Handbook of Research on Communities of Practice for Organizational Management and Networking:

Methodologies for Competitive Advantage

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Chapter 16
Future Tools for Sharing Knowledge:
Virtual Communities in the Web3D

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ABSTRACT

The goal of this chapter is to encourage an open discussion about current and future technological support for knowledge sharing and learning. This support can be especially beneficial for communities of practice, where technology can bring increasingly geographically distant companies and knowledge closer together.

The chapter introduces new technologies based on emergent Web3D and which can improve current ways of sharing knowledge and providing eLearning support. These are 3D virtual worlds as knowledge sharing tools and the concept of serious games as a way for improving learning processes.

An application that combines both technologies would unite the main features of constructivist learning theories, and therefore, be a useful tool for supporting communities of practices' learning and knowledge flow in a very dynamic way.

This chapter also suggests what ideal tools for knowledge sharing and learning on Future Internet could be like, the advantages that their use could provide and the factors the authors believe should be improved to turn this ideal tool into a reality.

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INTRODUCTION

The appearance of Web 2.0 tools has changed the way people communicate. Until their appearance, the traditional Web (called now Web 1.0 in order to distinguish it from the current web) was an almost unidirectional way of transmitting information. People created their web pages and filled them with contents, but there was no feedback from other users to complement these contents.

Nowadays, the proliferation of *blogs*, forums, instant messaging tools and *wiki*s (in other words, Web 2.0 technologies) provides a new communication scenario in which communities with similar interests can share their comments and knowledge in real time.

One of the factors that has contributed these tools' great success has probably been their ease of use. Very little technical knowledge or specific expertise is needed to use them. They are almost *universal* tools. And they have been very widely accepted. Nowadays, for example, Facebook has more than 400 million active users (statistics, 2010).

With regard to the use of Web 2.0 tools for sharing knowledge in the working environment, LinkedIn (LinkedIn Home Page, 2010), considered to be the biggest professional network, has more than 200,000 interest groups. Users share comments and information with other users with the same interests.

This level of acceptance means that knowledge sharing is not only easy but also fast. Fast, on the one hand, in that Web 2.0 tools provide real time communication. On the other hand, they are so widely accepted that it is easy to find groups sharing common interests and with huge numbers of active members willing to share their expertise. The combination of these two factors means that knowledge flow is quicker than when using other tools.

Reports about Future Internet are starting to talk about the up-and-coming web (es.Internet, 2009; Portal, 2010). According to these reports, one of Future Internet's objectives is to evolve the paradigm of users as content consumers and producers, introduced by Web 2.0, towards a new stage in which web services will be completely interactive and collaborative for all users. Another factor that is being introduced is the Web3D: one of the features of the new generation of web tools will be the inclusion of simulations of real life by means of 3D contents and immersive environments.

Only time will allow us to see the validity and success of these new trends. However, some advantages and disadvantages can be stated now, and that is this chapter's objective. The aim is to encourage an open discussion about the disadvantages of current Web 2.0 based tools and the possibilities that a new, more collaborative and immersive web can provide for overcoming them.

The chapter starts from the hypothesis that technological solutions that can be useful for communities of practice are more useful include **collaborative working possibilities, immersion and learning validity.**

