



## Review

# THEMATIC NETWORKS OF WEB 2.0, LEARNING AND KNOWLEDGE COMMUNITIES IN SUPPORT OF AGRICULTURAL RESEARCH

## Reseña bibliográfica

### Redes Temáticas de la WEB 2.0, comunidades de aprendizaje y conocimientos al servicio de la investigación agrícola

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**ABSTRACT.** Thematic networks of *Web 2.0* are very useful for the training of researchers. Its use means radically changing the usual perspective on how to work and train experts. They represent a new model of professionalism, with its potential and limitations, based on collaboration and teamwork. The website of Thematic Network “Manejo de la Simbiosis Micorrízica en Agrosistemas” was developed and published since 2008 with the aim to create a collaborative framework that foster the management of the information that the members of the network generate and to put it to the service of the scientific community and allows the exchange of knowledge and cooperation as a working method for the emerging future joint activities. The presence of this website on internet publishes and promotes the research carried out by members of this network and main results.

**RESUMEN.** Las redes temáticas de la *Web 2.0* tienen gran utilidad para la formación continua de investigadores. Su utilización significa cambiar radicalmente la perspectiva habitual sobre la forma de trabajar y capacitarse de los expertos. Representan un nuevo modelo de profesionalidad, con sus potencialidades y limitaciones, que se basa en la colaboración y el trabajo conjunto. Con el objetivo de crear un marco de colaboración que favorezca la gestión de la información que los miembros de la red generan y ponerla al servicio de la comunidad científica, además de permitir el intercambio de conocimientos y la cooperación como método de trabajo para que en el futuro surjan acciones conjuntas, se desarrolló y publicó desde el año 2008 el Sitio Web de la “Red Temática Manejo de la Simbiosis Micorrízica en Agrosistemas” que divulga y promueve el trabajo investigativo realizado por los miembros de esta red y sus principales resultados.

**Key words:** World Wide Web, research networks, vesicular arbuscular mycorrhizae, information and communication technologies, knowledge and information systems

**Palabras clave:** World Wide Web, redes de investigación, micorrizas arbusculares vesiculares, tecnologías para la información y la comunicación, sistemas de conocimiento e información

## INTRODUCTION

In the last two decades, we have witnessed technological changes that have modified social and cultural habits in society. The

greatest revolution has taken place in the way of communicating among ourselves, but no doubt that the emergence and use of Internet has supposed a revolution both at the communication level and its usage in the professional, personal, leisure and relations fields (1).

Man faces one of the largest challenge of history, where human

existence and its future get closer to unimaginable that can foster well being and happiness, only if we are able, from an ethical stance, to channel scientific and technological development for its human, moral and social growth.

The scientific and technical revolution has caused deep changes in human development and its values, with positive and

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negative impacts in all fields of society. It is said that with the XXI century in a globalized world, mankind has entered to the Era of Information and Knowledge due to the great progress of Electronics, Cybernetics and Telecommunications (2).

TICs are the set of resources marked by allowing domestic development, the indistinctly use and combination of any modality of symbolic encoding of information. Verbal, fix or moving icons, the sound, are sensitive to be used in computerized systems (3). Strategically, to face TICs' impact it is a must to strengthen cooperation, human exchange through information structuring, services and information resources around knowledge areas, in the so-called thematic, academic, research, scientific, or simply knowledge networks (2).

Internet is already a mass communication mean. In recent years, great changes have taken place in internet and in TICs which have been expressed on the Web. One of the phenomena that in a short time have extended through Internet and even beyond it has been Web 2.0. We have already started talking about Enterprise 2.0, E-learning 2.0, Education 2.0 all of this associated to the idea of modernity. Out of this process, something known as Web 2.0 has emerged. This concept includes ideas, tools, new interaction ways that make it different from the

incipient Web. Therefore, every day new types of social networks or virtual communities increasingly spread out for such purposes: to continually receive news on a specific issue, to register on a course, receive information from the distance, to develop professional cooperation activities, to become member of a community, among others (1, 4, 5).

