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# Collaborate to co-elaborate knowledge: between necessity and opportunity

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CHERPA - Croyance, Histoire, Espace, Régulation Politique et Administrative

## I. INTRODUCTION

The globalization, market liberalization and free trade and exchanges have contributed to the transfer of information and knowledge in a large extent. In fact, the wide use of the Technologies of Information and Communication (TIC) has greatly facilitated the growing of alliances and the setting up of network communities in virtual and physical forms. These phenomena, according to Weissbert [1] are behind the emergence of new paradigms for the establishment of a new generation of contemporary capitalism of what so-called “cognitive capitalism” in where network is a factor of production such as were capital, raw materials, task force, etc. in the past industrial capitalism decade. The severe competition urges the need to be more competitive. This reason makes the collaboration such as an incentive for innovation, generating benefits from the collective action through the realization of ambitious projects. In this approach, network interconnections create synergies between the actors involved in the activity and lead to the assembly of the labor forces working to achieve goals which might be difficult or even impossible to make individually. Thus, investment in collective action and work enables companies to build high value-added products/services and to enhance innovation in order to better face the international competition.

To meet this objective, this paper proposes, a conceptual clarification of the actions and meaning covered by the notion of “collaboration” that are drawn from professional literature, mainly in the field of Information sciences and communication and supported in practice by a case study about the mental representations of collaboration of an educational community in a junior high school. On the basis of our theoretical and practical investigation, we will propose a referential framework for collaboration that take into account, in a constructivist perspective, the mental representations of the actors mobilized in the collaborative work helping them to construct a right assimilation of the concepts. The right assimilation is very important to promote collaborative practices in the future because of a concept not understood, will be not easily accepted and therefore, poorly used despite the accessibility of collaborative tools.

## II. WORKING TOGETHER...BETWEEN COLLABORATION AND COOPERATION

The Atilf<sup>1</sup> Dictionary defines the term “collaboration” as a “participation to elaborate a common work” [2] while Le Petit Robert defines this term as the act of “working together, among several people who generate a joint creation and work” [3]. These

<sup>1</sup> ATILF laboratory : Laboratory of Analysis and IT processing of the French language=analyse et traitement informatique de la langue Française –CNRS/University of Nancy2 (France)

definitions are complementary because they underlines both, two main notions about collaboration which , at first glance, seem simplistic : the “common task to be carried out” and the “team work”. In fact, collaboration covers other practices which make this type of work as an organizational innovation that has continued to emerge since the 80s and led to the adoption of transverse structures meeting the strategic needs of companies and having theoretical interest for researchers [4].

With the widespread use of the TIC and the Internet within modern organizations, collaboration become an essential way of working available to us allowing to build teamworks and working together without any organizational or physical constraints. In this regard, the Internet has facilitated the formalization of networks participating to the expansion of collaborative phenomena whose emergence over the constraints of physical presence or geographical proximity. Moreover, in vertical organizations, the retention of information and a confinement of the hierarchical structures would be improved through collaboration. This way of working represent a good option as a form of an intermediate organization between the two forms of traditional and stable organizations which are the market and the hierarchy [5]. In this situation, the merit of collaboration is to by-pass the constraints related to the verticality of the structures in organizations and activate the functioning and the exchanges on multidirectional interactivities at a horizontal level. These interactions constitute a real enrichment for the organization.

Despite the development of collaborative practices and community projects facilitated by the TIC, the term “collaboration” remains ambiguous and suffers from its semantic proximity with the notion of “cooperation”. This last word means, according to the ATILF dictionary “participate with one or several persons in a work or in a concerted action with the aim of a common purpose” [6] referring like it is for the term “collaboration” to the action or the participation to realize a common objective. These two concepts – collaboration and cooperation- should be clarified because the realities covered by each of them are quite different, even if they seem to be similar and this etymological confusion is commonly found in the professional literature. Indeed, Daniel [7] uses the term “collaboration” to characterize “cooperation”. In the same way, even in the dictionary “Le Petit Larousse”, the term “cooperation” is regarded as “collaboration” [8]. In addition, in the literature we found a number of terms describing intentional arrangements such as : agreement, association, cartel, collusion, alliances, relation, collaboration, cooperation, etc. [9].

The semantic boundaries between these different concepts are relatively fuzzy, as evidenced by the profusion of the definitions in the literature in the fields of economy and management sciences. This situation is due, according to Combe to two factors : the difficulty of characterizing the multitude of the cases of

“arrangements” and to identify a clear separation between them and other modes of allocation of resources [10].

Considering these elements, some clarifications are needed. So in this paper we will highlight the different facets of “collaboration” and “cooperation”. We will also review what distinguishes them. These precisions are imperative because we believe that the assimilation of these concepts is a necessary step to bring into maturity and to achieve good results during the practice of the collaboration between individuals, private or public companies serving their competitiveness and innovation needs. About this point, the collaboration process consists in implementing a transmission of know hows, expertise and knowledge, communicated during the transaction by the partners to serve the purpose of obtaining an advantage or a result wanted by the transmitter and the receiver of information in the collaborative area[11]. For Dillenbourg, collaboration is defined as being any work performed in common, fulfilling a condition of symmetry at three levels: in the action, the knowledge and the status [12].

This triple symmetry is met at first, in the status of the individuals involved in collaboration who should be at the same level of recognition, intellectual competencies and expertise within their community enables them to contribute, by implementing similar skills together, to achieve the common goal. A symmetry is also met among the role of the participants in the collaboration because each of them must be free to hold or not the same kind of tasks as the other members of his community or different ones. The choice of the tasks to hold is mainly motivated by the interest or the desire which the participant finds in realizing them.

Independently of the situation in which it occurs, the collaboration is represented by Roschelle & Teasley as “... A synchronous activity that is the result of a continued attempt to construct and Maintain a shared conception of a problem” [13]. The synchronization of the actions in collaboration amplifies the interactions and exchanges between the participants which can, by mutual agreement, work together on the study of one or many aspects of the collaboration subject. These features make the sense of “collaboration” different from “cooperation” regarding to the aims and the ways of achieving the tasks that are not similar in collaboration and cooperation.

As defined by Llerena, Matt and Wolff, the terme “cooperation” means an intentional action led by several parties having social aims, involving the “we” rather than the “I” and promoting a learning process [14]. Cooperation implies also the presence of a contractual dimension between the established connections, expressed as a contract, a process and a result or a profit [15]. Indeed, The progress of cooperation is based on a strong coordination between the various agents and a mentoring work to insure the coherence of each individual actions in achieving the target set by mutual agreement. On the contrary, the term “collaboration” is used to describe work situations in which the members of a group pursue the same purpose because they share the same vision about it. Therefore, they put their resources and competencies to achieve, in a synchronized way, the different tasks leading to the goal that brings them to collaborate.

