The Influence of Interface Design on Knowledge Management through Virtual Communities of Practice for Permanent Education in Health

Carlos Eduardo Ribeiro and Claudia Mont'Alvão

***Abstract*—Present the development process of the redesign of the interface and the functionality of the system Communities of Practice Platform – CoPPla. A generic platform developed in Plone, a content management system (CMS) free and open source, written in Python for construction of virtual communities of practice. Offers a series of integrated communication and collaboration tools in an environment focused on knowledge sharing, where content creation and manipulation of objects is flexible and intuitive. It is mainly used as a support tool of permanent education in health projects. In 2012 the improvement of its functionality started and the redesign of the interface by applying concepts of user-centered design, ergonomics and usability.**

***Index Terms*—Interaction design, communities of practice, permanent education in health, knowledge management.**

I. Introduction

With the advance of Information and Communication Technologies (ICTs), information sharing is getting faster. The use of ICTs facilitates the circulation of information and knowledge, but the cognitive ability and the capacity for innovation are not affected by the technology [1]. By this mean, the communities of practice using traditional technological tools used in corporate, personal or relationship websites, only change their goals and forms of use [2].

This article describes the development of a conceptual interface to the community of practice platform used as support for national policy of permanent education in health of the Ministry of health.

The proposed interface presents the main components that must be considered in the interaction of a community of practices using concepts of user-centered design, ergonomics and usability. For the case of interaction between people and systems, it is included in this study, the issues involving affection, cognition, social and cultural environment.

Make sure that the tools used on the platform are intuitive, is the aim of this work, in which there is the possibility of design influence in the proactive participation of the user. The platform is being used in support to the project Care Paths from the Ministry of Health with classroom and distance education (EAD). Started in March 2013, it is in its third stage, and heads towards the final aim to offer training in Mental Health, crack and other drugs to a total of 290,197 Community Health Agents (ACSs), Nursing Assistants and Technicians (ATENFs).

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The authors are with the Laboratory of Ergodesign and Usability of Interfaces, Graduate Program in Design at Pontifical Catholic University of Rio de Janeiro, Rua Marques de São Vicente, 225, Rio de Janeiro, 22451-900 Brazil (e-mail: cadu@focar.com.br, cmontalvao@puc-rio.br).

II. Communities of Practices

In Brazil, several terms are used to describe the collaborative activities in virtual environments. Learning communities, communities of practice, virtual communities, collaborative groups, social learning, collaborative learning and digital habitats are the most common.

The term community of practice was created by Etienne Wenger together with Jean Lave in 1991 in his studies of how people learn. They identified that the learning goes beyond the relationship between student and teacher, revealing that a social network created by the exchange of ideas in classroom or virtual group [3].

According to Wenger [4] a community of practice appoints a group of people who gather around a common topic or interest. These people work together to find ways to improve what they do, solving a problem in the community or on daily learning through regular interaction.

Typical activities of community of practices according to Wenger [5]:

1) Solving Problems: "Does anyone know how to solve this problem?", "We have a first draft of the requirements of this project, is it complete? Does anyone have any comments about it? "
2) Information Request: "What is the most appropriate form to forward this question?", "Where can I find code for this functionality that I need to implement?"
3) Experience Search: "Who has already found a context such as that in any other client?" "How was the question dealt? ","Is the situation that occurred on client X many years ago repeating on client Y?"... "Could anyone help me solve it?"

Currently, organizations are recognizing the contribution of communities of practice in the creation and sharing of knowledge, connecting people through social networks, identifying skills and being learning model [2].

Learning should be thought as social relationship, as a process in which "people are not only active participants in the practice of a community, but also, develop their own identities relating that community" [1]. The use of information and communication technologies facilitates the circulation of information and knowledge however the cognitive ability and the capacity for innovation are not affected by the technology [1]. By this mean, the communities

of practice use traditional technological tools used in corporate, personal or relationship websites, changing only their goals and forms of use [2].

Several computer tools can be used to implement communities of practice, since traditional communication tools such as chat rooms, discussion forums, e-mail, instant messaging, etc. Tools for managing and publishing are also necessary. In this context, innovation is not on the tools, but on its use, which enables members of the community of practices, the dissemination of knowledge [5].

The interfaces required by communities of practice are identified by Wenger [5] through tensions present in the terms of trade between the members and the community, generating three types of requirements that define technological possibilities which aim to meet the needs of members of a community: Interaction (synchronous and asynchronous), Publishing and Tendency (individual participation and community cultivation) [6].

