approach for studying virtual work and virtual teams (Ahuja and Carley, 1999; Quan-Haase and Wellman, 2004; Robert et al. 2008). From this perspective, social actors interact. This perspective focuses on these interactions (between individuals within a group and between groups within an organization, etc.) and allows a better description and understanding of the organization's activities (Lamb and Kling, 2003; Reagans et al. 2004). Thus, this perspective allows us to take into account both types of parameters: those corresponding to the social actor (relative to other network actors) and those corresponding to the relationship between each actor and the global network (Reagans et al. 2004). Among the many concepts used by the SNA (Social Network Analysis), the most studied one is probably the centrality.

The centrality of actors

The usual conception of the centrality requires the study of every actor's involvement in a network. A system is said to be centralized when all relationships involve a single actor (Burt, 1980, p. 117, 1982, p.33). This strongly contributes to describe the inequality in the involvement of each actor in a relational network (Burt, 1980 p.117). Although some authors point out the importance of peripheral positions (Granovetter, 1973), it is generally assumed that the centrality in a network translates the "importance" of the individual in his network. Some authors have linked this idea of centrality to the one of power (Bonacich, 1987), influence or leadership (Wasserman and Faust, 1994). Those who have the most central position in a network have a privileged relationship in any exchanges.

How to identify the 'most important' actors in a network? Several authors agree that the most important actors are usually located in strategic locations in the network. If we define the centrality of a graph as its center, does it actually contain the most important person? An actor is important if "links on this actor makes it particularly visible to other

actors in the network" (Wasserman and Faust, 1994, p.172). These links are not only direct links, but include indirect links, involving intermediate links.

Authors such as Knoke and Burt have distinguished two major classes: centrality and prestige (Wasserman and Faust, 1994, p.173). The most intuitive definition of centrality is to consider that an actor is central if he is involved in several relationships (Wasserman and Faust, 1994). Several additions and changes of this concept have been proposed since then (see Wasserman and Faust, 1994 p. 174). Similarly, several measures have been proposed by the authors to assess the "importance" of an actor. The indices differ according to the level of analysis. This may be an actor (we will refer to the activity (degree ...), the position (proximity, betweenness position)), a dyad (dyadic measures), or the network as a whole ("Eigenvector" " intermediate position overall"). Another difference lies in the data. Relationships can be symmetrical (the relations from A to B are equal to those from B to A) or asymmetrical (opposite case). In the case where communication links are symmetric, indices concerned are called "centralities". In the opposite case, when there is an asymmetric flow of communication, the indices concerned are called "influence". A detailed description of the main indices of centrality is presented in Wasserman and Faust (1994). Freeman's measures of centrality (1979) are among the most famous. He proposes three measures of centrality: degree, closeness and betweenness. The degree is the number of direct connections an individual has with other members of his network. This measure considers that the more an individual is central, the more he is directly linked to a large number of individuals in the network. This notion of degree is defined into two parts: the exchanges that the individual receives from the network members (the In-Degree) and the exchanges that the individual sends to members of the network (the Out-Degree).

The closeness provides a more global view of the centrality since it considers the proximity of an individual towards others. Finally, the betweeness considers that an individual may be poorly connected to others, even distant, but he can serve as an intermediary in the exchanges between other individuals in the network.

Other centrality measures can be used to treat several aspects of the importance of an individual, giving the central individual more information, power, prestige or influence. The ones we used in our research are summarized in the table below.

Degree	A measure of the activity. The central actors have more relationships than other actors in the network.
In-degree	Oriented links of network members to the individual
Out-degree	Oriented links of the individual to network members
Eigenvector	Assessment of the centrality of an actor, considering that his centrality depends on the centrality of actors he is connected with.
Authority	For a weighted graph, we can add all the weights of relations from and to an individual.
Hub	Node having important degree and betweenness.

Table 2: Centrality measures used.

These measures allow us to better interpret the concept of a centralized structure in a communication network. This structure is influenced by the social capital of the individual.

THE CONCEPT OF SOCIAL CAPITAL

Over the last 10 years, the concept of social capital has been mobilized in many works and in different disciplines. In the early 1990s, the number of studies using this concept did not exceed 3. In 2003, there were more than 300 studies of this type were carried out (Putnam, 2004). This abundance creates an heterogeneity of definitions, interpretations and approaches. The question on the definition of "social capital" is therefore difficult, ambiguous and involves several sources of interpretation. Without being complete, the following paragraphs attempt to describe the common elements between different approaches.

Preliminary

In his book Bowling Alone (2000), Putnam believes that the concept of "social capital" has been referred originally by Hanifan in the 1920s. For him, social capital includes the goodwill, friendship, sympathy and social relationships among the members of a social unit. From his point of view, each individual is related to others, allowing the accumulation of social capital.

So the social capital is a phenomenon supported by the network of individual relationships. Its effects are beneficial on an individual and collective level.

In his study of the class concept, Bourdieu has identified three aspects of the concept of capital: economical (income, wealth), cultural (language, knowledge and know-how, intellectual capital ...) and social capital. One characteristic of these resources is to find their effectiveness in their social environment. Bourdieu (1980, 1985) defines social capital as "all present or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance and mutual gratefulness, or, in other words, to membership in a group, where all agents have not only properties in common ... but are also united by permanent and useful links ". Thus, the volume of capital of an individual depends on the density, the nature and the extent of his network of relationships, but also depend on the volume of capital from those he is linked. Bourdieu uses this concept in his interpretation of power, these social relations that increase the ability of an actor to develop his own interests.

Coleman (1988) introduced the concept of social capital, based initially on two concepts to describe and explain social action. The first is the sociologists' one which considers that the actor is socialized and that actions are governed by social norms, rules and obligations. The second is the economists' one, which considers that the actor has goals he fixes independently, that he acts independently and is fully guided by personal interests (p.95). By combining these two approaches, Coleman introduces the concept of social capital (p.96). He borrows from the economists the principle of rational action to use it in the analysis of properties of social systems (p.97). The notion of capital is also presented with concepts of financial capital, physical capital and human capital, expressed through relationships between people (p.118). He defines the concept of social capital in three aspects: the obligations and expectations, which depend on trust (trustworthyness) existing in the social environment, information flow capacity of the social structure and norms coupled with sanctions. So Coleman (1988) develops a reflection on social capital focused on the functions. Like other forms of capital, social

capital is productive, making possible the achievement of certain ends that could not be reached without him.