Although “collaboration” and “cooperation” reflects a state of convergence towards common goals, they distinguish themselves about the sharing of objectives, the modes of fulfillment of the tasks and the need of pre-existing skills, used to drive the process of collaboration to realize the common task. Concerning this point, the distribution of tasks in a cooperative work is done according to a principle of individual specialization into tasks or sub tasks. The responsibility of individuals in the cooperative process is limited to

the execution of the task/sub task assigned to them. while in a collaborative context, each individual involved in the collaboration action has a double responsibility : at a personal level towards the realization of the tasks affected to him and a collective level about the his contribution by supporting the other members in reaching the ultimate objective fixed by the community [16].

In spite of the convergence of the definitions given at the biguining of this paper towards a more or less similar direction about the objectives and to the groupwork, collaboration and cooperation remains a process among which the progress, le relationship and the management are different, according to several views. This process is based on a transversal approach of sharing resources and capitalizing the role of the acteurs involved in the process. Furthermore, the exchanges and interactions, between the actors involved, allows to find solutions and create points of meetings between various entities or individuals to make them being interfaces to enhance an outsourcing of skills and knowledge intra or extra firms at the service of innovation and the creation of the added value, such as improving the quality of a product or a service. However, beyond the notion of “process”, the main criteria which appear to distinguish them are specified in the table below which lists the aspects of differentiation from Dillenbourg, Henry & Lundgren-Cayrol points of view [17].

TABLE 1

DISTINGUISHING FEATURES ABOUT COLLABORATION AND COOPERATION FOR DILLENBURG (1999) AND HENRI & LUNDGREN-CAYROL (1998)

Collaboration	Cooperation
<b>Skills</b> - Maturity-Experience, - Autonomy - Self Control	<b>Skills</b> - mentoring/supervision - Pyramidal Hierarchy - Control of top management
<b>Modes of participation</b> - Individual and Collective - Voluntary/ spontaneous	<b>Modes of participation</b> - Division of tasks / sub-tasks -Mandatory/ imposed
<b>Realization of the tasks</b> - Explore, create,communicate - global responsibility and support to peer	<b>Realization of the tasks</b> - process of a specialization - individual responsibility of the task / subtask assigned
<b>Collaborative space</b> - Network: interaction - Synergy between the cognitive and collective aspects	<b>Cooperative space</b> - learning collaborative skills/ - Knowledge & information transfer

The main feature in the collaboration as a processus of a way of work is the flexibility and the non-hierarchical organization of the collective work. This offers many advantages to participants, giving them the free will and the autonomy to perform a task by alternating phases of individual/ collective and exploratory/ structured phases to optimize the work done and the rôle of each for achieving it. Furthermore, the practice of collaboration supposes the presence of pre-existing skills allowing to work with autonomy, being responsible at once of the task to be achieved and of the support brought to other members of his community or network.

The collaboration remains a mode of voluntary work and its motivation emanates mainly from the will and the capacity of the agents to get themselves involved within their community and from their interest to share and to exchange. Another characteristic of the collaboration consists to alternate, during its progress, phases of learning and exploration in opposition to cooperation process which is more restrictive because of a strict division and allocation of

tasks/sub tasks and a highly supervision and control maintained by the hierarchy to prevent any opportunist behavior. Contrary to the collaboration, the role of the agents in cooperation does not exceed the execution of the tasks allocated to them. So, the aim of the interactions in a cooperative processus is limited to establishing an acceptable level of convergence and coordination between individual actions and the final goal to achieve.

The objective of this comparison is to highlight the value of collaboration that shows all its facets in a network context which forms an area where individual skills and collective knowledge interact to build a new knowledge. In this regard, it is necessary to emphasize that collaboration as well as cooperation are not a linear process [18]. They both face in practice, a succession of problems about allocation and creation while progressing. These problems find their origin in the presence of interiorized mental representations which harm the correct appropriation of the collaborative mechanisms and consequently, minimize the efficiency of the collaborative work and the sharing with the network or community.

An example of mental representations of an educational community will be presented in the following section regarding the concepts of collaboration and cooperation. This case study has shown that in practice as it was related in the professional literature, a confusion persists in the understanding of the specificities of the concepts of "collaboration" and "cooperation" and of the practices they cover.

### III. CASE STUDY ABOUT THE MENTAL REPRESENTATIONS OF "COLLABORATION" AND "COOPERATION" BY AN EDUCATIONAL COMMUNITY

#### A. Background of the Study :

The case study proposed in this paper derives from a research study, realized in a PhD dissertation in the field of information sciences and communication. This qualitative study were held from the 19<sup>th</sup> to 29<sup>th</sup> of May 2009 and conduct in a junior high school in the department of Vaucluse (city of Avignon) equipped with a numeric working space called P.R.O.V.E.N.C.E.<sup>2</sup> which is a regional projet to help enhance the use of the TIC tools in cyber working spaces offering an outfit of personal and collaborative services for various categories in the educational area : teachers, pupils, parents, partners, etc.

This qualitative survey follows upon a quantitative first survey, realized between May, 2006 and March, 2007 in various junior high schools through the deployment of the apparatus Ordina 13. This projet comes from the undergoing project, currently in effect by General Council of Bouches du Rhône (region of Marseille) in order to purchase a laptop to all the High School Fourth and Third Grade students. This quantitative first survey, was supported by a questionnaire, with the objective to evaluate the existence or not of collaborative activities within the Ordina 13 apparatus. This Likert-scale questionnaire included two hundred and four questions aggregated around twenty six indicators; at the end of the questionnaire a blank page offered the possibility to the teachers to note remarks on the apparatus. After evaluation of the inquiry, we

made several reports. Firstly, the collected answers were too vague to be significant, secondly, there was a high number of none response, thirdly, almost no collaborative activity appeared through the answers given.

The heuristic value of this quantitative first survey, with exploratory meaning, testify the fact of the prominence of vague answers and none responses given concerning the terms "collaborative work" and "co-operative work" which reflect a real absence, in the educational sphere of consensus around these syntagms. The content analysis of the answers spaces have revealed the teachers's malaise towards the deployed system but also about the expert vocabulary employed. Therefore, because we considered this quantitative investigation as a survey of opinion, it become necessary to complete it by a second survey to cover the qualitative aspects that focus on the compendium of mental representations on collaborative and cooperative activity by educational stakeholders.

