

# The Global Crisis and Academic Communication: The Challenge of Social Networks in Research

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**Abstract:** The global economic crisis is seriously affecting academic research. The situation is provoking some big changes and an urgent need to seek alternatives to traditional models. It is as if the academic community was reinventing itself; and this reinvention is happening online. Faced with a lack of funding, researchers have determined to help each other develop their projects and they are doing so on social knowledge networks that they have created for this mission. The purpose of this paper is to analyze different social networks designed for academic online research. To this end, we have made a selection of these networks and established the parameters for their study in order to determine what they consist of, what tools they make use of, what advantages they offer and the degree to which they are bringing about a revolution in how research is carried out. This analysis is conducted from both a qualitative and a quantitative perspective, allowing us to identify the percentage of these networks that approach what would be the ideal social knowledge network. As we will be able to confirm, the closer they are to this ideal, the more effective they will be and the better future they will have, which will also depend on the commitment of users to participation and the quality of their contributions.

**Key words:** Academic social networks, Web 2.0, research, participatory knowledge.

## 1. Introduction

“It is a change of epoch, a change of era. Many things are changing, both in public life and in private life. The mentalities of the people are changing too. I believe that it is a change similar to what Europe went through in the shift from the Middle Ages to the Renaissance, except that then it took a century and now we are going through it in just two or three decades. We are experiencing a change of coordinates, of mentality and of sensibility.” These are the words of Professor Emeritus in Sociology Amando de Miguel Rodriguez [1] in reference to the economic crisis that we have been experiencing since the collapse of Lehman Brothers Holdings in 2008.

Many countries, especially in Europe, are facing a

period of huge changes, brought about largely by the economic cutbacks that they have been subjected to. One sector affected by the devastation arising from the current crisis is the scientific and academic community. This has been made clear by scientists themselves in texts such as the open letter signed by 42 Nobel Prize and Fields Medal winners to the heads of state and government of the European Union, expressing the idea that science is fundamental for progress [2]. In the face of the crisis, while continuing to call for greater investment, many scientists have diligently gone on pursuing their work by all means available, one such means being the Internet, where they have begun working in groups through social networks. These are not general social networks like Facebook or Twitter, but social networks created by and for researchers where they can exchange knowledge. This gives them, in addition to the usual

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resources, tools that serve to facilitate their everyday research activities, which can be summed up in three basic tasks: communicate, collaborate and share (hereinafter referred to as “CCS”).

These three functions together allow researchers to use these networks to work in groups, help each other, and engage in group discussion. In this way, through shared research, other researchers or academics can take over a research project so that it can progress exponentially, or so that new avenues of study can be opened up. This has resulted in a constant increase in articles and other publications, a worldwide scientific revolution that has been possible in part thanks to this kind of network in which researchers commit to thinking collectively, as Levy suggests in a clear reference to Descartes, from the perspective of *cogitamus* (“we think”) rather than *cogito* (“I think”).

From this we can see a clear relationship between the changes in researcher practice and technology, specifically ICTs (information and communication technologies). The concept of ICT refers to the set of technological tools that allow us to access information and share it with others [3]. Thanks to these tools, relationships with knowledge sources have increased and individuals are now able to communicate with each other in a different way, which in turn has changed traditional conceptions of communication of and access to knowledge [4]. But it is not simply that these new technologies have facilitated advances in this sense, but that the change is being brought about by the volition of thousands of users. In other words, technology alone can not force people to participate against their will; however, for those who are willing, it can provide the environment necessary to facilitate collaboration and communication [5].

Evidence of this can be found in the concept of the collaboratory, a term coined by former UNESCO Director-General<sup>1</sup> Koichiro Matsuura, which combines the words “collaboration” and “laboratory”. The concept defines the combination of technology,

instruments and infrastructure that allows scientists to work with remote facilities and other colleagues as if they were located in the same place and with effective interface communication [6]. As Jane Russell points out in Ref. [7], these “centres” without walls’ are associated with a new paradigm in scientific practice that gives researchers in any field easy access to people, data, instruments and results; a kind of virtual research lab which, judging by the figures provided by the National Science Board, represents a significant challenge to traditional research methods that has been growing and gaining force gradually for a few decades: from 1981 to 1995, the number of articles with more than one author increased by 80% and the number of articles based on international collaboration increased by 200%, while there was a total increase in the production of articles of 20% [7]. These data make it clear that the first collaborative applications in the field of research focused on speeding up and enriching the process of writing scientific articles, as a direct consequence of the adaptation of scientific production methods to the new digital environment [8].

