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TOWARD A METHODOLOGICAL FRAMEWORK TO SUPPORT PROFESSIONAL VIRTUAL COMMUNITIES

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ABSTRACT

The fast progress of information and communication infrastructures, especially networking technologies over the past few years, has offered new possibilities for the knowledge creation and sharing within organizations through the emergence of collaborative networks such: virtual community, community of practice, community of interest.... The CSCW tools or groupware are the famous tools to support these forms, in particular, can be deployed to help organizations manage their empiric knowledge more efficaciously. The complexity of CSCW tools is growing from classical workstation to capillary CSCW; however, current solutions usually are not very customisable and interoperable and are not utilizing the full potential of the community support idea. In our research; we have focused ourselves on virtual professional communities, and we are interested on the specification of a collaborative framework for supporting and sustaining the development of such communities. In this paper we introduced our architecture model for a generic community support platforms designed to fulfil all theirs requirements.

Keywords: *Community of practice, Professional virtual community, Collaborative tools, CSCW, Groupware, Knowledge management.*

1.0 INTRODUCTION

Computer supported cooperative work (CSCW) is a large field of investigation, is focused on infrastructure enable persons or groups of persons to communicate, cooperate, perform a common task, solve a common task on a set of joint artefacts, shared their knowledge, etc. The development of these technologies of information and communication has promoted the emergence and the apparition of new forms of collaborative networked organizations: virtual enterprises, virtual teams, virtual communities, etc. In fact, these communities: of practice [26], of learning [9], of interest [15], of knowledge [3] [14], of project or professional virtual seem as a large body of empiric knowledge; they allow creation, sharing and capitalization of knowledge within the organizations. The professional virtual communities present a kind of aggregation of collective expertise on subjects or particular fields, this organizational form has gave place to many research works emanating from various fields: computer science, management, social and human science, etc. The complexities found in this research area are namely in the concepts, terminologies and associated meanings (for a broad overview of collaborative networks, we refer to [5]). These studies started by being interested to the comprehension and understanding of "why" appear these new organizational forms, and "in what" arises and resumes the objectives of their establishment. Recently, some work dealt with this subject and they focused rather on "how" manage and sustain these communities [23]; [27]; [10]; [16]. However, rarely are those devoted on the «how» identify, build or successfully support such community [22]; [20];[10]; the various proposal introduced on the few recent years, are limited to methods and guidelines which are more or less specific and meet to fulfill a specific need. In our work, we has been undertaken in how to build integrated *professional virtual collaborative environment (PVCE)* with the aim of supporting and successfully sustaining large set of collaborative networked organizations, especially professional virtual community across organizational boundaries and over their whole lifecycle.

Many models, tools, groupware and interaction patterns have been developed for supporting collaborative work. Each one focused on specific or narrow aspects of collaborative work. Groupware products include, amongst others, structured communication systems, shared whiteboards, group scheduling systems, videoconferencing systems, co-authoring systems and workflow management systems (for a broad overview of groupware products, we refer to [21]). As the number of CSCW is increasing, new collaborative networked forms are emerged, and so; new sociological consequences of this new way of working are identified. One of the most important results about these collaborative systems is that, most of the time, they offer a little interoperability and they are designed to support one specific kind of community, or well adapted for one narrow aspects of collaborative work, but can not be applied in large and dynamic work situations as envisaged by collaborative networked organizations. An overview of the literature [5] found that the behaviour of virtual community specially professional virtual community is not understood well enough and a solid theoretical basis to support developments in these areas is missing, when the basic concepts are not understood, it is difficult to develop support services for set up, operation and disclosure of PVC.

For all these reasons, and for the lack and the absence of reference models for collaborative networked forms (Fig. 1), we consider that the actually challenge is to establish a groupware which support large kinds of collaborative organizations such virtual groups of project, virtual communities, virtual enterprises, etc., and provide a very wide range

of collaborative tools adapted to their multiplicity and complexity collaborative work's requirement, en consequence; they must be generic, very flexible; and more importantly, they should provide services which allow the users to personalize their environment, to switch at run-time from one tool to another, to develop their own collaborative processes, to specify their suitable workflow, and more then functionalities.