For this second survey, we have adopted, a comprehensive approach based on the saturation method. We will develop later in this paper the meaning of the "comprehensive approach" adopted. Briefly let us present the saturation method. For Mucchielli [19] "*saturation validation test means the time during which the researcher realizes that adding new data in its search causes a better comprehension of the investigated phenomenon. This is a signal that he may stop data collection or their analysis wanted actions experienced simultaneously (...)*Saturation, when reached, is therefore a maximum diversity of the investigated phenomenon data.". The strength, but also the richness of this methodology is, in the fact that we don't need "to get the numbers" and to multiply the interviews to obtain tangible results. So, with only seventeen interviews we have established and covered the range of variations of the possible models. We decided to stop recording at this level because the additional materials did not bring any more new information.

About this survey, we study the collection and the heuristic extraction of the mental representations of the educational community concerning the items "collaboration" and "cooperation". Before presenting them, we find it appropriate to define the meaning of "mental representation". Issued from the field of cognitive psychology, mental representations " *are born, formulated and constructed from the individual, contextual and social elements, and the changing world in which we are living, the conditions under which we operate, the education we receive, the social influences such as solidarity, citizenship, social support. They also change over time in a process of construction-deconstruction because the world changes, the social phenomena are increasingly "multi" or burst into pieces and because the social cues does not remain reliable forever* "[20]. It might be interesting to take as a starting point this definition to emphasize that the concept of "mental representation" is in perpetual construction and deconstruction depending on the context mutations and on the influences of the individual and social learning. So, it is clear that the confrontation of the individual point of views, perceptions and contradictions is the key of a truly heuristic approach aiming to make evident the emergence of an innovative point view about a subject which form the sum of the individual representations. These perceptions, when they are put together , can create a shared understanding and a common consciousness of a concept or a situation and do emerge what is "in the eyes of all" yet it is not proved. The collection and the comparison of the mental representations of the educational community constitute therefore, a joint approach including constructivism because the mental representation is intimately constructed by each individual, and systemic because every element of a context can contribute to

<sup>2</sup> PRO.V.E.N.C.E. : *Projet de Valorisation des Espaces Numériques pour les Communautés Educatives = Project of Valorization of the Numeric Spaces for the Educational Communities. Available at : <http://pedagogie.ac-aix-marseille.fr/tice/ent/index.html>*

"develop sense". In this constructivist-systemic perspective, the elements of the context that may influence the formation of the mental representations studied, such as the fine description of the social environment of work, the periods and durations of investigation, the technical support, the behavior, etc. have been observed and recorded in the final research report but it will not be appeared here. Nevertheless, they will be used implicitly in the analysis of the perceptions collected.

This study seemed to be interesting for many reasons. First of all, because we find frequently that *"collaboration is certainly one of the themes in fashion, a crossing point within today's political and pedagogic speeches"* [21]. Secondly, educational structures are responsible of training tomorrow's citizens and competencies. Hence, it's legitimately that educational institutions offer to students, during their learning process, the opportunity to acquire the TIC skills and tools and to integrate new ways of working in collaborative and numeric environments. Indeed, collaboration constitutes a stakeholder in the context of working for the educational actors and an essential core of knowledge to master for students who should fully validate these items before leaving the high school. As it is stipulated under the item 2.7 of the B2I<sup>3</sup>, the computer skills must be used by the pupils to develop a collective work within the community. Lastly, we found no consensus in the literature - at least in the field of Information sciences and communication - about the meaning of the term "collaboration". In Education Sciences, the same observation was noted. Regarding to this, Baudrit [22] states that there are not enough consensus about this term and some confusions are possible with "cooperation" and with what distinguishes them. Consequently, it seems difficult to establish an effective collaboration if its meaning is not well known. We then, set the hypothesis that it is a priority before any implementation or practice, to develop a referential framework about collaboration in order to master all facets it implies. To be effective and accepted by the educational sphere, this referential guide should be drawn from the mental representations which are part of the population to which it is intended. It is noted, that these existing representations will be the starting point to modify them and to set up new perceptions most appropriate for developing an effective collaborative work.

### B. The Methodology of implementation :

Our investigation is qualitative and our approach wants to be holistic and supported by a combination of constructivism and systemic methods. We will focus further in this paper, on the synergy between these approaches within the subject we are handling. To realize this study, our method of research consisted to lead semi-structured and comprehensive interviews with the listed population of teachers. According to Kaufmann [23], this technique of interview is more appropriate because it allows to identify through the answers, the identical and the social underlying processes influencing individual perceptions of a phenomenon. For example, recurring

<sup>3</sup> *Brevet Informatique et Internet (B2i) : contains three levels of mastering the information technologies and the communication tools : school, junior high school and high school. The B2I asserts the training to each future citizen to enhance a large use of TIC that have become part of the economic, social, cultural and educational landscape. It belongs to the school to inculcate to the pupils the skills to put them use in a thoughtful and effective way these technologies and to educate citizens to perceive the possibilities of legal and social constraints which join these uses to form autonomous, responsible citizens, with critical sens.* IN : « Arrêté du 14 juin 2006 relatif aux connaissances et capacités exigibles pour le brevet informatique et internet ». BULLETIN OFFICIEL, n° 42, 16 novembre 2006. Available at : <http://eduscol.education.fr/cid46073/b2i.html>

sentences in a speech, even lies or contradictions allow us to get indirectly, the exact individual representation of a phenomenon, identified even if it is clearly expressed or latent. We opted for this technique of investigation because it tends, as reminded by Guigon and Morrissette " *to facilitate the free expression of the interviewee, while allowing the researcher to control the discourse according to the objectives of its research and... to minimize the influence exercised by the researcher and his question*" [24].

In other words, the semi-directed interview allows to get to the interviewees a space in which they enjoy a certain freedom of thought and expression about the subject we investigated. The fundamental principle of the semi-directive interview is to adopt an emphatic attitude with the interviewees. It is convenient also to have an open minded attitude, a high availability and neither have an a priori<sup>4</sup> or a value judgment concerning the points of view given by the interviewees when facing them. Thus, it seems preferred to us to use this instrument for the exploration of the mental representations because the words are the main vector to express opinions and attitudes in front the perception of collaboration of a community in an educational sphere.

The sample of our population includes 17 teachers of both sexes, different ages, and working in various disciplines : *Life Sciences and Earth Sciences, Technology, languages (English, Latin, French) Mathematics, Sport, History and Geography.* The interviewees were selected according to the following and non restrictive criteria : being voluntary, available and using or not the numeric working space PRO.V.E.N.C.E. In the facts, the cluster of the teachers interviewed have to be representative of the educational community by the variety of their technical skills, experiences, maturity, opinions and attitudes.