The concept of social capital by Putnam (1993, 1995) is based on three elements: moral obligations and standards, social values (especially trust) and social networks (including associations). According to him, social capital refers to features of social organizations such as networks, norms and trust. It facilitates coordination and cooperation, developing therefore mutual benefits. The social capital is a factor that positively influences economic performance and social integration. This author raises the trust as the central concept for developing social capital. It emerges from local interactions and reciprocal attention. It allows the development of "good actions" to be rewarded by the positive development of mutual relations. It is needed in complex, ambiguous, contingent and risky environments, where the actors have difficulty to anticipate the reactions of others. Thus, the concept of social capital by Putnam can be interpreted as a mechanism for increasing consensus and the integration of values (sociology of integration), while that of Bourdieu may be interpreted as a mechanism involved in social conflicts and power structures (sociology of conflict) (Martti Siisiäinen, 2000).

Burt (1992) considers the social capital from the relational point of view rather than focusing on individual attributes. Social capital is close to relational capital that is to say, friends, colleagues, partners ...from an individual's perspective, the usefulness of social capital depends on 'structural holes'. By "structural hole" in a network of relationships, he means the separation between two non-redundant contacts. Contacts will be considered redundant if they know each other directly or indirectly: they will be in a situation of "structural equivalence". In other words, the usefulness of social capital increases if members of relational networks do not know each other. This non-redundance of contacts allows the actor to diversify the sources of information and to implement forms of control in exchanges. According to Burt, property and human assets are the production capacity of the firm. The intra and inter-firm relations constitute the social capital. Social capital represents the structure of contacts within a network and the resources they hold. In the first case we describe how we reach and in the second case we described who is reached (Burt, 1992. P.61).

In summary, those who promote the concept of social capital consider that social relations, based on norms, shared values and trust, facilitate coordination and cooperation between individuals. It is a beneficial resource to a collective and an individual point of view (Riemer and Klein, 2008; Robert et al., 2008). At a macro-social level, authors such as Putnam consider the sociability and participation in associations, standards and values as a capital stock influencing social and economic phenomena. This point of view has been supported internationally by the World Bank and OECD. However, empirical validation at a macro social level remains to be established, which can lead to conflicting results depending on the level of analysis (Ponthieux, 2004).

Definitions of social capital are numerous, depending on the level of analysis: individual or collective (Yang et al. 2009, p.186; Badrinarayanan et al. 2011). The authors propose to differentiate between situations where the capital is considered as a dependent variable or as an independent variable. As a dependent variable, in the IS area, it means to study the impact of ICT on social capital, and as an independent variable, it means to study the effects of social capital on the use and development of

ICT. They show that there is relatively little research on the topic of social capital as an independent variable (p. 190). This work fits into this last perspective and aims to complement current research in this area.

So, relationships and social interactions are at the heart of the concept of social capital. It is also the case for the social network. Are these two concepts the same?

Social capital and social network

The social capital has its origins in social interactions between actors belonging to an identified group. This notion of a group of actors is also studied in the field of social networks. These two concepts, social capital and social network are closely linked. The sociologist Bourdieu, cited by Montes and Pronovost (2007) considers social capital as the sum of resources, for an individual or a group, from a sustainable network of more or less institutionalized relations, contacts and mutual gratefulness (p .7). Adler and Kwon stipulate that the social capital is "the benevolence available to individuals and groups. Its origin comes from the structure and the content of actors' social relations. Its effect is manifested in the form of information, influence and solidarity available to the actor (p.8). According to Lin, the social capital is made of "resources embedded in a social network, [...] moreover the social capital represents assets available in the network" (p.8). So the network concept is very close here, in terms of social network analysis.

The Social Network Analysis (or SNA) is indeed an approach that considers society as a system of actors - individuals, groups, organizations - linked by a number of relationships. These relationships can be of several types and the analysis consists of the study of the presence (or absence) of these relations (Tichy, 1981; Brass and Burkart, 1992). A social network represents a set of nodes (individuals, organizations) linked by a set of social relationships (friendships, transfer of funds ...) (Laumann et al., 1978). Network analysis includes a description of the structure and the configuration of relationships, and the identification of their causes and their consequences (Tichy, 1981; Laumann and Pappi, 1976; Nohria, 1992). From this point of view, social actors interact. This perspective focuses on these interactions (between individuals within a group, between groups within an organization, etc...) and allows a better description and understanding of the organization's activities (Lamb and Kling, 2003). Thus, this perspective manages to consider both two types of parameters: those corresponding to the social actor (relatively to other actors in the network) and those linking each actor to the whole network.

Authors who have studied the two concepts all assume that the two concepts of social capital and social networks are muddled (Montes and Pronovost, 2007, p.9). Some like Putnam consider social capital as a quality of groups (governed by the law, trust) and others like Burt see it as the value that an individual can have from his social relations (Burt, 1980, 1982). Freeman suggests an association between different dimensions of social capital (trust, loyalty, shared vision ...) and the use of topography tools (sociomatrix of formal and informal interactions) on the network (Montes and Pronovost, 2007, p.10). The idea of the simultaneous use of the social capital and social network concepts seems unavoidable. This is the case of this research. To do this, we are presenting some assessments to this concept of social capital.

1.1 The social capital measures

This concept of social capital is used by some studies in management in general and in information systems particularly (Cucchi et al. 2009; Yang et al., 2009; Riemer and Klein, 2008; Robert et al. 2008). In management, social capital is used primarily in the field of knowledge management.

We can use the definition of Nahapiet & Ghoshal (1997, 1998) who consider social capital as "the sum of actual and potential resources embedded within, available through, and coming from the network of relationships possessed by an individual or a social unit". Thus, these authors adopt a wider perspective by including both the structural dimension of the network and potential resources mobilized by the network.

As noted by Putnam (1995, 2004), the concept of social capital is still under construction. The main contribution of these authors is to respond to a need for clarification and operationalization of the concept of social capital. Nahapiet and Ghoshal (1997) consider that there are three attributes of social capital:

- The structural dimension
- The relational dimension
- The cognitive dimension

The structural dimension

The structural dimension refers to the pattern of connections between actors, including links through the network, configuring the network in terms of density, connectivity, etc ... (Nahapiet and Ghoshal, 1997). The structural dimension "concerns the properties of the social system and the whole network. This term describes the impersonal configuration of linkages between people or units "(p. 244). According to Burt (1992), the structural dimension describes the set of connections between actors, the presence or absence of links between actors. This information is given by questions such as: Who can you reach? How can you reach them? The network structure does not predict directly the attitudes or behavior; it predicts similarities between attitudes and behavior. (Burt, 1992, p.60). He underlines the fact that people develop relationships with other people like themselves. According to the author, there are reasons for this. Socially similar people, even when they pursue different interests, spend time in the same places. Relationships emerge. Socially similar people have more common interests. Relationships are maintained (Burt, 1992, p.60). By 1982, he proposed an analysis of the network structure based on six models, depending on the kind of approach: relational or positional (Burt, 1982, p.30). Most of these models measure social integration. An actor is "isolated" at the periphery of the system if he has no relation with other actors of the system. Two models have been used to describe the social integration of actors: centrality and prestige. An actor has a central position if he is involved in all relationships in the network (Burt, 1982, p.33).