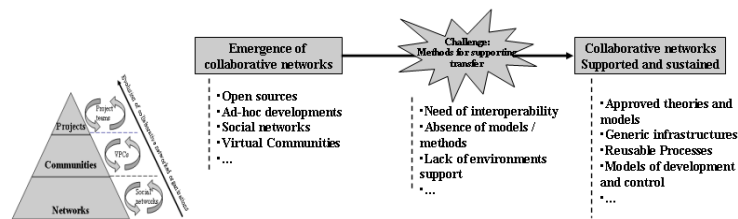


Fig. 1: Evolution of collaborative forms and the need of reference models

Considering these different issues, our aim is not to specify new patterns, collaborative tools or so, although, we based ourselves on the earlier work based understanding and analyzing of the nature, the characteristics, the requirements and the structure of professional virtual community, in order to propose a methodological framework and an overall architecture providing a generic, flexible, configurable and malleable collaborative/cooperative environments.

This paper presents our research in progress which falls under the collaboration engineering [25] and which is located at the crossroads of management, of the sociology of the organizations and of information system (CSCW, CIS). This paper introduce our proposal framework, a collaborative environment to support the increased mobility of workers and the flexibility of work and interaction, it leads the challenge of the definition of reference models for supporting and sustaining users in different organizations, with different roles within the collaborative process, using a wide range of different tools with different functionalities, thus this environment, need to be extensible and adaptable to varying work situations and collaboration forms, support reuse and combination of tools for different team settings, the users need to be able to extend, tailor, and personalize their work environment in order to adapt their changing needs. This paper is organized on two parts, in the first one; we introduce an overview of the literature on the related works especially the existing models and platforms introduced for supporting and sustaining collaborative works. In order to better determine our positioning and contribution, we present the limits of these models and the actual tendencies of the collaborative works.

The last part which is the focal part of this paper, it presents our different contributions in progress focalized on the specification of a flexible collaborative platform support for professional virtual community (and more collaborative forms). Finally we conclude this paper by drawing our future work and various prospects.

2.0 APPROCHES TO SUPPORT COLLABORATIVE WORK

Computer Supported Cooperative Work (CSCW) emerged as a research area in the mid 80's [2]. Several types of collaborative applications recently advertise their contribution to "community support" and labelled this area of research as Collaborative work environments (CWEs) which aimed to provide "the ability to collaborate over time and space, within and between organizations or communities [...] to achieve flexibility by making best use of the knowledge and competences available"[1]. However, none of the proposal models and platforms until present seems to be general and complete enough, more of them are concentrated at the specification of collaborative tools (co-authoring, synchronous communication, workflow, etc) rather then collaborative environments (we refer to the typology of collaborative tools given in [5]).

In general, community support is seen as a kind of cooperative information system, it includes models and methods for supporting communication, coordination and collaboration (and more cooperation) in a group of people. It includes support for synchronous and/or asynchronous communication, support for exchange of information and knowledge, support for coordination of tasks, support for collective resolution of problems, etc. In the literature, we can distinguish three principal approaches adapted in the development of the cooperative systems (CSCW): ad-hoc development, use of the patterns, and platforms for CSCW.

- In the ad-hoc development, the application is usually established from nothing, making little or not call to the use of the components or models refined. It is the result of an unstructured or semi-structured process adapted and defined by the owners of the application, the famous examples are the open sources appeared at the few recent years (egroupware, phpcollab, etc.).
- The patterns of CSCW, make it possible to establish an application (a tool) based on a whole of preset modules which can be re-used and combined in various ways, such as DistEdit (employed to adapt the individual editors to the shared edition [13]), and Thinklets (employed to develop repeatable collaborative processes [24]).
- Platforms or methodologies of CSCW (models), make it possible to design a collaborative framework or cooperative information systems based on models defined, it is enough to instantiate and adapt it to there applicability, such as MeDICIS for the design of the framework of co-operation between firms [4].

The several proposal methods and frameworks do not take into consideration the adequacy of tools and functionalities integrated with the needs and the requirements of the large wide of diversity users. Therefore, this new alteration led to find more flexible and efficient solutions to implement environments adapted to all collaborative situations. The establishment of such solution reposes mainly on the specification of a cooperative information system (CIS) in which, users have the possibility to configure, personalize, specify there ones collaborative environments. In our research, we proposed a specification of new collaborative framework that exploits the existent theories, methods and models (MeDICIS, Thinklets, Ontology...), and profits from strengths of each particular model and encloses the three different approaches mentioned above (ad-hoc, pattern, and methodology).