Thematic networks are useful in Web 2.0 for continuous formation based on the cooperation, exchange of experiences and professional knowledge. To gain access to this project means completely changing the habitual perspective and bet for a model based on the contribution and democracy of knowledge.

## DEFINITION OF WEB 2.0

The term Web 2.0 was "invented" by Tim O'Reilly and Dale Dougherty in 2004 preparing a conference that O'Reilly Media would organize to work on the analysis of social and communicative changes taking place on the web since the year 2000, what they were calling the "new Web". From this first Web 2.0 Conference, the term was disseminated worldwide and rapidly patented by the O'Reilly Media team (6).

The definition of Web 2.0 can be made from three big perspectives known as technological-instrumental, philosophical and

social vision (1): The first of the two visions implies a technological-instrumental from the Web 1.0; the transfer from a static web to a dynamic one, the transformation of the web for reading to a web for writing, the change from a text Web to an audiovisual one, and the use of new communicative and more participative tools. Table I shows the main differences between Web 1.0 and Web 2.0.

The second way of defining Web 2.0 is from a philosophical point of view, that includes a communication philosophy that avoids looking at the digitalization as a mere tool taken to a technology, that can provide a reasoning loss. From that perspective, two main ideas are assumed:

- a) is a philosophy of the cyberspace that returns a leading role to internauts and the hegemony of contents over the design,
- b) the important things are persons, not the tools they work with.

And last, a third vision, the social one, that looks forward to break the idea of the user as mere receiver of information and as counterpart, it is assumed the need of content realization collectively.

Web 2.0 is not a technological revolution; it is rather an attitude, a social revolution that looks for a participative architecture through applications and open services, social approach mainly, with the possibility of using contents on new and meaningful environments (7).

**Table I. Differences between Web 1.0 and Web 2.0**

|                      | Web 1.0 (1993-2003)<br>Several web pages to be accessed through a browser | Web 2.0 (2003-)<br>Lots of content shared through high interactivity services |
|----------------------|---|---|
| Mode                 | Reading   | Shared writing  |
| Minimum content unit | Page  | Message – Article – Post  |
| Status               | Static  | Dynamic   |
| Visualization mode   | Browser   | Browser, RSS reader   |
| Architecture         | Client-Server   | Web service   |
| Editors              | Webmasters  | All   |
| Participants         | Expert people   | Amateurs  |

## RESOURCES OF WEB 2.0

Web 2.0 is another stage of TICs evolution. Its tools foster relations and interactions, they are platforms for circulating information and therefore knowledge sources. They support collaboration and interaction taking users into account. They also have a great potential to be suitably used for teaching and learning. Some of these tools are described in Table II (6, 8).

Blogs, educational web portals, virtual classrooms, spaces for exchanging multimedia files, (pictures, videos or presentations), among other resources of Web 2.0 are in full expansion and popularity (4).

From the tactical point of view, it is very important to develop interaction spaces by creating information, training, consult, advisory and discussion services that favor the use of permanent virtual exchange spaces for persons involved in the processes. It is essentially the creation of human networks supported by TIC that dynamically and systematically motivate the interaction among persons thus strengthening generation,

dissemination and exchange of information and knowledge according to professional, institutional and social objectives in each particular context (2).

## SOCIAL NETWORKS OR VIRTUAL COMMUNITIES

The issue of social networks or virtual communities is growing in recent years parallel to services and tools of the so-called Web 2.0. In general, three great types of networks can be identified though the limit differentiating them is sometimes not well-defined (4). In this regard we could talk about:

- ◆ general purpose, mass or megacommunities networks (for example: Facebook, Twitter).
- ◆ open networks to share files, videoclips, presentations, pictures (for example: YouTube).
- ◆ thematic networks: microcommunities with a specific interest (for example: Google Groups).