Today this is even more evident and relations between researchers working in the same field in different parts of the world have intensified thanks to Web 2.0. Also known as the social web, this network is based to a large extent on interactive relations open to Internet surfers who want to participate in communicative processes of production, dissemination, reception and exchange of all kinds of files [9], an activity that finds its finest expression in social networks.

Social knowledge networks are also collaboratories, serving as a meeting and discussion point where users can work collectively. Moreover, online social networks in general, as Flores-Vivar suggests in Ref. [10], are the flagship of Web 2.0. The combination these two aspects—their importance within the web universe and their capacity to put members of the academic community in contact with each other—make them a powerful tool driving a new

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<sup>1</sup>From 1999 to 2009.

revolution in knowledge that is bringing about an epistemological paradigm shift. To highlight this change we have decided to conduct a study based on the analysis of different social knowledge networks that connect researchers from all over the world. The results of this project are outlined in this article, which we have organized as follows:

First of all, we will discuss the state of the question in order to contextualize the study. To do this, we will offer an overview of social knowledge networks and the different types thereof in the context of Web 2.0. We will then establish the methodology and the different parameters for analysis that led to the series of results presented under the heading Analysis and results.

Following this, the final section will set forth the general conclusions of this study, which aim to cover the following objectives:

- to establish an experience-based definition of the academic social networks created on the Internet;
- to list the main characteristics of these types of networks;
- to examine the basic principles underpinning such networks;
- to highlight their potential;
- to identify their deficiencies or weak points and the importance of correcting them in the interests of ensuring their successful future development.

## 2. State of the Question

Social knowledge networks arise out of the academic community's need to reinvent itself and to find new ways of ensuring its survival and evolution even in the hardest times.

They form part of what is known as Science 2.0, a term that covers the whole range of applications and platforms designed to help scientists in their daily activities, offering them different tools to manage their work flows, facilitate the search for pertinent information or provide them with new ways of communicating their findings [8]. The concept

therefore includes networks of scientific blogs, 2.0 journals and reference managers, as well as the academic social networks that are our object of study.

There are many different names for these networks, which, apart from bringing together researchers from all over the world, are focal points of constant creation and shared development of knowledge. What we refer to here as knowledge networks<sup>2</sup> other authors call research networks or academic social networks. Their essential priority is to communicate and disseminate scientific information, seeking to reach a large number of readers, and to this end they make use of the web, so that through a message or a link or a file attachment, information can be shared with all their members [11].

In Ref. [12] Garcia-Aretio attributes to these networks the objectives of sharing, co-creating and building knowledge through their relations and communication exchanges, while for Salinas et al. [13] the basic principles are information exchange and an adequate flow of information which, according to these authors, depend on accessibility, the culture of participation, collaboration, diversity and sharing that condition the quality of life of the community, the communication skills of their members and the relevant content. For Sanudo [14], central to their activities are knowledge production, resource management and achieving results geared towards innovation, among others.

Some networks of this type outline their own definition, such as ResearchGate, which does so using the graphic explanation shown in Fig. 1.

These are different ways of referring to the same functions or objectives, the aforementioned CCS, key elements underpinning these kinds of networks for which, based on our analysis, we have established our own definition:

“Academic social knowledge networks are a meeting point for researchers from all over the world,

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<sup>2</sup>A concept coined decades ago but that has now been consolidated with the arrival of Web 2.0 and online social networks.



**Fig. 1** Diagram of the three pillars that define ResearchGate.

who join forces in an effort to advance their studies on the basis of three basic principles: communication, collaboration and sharing their knowledge in a democratic virtual environment that is optimal for dissemination provided there is a commitment to participation and a faithfulness to academic rigour.”

These networks have two different types of idiosyncrasies: the first relates to the topic they address, and the second to their operating policy. With regard to the first, two basic types can be identified: general networks and specialist networks. General networks cover a more diverse range of disciplines, allowing for interdisciplinary exchange on a single platform, thereby fostering transversality of knowledge.

Specialist networks, as their name suggests, focus on specific fields, although the degree of specificity may vary (ranging from fields as broad as the social sciences to others limited to the study of history or even further to the history of a particular discipline, movement or period).