Other authors propose to study the structural characteristics, but also the characteristics of the links and the participants' characteristics within the network. In his chapter on social network analysis, Tichy proposes to study the characteristics of links according to four axes: reciprocity, clarity of standards, intensity and multiplexity. Similarly, the structural characteristics may be, in his point of view, organizational density, grouping, size, visibility, the criteria for recruitment, openness, stability, connectivity, density and centrality. Finally, he also proposes to examine the

characteristics of key participants, as we consider them as a star, as a liaison agent, as a bridge, as a gatekeeper or as an isolated actor (Tichy, 1981 p.229).

Degenne and Forsé (1994) point out the importance of the structure as a constraint and as emergent effect: The structure is concretely considered as a network of relationships, but it is also «constrained». It is the network as a constraint on selection, orientations, attitudes, opinions, etc. ... of individuals. So network analysis allows a structural analysis whose purpose is to show how the shape of the network can explain analyzed phenomena (Degenne and Forsé, 1994, p.8). Therefore, we agree with Nohria that networks are more processes than structures, they are continually formed and reformed by the actions of actors who, in turn, are constrained by the structural positions in which they find themselves (Nohria, 1992, p.7).

This structural dimension allows the consideration of two levels of analysis. At the individual level, it measures a set of indicators on the position of an actor in the network: centrality, prestige, ... (see Wasserman and Faust, 1994). These measures can then assess the social integration of the actor in the network (Burt, 1982). A measure of the structural dimension proposed by Nahapiet and Ghoshal (1997) includes:

- The links in the network (who do you know?)
- Network configuration
- An appropriate organization

Regarding this research, the structural dimension will be treated in two ways:

1. With whom do you work?

As we study the relations in a professional context, we consider in this research links in the network which allow us to know with whom the individual works.

2. The use of social network analysis

In fact, we believe that there is not a single structure but many structures. The homogeneous characteristics of structures depend on the context of use. We use social network analysis to compare the structures of relationships.

Thus, in the structural dimension, we focus on the centrality of the individual in his professional network and we believe that this centrality positively influence the use of ICT.

The cognitive dimension

Communication between actors has a sense only if they share in the understanding of the context. This common knowledge is the cognitive dimension. It refers to resources that enable a common understanding, representations and systems of common meaning, common language, code and story sharing. A measure of the cognitive dimension proposed by Nahapiet and Ghoshal (1997) includes 3 aspects:

- shared codes and language

The language has an important social function in social relations. It is the means by which people exchange information and conduct their business. By sharing a language, it allows actors to meet each other more easily. The shared language also provides a shared repository which allows evaluating the potential benefits in the exchange.

- shared histories

The stories, myths and metaphors also provide powerful tools for groups to share and preserve rich systems of meanings. Metaphors, by ignoring contexts, allow the combination of imagination, observation and cognitive capacities. The stories, rich in details, facilitate the sharing of tacit knowledge and improve practices. The emergence of stories in a group enables the creation and exchange of new interpretations of events by facilitating the exchange of knowledge, including those which are tacit.

- shared tacit knowledge

Based on the fact that we know more than we can say, Polanyi (1967) supports the idea that any form of knowledge has theoretical and practical aspects where the tacit dimension is essential.

Regarding this work, we consider the cognitive dimension in the choice of good individual behavior at work. This allows us to interpret the level of proximity, similarity in their vision and to position unified actors. Therefore, the idea of shared vision represents the cognitive dimension and it should influence positively the use of ICT.

The relational dimension

The relational dimension refers to what is mobilized throughout the relations, including attributes such as trust, norms and sanctions. A measure of the relational dimension proposed by Nahapiet and Ghoshal (1997) includes 4 aspects:

- Trust

Trust is one of the cornerstones of the relational dimension (Henttonen and Kirsinarja, 2005; McAllister, 1995; Jarvenpaa et al. 1998). The actors who develop a sense of trust involve themselves more in social interaction. They tend to take more risks in exchanges, to try more things. Finally, trust can adapt more easily to changing and complex situations, ignoring more or less opportunistic behaviors.

- Standards

The cooperation standards facilitate the beginning of the exchange of knowledge. Openness to criticism standards also permits to avoid the effects of groups that inhibit the development of intellectual capital

- obligations and expectations

The obligations and expectations mean a commitment or duty to carry out activities in the future. They act as "credit for error" to be repaid by future behavior.

- Identification

It is the process by which individuals recognize themselves through the values of a group or as belonging to a group. Identification with a group enhances the collective processes and exchanges opportunities. It acts as a resource influencing the motivation to share.

This relational dimension is multifaceted. It has close links with the loyalty, commitment, involvement. It may also represent the relationships of authority or power, that is to say, the networks of influence. We have thus represented the relational dimension in our research by the network of influence and trust. These relational aspects should influence positively the use of ICT.

In summary, we consider the dimensions of social capital in its structural, relational and cognitive, to explain the use of IT by measuring the centrality of users of IT within a social network. This is what our research model describes below.