The reasons that justify the need of using these virtual spaces for collaborative works among communities of professionals are of different nature, but they could be basically summarized in two (3).

a) The use of resources provided by internet (e-mail, foro, messengers, virtual classrooms, file exchange), allows to go beyond physical contacts and achieve communication among each of the subjects, surpassing space and time limitations.

b) The other reason linked to the knowledge management concept is the one understood as the set of activities carried out to use, share, develop and administer knowledge in the hands of an organization and individuals, so they can be used as best as possible. A new "knowledge management" will permit younger members to learn from others with more experience. Therefore, it is important to provide shape and rebuild experience, turning it into a document or other type of digital object (video, multimedia presentation, conceptual maps or narrative text).

Internet and the resources included in the Web 2.0 have been considered as an opportunity in the cyberspace, virtual spaces of social networks also known as learning communities.

**Table II. Tools of the Web 2.0**

| Type                    | Function  | Tools  |
|-------------------------|---|--|
| <b>Of communication</b> | To share ideas and information  | <ul style="list-style-type: none"> <li>• Blogs</li> <li>• AudioBlogs</li> <li>• VideosBlogs</li> <li>• Instant messages</li> <li>• Podcats</li> <li>• Webcams</li> </ul>     |
| <b>Of collaboration</b> | To work with other people, for a specific objective, in a shared work space             | <ul style="list-style-type: none"> <li>• Of edition and writing</li> <li>• Virtual communities of practice</li> <li>• Wikis</li> </ul>                                       |
| <b>Of documentation</b> | To collect or present evidences of experiences, production, thought lines in time, etc. | <ul style="list-style-type: none"> <li>• Blogs</li> <li>• Videoblogs</li> <li>• Electronic portfolios</li> </ul>   |
| <b>Of creation</b>      | To create something new that can be seen and used by others.                            | <ul style="list-style-type: none"> <li>• Hybrid Web applications</li> <li>• Virtual communities of practice</li> <li>• Learning virtual worlds</li> </ul>                    |
| <b>Of interaction</b>   | For the exchange of information, ideas, resources and materials.                        | <ul style="list-style-type: none"> <li>• Learning objects</li> <li>• Social markers</li> <li>• Virtual communities of practice</li> <li>• Learning virtual worlds</li> </ul> |

The technological component is composed of communication systems, telephone, electronic mail, videoconference and other shared spaces where two or more persons can work simultaneously on the same document; shared information where data can be stored, modified and handle information; the possibility of doing joint activities (storm of ideas, voting and others).

The human component would be made up by the way persons organize their work and communicate; group management; aspects related to group work design; and group dynamics, the way in which people collaborate. Likewise, it is necessary to point out that each virtual community can communicate and exchange through different types of technological resources among which distribution lists, debate foro, chats, e-mail, file transfer, wikis, diaries/blogs/binnacle stand out, as well as collaborative virtual spaces (example BSCW, Moodle) (4).

In this way, knowledge generation, collaborative learning, and collective decision-making are made easier.

## THEMATIC NETWORKS

Thematic networks do not address the general public, but groups or small population of potential users linked for thematic affinities. In this type of network, the valuable, interesting and useful is not the "number" of persons linked, but the "quality" of the participation and communication among members of the virtual community, that is, the members of a small network should contribute with information and experiences, comments, files considered interesting by the rest of the community. If the participation or social communication does not work, the network turns inoperative and little by little it will disappear by hunger (3).