3.0 TOWARD A METHODOLOGICAL FRAMEWORK TO SUPPORT PVC (MiCS)

Recently, certain survey and research projects are interested to the problematic of supporting communities, and aimed to introduce platforms, frameworks [11] [18] [17], the absence of a reference models and structured methodology requires a preliminary engineering and research task to identify and model the main elements of this collaboration, and which must answer certain questions, for example: what are the characteristics of PVC? Why building such communities? Which are theirs requirements and needs? How ensure their best evolution and development? Which are the adequate technologies to support them? Which are the resources necessary to mobilize?... To answer these questions and to define our methodology named MiCS (Fig. 2), we are based on MeDICIS methodology and we are extended them to be more dynamic and not limited to one domain and support a large set of collaborative networked organizations. In our approach, we are categorizing the problematic of supporting collaborative networked forms (especially PVC) into three dimensions: *Design*, *Identification* and *Development* dimension (Fig. 3). We focus ourselves currently in this present paper to the first dimension and we extension thereafter our research on the two last dimensions by the definition of a tool for *identify* PVC through ontology networked analysis based on PVC features and the development of a structural model for *development* of PVC which assure the good management, development and also to support the transfer, the sharing, and the creation of knowledge inside the PVC.

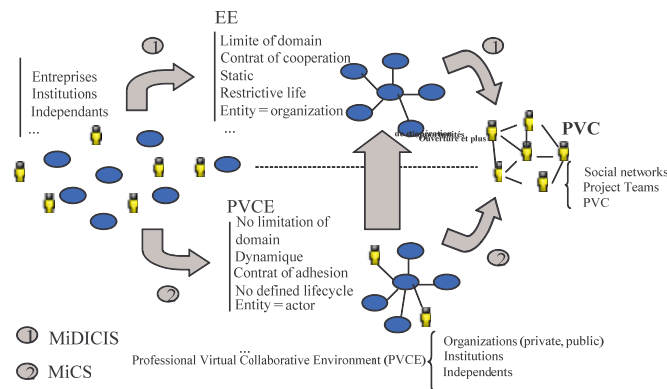


Fig. 2: From MeDICIS to our methodology MiCS.

The first dimension: *Design* dimension refers to the cooperative information system and the associated technologies in particular the collaborative tools support to the PVC. The aim is being to put collaborative tools at the service of the communities in order to support their evolution and to strengthen their cooperation. At this stage, it is advisable to study the adequacy of the collaborative tools and the intensity of cooperation developed within the professional virtual community, like their contributions in the process of creation of knowledge.

The *Identification* dimension refers to the definition or the surround of the potential resources that form a community based on a list of a crucial structural PVC characteristics. And the last dimension: *Development* refers to the definition of a structural model of management which guide and assure a successfully evolution and expansion of PVC during their lifecycle.

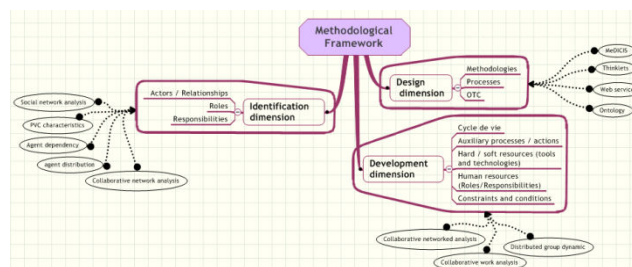


Fig. 3: A map modelling of our methodological framework

We are investigating an ad-hoc process for building and sustaining PVC (Fig. 4), our ad-hoc process gathers the three great dimensions mentioned earlier (Fig. 3). This process has the particularity to support such sponsored and spontaneous PVC, it has for objective to support exchange, to capitalize the new knowledge created and emerged from the interaction inter-members and to develop and disseminate best practices.

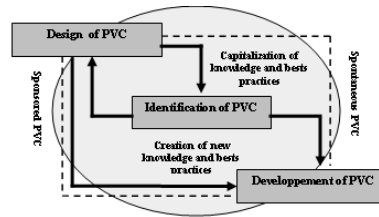


Fig. 4: Ad-hoc Process for building and sustaining PVC.