THE RESEARCH MODEL

Among the tools of ICT, some have the characteristic that they can support social relationships. We think about common tools such as email (Cucchi, 2004), the mobile phone, online discussion tools such as Messenger or Skype, or social networking tools like Facebook. Indeed, they all have the particularity to connect a user with other group members.
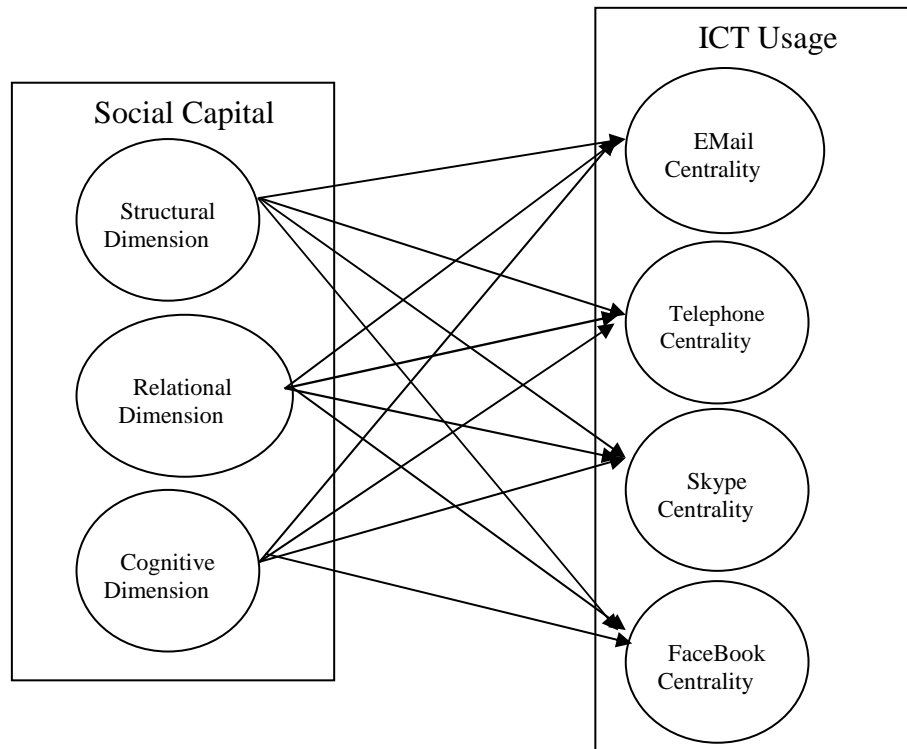

Figure 1 : Research Model

The research model (see figure above) attempts to show that social capital has an influence on the uses of various electronic communication tools. The relationships are tested on the basis of indicators of social network analysis. As the research is an exploratory one, we do not know, a priori, any meaningful connections. We can therefore formulate the following research hypotheses:

H1: There is a significantly positive effect between the structural aspects of social capital and the use of Email

H2: There is a significantly positive influence between the relational aspects of social capital and the use of Email

H3: There is a significantly positive influence between the cognitive aspects of social capital and the use of Email

H4: There is a significantly positive effect between the structural aspects of social capital and the use of the Telephone

H5: There is a significantly positive influence between the relational aspects of social capital and the use of the Telephone

H6: There is a significantly positive influence between the cognitive aspects of social capital and the use of the Telephone

H7: There is a significantly positive effect between the structural aspects of social capital and the use of Skype

H8: There is a significantly positive influence between the relational aspects of social capital and the use of Skype

H9: There is a significantly positive influence between the cognitive aspects of social capital and the use of Skype

H10: There is a significantly positive effect between the structural aspects of social capital and the use of FaceBook

H11: There is a significantly positive influence between the relational aspects of social capital and the use of FaceBook

H12: There is a significantly positive influence between the cognitive aspects of social capital and the use of FaceBook.

This model will be tested using a methodology described below.

METHODOLOGY

The questionnaire[1]

Data collection has two aspects. The first one is related to individual perceptions about two dimensions: the social capital dimension and the use of tools supporting the technology dimension. We relied on the measurement scale of Chiu et al (2006). This one has been adapted and enriched for measures of social capital. This data was collected on a Likert scale of 7 points. This data is not involved in the proposed paper.

The second aspect is the collective dimension. The aim is to gather information to report relational and collective dimensions and to process them according to the Social Network Analysis approach (Wasserman and Faust, 1994; Lazega, 1998). For this purpose, specific data that reflects the position of individuals in the network have been collected. This data takes the form of a list of names and a measure indicating the strength of the relationship. For example, for the structural variable "working relationship" this question was asked to the actors of the group:

"Among the students of your class (maximum 10) which ones would you like to work with (outside of class hours)?"

By following a mask, then the respondent should provide a list of names, associating each name with the average weekly time spent working together.

Doing so, the respondent refers to the list of actors in the group he seems nearest (or farthest) according to the structural variable. Here is the list of structural variables used:

- The structural variable "preference to work" to identify the general pattern of relations in the working group
- The structural variable "capacity to influence the behaviour" to describe relations of power within the group. These relationships can be construed in the broadest sense. To use the dichotomy drawn by Weber, power can be described rather in terms of authority, i.e. the ability to provoque voluntary action by another social player. Indeed, among students there is no hierarchical relationships (or similar) that may impose decisions and orders.

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[1] The specific questions addressed in the questionnaire is available in appendix

- The structural variable "shared vision" is used to characterize the homogeneity of individual representations in the network. In this work, the shared vision focuses on people's behavior at work, questioning what they consider to be "good individual behavior in a group."
- The structural variable "trust" to characterize the relational dimension between social actors within the network.
- The structural variables related to technology uses: frequency of message exchanges, frequency of telephone conversations, frequency of Skype / MSN exchanges (or by similar tools).

The use of these structural variables aims at characterizing the relationships between individuals in two dimensions: the real and emotional dimension and the "virtual" dimension of technology uses

Sample

At this stage of the research, the team designed a questionnaire (see appendix). It was developed with Sphinx software and was put on-line for the students of the IAE (a Business School from the University of La Réunion). This mode of administration facilitates the data collection and expands its potential use in other environments and / or other conditions: administration with other students, students from other universities, teams or services in companies ... From an operational perspective, the students are gathered during a working session and should connect to a server (SphinxOnline for the administration of the questionnaire through the internet). The person in charge of administering the questionnaire emphasized the anonymous nature of the results presented. He also stressed on the need to collect a significant share of the group. Indeed, the unit of analysis being the place of the individual in the group, an insufficient number of responses would not address the collective dimension. To date, data from 199 students from different levels were collected (Bachelor, first or second year Masters degrees from 11 different classes). This first stage was used to validate the relational data gathering with an on-line questionnaire[2].

The research model has been treated with a "Partial Least Square" (PLS) methodology. It has been used to verify the adequacy of the data and the research model.

Centrality measures

The programmable environment for statistical treatment R (V 2.10.1) was used to process relational data. Packages Statnett and Igraph were used to automate the calculation of a set of centrality indicators (see the list of indicators Table 2). These indicators are calculated from multiple adjacency matrices characterizing the relationships of various kinds: labor relations, relations of trust, proximities representations (individual behavior in group), relations of influence, use of email, phone usage, use of video conferencing such as Skype / MSN and use of FaceBook. A factorization procedure has been used to identify the most important dimensions.

Factor Analysis Process

The data used comes from calculations of actors' centrality.