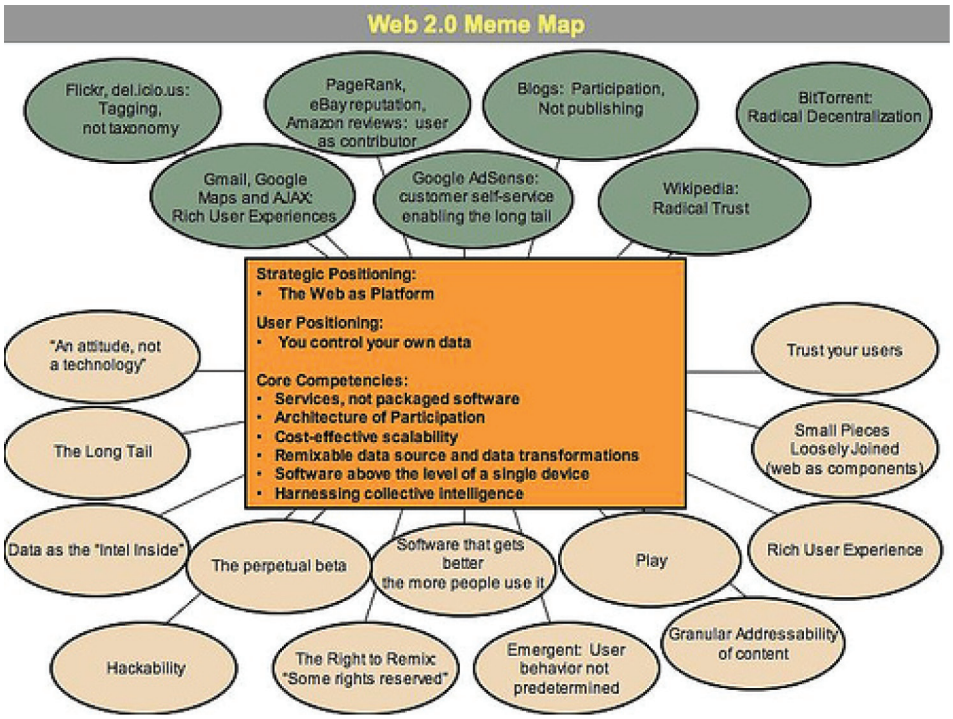
Taking this into account, the next section presents a state-of-the-art analysis of current Web 2.0 tools for collaborative work and learning. Virtual world characteristics and serious games that can improve Web 2.0 tools' knowledge sharing and learning are then explained. Section 5 lists the features that can be useful for CoPs and Section 6 suggests factors that should be improved in next generation tools. Finally, conclusions are presented.

STATE OF THE ART

Web 2.0 for the Technological Support of CoPs

The state-of-the-art in collaborative tools for knowledge sharing and creating virtual communities is based on Web 2.0 tools.

Figure 1. "Meme map" of Web 2.0 that was developed by Tim O'Reilly et al. during a brainstorming session. Extracted from (O'Reilly, 2005 #3).



Web 2.0 is defined as new digital platforms for generating, sharing and refining information on the Internet. It is a new way of understanding the Internet that provides information flow and management depending on the behavior of the users that access it. It allow users easier, more centralized access to contents and participation in creating and classifying contents by means of increasingly easy-to-use and intuitive tools (Torre, 2006).

The term was coined by Tim O'Reilly during a brainstorming session in 2004. In this session a "meme map" of Web 2.0 was developed (see Figure 1).

There are considerable differences between Web 2.0 and Web 1.0 (the traditional web) that have converted it into a tool that promotes collective intelligence. McAfee uses the acronym **SLATES** to refer to these differences (McAfee, 2006):

- **S – Search.** The ability of searching using keywords instead of traditional Intranet tools such as page layouts and navigation aids.
- **L – Links.** Links between web pages are an excellent guide to what is important and provide structure to online content. In this structure, the 'best' pages are the ones that are most frequently linked to.
- **A – Authoring.** New Web 2.0 tools provide a way for non-authors to become authors. Wikis provide an iterative way for creating and managing contents and blogs provide a cumulative means.
- **T – Tags.** Categorization of content by user-added *tags* is widely used. They are short,(usually one-word) descriptions. This makes searching easier, without dependence on pre-made categories. Collections

of tags are created by users following their own criteria.

- **E – Extensions.** Following the tagging system, smart software is able to suggest pages that can be interesting for users, taking into account their preferences in any specific search.
- **S – Signals.** Ways to alert users about updates in the content they are interested in. This is not only done by means of email alerts. RSS ('Really Simple Syndication') systems also provide information to software about updates, called *aggregators* that users only have to check.