During the conversations, recorded on digital support and entirely retranscribed afterward, we proceeded to the collection of the mental representations and perceptions expressed by the interviewees in order to refute or confirm the absence of consensus on the term " collaborative work " and " cooperative work " in the educational sphere. We considered through the level of their knowledge about these concepts, their level the collaborative practices and tools. After we have explained the objectives of the interview to the interviewees, we start the conversation with the following query : " *We are going to work on an educational devices assisted by computer and before this, it is necessary to verify that we agree with some definitions, What is the meaning would you give to these terms : ENT<sup>5</sup>, sharing, cooperative work, groupware, collaborative work?* ". Through this first part of interview, we tried to get the most spontaneous mental representations belonging to the teachers interviewed. Then, we approached the first theme of our interview<sup>6</sup> concerning autonomous work, collaborative work, education project. At the same time, we asked the interviewees the following question: " *How do you explain these concepts to someone who knows nothing about them ?* ". The interest of this question is to allow us to observe if this reformulation

<sup>4</sup> *An priori is any idea or a knowledge previous to an experimentation or a series of special experimentations. (Lalande, 1999).* » cit. IN : E. ETHIS, 2002, p. 6 [HDR dissertation] : " « Po (i) étique du questionnaire : spectateurs et publics de la culture réinventés par les enquêtes de pratiques », Available at [www.u-grenoble3.fr/les\\_enjeux/2003/Ethis/ethis.pdf](http://www.u-grenoble3.fr/les_enjeux/2003/Ethis/ethis.pdf)

<sup>5</sup> ENT : Environnement numérique de travail = numeric working environment.

<sup>6</sup> *The original interview contains 5 categories of questions : 1) work autonomy, pedagogy of project, collaborative work. 2) The practice from the teachers point of view . 3) The practice from the pupils points of view . 4 - The added value of an ENT from the pupils points of view. 5) The educational added value of an ENT from the teacher point of view*



of the initial question modifies (or not) the mental representation expressed first – here, the question reformulated is not to define the concepts as perceived but to explain them to a third person. Thus, we asked the participants rather than giving a definition, to express their perception and own representation concerning the terms "cooperative work" and "collaborative work".

Finally, the interest is not to know a theoretical and formal definition about these terms but to agree with a useful meaning and a good perception about how to exploit them in their educational work.

### C. Exploitation of verbatims by content analysis for extracting mental representations :

At first, we proceed to the reading of the seventeen conversations which constitutes our corpus of interviews in order to identify recurring expressions and fragments of sentences in teachers' verbatims representing their perception about the items "collaborative work" and the "cooperative work". Then, we drew up a list of twenty-one forms, carriers of meanings such as "group work", "common resource", etc. We grouped together all the forms having a strong proximity in semantic families.

In the following table, these semantic families were classified by frequencies of groups of the main forms founded in the speech of the teachers which expressed their representations about "collaboration" during the Interview.

FIGURE 2  
FREQUENCIES OF AROUND "COOPERATION" AND "COLLABORATION"

<b>Group Work (6)</b>
<i>Creating Group</i>
<i>Working several time together</i>
<i>Working with colleagues</i>
<i>Working Together</i>
<i>Working more</i>
<b>Put in common (5)</b>
<i>Common product</i>
<i>Being together for a set of time</i>
<i>Distribution of tasks</i>
<i>Participating in an activity</i>
<b>Multidisciplinary work (3)</b>
<i>Interdisciplinarity</i>
<i>Transdisciplinarity</i>
<b>Ambiguous (3)</b>
<i>Fuzzy</i>
<i>Not clear</i>
<b>Partnership (2)</b>
<i>Exchange</i>
<b>Voluntary activity (1)</b>
<b>Master TIC tools (1)</b>

### D. Analysis of the corpus and strategy: a kaleidoscopic vision

Concerning the mental representations of the teachers interviewed, we realized that the members of this educational community had a vision in "kaleidoscope", not totally erroneous nor complete about the "collaborative work". Indeed, the frequency of the expression "working in groups" in the answers at the expense of other specific expressions shows that "collaboration" is perceived, at first, by the educational community as a way of working and secondly, as a mode of allocation through the expression "putting in commun" resources and pedagogical productions according to the precisions given later,

by the interviewed teachers about what they mean by this expression. The problem of misunderstanding the concept definition comes only at the end, to make the collaboration appears for almost of the teachers as a fuzzy and unclear concept. Only two teachers associated this concept to the idea of "partnership". This analysis demonstrated the necessity to proceed to an adjustment of these mental representations expressed, about the concept and the practice of collaboration in order to harmonize the mutual understandings within the educational community and to develop a collective practices and productions.

## IV. DEVELOPING A REFERENCIAL FRAMEWORK FOR COLLABORATION TO ENHANCE KNOWLEDGE CO-ELABORATION

### A. Reasons for developing a referencial about collaboration

There is useful to establish a common referencial around the concept and the practice of "collaboration". It is preferable that this referencial be conceived from the mental representations of the interested who are going to use it for developing collaborative practices and insure that this guide may be transferable to any complex organization. What are the reasons which justify the utility of such a referencial in implementing the collaboration process ?

#### To Explain an expert speech :

In the educational sphere, often, the expert language is not assimilated by all members. Consequently, a feeling of unease may settle down between "the specialists" who understand this language and the others who do not. Almost all teachers have entrusted to find the ambient speeches of the experts about collaboration, increasingly complex. They are expressed their felt in the following way: "this type of term [collaboration] is complicated and difficult to define", "I don't like this kind of terms which are all modeled to fit each work context". These speeches have for consequence, to provoke not only a marked disconnection between the community and the educational authorities but also lead to a pejorative mental representations that teachers have of themselves and of their teaching practices. In this context not favorable to the development of the collaborative practices, it is important to develop and provide an understandable referencial framework for the educational community to "re-inject the human" at the center of the appropriation process of collaboration.

If the terms related to collaboration are misunderstood, certainly, the appropriation of the collaborative tools will be made, but only at an individual level for developing a personal and standard utilization of this tools blocking any collaborative initiatives at a collective level.

#### To Help the actors to feel effective in their work :

The teachers interviewed told us, sometimes tacitly, their fear of feeling a deficiency of knowledge and a personal ineffectiveness within the community. Bandura states concerning the modification of the individual self-efficacy feeling in contact with the community that the members may feel "little" or believe more or less in their ability to organize and execute the line of conduct required at the collective level, to produce the wished results and benefits "[25].