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2 Some authors talk about "name generators"

Firstly, in order to avoid scaling factors and to limit the effect of differences in distribution, the data will be centered and reduced. The method "Listwise deletion" is used to perform missing data.

In this process of factors construction, a first question is to know if the initial data, indicators of centrality, can be factorized. These data should be suitable enough to permit to find common dimensions which are meaningful and not only a statistical artifact (Evrard et al., 1997, chapter 10). Two tests are available for this purpose:

The sphericity test of Bartlett: it measures if the set of points has specific directions or if it has a spherical form. The test of data adequacy (MSA Measure of Sampling Adequacy) of Kaiser, Meyer, and Olkin can be calculated globally (KMO index) and for each variable (MSA index) in the Anti- Images Matrix, the diagonal matrix of Anti-Image Correlation in SPSS). These values must be greater than 0.5.

The method of maximum likelihood is used to construct the factors because it is the most robust. The Kaïser test (Eigenvalue greater than 1) will be used to determine the number of factors. For each concept, gathered in one factor, the Cronbach's alpha is calculated to verify the validity of the factor. The value of this indicator should be greater than 0.70.

After this factorization procedure, three factors were obtained:

- « Centrality » : Degree, Eigenvector, Hub and Authority
- « Closeness » : Closeness, Closeness in, Closeness Out
- « Betweeness » : Betweeness

Treatment of the structural model

The proposed structural model has been performed with Partial Least Square (PLS software Smart V2.0M3). This is an alternative technique to methods which are based on analysis of covariance. Many reasons explain this choice. Firstly, this work presents an exploratory nature. The methods based on analysis of covariance structures (like LISREL) are suitable for confirmatory researches. They intend to confirm the parameters of a known theory. By trying to maximize the explained variance, PLS is rather oriented to the prediction. Moreover, as we often meet in the social sciences, the data collected contains errors and their distributions are not well adjusted. Thus, the condition of normality of data is not fully respected. From this point of view, the PLS methods are less sensitive and accept data whose distribution is less adjusted. The sample size and the number of indicators needed for the convergence of the models are also lower. In summary, according to Chin (2000), PLS has the characteristics of a more flexible approach, particularly adapted to exploratory research.

Results

From a methodological point of view, the initial model was tested with the three measures of centrality that have emerged from the exploratory factor analysis. In order to be clear and concise, we chose to focus on the first measure "Centrality". Indeed, the associated indicators are those that occur most frequently in the work dealing with the social network analysis (including measures of degree and Eigenvector centrality). The presented results will test the research model using a measure of centrality composed of Degree, Eigenvector, Hub and Authority.

Initially, the criteria for goodness of fit of the model will be examined. In a second step, the results of the treatment of the structural model will be discussed

The adjustment of the model

The adjustment of the model aims to know if the results are adequate and may be interpreted.

		AVE	CR	R^2	α
Relational	Influence Centrality	0,68	0,91	0,37	0,88
	TrustCentrality	0,64	0,90	0,00	0,85
Cognitive	Vision	0,60	0,88	0,55	0,83
Structural	WorkCentrality	0,63	0,89	0,61	0,85
IT Social Network	MSGCentrality	0,63	0,90	0,66	0,85
	TELCentrality	0,66	0,91	0,55	0,87
	SKYpeCentrality	0,72	0,93	0,22	0,90
	FCB CEntrality	0,62	0,89	0,17	0,89

Table 3: Indicators of quality adjustment « Centrality »

The indicators described in the table above characterize the quality of adjustment of the global model. Thus, the levels of variance extracted (AVE: Average Variance Extracted) are above 0.60, beyond the limit value of 0.5, the levels of reliability (CR: Composite Reliability) are above 0.88 and well above the limit of 0.7, the percentages of explained variance of latent variables (R2) have different levels and are discussed in the results part, the Cronbach's alpha (α) are higher than 0.83 and show the convergence of items to the latent variable. In terms of convergent validity, Chin (1998) considers that the level of AVE should be greater than 0.5. This is the case for all constructs. Assessment of discriminant validity is to ensure, in the case of reflexive measures, that the variance shared by the latent variable with its items is larger than the one shared with the other latent variables. This means that for each latent variable, the square root of the AVE is higher than the correlation with the other latent variables. It is the case in the tested model (see Appendix). In addition, items of each measure load more on the latent variable than on the other (see Appendix). Consequently, according to presented quality indicators, we can consider that the measures used satisfy conditions of convergent validity and discriminant validity.

The final model

Data processing was carried out in two stages. Initially, the concepts used in the context of the social capital theory (trust and Influence for the relational variables, vision for the cognitive dimension, centrality at work for the structural dimension) were linked to the variables about the ITC use (centralities in email, telephone, Skype/Msn and Facebook networks). An approach by bootstrap was performed in order to test the relationships on the basis of 300 random samples consisting of 100 observations. In this way, the treatment of this initial model revealed significant structural relations.

On the basis of these significant relationships, a second model was built. It considers only the structural relations with a high level of significance (p <0.01).
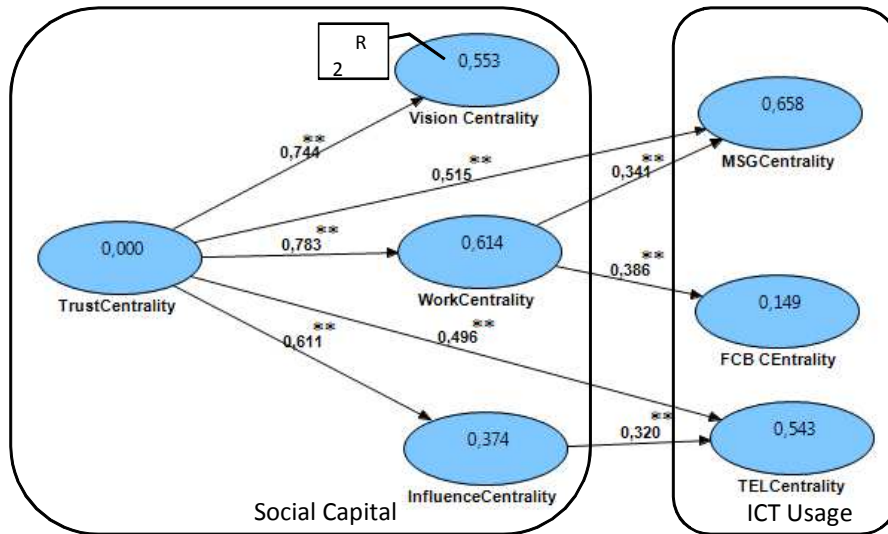
Figure 2: The final structural model

As we can see in the figure before, two types of concepts appear in the final model: the concepts of social capital as independent variables and those of the use of ICT as dependent variables.