To achieve our intent and for illustrate our proposal ad-hoc process, we had to specify models and tools which incorporate the three phases mentioned above (design, identification, and development), for that, we had analysed and studied a set of collaborative models and theories with emphasis on coordination and organisation aspects of work practices to obtain enough information for developing own framework; we based ourselves on MeDICIS methodology for designing inter-enterprises cooperative information system [4], the Thinklets (design patterns for collaboration engineering), and we adopted an ontological approach for the implementation of MeDICIS's models. This coupling between MeDICIS, Thinklets, ontology, and inference engines (rules, reasoning, deductions...) makes it possible first, to design the community and the collaborative processes in which they operate, interact and base. And second, to deduce new collective knowledge starting from the initial knowledge shared and capitalized in the bases of MeDICIS.

Fig. 5 shows our overall architecture model of the virtual space shared by professional virtual communities specifically and virtual networked organizations generally (administrations, public and private organizations, professional, etc.). Our specification of the framework provides an adaptive, flexible and evolutionary support for collaborative work (virtual project teams, virtual communities, virtual enterprise...) and especially for successfully sustains PVC through their lifecycle. It is based on MeDICIS methodology and RDF ontology as technologies of conception and implementation. This platform provides a static part with basic modules sharable even by the whole users of the platform and gives access to the common information and knowledge, and a dynamic part with specific modules accessible through web services interface, and specified according to user's profile (member of virtual project team, member of VPC, etc.) and gives access to specific collaborative environments with configurable tools, functionalities, etc.

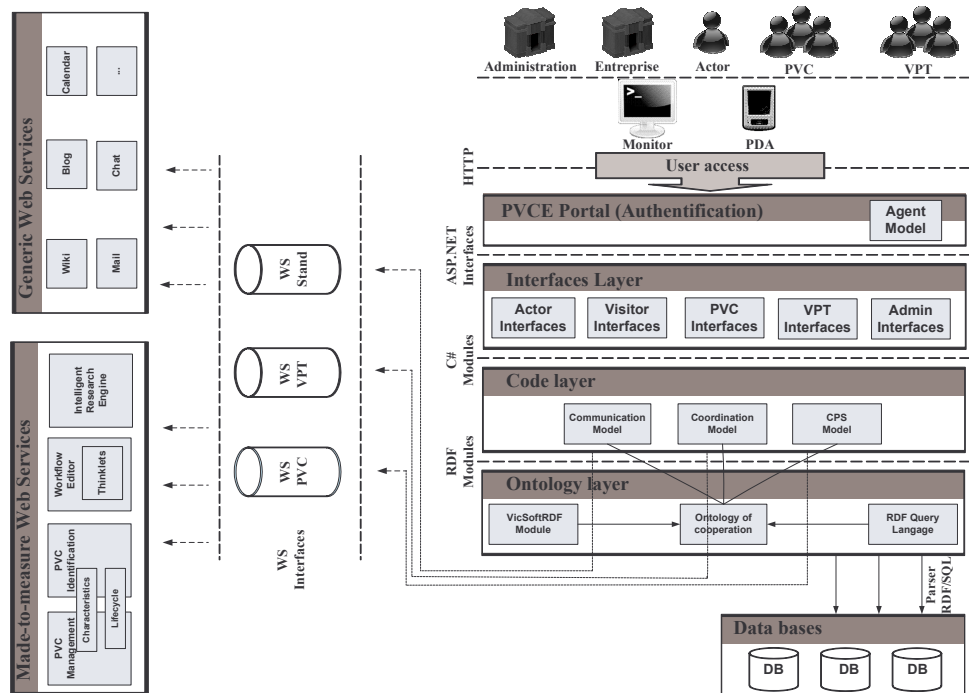


Fig. 5: Technical architecture of the framework.

The dynamic part consist mainly on two sort of web services: generic web services, on which over collaborative tools are integrated and specified according to the requirements of the collective (project team, PVC, etc.) the intensity of the collaboration, and work mode (cohesion, collision, ...); and made-to-measure web services, on which they are developed and specified according to the organization business needs. In this category and for assuring a successfully sustain of PCV, we were specified four web services, which we qualify as necessary but not sufficient to support PCV: Intelligent search engine, Workflow Editor, PVC Identification tool, PVC proactive management tool.

A dynamic library of collaborative tools is available through web services (whiteboards, chats, wiki, blog, shared calendar, etc.) and which are specified in function of the collaborative work situation designed by the workflow processes based on coupling the coordination model of MeDICIS and the Thinklets. These collaborative tools are classified through their cooperative intensities and they could be dynamically involving with others tools due to the use of web services as technology of integration. In our approach of supporting community work by integrating collaborative tools and workflow editor, we aimed to facilitate ad hoc collaboration and dynamic work contexts, and so the emergence of collaborative networks (PVC).