Several tools have been built using these components. Some of them are useful for both knowledge sharing and learning and have become very popular.

With regard to tools that promote knowledge sharing and collective intelligence, Perera compiles three popular groups (Perera, 2007): *Wikis*, *blogs* and *podcasts*.

- *Wikis* (the word comes from the Hawaiian, meaning hurry). These are collaborative web sites whose content can be edited by anyone who access to them. Wikis can be used not only as a source for obtaining information and knowledge, but also as a method of virtual collaboration, e.g., sharing dialogue and information among participants in group projects. They also allow collective learning, using wikis as a collaborative environment to construct knowledge or to be part of a virtual community of practice.
- *Blogs*. The term was coined by Jorn Barger in 1997 and defined as "A Web page where a Web logger 'logs' all the other pages she finds interesting" (Blood, 2004). The word 'blog' is a contraction of 'Web Log'. Blogs can be written by one person or by a group of contributors.
- *Podcasts*. This is a way of creating audio-visual content. Users can listen to podcasts and watch vodcasts on their computer (e.g. using Windows Media Player), or download them to portable MP3/MP4 players and listen or watch them anywhere.

With regard to learning capabilities, there is also software known as Learning Management Systems (LMSs). These are applications used for managing, distributing and tracking eLearning activities. They are increasingly used by companies and large institutions.

These systems do not usually include authoring features but are focused on managing previously created contents. Authoring is done by means of Learning Content Management Systems (LCMSs).

These are considered to be valuable learning tools and, therefore, many different systems have be created. Proprietary systems such as Blackboard (Blackboard Home Page, 2010) and Desire2Learn (Desire2Learn Home Page, 2010), and open source systems such as the popular Moodle (Moddle Home Page, 2010), Ilias (Ilias Home Page, 2010) and ATutor (ATutor Home Page, 2010) are widely used nowadays.

Web 2.0 Pros and Cons

These tools seem to be useful for running communities of practice. But the question remains: is this Web 2.0 technology really useful for supporting communities of practice? Has this been proved? And, if it has, could it be improved in order to obtain an even more suitable way of running communities of practice?

Hamburg et al. (I. Hamburg, 2007) use the term virtual communities of practice (VCoPs) referring to Web 2.0 support for communities of practice and they enumerate several advantages and disadvantages associated with them (view Table 1).

Table 1.

Virtual Communities of Practice	
Advantages	**Disadvantages**
People and information can be accessed anytime	Members have to be motivated continually
Through participants' different expertise and knowledge, their innovative ideas can contribute to more effective problem solving and decision making	Lack of "face to face" communication can contribute to growing social isolation
Cost effective	The hardware and software required and/or difficulties with the use of the VCoP supported technology can prevent people interested from participating
People feel less inhibited while interacting and this is particularly important for learning.	

In general, it is considered that Web 2.0 tools, although they do have some disadvantages, are useful for geographically distant communities of practice.

But Web3D technologies could provide a way for obtaining Web 2.0's advantages without suffering its disadvantages. Specifically, from authors' point of view, two emergent technologies could achieve this. They are examined in next section.

Web3D Evolution

Web3D technologies are predicted to be the evolution of current multimedia web. They will provide new ways of showing information and interacting with it via 3D contents and simulations.

These new technologies' features, which are apparently disjointed, or at least do not seem to be useful for communities of practice, include some technological systems that could remove the disadvantages of Web 2.0 explained in previous section:

- **3D virtual worlds.** In these systems one of the objectives is to achieve user immersion with a more or less faithful simulation of the real life. One of the main factors in obtaining this immersion is that users are usually represented by 3D avatars embedded in the virtual world and they can communicate and interact among themselves. One user's actions can affect the virtual world and they are noticed by the rest of users connected.