The "policy required" might be the sum of the intermediate objectives and the process to implement to reach them. But, if within

a community, the perception by the members of their capabilities is negative, we can expect that their attitude passes successively through this stages : a simple refusal of the technology or its systematic avoidance until sometimes, provoke an aggressive behavior that emanate from the fear to be judged to not make well. The interviewees expressed these feeling during the collection of the mental representations as follows : " *anyway, what I make with these technologies, it is not good!* ". We therefore suppose that what is observed within the community educational could be valid in any other context or organization : an emplementation within the community or the organization of a vicious cycle that begin with the feeling that "each knows something", which entraine an erroneus mental representation of the situation - here the collaborative work - and a perpetual questioning leading to a non-appropriation and /or misuse of the numeric space of working or the collaborative tools and the group projects.

After the explicitation of the felt about the expert speeches and the feeling about the efficiency of individuals involved in the collaboration, we shall approach in the following section the appropriation process in collaboration. The appropriation constitutes the gap to fill between the mental representation that the individual made of the collaboration and his ability to develop innovative uses of the collaborative tools and working.

### B. The process of co-elaborating knowledge :

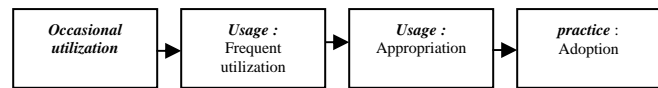
The goal of any collaborative action is to generate knowledge value- added. It is suitable for this purpose, to gather the conditions to increase the cognitive proximity, the membership, the communication and exchanges of informations between the agents involved in the collaboration work to achieve and reach the objectives fixed by the community. The process of co-developing knowledge and objectives shared by the community can also enhance the skills of those engaged in this process, enabling them to adopt good practices and develop their innovative capacity. According to Jonnaert, skills are an important element in the collaboration because they favorate an establishment of a link between the knowledge and the capacity to transform it into effective actions [26]. The co-elaboration of knowledge through collaboration is based on a set of mechanisms which must be taken into account by the community that are including learning skills, managing information, knowledge, cognitions and relations. These are the factors which guarantee the success and the efficiency of the collaborative work and the intensification of the skills of the individuals within their community.

#### *The appropriation of collaboration.*

The appropriation of the collaborative way of working is based on the notion of "usage" which is determinant to optimize the exploitation of the potential offered by information sciences and technologies of collaboration and to modify the mental representations which affect the development of good collaboratives practices. By the concept "usage", Kouloumdjian & Chartier means the stability in time and the reproducibility in the utilistion of new techniques until they are integrated like costoms in mental plans and made part of everyday life [27]. By this way, the appropriation is resulting from the frequent "use" of a technique or a method of working. About collaboration, the purpose of the "usage" is to develop an appropriation of the collaborative work and concepts and the appropriation pursues the objective to adopt good collaborative practices and to consider them in emplementing innovative uses. The

connections between these concepts are detailed in the following process :

FIGURE 3  
APPROPRIATION PROCCES : FROM UTILIZATION TO PRACTICE



The transition from an occasional utilization to appropriation of the collaborative practices may take time. Rightly, we consider that a referencial of best practices proposed to the actors of collaboration is a pedagogical way to change the psychological resistances and the tendency to reject anything new. It will also enable the individual to install an ambient approach towards a tool or a technique and to build his own representation and reflection about the innovative uses he can do with, adapted to his own work situations.

#### *The management of information and relations flows :*

The information abundance which characterizes our times through the widespread use of the TIC tools and Internet has certainly, facilitated the access to large volumes of data but raised the problem of managing and communicating information within the structures of an organization which are increasingly complex in their working. Indeed, the spread of networks and virtual communities has profoundly altered the report to information and the traditional paradigms of information flows. Before the advent of the TIC and Internet, the circulation of informations and competencies were divided up in physical and closed hierarchical structure [28].

The TIC tools enable the decentralization of informational exchanges and allows informations to flow in several directions overcoming the constraints posed by organizations with vertical structures. Nevertheless, their use pose the problem of validating of the relevancy of the existing information over networks, which is in the context of the Internet behind a loss of sense. Frequently, the useful informations are embedded in a large volume of irrelevant and non valid ones. This situation make necessary to have a system form mangning and validating informations before and during exploiting them.

Certainly, technological tools and search engines brought a solution to face the abundance of information by allowing the automatic collect, treatment of large volumes of data, and their rapid dissemination to those who can use them to make decisions. In spite of the interest of these tools, they act only at a intermediate level because they do not make information more relevant or available nor transform it to a value added knowledge or relevant actions [29]. These value-added activities could not be held by any search engines or computers which cannot compete with the ability of individuals to analyze, to share, to validate information and to make good decisions. The place of the human capabilities in the processus of building knowledge and managing information is determinant for giving a value to the creations or actions. In collaboration, the synergy between the individual capacities and the computing tools is interesting because if the TIC are an instrument which serve the creation of knowledge by allowing the increase of the creative interactions ", the human beings are at the origin of the establishment of the networks in which these interactions take place [30]. Chronologically, the existence of a communitie precedes the creation of knowledge, according to Callon who considers that a knowledge can be created and find a social utilization only if before this phase, a network is set up and structured in minimum to make the construction of knowledge possible [31]. In the same idea, for

Feldman, human beings are an asset preventing what she named "informational disasters" [32] caused by a false, incomplete or obsolete information that any technological tools so sophisticated they could be, no matter can solve.

In an organization, it is more appropriate to focus when considering organizational problems, to issue them in terms of information management and flows between individuals to avoid management errors resulting from the syndromes known in the literature by "technological determinism" [33], "technological obsession" [34] or "technological unthoughts" [35]. These various expressions point, in fact, the same phenomenon : the incapacity of computing and technological tools to bring complete solutions for improving the performance of the decision-making process and the capacity to use effectively the information accessible through these tools. Putting these tools, which must be just the content container, in the heart of the reflection about issues to solve the organizational problems is reducing the role and the potential of other approaches which privilege the contents besides the forms that value the informational contents.

In the field of collaboration, we can also find these informational failures in many situations for example, during practicing it via virtual groups or collaborative cyber platforms. The analysis of a collaboration process under a technological scope would mean to consider that a platform of collaborative work is the element which allows the collaboration to exist and make creation of knowledge. This idea is not true because, there are at least, two processes which are displayed before and during the setting up of collaborative practices : the appropriation of collaboration and the use of pre existing skills to optimize the exchanges and the creation of knowledge by the community involved in the collaboration action. In addition, during collaboration, the exchanges of information are synchronized, multidirectionals and motivated by the interests of the participants to exchange and to collaborate with a community. Therefore, the question of the abundance of information arose in collaboration with the increasing of these exchanges between the members a collaborative community. These problems make necessary to have a system for managing the collaborative space, including : management of the interactions between members, capitalization of information flows and access facilitations to the informations to maintain constantly the circuit of creation of new knowledge within a community.