In terms of operating policy, we are particularly interested in addressing the question of whether the networks are free or require payment of a subscription fee to gain access.

In this regard we have aimed to take samples of both categories, although we have considered dedicating special attention to free or open access networks, which are based on a philosophy that is

becoming increasingly predominant, fostered to a great extent by those voices calling for the publication of raw data compiled in publicly funded research [8].

Open access is a movement that advocates free access to scientific or academic online resources, which should not be restricted by any impositions other than technological limitations or the Internet connection of the user [15]. The resources may therefore be downloaded, read, distributed and otherwise used in accordance with the licence, which includes what is normally referred to as Creative Commons, one of the more common systems for open access publication, encompassing diverse categories depending on the restrictions applicable, such as author acknowledgement, non-commercial use or a prohibition on modifications to the work.

Open access is a philosophy whose basic principles, according to Tapscott [16], are collaboration, transparency, sharing and empowerment. It has now become a viable option endorsed in international declarations that seek to define the concept, such as the Budapest Open Access Initiative signed in 2002, the Bethesda Statement on Open Access Publishing in June 2003, or the Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities in October 2003.

These declarations and others that have followed them uphold the need to promote the principle of open access, based on the idea that if we can make the best

use of information technologies we will be able to expand distribution capacity while reducing costs in order to provide wider and easier access to research results, thanks to the advantages offered [17], which are:

The cost is low and the results can have a big impact in a short period of time, facilitated to a large extent by the viral nature of the Internet, as well as the reduction of time needed for the evaluation and publication process compared to the time needed to produce a print publication;

The results obtained can be compared with other previously published results, or the data can be reused for further research without the need for a new investment, which constitutes a vital advantage for small research groups with limited resources.

Added to the above is the fact that all scholars in a discipline will have equal access to the information provided they have internet access without censorship or government restrictions, thereby liberating research from the constraints of intellectual inbreeding to open it up to the world in the interests of development fostered by the “collective intelligence”, meaning simply “a form of universally distributed intelligence, constantly enhanced, coordinated in real time, and resulting in the effective mobilization of skills” whose basis and objective is the “mutual recognition and enrichment of individuals rather than the cult of fetishized communities in hypostasis” [18].

In this regard, we could also cite Bailon-Moreno et al. (quoted in Ref. [8]) in relation to the Ortega hypothesis, according to which scientific progress is based on the minimal contributions of a multitude of scientists. Because, as will be shown below, these types of networks can only function positively with the commitment of users, who collectively form what Surowiecki analysed in *The Wisdom of Crowds* [19] or Rheingold in *Smart Mobs* [20] and to which Cobo Román and Pardo Kuklinski refer in Ref. [21] as a form of knowledge that is more valuable when multiplied because, according to the authors, shared or

distributed knowledge is on average much more effective and accurate than the knowledge that may be produced by the most acclaimed or accomplished expert.

### 3. Materials and Methods

We apply a methodological system based, on the one hand, on the theories proposed by the authors mentioned above, and on the other, on a qualitative study for which a series of analysis criteria have been established through the comparison of different platforms of the same kind.

To conduct this study, we have first made a selection of the knowledge networks to be analysed. The basic premise has been that they need to be networks whose mission is to bring the academic community together, and that have a marked social character<sup>3</sup>, i.e., they allow dialogue by connecting users to each other. In addition to this, we have had to distinguish between two types of networks of this kind: general networks on one hand and, on the other, networks focused on a specific field.

For general networks, the selection has been made taking into account the number of users registered and the quantity of documents stored, and considering Metcalfe’s Law, according to which the value of a network increases in proportion with the square of the number of system users ( $n^2$ ), which Foglia [22] shows using the graph in Fig. 2.

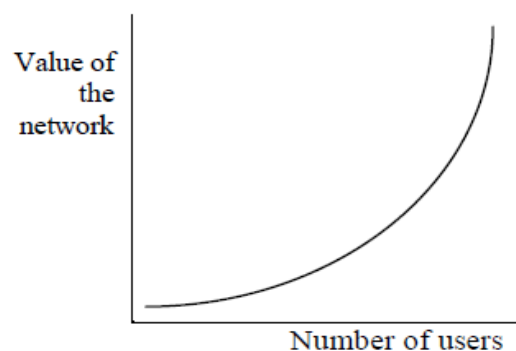


Fig. 2 Metcalfe’s law.