These characteristics provide two useful advantages for communities of practice:

- *Face-to-face communication.* Immersion by means of avatars can make up for missing face-to-face communication. Avatars can simulate human behavior by expressing emotions or including non-verbal language during speech.
- *Easier collaborative working possibilities.* Virtual worlds enable, at least potentially, communication channels that are more natural than when using Web 2.0 tools. This could improve the way collaborative work is done. In addition, the possibility of including not only current multimedia information but also 3D content could make it easier to understand knowledge.
    - **Serious games.** Serious games are systems that use gaming technology with any purpose apart from leisure. These technologies can avoid the continuous need for work on motivation. Their design and philosophy of "play to learn" can provide continuous goals that keep users motivated if the system is correctly developed.

Figure 2. Users speaking in Second Life (extracted from http://www.dot-secondlife.es/blog/?p=88)

This could remove another Web 2.0 tools' disadvantage: the need to create continuous motivation for community members.

Finally, as with any other kind of software, the ease of use of both systems has to be studied in depth. However, Web3D technology has an initial advantage over Web 2.0 technology: 3D simulations of real aspects (i.e. 3D avatars simulating a real person) can stimulate natural communication channels, and, in this way, provide a more intuitive, easier use, at least potentially.

The next sections detail the main features of each of these technologies.

VIRTUAL WORLDS' KNOWLEDGE SHARING CAPABILITIES

There are almost as many definitions of virtual worlds as there are virtual worlds. From the author's point of view, a virtual world is *a synchronous and continual network of inhabitants (users or autonomous agents), represented by avatars embedded in 3D applications and supported by computer networks* (D. Oyarzun, 2010).

Nowadays, there are a great number of very popular virtual world with different purposes.

For example, there are virtual worlds for leisure such as *World of Warcraft*, *The Sims Online*, *Moove* and *Playdo*; for general purposes such as *Second Life*, *Habbo Hotel* and *There*; for advertising such as *Disney's Toontown Online*, *Coke Studios* and *Dubit*...

There are also virtual worlds about tourism, culture, medicine… in short, the popularity that virtual worlds have obtained implies that there are worlds for any imaginable environment.

The main conceptual elements of any virtual world system are: users, avatars, the virtual world itself and the autonomous agents.

Figure 3. Virtual world's elements schema

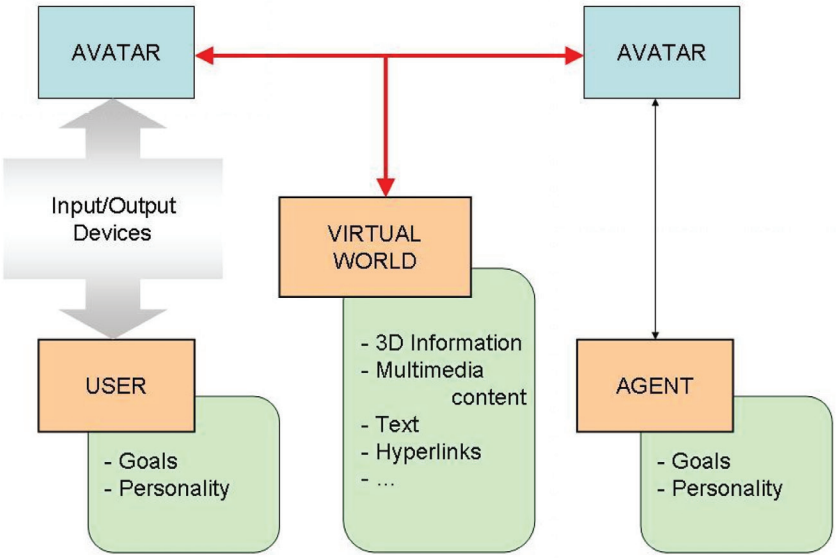


Figure 3 shows a schema of these elements and the communication channels between them:

- **The user** interacts with the virtual world through his/her avatars. Avatars are controlled by Input/Output devices.
- **Agents**, in the same way, are represented by means of avatars, which are directly controlled (via software functions).
- **Avatars**, driven by users or agents, can interact between themselves or with the virtual world.
- **The virtual world** channels the interactions between avatars and manages the contents, objects and services that are provided.