Even when community members collaborate and share their requests through this virtual space, for example: help or answer in the threaded discussion, discuss a particular problem or potential solution, etc., new knowledge has been explicated, reviewed, modified and generalized into guidelines, reports, directives, or practices through the use of the ontology and the inference engines included to the platform, members can access to the knowledge by interrogate the research web service through a query interface passing request to an intelligent search engine. This search engine through the use of the ontology can retrieves new and relevant knowledge not only related directly to the given request but explored more advanced knowledge.

We can resume our purposes of the definition of this framework outlined above into:

- Supporting and sustaining a large set of collaborative networked organizations especially PVC;
- Personalising and configuring the workspace in function of the different needs and constraints of the collaborative work;
- Providing a workflow editor and features tools for designing collaborative processes;
- Providing a PVC identification tool to identify collaboration opportunities;
- Providing a PVC proactive management tool to successfully manage and assure the best evolution of the collective through their lifecycle;
- Assuring the traceability and the capitalisation of the flow of the shared information and knowledge;
- Managing the collective knowledge sharing through the collaborative environments;
- Improving flexibility, adaptability and co-evolution of the environment by the use of the web services as technology of integration;
- Providing a common base effective of sharable information/knowledge through software tools;
- Increasing the chances of PVC involvement even from distributed and geographic dispersed organizations;

Our proposal collaborative framework and associated design patterns, collaborative tools has for objective to support and sustain different collaborative networked organizations such as project teams, communities of practice, and more especially professional virtual communities -our purpose of research-. In earlier research project ECOPICS¹ [6], a virtual environment based MeDICIS methodology has been developed and experimented to support virtual inter-enterprises project teams. In our work we have inspired from to specify our collaborative environments which coupled the access and work in different modes: project, community, etc. This collaborative environment will enable all knowledge workers across organizations to network and form groups and professional virtual communities, sharing and creating knowledge, and developing best practices.

We have adopted .NET, Web services and ontology technologies to specify and develop our collaborative platform. By the way, users have the possibility to create, specify and personalise their collaborative processes, their collaborative spaces, their collaborative tools and so on, professional virtual community can be emerged or intentioned by companies and collaborative tools can be specified and integrated to the community shared space in function of the level of the cooperation and the state of there development. This is the main subject of our ongoing work into the two others dimensions of our methodology approach: identification and development, and which will be addressed in future papers.

4.0 RELATED WORKS

In the few recent years, a large number (over 40) of CWE research works based projects can be found in the literature such us Legal-IST project², Ecospace project [18], Laboranova project³, Ecolead project [17], etc. These projects put a

¹ [ECOPICS](#)

² [LeGAL-IST](#)

³ [Laboranova](#)

strong emphasis on the CSCW tools and infrastructures to support collaboration within organizations due to the lack of consolidated and holistic approaches. The Ecolead model and Ecospace project are the mainly contributions examples of platforms support for virtual organizations. Ecospace project's aim is to create and deploy an eProfessionals collaborative working environments, and Ecolead project's mission is focused on the specification of framework for Virtual Organizations. These research works are currently in progress, and at the difference of there, the key initiatives and benefits of our proposal model are that is more generic and support both spontaneous and sponsored PVC, virtual project teams, and all collaborative networked organizations. It leads to offer the most flexibility and liberty to member to specify and personalize their own collaborative environments. The use of Web service and .NET as technologies of integration permits plus the flexibility of the environments and more nomadism of users.

5.0 CONCLUSION AND PERSPECTIVES

Professional virtual community is a recent field of investigation; several works have been developed on this topic treating various points of view: sociology, management, information system, etc. In this paper, we have introduced an overview and an analysis of works related to this field in order to outline better our problematic and our research work focused on the definition of a reference methodology to support VPC through three dimensions design, identification and development. We have introduced and presented our framework designed to sustain and support professional virtual communities over their lifecycle. Our proposal solution is based on the coupling of MeDICIS methodology, Thinklets patterns, ontology and web services. It is expected to allow a high flexibility for communities by supporting their collaborative processes, and their development processes throughout this overall virtual space architecture, also our platform allows the members of a community to create and design their own collaborative process through the workflow editor integrated. In our future steps of research, we work into the definition of a tool for the identification of PVC through ontology cooperation network analysis and the definition of a development model assuring the evolution and the growth of VPC.

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