<sup>3</sup>Taking advantage of the resources offered by Web 2.0.

We therefore chose three basic networks: ResearchGate (2.2 million users and 35 million documents), Academia.edu (2,201,270 users and 1,661,926 documents as of February 6, 2013) and Mendeley (2,153,818 users and 351,357,178 documents as of February 8, 2013). The supremacy of these networks is also reflected by their media exposure and the interest that investors have taken in them, as well as awards received. Evidence of this is the space dedicated to Mendeley on the blogs of the Wall Street Journal, Tech Europe, and The Guardian, which rated it at number 6 among the “Top 100 Tech Media Companies” [23], and awards such as “European Start-up of the Year 2009” [24] and “Best Social Innovation Which Benefits Society 2009” [25].

In terms of the interest that these kinds of networks arouse outside the academic community, it is worth noting that ResearchGate benefits from powerful investors such as Founders Fund, and from collaborations with Benchmark Capital, Accel Partners and others such as Michael Birch and David O. Sacks, who trust in the network’s potential, as clearly expressed by Luke Nosek, Founders Fund coordinator and partner [26]: “We have a genuine appreciation for the considerable success that the team at ResearchGate has demonstrated since the company was founded. We truly believe that the network has the potential to disrupt a much-outdated system”.

For specialist networks, the selection criteria have been different. There are networks of this kind associated with a wide range of disciplines, with some of the most prolific fields being those related to the natural sciences. These include the networks Biomed Experts, Epernicus, Scilife and Nature Work, and many other networks with large numbers of users that have been the subject of numerous studies. There are others, however, which to date have not had so much visibility, such as those associated with the social sciences, which are the very networks we have determined to focus our attention on given their increasing proliferation and the lack of articles

studying and analysing them, despite the fact they constitute a substantial change in terms of the knowledge models used in their different research areas.

Of these we have selected five for their affinity with our field of study, which is essentially the field of communication. We have therefore focused on the following networks: Social Science Research Network (hereinafter SSRN), H-net, ECREA, NECS and Portal de la Communication.

We have thus made a selection of eight (three general and five specialist) networks for study using a qualitative analysis, for which we have established a series of variables (a total of 70) grouped into five categories, which in turn are broken down into more specific subcategories, allowing us to extract the characteristics not only of the networks but also of the users who participate and their content, and to determine their nature, what they offer and how they contribute to communication and exchange, among other aspects. These five categories are outlined below:

(1) General parameters: This section offers a general idea of the network, both with regard to its size and to the basic characteristics that define it, such as the type of users it targets, the geographical regions it covers and its objectives (plus eleven other parameters).

(2) User data: This section is made up of twenty-two items consisting of the fields to be filled in every time a new registration is completed. This allows us to determine the type of information that this kind of network considers relevant for the creation of user profiles.

(3) Services and resources: This is a list of 28 actions and resources that determine the possibilities that network users have, ranging from conducting searches to the option of contributing files or creating work groups. Many of these features originate from conventional social networks, such as the use of a wall or chat function, but there are also others that are

highly useful to academics, such as repositories for storing users' documents and consulting the documents of other users, bookmarking, and the facility to create quotes or links to scientific or academic databases. This section also determines the involvement of the network and its tools and resources in the achievement of CCS, which are the fundamental pillars for this kind of network.

(4) Content: This section allows us to analyse the kind of files stored on the network and the nature of their organization or access (whether you need to be a registered user to view them, whether they can be downloaded or whether all or only a part of the information stored is accessible).

(5) Miscellaneous: Here we include other types of data that did not fit into previous sections but that are of relevance.

Upon completion of the qualitative analysis based on the parameters encompassed by each category, we have sought to extract a numeric representation of the data through the use of percentages. Our aim is to confirm, on the basis of a figure, the extent to which each network conforms to our concept of knowledge networks, irrespective of whether they are general or specialist networks.

We have not been able to determine this from the initial parameters, as among the seventy that we have established there are many that have no special relevance or are descriptive in nature and therefore not applicable for this purpose. Thus, based on our ideal conception of knowledge platforms, we have made a selection of the 25 most important aspects that define them, as shown in Table 1, giving each one a value of four points<sup>4</sup>, i.e., 4% of the total.