So users and agents are the intelligent elements in the virtual world; avatars provide a natural way for interaction and communication between themselves, and the virtual world is the basis for knowledge sharing.

Virtual worlds include interaction factors not associated with users, agents or avatars. In other words, terms, contents and media that Straaten defined for categorizing a virtual world (Straaten, 2000). They include the following functionalities and features:

- **Functionalities.**
  - *Interaction channeling*. The virtual world is the element that makes interaction between avatars possible. Although the avatar is the element that allows interactions between users and users and agents, they cannot exist without a medium. Therefore, this is one of the main functions of virtual worlds.
  - *Physical rules*. The rules that control the avatar and other interactive objects' interactions. There can be realistic or non-realistic rules such as 'an avatar cannot go through a wall' or avatars flying in Second Life. Each virtual world establishes its own rules and physical laws that condition interactions.

  - *Logical rules*. They refer to objectives or goals in a virtual world. They, too, are different in each virtual world.
- **Features: contents.**
  - *3D objects*. 3D static or dynamic objects, in the sense that they can have associated behavior or not. They can be both 3D objects that conform to the environment or the objects which users or agents can interact with. Objects' behavior (for example, a virtual pen that writes when an avatar takes it) are defined by the object itself or by virtual world rules. Techniques for defining object behaviour (the objects tell the avatar what it can do with them) was created in the 90's and it is known as Smart Object technique (L. Goncalves, 2001).
  - *Multimedia contents*. This is general information. It can be static or dynamic. Static information is text, images, videos, etc. Dynamic information is, for instance, Google mapping in the virtual world. This dynamism is controlled by virtual world rules or by an agent that is not represented by means of an avatar.

In resume, the virtual world provides the medium for interacting avatars and offers information and services.

Therefore, virtual worlds keep two Web 2.0 advantages for giving technological support to communities of practice: Real time collaboration and interaction and knowledge sharing.

They also provide two more advantages that are useful for communities of practice support and avoid Web 2.0 disadvantages.

- **Face-to-face communication.** Representation by means of avatars tries to simulate human-to-human communication. The inclusion of natural and intuitive tools that allow avatars to express emotional gestures and non-verbal language makes communication easier in geographically distant communities of practice. This is one of the main advantages of Web 2.0-based supporting tools and one of the virtual worlds' strengths.
- **3D contents.** Some information is better understood by means of 3D simulation. Virtual worlds makes it possible to complement multimedia information with 3D content and to embed all of it in the own environment. Virtual world users can interact in real time and in a collaborative way with both multimedia information and 3D contents.

SERIOUS GAMES LEARNING CAPABILITIES

Serious games is a term for games whose goal is not leisure. In other words, they use the same technologies and algorithms (even the same graphic and logic engines) as traditional computer games but with a purpose different other than playing.

A. Derryberry (Derryberry, 2007) has compiled the minimum features that are common to all serious games (due to the fact that they are games):

- **Backstory and story line.** The story upon which it is based and a story line that it follows.
- **Game mechanics.** The handlers for all the specific functions within a game.
- **Rules.** The constraints in play on every player's actions and abilities.
- **Immersive graphical environment.** The sensory representation of each game's experience layer, including 2D/3D graphics, sound and animation.
- **Interactivity.** The impact a player's actions have on the world.

- **Challenge/competition.** The competition against the game, against one's self, and/or against other players.
- **Risks and consequences.** Consequences of each challenge in the game world.