Situations of "imperfect information" may appear during the collaboration and minimize the transfer of actionable knowledge and generate a supplementary cost to close as well as well possible to the efficiency potentially obtained in a situation of "perfect information" [36]. Informational dysfunctions in collaboration can appear in many other aspects : abundance/poverty of exchanges, opportunist behaviors of the agents which would seek to maximize their role within the network and difficulty to extract knowledge within networks of expertise. Consequently, to manage the informational and organizational flows, the aim of the supplementary investments is to establish a system of animation, control and incentive to limit the divergence of interests and the irrational behaviors of those involved in collaboration. So, in the presence of situations with incomplete information, the actions of collaboration are also "imcomplete" because it's the relevant and the multiple interactions within the collaborative space which allow to share and build to knowledge within a community. We precise about this idea, that the adoption of rules in constructing the collaborative space as a moral pact between the participants is determining to take away all the opportunist behavior and the crippling mental representations which minimize the efficiency of the collaboration.

In conclusion, skills, abilities and tools must be implemented together to harmonize the interactions within the community and what is cognitive and what is collective for bringing the useful information to achieve the ultimate goal in a network or community. This synergy is supported by a cognitive management that combines a constructivist and a systemic approaches and by rules to guide the actions of the agents involved in collaborative work. In the following sections we present these approaches.

#### *The cognitive management :*

The passage to a "complex" organization, "globalized" and "computerized" requires an involvement from the actors who must be proactive and responsible of their work and also a management based on knowledge as a factor of value added actions which we could be considered as "cognitive". This concept according to Craipeau "does not concern any more the material activity but activities such as data processing, coordination, ie. the relations in the working and social, aera, the convergence in the use of the TIC and the knowledge management (...) The cognitive management. These activities are a part of the management of the knowledge and draft the question of the collective aspects in working" [37]. According to the author, it is necessary to establish through a system of knowledge management a synergy between the individual who held cognitions and the organizational strategy exploiting the cognitive skills as a tool in the working and the decision-making process within an organization.

We have seen in the previous sections, that to strengthen the engagement in the collaboration process, the modes of working associated to the TIC tools and to the group in a collaborative working space must to be clarified via a referential framework. For Bouvier [38], managing complexity in the new forms of organization implies a reflexive articulation between the collective intelligences, transforming tacit knowledge into explicit one and identifying and structuring networks or communities to enhance the capabilities to innovate. In short, it consists in setting up a project management, encouraging the a networking organisation and structuring the organizational and informative memory of the company. The cognitive management assimilated also to a management by intelligence aims to create "links" which make "sense" and create "knowledge".

Collaboration as a space of elaborating knowledge is part of the cognitive management and can take a place in a systemic approach for the reasons that we discussed below. But first, let us specify what we mean by the notion of "systematic" and its utility in the approach of collaboration.

#### *To think and act in complexity :*

The systematic approach is a method which recovers historically from the general theory of systems. The precursors of which, are Von Bertalanffy, Wiener and Shannon, but it is a grouping of researchers in the 50s, known as the "School of Palo Alto", coming from various disciplines but having the similar affinities who took the initiative to apply this approach to the human relations. The systemic approach is related to the concept of "model" and it is a method of modelling and interdisciplinary analysis. It claims the ambition to "read", to "understand" and therefore to "make understandable" a complex reality in Edgar Morin's sense. In complex situations, it brings, in addition to other methods, a global and dynamic vision and both of



an operational and heuristic representations by taking into account the interactions instead of neutralizing them. In this way, it completes the classical analytical approaches which isolate the object in space and time to objectively study it. In the following table, we summarize the characteristics of each of the two approaches (analytic and systemic). The systematic approach allows to give a sense to elements which can seem disconnected at first glance, by placing them in their context for studying them.

TABLE 4  
COMPONENTS OF THE SYSTEMATIC AND ANALYTIC APPROACHES

Analytic approach	systemic approche
Closed and isolated object	Opened system
Permanent	Mouvement
Rigidity	Flexibility
Several elementary parts	Makes of opened systems
Simply decomposed elements/ rules of combination	Interactions between elements and environment
Independance of the subject	Subject and observer form a system
Static vision	Dynamic vision
Oriented « connaissance »	Oriented « creative »
Linear causality	Circular causality

The systemic approach is based on the concept of system. There are many approaches and so many mental representations about this concept through out disciplines. For a biologist, a computer scientist or a manager, a cell, a computer or organization are respectively considered as systems for the specialists interested in studying them. In this perspective, Von Bertalanffy defines a system as "a set of parts and units in mutual interrelations" [39]. According to De Rosnay, a system is "a set of elements constituting an overall entity having a limit" [40]. The most common definition indicates that a system is "a set of elements in interaction such as some modification of one of them entails a modification of all the others." [41]. Overall, in a systematic approach we focus on studying the interactions between the various components of the system replacing them in their context. In a collaborative perspective, the systemic approach is mobilizing and promoting a holistic approach because it took into account all the elements which interferes in the process when working together such as resources, organizational and informational flows, methods, social context and persons that make possible the collaborative work and form the collaborative space.

In sum, the systemic approach applied to collaboration privileges a good understanding of a sujet or situation to conceive good actions. Besides, inside the collaborative space, the multidirectional interactions between the agents took their relevance from the notion of "feedback" which is a motor for validating new informations in a process of elaborating innovative knowledge. This notion which constitutes a fundamental of the systemic approach have also, an important role in improving the quality of informational exchanges and the convergence towards a consensus within the community about the knowledge they generate. This fact, allows scientists to better ancore their achievements in society because they are supported by the community which allowed their elaboration. This community will try to maintain them viable outside the collaborative space as long as possible. For example through the development of applications from the scientific results obtained by a community of researchers. In addition to the management, systematic and cognitive aspects which allow to consider the collaboration as a set of various facets which are built through the approaches presented in

this article, it is also useful to put up some rules of actions to make the collaboration be an harmonized space for communication, dissemination of the information, exploration and creation of knowledge. These objectives must be shared and understood by the future actors of the collaborative work who also have to perceive the borders between the collaboration and the other opportunist behaviors which can settle down implicitly in the collaborative space between the agents.