#### 4. Analysis and Results

Based on the 25 parameters established and after conducting the quantitative analysis, we obtained the results summarised in Table 2, regarding the degree to which the networks studied conform to the ideal for

participatory knowledge networks developed on the Internet by collectives of researchers and academics:

The figures show that the general networks conform more closely to the idea that we have of a knowledge network than the specialist networks, with ResearchGate (which is also the most popular) standing out above the rest. This may be due to the fact that because it has the largest number of users and the highest user participation, it is able to monitor actual user needs more dynamically and adapt the network accordingly. Another determining factor is a network's international character; we therefore especially take into account the languages in which it is established, which as a general rule is English. The one exception is Portal de la Communication, which has opted for Spanish and Portuguese, which thus, despite not operating in English like the others, also expands its potential by reaching beyond national borders. As can be seen, this platform is located at the halfway point towards the ideal and is designed more as a portal than a network as such, although we have decided to include it because of its uniqueness, the work it performs, and its marked social character, which bring it closer to our idea of a knowledge platform.

In terms of user fees, as noted above we have sought a mixture of options. The three general networks studied offer free access, unlike some of the specialist networks such as ECREA and NECS, both of which finished in last place, below those without user fees. This makes it clear that the option of open access is viable, and that there is no reason that the quality of the platform will be lower if payment is not required, but rather that free networks can be just as sustainable. Moreover, the platforms analysed (both general and specialist) that do not charge user fees have more users (while NECS has around 1,100 users and ECREA has 3,500, Social Science Research Network reports more than 1.3 million and H-net more than 100,000).

<sup>4</sup>25 parameters with a value of 4% each = 100% of the total.

**Table 1 Important aspects for defining a knowledge platform.**

Participation on social networks	Communication with users	Communication between users	Global character	Follow/be followed
Free to users	Search engine	Subscription to topics of interest	Upload files	Download files
Invite contacts	Citation	Creation of work groups	Share links	Wall
Chat	Forum	User recommendation	Sending updates	Repository
Calendar of events	Job offers	Statistics	News	Bookmarking

**Table 2 Percentage of conformity to ideal for online knowledge networks.**

General networks	
ResearchGate	84%
Academia.edu	75%
Mendeley	75%
Specialist networks	
SSRN	61%
H-net	52%
Portal de la Communication	49%
ECREA	39%
NECS	33%

In this respect, several aspects should be considered:

On the one hand, the wider the network's field of study, the more users will join, which in itself places NECS and ECREA at a disadvantage due to their very narrow focus (the first is the European Network for Cinema and Media Studies and the second is the European Communication Research and Education Association), something that may be favorable for certain researchers not seeking transversality between disciplines but instead wishing to focus on a specific field. On this basis, it is clear that they have fewer users, while others like SSRN with many more users cover the wide range of all the social sciences.

On the other hand, it is true that many of the users registered on these networks are not willing to pay, either because initially they will only be exploring and getting to know the platform and refuse to pay for something that they are not certain they will benefit from, or because they are in favour of the philosophy of open access, or perhaps even because they are reluctant to pay for certain services online. In this sense, we find that often the number of users is not representative of the use of the network, since many

users registered on a network do not engage in any activity on it. This tends to occur more often on the networks with no user fees, where many register to try it out but soon stop using it. On networks with user fees, however, people may think it over more carefully but if they ultimately decide to register it is because they are truly convinced or at least have the intention to use the network. As a result we find that although they may have fewer users, the users they have may participate more than users on free access networks.

Indeed, low participation is one of the issues that most severely afflict these types of networks in general, constituting one of their most common weak points. Thousands of registered users do not participate, or if they do, they often abandon the network to a certain degree once they have covered their information needs and make no new contributions. We can affirm that only a portion of registered users participate actively and with a certain degree of regularity in the achievement of CCS. However, for the network to function properly participation is essential, because to truly build knowledge in virtual environments, according to No Sanchez [27], the conditions of active commitment, participation, frequent interaction and connection with the real world need to be met, a point also underlined by Arriaga Mendez et al. [11], who argue that the meaning and objectives of a network will only be made a reality through the work of the participants.