III. Permanent Education in Health

According to the Ordinance 198GMMS (Brazil, 2004) [7], Permanent Education is work training, where learning and teaching are incorporated to daily organizations and work. It is proposed that the procedures for training of health workers take as a health reference, needs of individuals and populations, from sector management and social control in health, having as goals, the transformation of professional practices and the organization of work and being structured from the issues of work process.

According to Ceccim and Ferla [8], Permanent Education in Health as "teaching-learning practice" means the production of knowledge in everyday health institutions, from the reality experienced by the actors involved, and the problems found in daily work and the experiences of these actors as the basis of questioning and change.

The work in health is a job of listening, in which the interaction between health professional and user is determinant in the quality of healthcare response. The incorporation of up- dated technology is urgent and constant, and new processes of decision-making have an effect on technological, scientific, social and ethic care responsibility on treatment or health monitoring. Healthcare requires permanent education [9].

The Ministry of Health of Brazil (MS) [10], created the National Policy of Permanent Education in Health (Ordinance No. 1,996 GMMS) in which determines that the health education issues become part of the many system assignments. Observing and carrying it out, the Ministry of Health has created and introduced several strategies and policies towards the adequacy of training and qualification of health workers to the needs of the population and development of Sistema Único de Saúde – SUS.

Thus, the Brazilian Government has invested in the construction of collaborative virtual learning environments for permanent education in health through community practices.

The communities of practice allow healthcare professionals to expand their knowledge through the formation of a collaborative network with focus on the improvement of the work. The exchange of experiences in virtual environments generates a multiplier effect that contributes to its training and mainly for the quality of service to the citizen.

In a country of continental dimensions such as Brazil, proper development and good use of virtual platforms facilitates the spread of information and promotes shared knowledge, rapidly and undeniable resources saving; in this way, virtual spaces create benefits for the whole of society, since professionals are linked to one of the rare single health systems all over the world and the coverage is a constitutionally guaranteed right to the entire population.

IV. Methodology

Each new technology that is thrown, hits the audience with a specific design. As they are used, based on everyday experiences and with the products, the interfaces tend to be improved. Each technology brings new requirements, what causes a new project of components. When the new technological standard is established, it is time for new studies. Thus, another evolutionary step is set [11].

A. Interaction Design

The term interaction design is used by several authors with different definitions, but yet, complementary. Preece, Rogers and Sharp [12] describe the term interaction design meaning creating experiences that improve and extend the way people work, communicate and interact.

In a collaborative virtual environment, the interaction between people is even more important. During the development of the project, factors of affection and cognition, usage environment and cultural behaviors of users are being observed.

The process of design interaction is developed in four steps:

1) Identify needs and establish requirements;
2) Develop designs that meet the requirements;
3) Build interactive versions of the designs so they can be communicated and evaluated;
4) Evaluate what is being built during the process. These activities are complementary and are recommended to be repeated whenever necessary. There are also three important features in this process, which follows:
   - Users should be involved in the development of the project;
   - Specific use and the goals arising from the user experience should be identified, documented and agreed in the beginning of the project;
   - The interaction is inevitable in the four activities [12].

According to Wenger [13], communities of practice have a well-defined cycle as creation, expansion, maturing anddispersion activity, as shown in the Fig. 1 below.

For the development of the interaction design community, the life cycle described by Wenger [13] was compared with the interaction of end-users observing and identifying the information needs through the most significant points. It is also considered the main items that can influence, positively

or negatively, the user interaction with the system, of which we can highlight: affection, cognition, behavior and the environment of use.