In the concepts associated with social capital, the one associated with trust (TrustCentrality) has a special place. Indeed, the study of correlations between concepts shows that trust is correlated with variables of the use of ICT (except the centrality related to Skype / MSN) but also with social capital variables. Considering the place of this dimension in the literature, we decided to use it as a variable which can explain the other social capital variables: centrality in sharing the vision of the individual at work, centrality in the network of work and centrality in the network of influence.

The table below allows us to make an inventory of hypotheses identifying the relationships that have significant effect.

Hyp	Title (⇒ means « has an effect on »)	Effect(s)
H1	Structural dim.of SC ⇒ email usage	**Significant**
H2	Relational dim.of SC ⇒ email usage	**Significant trust** Not significant influence
H3	Cognitive dim of SC ⇒ email usage	Not significant
H4	Structural dim.of SC ⇒ telephone usage	Not significant
H5	Relational dim.of SC ⇒ telephone usage	**Significant trust** **Significant influence**
H6	Cognitive dim of SC ⇒ telephone usage	Not significant
H7	Structural dim.of SC ⇒ Skype/MSN usage	Not significant
H8	Relational dim.of SC ⇒ Skype/MSN usage	Not significant trust Not significant influence
H9	Cognitive dim of SC ⇒ Skype/MSN usage	Not significant
H10	Structural dim.of SC ⇒ FaceBook usage	**Significant**
H11	Relational dim.of SC ⇒ FaceBook usage	Not significant trust Not significant influence
H12	Cognitive dim of SC ⇒ FaceBook usage	Not significant

Table 4: Summary of assumptions

Some results are not summarized in the table above. These are significant relationships between the concepts of social capital and the role of trust.

Hyp	Title ($\Rightarrow$ means « has an effect on »)	Effect(s)
H'1	Relational Dimension Trust $\Rightarrow$ Cognitive Dimension Vision	**Significant**
H'2	Relational Dimension Trust $\Rightarrow$ Structural Dimension Work	**Significant**
H'3	Relational Dimension Trust $\Rightarrow$ Relational Dimension Influence	**Significant**

Table 5: Additional results

We can observe that these results put trust in the heart of the social capital. The centrality in the trust network is directly related to the centrality of the vision of "the right individual behavior towards the group,", but also to the centrality of the individual at work, and to the influence in the network.

DISCUSSION

Overall, social capital, described by the centrality in trust, influence, shared visions networks, and centrality in work activities, has an effect on the uses of ITC. However, the results presented above need some comments.

Firstly, the results show that the explanation of dependent variables associated with technology is different. Indeed, the tested model can explain nearly 66% of the variance of the centrality in email networks ($R^2 = 0.658$), more than 54% of the variance of the centrality in telephone networks ($R^2 = 0.543$) and less than 15% for FaceBook networks ($R^2 = 0.149$). We also note that technology such as Skype / MSN, has no statistically significant effect. We can consider that, in the context of student work, the social capital has different intensity effects according to the type of Computer Mediated Communication media. The highest intensity concerns the email and the telephone. The lowest intensity concerns FaceBook. We can interpret this situation in reference to the context of use. Indeed, the general context is the students working context and how they organize themselves to accomplish their work. The relative position of each of them in the networks has a significant effect on their position in the email networks. The context of use of this medium is linked to the context of work. In the contrary, we note the absence of significant relationships with Skype / MSN. The use of these tools is not related to the context of work. In fact, the position of individuals in working networks is not significantly correlated with their position in Skype / MSN networks. One possible interpretation is that FaceBook has features best suited to their use. Indeed, videoconferencing requires a computer with camera and a subscription with a minimum bit rate to operate. In addition, students often meet and don't necessarily need to virtually visualize each other.

However, the centrality in work significantly affects the use of FaceBook (coeff. 0.386). The level of R^2 is low; It means that other aspects are involved in the centrality associated to this media. We can assume that the relations established in the context of work activities continue using Facebook. However, other social networks probably overlap with the one of work relations. So, the characteristics of this tool's usage partially reflect the positions in work relations. Considering the popularity of these technologies, we can reasonably assume that these technologies are rather used in a context of fun and leisure. To verify this interpretation, additional questions should be asked in order to identify the network structure associated with entertainment relationships.

By having a closer look at the elements of social capital that have a significant effect on the email and telephone, we can also see the specific characteristics of each medium. Centrality in the email is directly associated with the centrality at work (coeff. 0.341)

and confidence (coeff. 0.515). Its use is significantly related to the structure of working relationships and trust relations within the group. Variables with a significant effect on the centrality in the use of the telephone are partially different. Again, the trust has a direct effect (coeff. 0.496). Therefore, the trust significantly affects the centrality in telephone usage. However, the centrality at work has no significant effect on telephone usage. The other variable having a significant effect is the centrality in the influence networks. The more an individual is central in the influence network, the more he will be central in the telephone usage. We must not forget that influence is the capacity of an individual to change the opinion or attitude of another individual. The interpretation of these results must also take into account the special nature of the telephone. Indeed, this technology is now commonplace and almost all students have access to it. However, it differs by the need to pay for telephone transactions. Indeed, the availability of the Internet for students allows them to communicate easily and without additional cost by email. This is not the case for the telephone where the cost of communication is important, particularly for students. This is why the density of networks involved in this medium is much lower than an email one. Thus, communication by telephone has a cost and the decision to communicate through this medium generally requires more reflections. It is a more engaging action, financially speaking. In this situation, the user will reserve its use to people important to him, i.e. those whose opinions matter and who are likely to influence him. Centrality in the influence dimension has then a significant effect (coeff. 0.320) on centrality in telephone usage. This suggests that the use of telephone is more focused on the intimate sphere, in relation to persons whose views may influence student behavior.

Regarding the variable "vision", it reflects the centrality of actors in the network of representations of "good individual behavior in a group". The centrality in this network is significantly affected by the centrality of trust in the network (coeff. 0.744). However, this variable has no significant effect on the uses of ICT studied. So the cognitive dimension of social capital, as it has been presented, does not have particular effect on the uses of ICT. Therefore, it would be premature to conclude a definitive absence of effect. Indeed, the considered students are together during 2 or 3 years, with departures and new arrivals each year. This context makes more difficult the development of the cognitive dimension (shared knowledge and culture in particular). Further research should help to better characterize this dimension.