We therefore need to ask what the low participation of certain groups of users could be due to. There may be various reasons for the reluctance of researchers to participate in these networks [8]. One factor may be



the highly competitive nature of scientific work, which fosters a certain degree of discretion in the dissemination of results until those results are published by conventional means. Another factor may be the age of the researchers, i.e., the fact that the more established researchers do not tend to be so familiar with the Internet and the new possibilities it offers, and prefer traditional methods, a situation that nevertheless is changing thanks to the up-and-coming generations of academics who have grown up with ICTs and who apply them in practically all spheres of action, both personal and professional.

Another aspect is the fact that there are knowledge networks where there is total freedom to post content, without the need for that content to undergo any type of review process, the most common type being peer review. While it is true that there are networks that do include a review requirement, such as H-net and SSRN, on others there is no filter whatsoever; this, rather than favouring collective progress, is actually harmful to it, given the hazard to scientific rigour constituted by the possible inclusion of erroneous information. Also this in a way keeps researchers from publishing freely [28], as any contribution not submitted to the scrutiny of their peers is always under suspicion. Moreover, any unreviewed publication would most probably not be taken into account in the evaluation processes to which researchers are submitted.

Of course, the review process does not guarantee total accuracy of information, as we have seen in cases such as that of Woo Suk Hwang, who published a fraudulent scientific finding in the journal *Science* in 2005, and which the publication subsequently withdrew, or Alan Sokal and Jean Bricmont's book *Fashionable Nonsense* [29], in which, to expose the cultural relativism and confusing and pretentious use of scientific terms by some intellectuals, the authors revealed that they succeeded in publishing a farcical article in the journal *Social Text* [30]. This demonstrates the fact that reviews, and thus the filters

established to ensure maximum reliability, sometimes fail, but at present they are the forms of legitimation that are most widespread and commonly considered to be the most reliable, and we therefore can not sidestep them, either for journals or for the knowledge networks that concern us here, which they endow with scientific rigour, trustworthiness and prestige.

## 5. Conclusions

A Spanish newspaper has asserted that "things are as bad now as in the worst moments of Spanish history" [31]. Nevertheless, crisis and change always go hand in hand. The current crisis is no exception, and while it affects many sectors of the population, those sectors will try to survive it however they can. This is true of the academic community, which is gradually embracing the idea that together we can move forward.

To this end, academics are making use of the resources available, including new tools that enable them to publish and share their knowledge with a great advantage over the conventional tools used in the past [32].

Most of these tools are available on the Internet, such as the social knowledge networks designed for the academic community. These networks have been developing for years but now more than ever have the potential to become a fundamental resource for research, not only at the national level but globally, given that the current crisis is not only affecting Spain but the whole world.

These networks did not appear with the crisis, but they can help to make the crisis more bearable as they offer a multitude of possibilities for communication and exchange of knowledge.

To this end, they offer a series of resources and services that have been developed through the application of the advantages of Web 2.0 to the field of research, such as work and collaboration online, the creation of interest groups, communication via chats or other types of messaging, and the possibility of

document sharing.

In this way, these knowledge platforms or networks have the virtue of offering two basic benefits, especially those that are open access:

- They benefit participants individually, as we must not forget that sharing research data publicly can have a positive effect on citation [33], thereby contributing to an increase in productivity and in impact;

- They benefit society in general, given that, according to the theories of Avalos [34] and Aguilera [35], research and education constitute the cornerstones of the economic policy of developed nations. Toffler suggests something similar in arguing that knowledge is the central element of our society today. In this context the search for knowledge guides our actions, is the source for the production of goods and services, and the means that allows us to pursue greater development [36].

We see the potential of these networks as lying in the fact that they allow academics to develop professionally while also pursuing the good of the public in general, both inside and outside the academic world.

To this end, the agents who participate in these networks are at once apprentices and masters, contributing their own experience and benefiting from the experience of others, so that traditional hierarchical structures give way to collaborative work, shared leadership, participation and coordination [37].

It should be noted, however, that all these synergies are based on an ideal conception of these networks. We conceive of a dynamic and constant exchange between all members of information that is checked, analysed in depth, in a reliable and thorough manner, which is not always the case.

In view of the above, we can conclude that this new research model is currently in an incipient phase and still needs to develop and mature, especially in terms of the quality and indexing of content, as well as the raising of awareness of the importance of advancing

together, because only in this way, united in practice, can we ensure the dynamic and stable development of research, without barriers and as a collective.

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