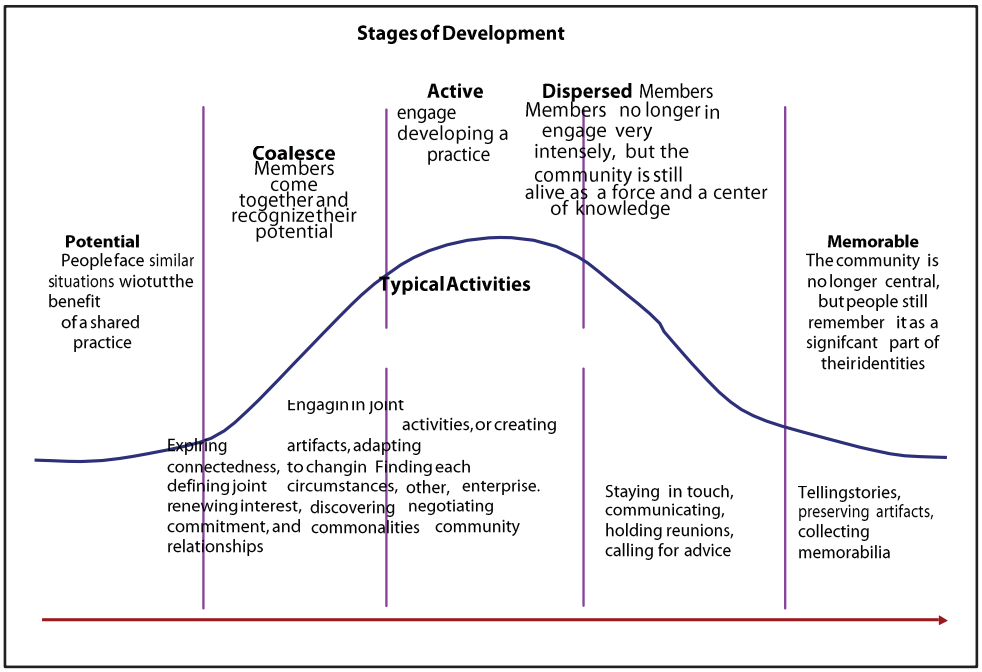

Fig. 1. Life cycle of a community [13].

B. *Competence in Information*

The literature surrounding the theme "competence in information" covers several areas, such as pedagogy, design, marketing, administration and consumer behavior.

When performing a job, a person may notice that there are gaps in the understanding on matters related to the tasks of this work. These gaps can be related to the knowledge needed to carry it on and/or to the meaning of the situation in which it develops. It is assumed that, to solve a given problem or fill out a cognitive gap, the individual chooses sources of information according to his/her prior knowledge about them, with the positive or negative experience in its use, and by the result obtained with previous use in similar situations. This dimension is linked to the cognitive aspects of individual information needs [14].

Still according to Miranda [14] in terms of theoretical definitions, information needs and skills share, then, similar constitutive dimensions. Both the needs of information as skills, can be understood in three considered dimensions: cognitive, emotional and situational. Knowledge can be built by internal cognitive relationships to the individual, influenced by the interaction with the environment. The different situations with which the individual comes across to solve problems, can provide different skills to deal with given context over time. The emotions from experiences and perceptions during the process of generating knowledge and skill acquisition can guide the attitude of individuals on different contexts.

Information competence, generated in work situations, can be seen as one of the requirements of the professional profile necessary to work with the information, with no concern to the kind of professional or activity. What specifies knowledge, skills and attitudes of a user who develops the competence of information is the efficiency and effectiveness to recognize the needs and to attend them and to fulfill tasks and goals to solve informational problems [15].

C. *User Experience (User Experience-UX) and Marketing*

In a generic way the basic principle of a UX Professional and a Marketing Professional is the same: meet your users.

Maybe the Marketing Professional replaces the word users by consumers. Regardless of the profession, we are talking about the relationship of people.

If both professionals want to create great experiences for users, therefore, they need to know something about them. This phrase, "meet your users" can be easily found in a quick study on literatures about use, ergonomics and throughout the universe of design concepts centered in the user. However, long before the term "user experience-UX" had become known, traders and the Marketing market were already concerned on meeting their users. A good Marketing professional is as focused on users as any UX professional [16].

Porter [16] describes that UX professionals are more focused on design than traders. People begin to consider the user experience, often as a response to a design process that ignored their users. They become UX professionals to correct this mistake. They have seen how harmful a superficial understanding of users can be. That's why the phrase "meet your users" is so important to UX professionals.

Still according to Porter [16], UX can be compared to a good marketing. It is intended to know which is your market, what is important for them, and design accordingly. It is also to hear after having conceived and adjust to market changes. It is easy to recognize that when you consider that your users

are the market you are designing. That's why good Marketing professionals can be part of the development of interaction design and UX professionals in the Marketing projects. Any good Marketing professional can say that knowing who the users are, it has been recognized as a good deal.

Considering the importance that the concepts of marketing can add to the development of the project, for this study, marketing topics like affection and cognition, attention and understanding, attitudes and intentions and decision-making were raised.

The development of CoPPLA consists of a multidisciplinary team composed of educators, psychologists, designers, programmers, communication professionals, administrators and information technology professionals who use their own community of practice to enhance the interaction and system tools collaboratively in a horizontal cooperation. Health professionals who promote the dissemination of knowledge and technological expertise in scientific network as well as the permanent education in health, are also part of this team.