## POTENTIAL USES OF THEMATIC NETWORKS IN INTERNET (4)

- It allows "to make public" the group or team making up the thematic network in the cyberspace. The fact of having a website serves to publish and provide public identity to a small group or team. Experiences can be disseminated through the website, documents written by the team and be accessible to any computer connected to Internet.
- It allows that network members can communicate any time and from any place. The use of discussion foro, instant messaging, e-mail and videoconference are instruments to establish and fluid communication and exchange of information and opinions among group members. Foro discussion is an excellent mean to build knowledge publicly and collectively.
- It allows to share and exchange individually-made resources. The individual work (projects, didactic units, cards, multimedia presentations, pictures, and others) can be easily uploaded to a website or to the virtual space of the group. In this way, the network turns into a collective library or repository of available educational materials.
- It allows generating documents through collaborative work at a given time. In this way, the network serves as an instrument for team work without the group is physically in the same real space.
- It also allows that each member can personally rebuild his/her experiences and transmit it to others, give opinions on topics, thus making his/her activity and professional knowledge public to the rest of the members of the virtual community.

- It makes possible the creation of channels with news of interest for the whole group. The virtual space of the team can also become a sort of newsreel in the sense that each member can publish news or information considered important for the team, calls to congresses, book publication, project scholarship calls; meetings and others.

Thematic networks permit to increase knowledge management so some members teach others through a formalized transmission of experiences. However, the mere creation of the network does not guarantee its success and usefulness as a communication resource and professional exchange.

Some of the causes that can lead to the failure of thematic networks are (4):

- members do not log on continually to the network so the virtual space is empty or the website is not fed with new documents, news or messages.
- some members are active and others are passive. It is important to avoid the division of the group between those who talk and write and those who simple look at each other; the important thing is that all, in one way or another, are involved and active in the virtual space of the group.
- the virtual network does not provide satisfactory "learning experiences" to the members. Each participant registered in the network is supposed to find new contents, debates, news, materials or any contribution meaning a experience or a new knowledge whenever he/she logs on.

## **WEBSITE OF THE THEMATIC NETWORK “MYCORRHIZAL SYMBIOSIS MANAGEMENT IN AGROECOSYSTEMS”**

Strategically, it is decisive to use TIC's impact to strengthen cooperation and human exchange by structuring information, services and information resources on knowledge areas, in the so-called thematic, academic, research, scientific or simply knowledge networks (2).

We live at a time in which a set of technological tools in Internet have mature regarding the way to operate in the network and that are going to inflict a quality change expressed in the increasing simplification to gain access to technologies and the recent importance of people and their way to work in teams. It will be efficiently used if we are able to generate a movement focused on putting new energy on the creative power of all network members towards shared objectives (9).

Social networks are a phenomenon to which the academic and scientific world can not refuse to take part in, since scientists and scholars also need to feel they are part of a community. Such networks offer the possibility of sharing information resources that scientists use for their work and that can be useful for their teams, or for other researchers working in the same scientific field. It should not be forgotten that these scientific networks based on the Web, combine useful collection, tools to investigate and share documents with a social approach. So the attraction to these purely scientific social networks mainly comes from a social dimension (10).

In recent years, enterprises and institutions worldwide have done considerable investments to set up their own digital communication infrastructure

which is an essential element putting them in advantage to come into competition (11).

In Cuba, this process has taken place more slowly. The first step was internet access in 1996, a decade that this technology became popular worldwide. Though we have 16 years connected to the Worldwide Web, the penetration levels of our country are still low. Despite the difficult economic situation of an underdeveloped country, the government has been interested in promoting the social use of these tools from spaces like Joven Club de Computación and the connectivity strategies in research and academic institutions. Social networks, as the expression of the era 2.0 and a new working philosophy on the Web, have become a tool that cannot be overlooked, it is not only a bidirectional communication channel, but also –and more important– an essential aid to positioning on search approaches and direct exploitation of contents (11).

The thematic network “Mycorrhizal Symbiosis Management in Agroecosystems” was officially created in December 2003, as a result of the progress of this field in our country and the joint work of different Research Centers and Universities, started from the last decade of the past century, term in which joint research leading to more than one PhD 4 and master theses have been done (12).