Finally, concerning the trust, we can observe the importance of this concept to understand the dynamics of social capital. This latent variable has a significant effect on all other social capital variables on one hand, and on the use of email and telephone on the other. However, it does not affect significantly the use of media such as Skype / MSN and FaceBook. The use of these media can be developed without regarding the position of individuals in relationships of trust. This assumes that the nature of relationships for these media needs less involvement. Indeed, trust is a necessary element in the regulation of relations when there is a risk of opportunistic behavior. Approaches close to the theory of transaction costs are difficult to apply in the context of work relations. In this context, the risk of opportunism is the one of the stowaway who benefits from the contributions of the group without offering other resources in exchange. It can also concern relationships involving the affect, where trust is used to reassure the other about his good behavior. On Facebook and Skype / MSN, the relationships do not require degrees of confidence. If the risk of opportunistic behavior is low, it's because the issues of the relationships are low too. Currently, for students of

the sample, these media are likely to maintain relationships without important issues, probably relations for leisure (example: friends in the same class).

CONCLUSION

This paper develops hypotheses regarding ongoing research. In a first theoretical part, the main theories related to the use of information technology are described. Emphasis is put on the difficulty inherent in these approaches, to take into account the social dimension generally and relational aspects particularly. Concepts of social capital and social network analysis are proposed to better integrate the relational dimension in the use of IT. Research hypotheses are then expressed. In a second part, information relating to the methodology is explained. It includes data collection, indicators used, PLS method of treatment and adjustment criteria used. Finally in a third part, a discussion of the results is developed.

- Research contributions

The main research contribution is to integrate the position of individuals in a network as a measure. The classical approach based on questionnaire and scale of perception uses only the actor's point of view. They are usually Likert scales used to measure the perceptions of the interviewee. In doing so, the collective dimension can be understood only through individual perceptions towards a community. For instance, the question asked here is: Do you trust the other members of the group?

The approach we propose uses the indicators of the centrality of social network analysis to capture the influence of group pressure. By positioning the actor within a network of relationships, these indicators manage to assess their "importance" in the group. The nature of the relationship is also taken into account. For example, considering the relationship of trust, the question becomes: Who do you trust? The indicators of centrality permit to obtain measurements of actors' positions in the trust network.

Thus, the use of social network analysis has revealed the importance of the position of actors in networks of relationships. As an actor in a socio-technical system, the individual has a position that affects his behavior in general and his use of ICT in particular. The results of this research help us to understand the nature of the resources of social capital in a professional context and the use of ICT. The studied Computer Mediated Communication media (email, telephone, Skype / MSN and Facebook) have different contexts of use. The use of email is associated with the work centrality and the trust centrality. FaceBook is associated with work centrality. These two media are therefore sensitive to the context of work. However, the use of telephone is associated with centrality in the network of influence and of trust. Considering also that telephone transactions are paying transactions, it seems that this media is more concerned by intimate sphere, intended primarily for important people. Finally, tools like Skype / MSN do not appear significant.

- Contributions to practice

From a managerial point of view, these results show the influence of social relations in the management of organizations. These relations, as the dynamics of social capital, directly and indirectly affect the use of ITC. Managers and business leaders perceive better the links between the social context and the "free" use of these technologies (their use is not compulsory). However, these technologies are used extensively by organizations which have to support the collaborative process of production. This is

particularly the case of project teams located in different places, where the use of ICT is essential.

Beyond the raw results, this approach can potentially facilitate management decisions. In terms of diagnosis, this approach by analyzing the social networks also provides maps of relationships between individuals. These maps reveal the good or bad working of the group (clans, isolated people / service, centralization of exchanges ...). Management situations can then be interpreted. In terms of results, this approach can consider the effects of some management decisions. Many managerial decisions change the map of relations between employees and / or subcontractors: recruitment, reorganization of services, promotion of individuals, training, meetings, motivational sessions, festive meetings ... these are decisions that can change the position of actors.

- Limitation

This exploratory research used responses from students. This sample allows us to evaluate the appropriateness of some assumptions. However, it has a specific character that must be taken into account. For example, the nature of the studied population may influence the interpretation related to telephone usage. In the case of the use of telephone in companies, terminals can be supported by the organization. This is the case of commercials, executives, mobile staff such as carriers... As the financial constraint is different, the uses should probably be affected.

- Future research

Different tracks can be taken at this stage of research. We will focus on two aspects.

Concerning the nature of the sample, we would like to apply the work in the larger area of firms: development teams, health workers.... Studying students allows us to consider the dynamics of the group at work, but it cannot take into account professional constraints. Besides the limitations related to the use of mobile phones, we must also note the absence of an imposed hierarchy in the group. In traditional organizations, an official hierarchy controls the decisions and the power of actors. It's not the same case in a class of students. However, informal and collaborative organizations are increasing. The open-source software production or collaborative productions like wiki ...can be cited for example. The approaches such as those proposed in this work may provide tracks to facilitate the management of such organizations.

Concerning the factors affecting the position of actors, we cannot give a definitive interpretation at this stage of our work. Indeed, the method shows a position, but it does not explain it. We did not study the causes that may affect the position of actors. This knowledge would be very useful in order to understand the dynamics and potentially to decrease dysfunctions (isolated actors, fragmented groups, clans ...). This point will be at the heart of the future research.

APPENDIX

Appendix 1 : Construct Correlations

	FaceBook CEntrality	Influence Centrality	MSG Centrality	SKYpe Centrality	TEL Centrality	Trust Centrality	Vision Centrality	Work Centrality
FCB CEntrality	**0,79**							
InfluenceCentrality	0,19	**0,82**						
MSGCentrality	0,40	0,55	**0,80**					
SKYpeCentrality	0,44	0,13	0,54	**0,85**				
TELCentrality	0,41	0,62	0,74	0,35	**0,81**			
TrustCentrality	0,33	0,61	0,78	0,41	0,69	**0,80**		
Vision Centrality	0,32	0,75	0,65	0,29	0,62	0,74	**0,77**	
WorkCentrality	0,39	0,51	0,74	0,41	0,62	0,78	0,63	**0,80**

Table 6: Construct Correlations

In the diagonal is the square root of extracted variance (AVE = variance shared by the latent variable and its indicators). To the discriminant validity point of view, for each latent variable, this value must be greater than the correlations with other variables.