Both traditional and serious games are built using these basis features. Serious games are classified depending on their purpose:

- **Advergaming.** Games designed with commercial purposes. The whole game is oriented toward a commercial product or mark.
- **Health games.** Games that try to make players aware of healthy habits or specific exercise training.
- **Political & Social Games.** Games that try to encourage players in rules about and civic life and behaviour.
- **Others.** Any area the reader can imagine …
- **Learning games.** The serious games this chapter is focused on. Some sources consider all serious games to be learning games; in fact, the list above could be defined as learning about different issues. However, in this group we refer to learning skills related to new knowledge and education.

The main benefit of learning games is the concept of "playing to learn". The learning process is made enjoyable. Different studies conclude that the main advantage of game-based learning over traditional learning is motivation (S. de Freitas, 2006) and another important factor that is useful in some cases is safety.

- **Motivation.** Obtained thanks to fun and continuous goals. A well designed game avoids players getting bored and continuous goals, maybe of increasing difficulty, motivate players to continue their learning process.
- **Safety.** In some cases (i.e. learning to repair a dangerous machine) players can learn new skills without a risk to their health.
- **Asynchronous learning.** The role of a real tutor as a continuous monitor for the learning process disappears. Students can start or continue their learning processes when they want. Although a real tutor will be always necessary, the learning process can be managed either in a synchronous or in an asynchronous way, depending on the needs.

Thanks to these three factors, serious games, specifically learning games, become a very useful tool for learning. Depending on each case, they can be used as a complement to traditional learning or as an autonomous tool for learning.

HOW COMMUNITIES OF PRACTICE COULD BENEFIT FROM BOTH

Virtual worlds have been widely used for knowledge sharing and eLearning, maybe due to their ability to show 3D and multimedia information and the possibility of interacting with tutors and other student in the same virtual place in real time.

Nowadays, a lot of different learning institutions and education centres, from prestigious universities like Harvard or the Imperial College to medical assessment centres, are represented in general purpose virtual worlds like Second Life. On the other hand, several virtual worlds have a completely educational focus. Examples of this include Mokitown (Mokitown Home Page, 2010), focusing on children's education, and Whyville (Whyville Home Page, 2010) for science learning.

In fact, several studies (W. H. Bares, 1998; Dalgarno, 2002) consider virtual worlds to be a suitable environment for applying constructivist

education theory, partially examined by Piaget (Piaget, 1954).

This theory establishes three points:

- Student create their own knowledge representation and therefore, there is no unique knowledge representation.
- Learning occurs when, in active knowledge exploration, students discover a gap in their knowledge or incoherence between their current knowledge representation and their experience.
- Learning occurs in a social context and therefore interaction among students is necessary in the learning process.

Although there is some criticism with regards to the possibility of achieving effective learning in current virtual worlds (Berge, 2008), even these opinions focus on the problem with the learning curve in virtual world use. They consider the potential of eLearning to be very valuable and are optimistic about the evolution of these worlds towards an environment that makes education easier.

Bearing in mind the advantages and disadvantages in state-of-the-art, a tool that combines virtual worlds' and serious games' main features would be very useful for supporting communities of practice.

Virtual worlds support **high-performance, collaborative working** (thousands of people can interact simultaneously within the world and between themselves). They can communicate via verbal and non-verbal language creating an **illusion of immersion** and minimizing the lack of face-to-face communication (in worlds like Second Life it is quite common to organize symposiums and speeches).

On the other hand, serious games, if well designed, provide **continuous motivating learning experience** for players.

A combination of both tools is a tool with which expert users can design stories in an easy way to disseminate knowledge. These stories are the basis for interactive and collaborative games that motivate the rest of the community to follow the story and learn. Moreover, it includes the collaborative and knowledge sharing capabilities of virtual worlds. That is, immersive forums where all the members of the community can share their expertise and comments.

This tool keeps the advantages of Web 2.0 tools for supporting communities of practice and avoids the disadvantages. Immersion and collaborative possibilities provide the nearest approach to a face-to-face community of practice but in a geographically distant world. The learning features can even improve on face-to-face communities' advantages.