As mentioned before, having a website is an opportunity to be seen in internet. The website of the “Mycorrhizal Symbiosis Management in Agroecosystems” (Figure 1) was created in 2008 and has the objective of promoting and spreading out working themes, perspectives, and progress of the thematic network and working results of research works through PhD and master theses, scientific articles, books, brochures, among others. It is not only a space for the continuous exchange, but also looks to make the network known

and favor information management that members could generate to make it available to the scientific community. It allows the exchange of knowledge among research groups and assumes cooperation as a working method. Its mission is creating a collaboration environment that permits the emergence of joint actions in the future. (12).

Figure 1. Splash window of the website.

The site reaches fields like: information, promotion and visibility, coordination, collaboration, research, innovation and extension work. The network plays an educational role through the website which eases for the process of universalization of higher education in Cuba; besides, it provides evidences of the work done in the country on this issue. So far, the work on this field has set the trend towards using it in agricultural production so there is valuable information on AMF (Arbuscular Mycorrhizal Fungi) in different crops and in different types of soil (12).

The need of advancing towards a higher qualitative stage of development in the network according to the challenges of the new Web is an urgent need in the digital era we live in.

The networks for information exchange are a great leap forward developing human relations for data, information, knowledge and tools exchange, for the training of personnel and organizations in general. The change is already happening, researchers, from now on, will no longer accept a scientific world without the new concepts of the Web 2.0 (10).

The network is a tool for reading abilities and production of information. As a matter of fact, Web 2.0 offers the possibility, not only to educate in the quest, selection and analysis of information, but also in the production and dissemination of information of our own (13).



Home screen of the website

Web 2.0 supposes a change of direction and paradigm because is the web which gets closer to users and not users to it. News groups, distribution lists, e-mail, foro, chats, blogs, search mechanisms, markers, and wikis are examples of new applications that engulf different communicative modalities. The new thematic networks of science and knowledge focus and specialize on collaboration, dissemination of tools and investigations, multimedia application for spreading out science, exchange of experiences, scientific maps, and the creation of specialized researchers communities. Scientific publications and traditional systems for knowledge dissemination are receiving the effect of the “social” galaxy” of Internet.

The next quantum leap of the knowledge society is the intensive application of tools of the so-called semantic Web (14).

The website of the “Mycorrhizal Symbiosis Management in Agroecosystems” faces a development stage marked by increasing needs of its users.

It is necessary to find ways to promote users participation by providing them with the best use of the available infrastructure. It is necessary to take up the opportunities of this set of tools of the Web 2.0 that simplify the way to have access to TIC granting a top importance to people for team work.

Current trends in web applications are governed by the archetypes of Web 2.0, in which design patterns, business models and architectures are defined for this type of software product.

The adoption of these standards can be highly useful for economic, cultural, educational, social, and political goals of our current society. The fact of upgrading our web applications is vital for Cuba and the Revolution without bypassing the constant training of the staff involved, the readaptation of international trends to our reality and the constant desire that information and the Cuban reality reach vigorously every corner of the world (15).

## CONCLUSIONS

- ◆ Web 2.0 is the transformation given to traditional applications that work through a final user-oriented web. It comes to applications generating collaboration and services. It is a stage that has defined new

projects in Internet and minds to provide solutions for the final user.

- ◆ Thematic networks have increased in recent years parallel to the development of services and tools of the so-called Web 2.0 which can be considered as an opportunity of the cyberspace. Thematic networks allow sharing information resources used by scientists which can be useful for researchers working on the same study fields. Thus, knowledge generation is made easier as well as joint work, collaborative learning, and collective decision making.
- ◆ The Website of the "Mycorrhizal Symbiosis Management in Agroecosystems" is published in Internet and provides help in information management every member of the network can generate making it available to the rest of the members of the scientific community.
- ◆ This is a way to promote more communication among interested ones on the topics dealt with by the network and also, a higher visibility of the network itself and their members is achieved. Due to the need of the site to move to a superior qualitative stage, new functions are planned to be included always focused on the final user.

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