V. Case Study of CoPPLa System

The system Communities of Practice Platform - CoPPla is a generic platform for construction of virtual communities of practice, providing a range of integrated communication and collaboration tools in an environment focused on knowledge sharing, where content creation and manipulation of objects is flexible and intuitive.

CoPPla is developed with Plone, a Content Management System (CMS) free and open source, written in Python language. Plone is among the top 2 of all open-source projects in the world, with more than 300 consultants in 57 countries. The project is actively developed since 2001. It is available for more than 40 languages and has the best safety record among the great CMS. (PLONE.ORG, 2014).

CoPPLA platform provides resources for the management of the community, allowing the creation, storage, and access to its content and participants. The set of management tools, communication and publishing are configurable and involve the manipulation of texts, images, web pages, links, events, discussion forums and spaces for learning experiences. Users have the ability to create and manage their communities as a space for sharing knowledge, involving learning activities. The platform offers spaces for the creation of content and interaction between participants through:

1) Calendar: Where events can be created by participants and moderators;
2) Collection: Storage of the general content of the community. Files and images can be inserted, links, pages and folders. Used for publishing collective productions;
3) Portfolio: Used for publishing individual productions, provides the creation of files, images and pages;
4) Tasks: Space for delivery of tasks (in educational contexts);
5) Discussion forum: In the communities, discussions may arise in comments of published items or through an environment of conversation that uses the Plone board product;
6) Notifications: Two forms of notification in communities are used. The first is a mechanism that allows moderators to send messages direct to the participants, and the second is through a daily summary of activities of the community sent by e-mail;
7) Users Profile: It displays information concerning the user as well as shared content;
8) List of participants: It displays the participants and moderators of the community. It is possible to research and access the profile of everyone;
9) Activity level: A tool designed to check the level of interaction in the community, both collective and individual;
10) History: It stores all content produced by the participants, it allows to search for specific content by using filters such as, name, date of creation, who published it, among other issues.
11) Invitation: A tool for sending invitations via e-mail, where you can attach customized messages.
12) Community profile: Through the home page of a community you can find your name, image, description, list of participants and history.

VI. Interface Design

The proposed interface exposes the main components that must be considered in the interaction of a community of practice in the context of permanent education in health. The platform has a set of users, teachers and health professionals who share their knowledge by ensuring the dynamics and functioning of the tool.

To make sure that the tools used on the platform are intuitive is the aim of this work, in which shows the influence of design on the proactive participation of the user.

A template which can be adapted to any content generated by the tools of the community, separated into 3 columns for easy adaptation to mobile devices. On the left are the tools of interaction, in the Center the latest posts or activities of the community and on the right the supporting information, such as monitoring of events and courses, just below, the preview of the participants of the community. All Visual elements compose modules that work in contrast with the background, enabling perception of visual hierarchy intuitively. In addition, the use of modules overlapped to each other, allows easy visual adaptation for applying sub-groups of communities to the system, if necessary.

According to Formiga [17], the user's perception and response to symbols are conditioned by physical and psychological characteristics known as ergonomic factors. In order to have a correct understanding of the message, it is necessary that the user masters the repertoire or that the message is so clear that the relationship with the object, action or idea is done immediately.

Thus, the use of icons associated with the name of tools aims to facilitate the use of the system and keep the user informed on which content he's browsing according to the selected icon.