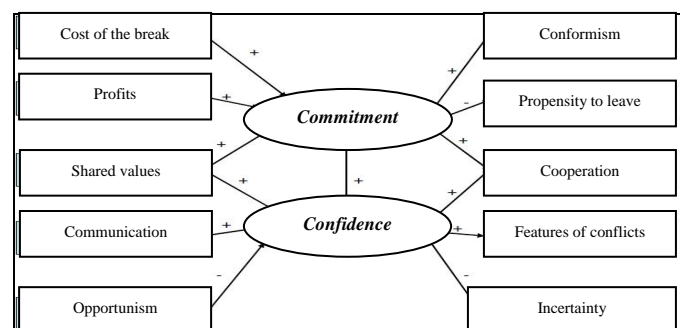
Rules for best practices in collaboration

These rules are essentially based on the notion of « trust » without which the actions in the collaborative process are unthinkable. The collaboration, as we underlined it at the beginning of this paper is a voluntary action, motivated only et mainly by the desire and the will to share with a community pursuing an interest or a common goal [42]. In spite of the motivation of the actors involved in collaboration, rules are necessary to coordinate the roles of each agents and to maintain the communication and the cohesion between the participants engaged into the action. These rules are related to involvement and translation which ensure a successful collaboration work.

a) Confidence to insure involvement.

According to Lessard, Kamanzi and Larochelle, the collaboration creates a favorable framework for reflection, exchange of experience and innovation. It is also an instrument of integration offering, moral support and mutual assistance. " [43] We can invest the moral support and mutual assistance under the notions of trust and involvement which constitutes the two main reasons for setting up collaborative activities. For Deaudelin and Nault, the action of engagement is "an emotional and psychological disposition without which collaboration can't be envisaged...manifested through the availability, ... and the energy ... to achieve the group's work ... to appreciate the effort by others to measure the quality and quantity of work performed by the group and felt that the involvement is mutual." [44]. In these definitions it appears that the act of engagement bases itself on the feeling of confidence but the reverse is not true. The refusal to make a commitment does not mean that it does not trust and confidence between the parties. Through the theory of Morgan & Hunt related to commitment and confidence in collaboration, the involvement is closely linked to the notion of confidence. they form closely a couple of mediators in the cooperative work and a fortiori in the collaborative one [45] :

FIGURE 5  
MODEL OF INVOLVEMENT – CONFIDENCE (MORGAN, HUNT, 1995)



This union between confidence and involvement is not exclusive to the Information Sciences and Communication, but is part of any executive process involving several parties. Besides the confidence,

the notion of commitment is also motivated by the sharing of a common vision and a consensus around the objective to realize with the operation of translation and intermediate objectives.

#### b) Translation to better communicate.

The second rule to set up when implementing a collaborative work is about the notion of objectives. As reported in the conceptual definitions in this paper, the participation allows the agent to keep freedom and autonomy in the collaborative space whether virtual or physical. However, collaboration must obey to some mechanisms required for regulating the interactions and making them productive.

These mechanisms involve negotiation, translation and definition of intermediate objectives. According to Callon, the operation of translation is imperative because it allows to forge links between separate worlds, principally in collaborations which involve heterogeneous or multi-disciplinary teams who should collaborate to reach a common purpose [46]. For example, an economist and a scientist may be interested together in the same problem but are going to use different jargons to characterize their subject of study and are going to handle it by employing different methodologies appropriated to their disciplinary referential. Hence, the utility of the translation of the specific concepts in a accessible language so that their understanding is the same by the actors involved in the collaboration even they come from Various fields.

It is also difficult to lead an effective collaboration if it concerns an exploratory work that aims to produce innovative knowledge. In this case, the ultimate goal is vague and can not be precised clearly regarding the expectations and the uncertainty of the results. The difficulty of defining the ultimate goals in a partnership action may affect the feeling of cohesion, motivation within the group by giving them an impression of a lack of productivity despite the work being done [47]. To avoid the demotivation in such situation, it is important to supervise the exchanges within the community by setting intermediate targets periodically, which eventually may lead, later to the ultimate purpose of the collaborative work.

#### V. CONCLUSION

Collaboration is regarded as " a territory inside which the actors have significant leeway, supported by their peers and ensuring a balance between the final purposes of the community, the objectives fixed beforehand and the intermediate objectives. " [48].

Collaboration is it an opportunity or a necessity?

In our opinion, both! It is a need because of the generalization of the TIC tools, the presence in force of networks and communities, the participative web, etc. which are part of challenges and paradigms representing the information society in which we are living. These technologies offer to us the possibility of widening the scope for collaborative action including actors who are geographically distant and giving them, even the distance, the possibility to work together via virtual communities.

Collaboration constitutes a recent paradigm in network spaces in our information society, where communication, sharing and building knowledge, at a large scale, are the opportunity to expand into a globalized vision integrating political, scientific and economic networks. This network integration enhance the industrial and commercial valuation of the knowledge produced inside the

established communities. For example, the inventions conducted within universities might be transformed into innovation via the integration of the academic, political and economic network facilitating the valuation of the results of the Academic research and development into industrial applications.

In our view, we believe that a referential of best practices in collaboration has a citizen utility promoting professional practices of collaboration tools and developing a positive mental representation and reflection about its multiple advantages. These may concern at a personal level the developing of the critical sense and the increasing of the self-confident and the self-respect given with the support and the recognition of the peers within a community.