However, there are some technological gaps that have to be solved to be able to create this useful tool. These gaps are explained in next section.

DISSERTATION: CURRENT AND FUTURE TECHNOLOGICAL POSSIBILITIES

The sections above have explained features included in Web 3D technologies that could improve current Web 2.0 support for communities of practice by reducing some of their limitations.

However, this is an emergent technology that needs to be developed or matured if it is to be really successful. There are some gaps to be filled before being in a position to develop the ideal tool for supporting communities of practice:

- **Content authoring tools.** Content creation for virtual worlds, especially for 3D content, is a difficult task that is usually performed by expert authors. Development of tools that allow non expert users to create contents in an easy way will be needed in order to obtain a useful system.
- **Storytelling.** Related with the previous point, there is not only a need to create contents but to create stories too. Communities

of practice can be very dynamic entities and knowledge should be spread among members quickly. Tools for giving coherence to contents and creating stories that allow experts to disseminate their knowledge will be needed.

- **Standards.** Each virtual world and serious game has its own way of managing contents and information. The specification of standards to avoid the need to use specific tools and facilitate the creation of communities is needed. Some initiatives like MPEG-V (MPEG-V, 2010) are trying to solve this need, specifically by creating a language that allows migration between virtual worlds and between virtual worlds and the real world.
- **Interaction paradigms.** Current virtual worlds and serious games have many similarities in their interaction with the traditional interaction paradigm WIMP (Windows, Icons, Menus and Pointers – mice). A new interaction paradigm is needed to make virtual worlds and serious games natural, easy-to-use tools.

From the author's point of view, the current state of technology allows communities of practice to have useful support, above all if they are geographically distant. However, coming technological trends will improve some features of face-to-face communities of practice.

Filling these gaps would also allow communities of practice to develop tools to meet their own specific needs or 3rd parties to develop generic tools useful to the most of them.

CONCLUSION

The objective of this chapter has been to encourage an open discussion about current and future technological support for knowledge sharing and learning. It is specially focused on the communities of practice technological support.

The chapter has provided an examination of state-of-the-art Web 2.0 support for these purposes. Tools like wikis or blogs are now widely used for obtaining and managing collective intelligence and make the creation of virtual communities possible.

However, some disadvantages still exist. In these technologies, face-to-face communication is missing and community managers have to motivate the rest of the community continuously. Moreover, it would be highly beneficial to achieve more natural ways of interaction, which would provide intuitive, easy use.

To obtain this, new trends in Web3D technologies have been studied. Specifically, 3D virtual worlds and serious games features have been explained. The former provide a natural form of knowledge sharing and collaboration and the latter a way to motivate learning. The combination of both tools could be the ideal application for supporting communities of practice.

Finally, different aspects which the authors believe should be improved in order to obtain successful applications have been enumerated and explained.

As main conclusions, technological support for communities of practice is nowadays a fact with Web 2.0 tools and this may very well evolve with the implementation of new Web3D.

From the author's point of view, with the study of new interaction paradigms and standards and the development of tools for creating contents in an easy way, it will be possible to achieve the implementation of natural, intuitive and easy-to-use tools that will provide great dynamism in communities of practice and will make the management and coordination of geographically distant communities of practice easier.

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KEY TERMS AND DEFINITIONS

Web 2.0: New digital platforms for generating, sharing and refining information on the Internet.

Wikis: Collaborative web sites whose content can be edited by anyone who access to them.

SLATES: Acronym that defines the differences between Web 2.0 and Web 1.0

LMS: Applications used for managing, distributing and tracking eLearning activities.

Web 3D: An evolution of current multimedia web that will provide new ways of showing information and interacting with it via 3D contents and simulations.

3D Virtual Worlds: Synchronous and continual network of inhabitants (users or autonomous agents), represented by avatars embedded in 3D applications and supported by computer networks

Serious Games: Games whose goal is not leisure.