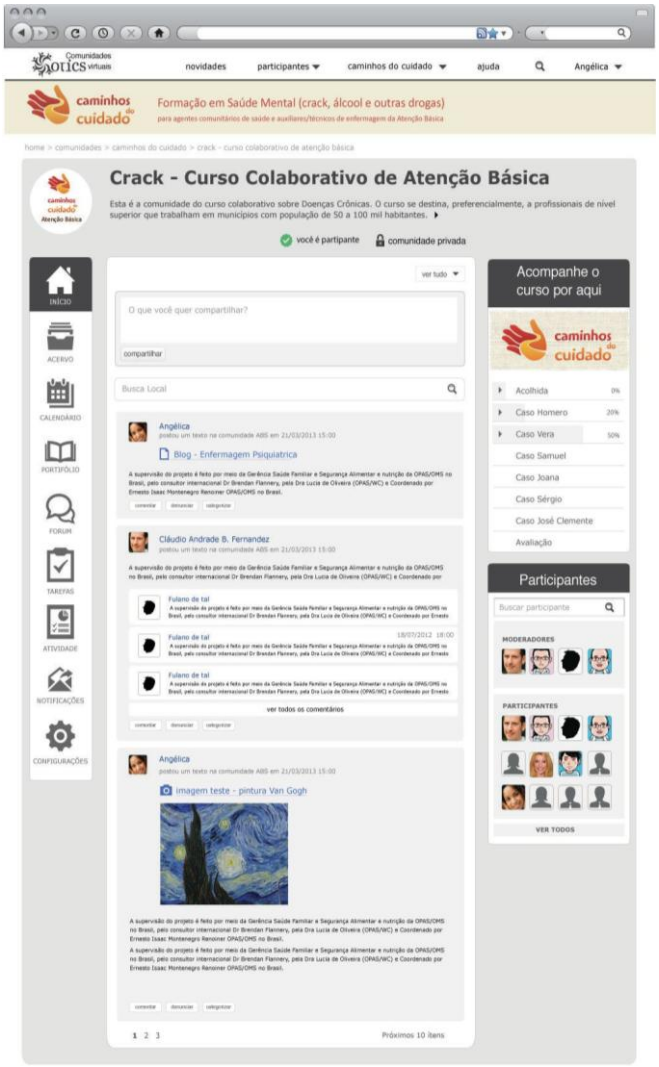

Fig. 2. Shows an example of the interface adapted to the content of the project "Care paths from the ministry of health".

VII. Conclusions

A study of interface design based on the needs of the community of practice platform for permanent education in health and in the specifications of the tools that make up the system was presented in this work.

Elaborate hypothesis was the influence of design on the proactive participation of the user. This hypothesis suggests that the implementation of the interface design with focus on the end user can make browsing more intuitive and enjoyable by encouraging the user to work collaboratively sharing knowledge in virtual environment.

The interface design presented, offers a modular structure easily adaptable to the tools and functionalities of the platform through a set of visual solutions using contrast techniques between Fig. 2 and background, making the hierarchy of information intuitive for the end user.

Through the tools menu in the left sidebar, the user can navigate between all the tools from the platform by selecting predefined icons.

This work, developed with the user's focus and participation, will be submitted to usability testing in order to identify positive and negative points in interaction design followed by proposed improvements.

In this way, initiatives for implementation of interaction design in the development of digital habitats such as communities of practices offering an environment with usability and visually pleasing for the exchange of knowledge and collective learning management, strengthening permanent education in health.

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Carlos Eduardo Ribeiro is a bachelor of industrial design specialized in Visual Communication Centro Universitário da Cidade – Rio de Janeiro, Brasil, 2001. He is an expert of information architecture (AI), user experience (UX) at Pontifícia Universidade Católica do Rio de Janeiro - PUC-Rio.

He studies at PUC-Rio's design graduate program of 2014, exploring the research line on ergonomics and usability for human-computer interaction, during research internship at the Ergonomics and Usability Lab (LEUI). His professional experience is in design, mainly graphic design, in projects

focusing collective and public health, continuing/permanent education, interactive design usability and information architecture. He is a senior designer working in permanent education and collective health projects for: The Oswaldo Cruz Foundation (Fiocruz – Brazil); The Municipal Department of Health and Civil Defense of the City of Rio de Janeiro - (SPS/SUBPAV/SMS-RIO); REDE UNIDA; Communitas Institute; The Collaborative Government for Health Networks; and the Brazilian Clinical Trials Registry (2009- present day).

Claudia Mont'Alvão was graduated with a BS in industrial design and completed master and doctorate degrees in transport engineering. In 2002 she became an assistant professor and researcher in graduate program in design at Pontifical Catholic University of Rio de Janeiro [PUC-Rio] and coordinates the Laboratory of ergodesign and usability of interfaces [LEUI] and since 2013 she is anassistant professor at this program.

she is a consultant in ergonomics/human factors and has been teaching about ergonomics in design last 20 years for under graduation and graduation courses in design and engineering. Since 2005, she has been hosting the annual events ergodesign (international congress on ergonomics and usability of human-technology interfaces: Products, information, built environment, transportation) and USIHC (International congress on ergonomics and usability, interface design and human-computer interaction), that will complete 15 editions in 2015.

Dr. Mont'Alvão has co-authored the main Brazilian text book about ergonomic/human factors, as organized books and published articles in the field of ergonomics/ human factors and design. She is serving as an editor-in-chief of the journal ergodesign & HCI, and is a reviewer for other ergonomics/human factors and design journals.