#### REFERENCES

- [1] J.L. Weissberg, « L'hypothèse du " capitalisme cognitif : pouvoir, valeur et coopération », pp.315-320. Available at : [http://innovinfos.free.fr/IMG/doc/Articles\\_Weissbert-2.doc](http://innovinfos.free.fr/IMG/doc/Articles_Weissbert-2.doc).
- [2] Atif Laboratory-CNRS, « Trésor de la langue française », Ed. du CNRS, 1971-1994.
- [3] Le petit Robert, dictionnaire, Paris Ed. Le Robert, 1995
- [4] C. Voisin, A. Plunket, S. Edouard & B. Bellon, « Une approche institutionnelle de la coopération industrielle », pp. 1-11 IN : La coopération industrielle par C. Voisin, A. Plunket et B. Bellon (éd.), Paris : ADIS, 1999
- [5] POWEL, cité par A. DESREUMAUX et Michel Marchesnay et Florence Palpacuer. Perspectives en management stratégique. Paris : Ed EMS, 2001
- [6] Atif Laboratory-CNRS, « Trésor de la langue française », Ed. du CNRS, 1971-1994.
- [7] M. F. Daniel, « La dimension morale de la coopération », in la coopération dans la classe : étude du concept de la pratique éducative, M.F. Daniel & D. Schleifer, Montréal : Ed. Logiques, 1996
- [8] Le petit Larousse dictionnaire, E. Larousse, 1995
- [9] D. Jolly, « Alliances interentreprises : entre concurrence et coopération », Paris, Edition Vuibert, 2001
- [10] E. Combe « Alliances entre firmes et course technologique », Paris, Revue Economica, 1995
- [11] A. Kreis, « La transmission de know-how entre entreprises industrielles : une coopération technologique personnalisée en vue d'exploitations commerciales conjointes ». Paris, Ed. Litec, 1987
- [12] P. Dillenbourg, "Collaborative-learning : Cognitive and Computational Approaches". Oxford, Elsevier, 1999
- [13] J. Roschelle & S.D. Teasley, « The construction of shared knowledge in collaborative problem solving. In C.E. O'Malley (Ed), Computer-Supported Collaborative Learning. pp. 69-197, Berlin, Springer-Verlag, 1995
- [14] P. Llerena, M. Matt et S.Wolff, « Coopération industrielle », Paris, Revue ADIS, 1999
- [15] J.L. Rullière & A. Torre, « Economie industrielle : développements récents. Les formes de la coopération inter-entreprises », Revue d'économie industrielle, hors série, 1996, pp. 215-246,
- [16] F. Henri & K. Lundgre-Cayrol, « Apprentissage collaboratif à distance : pour comprendre et concevoir les environnements d'apprentissage virtuels », Québec, Presses Universitaires du Québec, 2001
- [17] F. Henri & K. Lundgre-Cayrol, « Apprentissage collaboratif et nouvelles technologies », Québec : Office of learning technologies, 1998.
- [18] P. Llerena, M. Matt et S.Wolff, « Les incitations et la création de connaissances au sein des accords de coopération », in coopération industrielle, pp. 109-124. Paris, Revue ADIS, 1999
- [19] A. Mucchielli, "Dictionnaire des méthodes qualitatives en Sciences humaines et sociales". Paris : Armand Colin, 1996, p. 204
- [20] D. Bouaziz, « La force des représentations dans le champ du travail social », Paris, Revue Lien Social, Numéro 824, 2007
- [21] A. Chaptal « Rhapsodie sur la collaboration : Le travail collaboratif ». *Les dossiers de l'ingénierie éducative*, n° 65, mars 2009, p. 88-90.
- [22] A. Baudrit, « L'apprentissage collaboratif : plus qu'une méthode collective ? », Paris, Edition De Boeck, Collection Pédagogies en développement, 2007
- [23] J-C. Kaufmann, « Corps de femmes, regards d'hommes », Paris : Pocket, 2001

- [24] S. Guigon & J. Morrissette, « Quand les acteurs mettent en mots leurs expériences », Québec, Revue Recherches qualitatives, n° 26 (2), 2006
- [25] A. Bandura, « Le sentiment d'auto efficacité », Paris, Ed. De Boeck, 2002
- [26] P. JONNAERT. Compétences et socioconstructivisme : un cadre théorique. Bruxelles : Ed. De Boeck, 2006,
- [27] M.F.Kouloumdjian, Chartier, M. « Gérer les contraintes du temps et d'espace au niveau international », Communication et nouvelles technologies, Paris, PPSH, 1991
- [28] O. Delage. « La communication au cœur de la décision ». IN : Revue internationale et stratégique, n° 56, hiver 2004-2005, pp. 59-67
- [29] F-Z. Taouil. « Vers une approche de la veille technologique centrée sur l'humain », Colloque CONFERE « Conception, Innovation », organised by l'ENSAM, Marrakech, 6-7 juillet, 2006
- [30] N. Curien and P.A. Muet, « La société de l'information », Paris : la documentation Française, 2004
- [31] M. Callon. « La science et ses réseaux : genèse et circulation des faits scientifiques », Paris : La Découverte, 1988, p. 24
- [32] S. Feldman, « The high cost of not finding information ». KMWorld Magazine. Available at : [www.kmworld.com/Articles/ReadArticle.aspx?ArticleID=9534](http://www.kmworld.com/Articles/ReadArticle.aspx?ArticleID=9534)
- [33] R. REIX. « L'impact organisationnel des nouvelles technologies de l'information », IN : RFG, 1990, pp. 100-106.
- [34] T. Davenport, « L'art du management de l'information ». In : Les Echos. Available at : [www.lesechos.fr/formations/manag\\_info/articles](http://www.lesechos.fr/formations/manag_info/articles)
- [35] P. Robert. « Une théorie sociétale des TIC : penser les TIC entre approche critique et modélisation conceptuelle ». Paris : Lavoisier, 2009
- [36] B. Coriat, O. Weistein, « les nouvelles théories de l'entreprise ». Paris : Ed. LGF, 1995
- [37] S. Craipeau, « Le management cognitif », CERGIC Conference, janvier 2006
- [38] A. Bouvier, « Management et sciences cognitives », Paris, PUF, 2009
- [39] L. Bertalanffy, « Théorie générale des systèmes », Paris, Dunod, 1973
- [40] J. De Rosnay, « Le microscope », Paris, Edition du Seuil, 1977
- [41] E. Marc & D. Picard, « L'Ecole de Palo Alto », Paris, Edition Retz, Collection Psychologie dynamique, 2006
- [42] P. Dillenbourg e al, « L'essor des communautés virtuelles d'apprentissage ». Québec : Presses universitaire du Québec, 2003
- [43] C. Lessard, P.C. Kamanzi & M. Larochelle, « De quelques facteurs facilitant l'intensification de la collaboration au travail parmi les enseignants : le cas des enseignants canadiens », Education et Société, n° 23, 2009, pp. 59-77.
- [44] C. Deaudelin, T.Nault, « Collaborer pour apprendre et faire apprendre, la place des outils technologiques », Québec, Presses Universitaires du Québec, 2003
- [45] R.M. Morgan & S.D. Hunt, "the commitment trust theory of relationship Marketing", Journal of Marketing, n° 58, July 1995, pp. 20-38
- [46] M. Callon, et al. « Innovation et ressources locales ». Paris : PUF, 1989
- [47] Collins and Walker cit. par C. Deaudelin, T. Nault, « Collaborer pour apprendre et faire apprendre, la place des outils technologiques », Québec, Presses Universitaires du Québec, 2003
- [48] M. Callon. « La science et ses réseaux : genèse et circulation des faits scientifiques » – Paris : la Découverte, 1988