Items	FCB CEntrality	Influence Centrality	MSG Centrality	TEL Centrality	Trust Centrality	Vision Centrality	Work Centrality
CIGIgraphAuthority	0,2245	0,6279	0,5869	0,5465	0,6746	**0,8464**	0,5875
CIGIgraphEigenvector	0,3126	0,7573	0,6084	0,6112	0,7274	**0,9456**	0,5828
CIGIgraphHub	0,2857	0,5529	0,4672	0,4466	0,5083	**0,737**	0,4171
CIGIgraphInDegree	0,1802	0,5018	0,4665	0,4361	0,5388	**0,7167**	0,4995
CIGIgraphOutDegree	0,2574	0,359	0,2992	0,2871	0,3247	**0,5626**	0,2654
ConfianceIgraphAuthority	0,2259	0,5712	0,67	0,6031	**0,8567**	0,6734	0,6871
ConfianceIgraphEigenvector	0,2828	0,5529	0,7765	0,6997	**0,949**	0,6577	0,7528
ConfianceIgraphHub	0,2994	0,4475	0,6153	0,5479	**0,7927**	0,5424	0,6057
ConfianceIgraphInDegree	0,2344	0,5207	0,5937	0,4981	**0,7277**	0,6239	0,586
ConfianceIgraphOutDegree	0,279	0,3036	0,4119	0,3555	**0,6348**	0,4465	0,454
FaceBookIgraphAuthority	**0,7455**	0,2561	0,4146	0,3743	0,3596	0,3547	0,39
FaceBookIgraphEigenvector	**0,8635**	0,1165	0,257	0,3015	0,2032	0,1887	0,2377
FaceBookIgraphHub	**0,7588**	0,1746	0,2802	0,3254	0,2037	0,2038	0,2625
FaceBookIgraphInDegree	**0,8078**	0,0831	0,3002	0,2855	0,249	0,246	0,3033
FaceBookIgraphOutDegree	**0,7446**	0,0855	0,2554	0,2739	0,1952	0,1986	0,263
InteractionIgraphAuthority	0,3169	0,3859	0,6656	0,5004	0,6953	0,5368	**0,8153**
InteractionIgraphEigenvector	0,369	0,4865	0,7325	0,6227	0,7675	0,5627	**0,9349**
InteractionIgraphHub	0,3135	0,4138	0,5847	0,5245	0,608	0,4784	**0,8176**
InteractionIgraphInDegree	0,2741	0,3791	0,5207	0,3964	0,5414	0,5045	**0,7018**
InteractionIgraphOutDegree	0,2434	0,3262	0,3835	0,3582	0,4337	0,41	**0,6776**
MessagerieIgraphAuthority	0,3127	0,4843	**0,8407**	0,5677	0,7083	0,5853	0,6831
MessagerieIgraphEigenvector	0,3338	0,5073	**0,9346**	0,7077	0,7597	0,5851	0,7027
MessagerieIgraphHub	0,3249	0,3524	**0,7745**	0,5779	0,5595	0,3893	0,542
MessagerieIgraphInDegree	0,3172	0,4515	**0,7455**	0,5641	0,591	0,5589	0,5444
MessagerieIgraphOutDegree	0,3251	0,3789	**0,6599**	0,5254	0,4386	0,4339	0,4489
PouvoirIgraphAuthority	0,1447	**0,8404**	0,5146	0,5334	0,5504	0,6676	0,4637
PouvoirIgraphEigenvector	0,1106	**0,9485**	0,4709	0,5578	0,5543	0,6818	0,4244
PouvoirIgraphHub	0,1239	**0,8206**	0,3988	0,4782	0,4378	0,5113	0,3733
PouvoirIgraphInDegree	0,2026	**0,7977**	0,5253	0,5549	0,5605	0,6892	0,48
PouvoirIgraphOutDegree	0,2373	**0,6853**	0,3166	0,4178	0,3768	0,4749	0,3088
TelephoneIgraphAuthority	0,3347	0,4278	0,6478	**0,8096**	0,6175	0,5139	0,6123
TelephoneIgraphEigenvector	0,247	0,647	0,6378	**0,927**	0,6043	0,5634	0,511
TelephoneIgraphHub	0,3819	0,4301	0,6082	**0,8217**	0,5724	0,439	0,5366
TelephoneIgraphInDegree	0,3162	0,5334	0,599	**0,7672**	0,5294	0,5332	0,445
TelephoneIgraphOutDegree	0,4012	0,4789	0,5128	**0,7297**	0,485	0,4719	0,4015

Table 7: Loadings of items

Appendix 2 : Extract of the initial questionnaire

Social Capital and ICT

The network of relations

Among the students of your class (maximum 10) which ones would you like to work with (outside of class hours)?
(name of student and average weekly hours of work)

Name	Duration

Social Capital and ICT

The network of relations

Among the students of your class,
which ones might influence your behavior
(maximum 10)

Name	Ability to influence						
	☐ 1 Low	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7 High
	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7

Social Capital and ICT

Ability to share a language and representations

Among the students of your class, which ones are closest to your vision of the "good individual behavior within groups" (maximum 10)

Name	Far or near vision						
	☐ 1 far	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7 near
	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7

Social Capital and ICT

Relational capacity of actors

Among the students of your class,
which ones would you trust the most
(maximum 10)

Name	Level of trust						
	☐ 1 Low	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7 High
	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7

Social Capital and ICT

The network of communications by email

Among the students of your class, to which ones do you send the most email (maximum 10 people)

Name	Frequency of message exchanges						
	☐ More than 1 per day	☐ 1 per day	☐ More than 1 per week	☐ 1 per week	☐ 1 per fortnight	☐ 1 per month	☐ Less than 1 per month
⌄	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
⌄	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
⌄	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
⌄	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
⌄	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
⌄	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
⌄	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
⌄	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
⌄	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
⌄	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7

Social Capital and ICT

The network of communications by telephone

Among the students of your class, which ones do you call the most (maximum 10 people)

Name	Frequency of telephone conversations						
	☐ Several times a day	☐ Once a day	☐ Several times a week	☐ Once or twice a week	☐ Once every 15 days	☐ Once a month	☐ Less than once a month
⌄	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
⌄	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
⌄	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
⌄	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
⌄	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
⌄	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
⌄	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
⌄	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
⌄	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
⌄	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7

Social Capital and ICT

The network communications through instant messaging, video

Among the students of your class, list the people with whom you communicate the most with Skype, MSN, ... (maximum 10 people)

Name	Frequency of communication using Skype, MSN						
	☐ Several times a day	☐ Once a day	☐ Several times a week	☐ Once or twice a week	☐ Once every 15 days	☐ Once a month	☐ Less than once a month
⌄	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
⌄	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
⌄	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
⌄	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
⌄	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
⌄	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
⌄	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
⌄	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
⌄	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
⌄	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7

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