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## **Collective Intelligence for Knowledge Building and Research in Communities of Practice and Virtual Learning Environments: A Project Experience**

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### **Abstract**

There is little evidence about how collective intelligence, social networks, and communities of practice work in maternal health projects. In this paper, we discuss the approaches towards collective intelligence in a project by focusing on the virtual and web-based environments communities of practice and social network approach. This paper builds upon a research project IS0907 COST action and focuses on the communities of practice, social media within organization and team projects, and how through these networks and communities collective intelligence is building.

Also, the current investigation stands as an example of COST IS0907 team and the relationship built between countries and communities of practice through working groups, manage knowledge transfer, and improve research collaboration and partnerships. This

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article aims to present the working environment developed to facilitate collective intelligence role in knowledge building and how communities of practice can enrich collaboration, in maternal health project settings, both educational and effective health research and knowledge building.

**Keywords:** Collective intelligence, communities of practice, maternal health, virtual learning environments, knowledge creation, knowledge management

## 1 Introduction

Collective intelligence in various research contexts is a reality. Unfortunately, there is very few evidence helping shape the approach of collective intelligence in maternal health projects through communities of practice and social media, and in new knowledge creation and building. Large groups of people are remarkably intelligent, and are often smarter than the smartest people around them. Knowledge as collective intelligence is socially constructed from the common understandings of people and ideas [1]. There is a high use of web social media and communities of practice in projects; the result is to bring global players to the table to help establish social networks, communities of practice that will help to create new knowledge and improve health research and collective intelligence [1,2].

In reality, many organizations have already started reorganizing this way. Communities of practice is one example plus virtual learning environments where collaborating interactive networks of individuals come together in order to work on a specific or generally-defined topic [2, 6]. In addition, a virtual learning community (VLC) using knowledge building principles and practice (knowledge building community) is a powerful environment that immerses learners to learn from the best in most suitable environments [3,4,5].

This article describes the challenges and addresses the potential impact of collective intelligence through social media and communities of practice, in knowledge building and management in maternal health. Finally, we highlight the importance of collective intelligence in communities of practice and social media.

## 2 Collective Intelligence Definition and Benefits for Healthcare

Surowiecki states that in his book 'the wisdom of crowds', that a group of people can under certain conditions achieve better results than any individual itself; broadly defined, that collective intelligence is a way of thinking that connects many people, so that collectively they act more intelligently [7].

The development of collective wisdom and intelligence can be viewed in two ways - from individual to collective and from intelligence to wisdom. The individual can carry multiple intelligences; Gardner in reference 8 suggests that different intelligences may be different abilities. Normally a person can be good in one or many domains and poor in another area or skill [8].

In the context of collaborating intelligence is the ability of a group of people or team collaborating with each other effectively in order to produce synergies and to interact effectively in the learning environment. On the other hand, Collective Intelligence is the

ability of a team, organization or community and whole society to learn, plan, innovate solve problems, and understand the internal environment and external world with one mind[9].

Collective wisdom can be defined as the capacity of communities to cooperate intellectually in invention, innovation creation and to learn how to solve problems effectively. By definition, intelligence is thinking, and wisdom is a knowing and possessing deep understanding. Collective intelligence may lead to collective wisdom, but may also lead to “collective stupidity”[10].

There are many ways that collective intelligence can benefit health care and projects. Firstly, emergent findings indicate that collective intelligence improves knowledge retention. A collective intelligence approach will record, store, stimulate, innovate and bring available the knowledge across the organization. Also, collective intelligence can prevent duplications/past mistakes and can help organizations and people work more efficiency. Utilizing a Collective Intelligence approach can help individuals build upon existing and previous Knowledge. Moreover, collective intelligence increases the flexibility of organizations and can quickly share knowledge and take faster decisions or make changes. The teams can identify opportunities for capturing new knowledge, including establishing new roles and creating best practices, and sustainable working practices [2].

Another area of application of collective intelligence is the open innovation concept. Open innovation started in business and is the use of internal and other companies’ ideas to develop new businesses ideas or products [11]. Open innovation is one of the important components of the European Innovation System, where all key stakeholders need to be involved in a Quadruple helix innovation model where means that academia, universities, government industry and citizens collaborating together in order to drive structural changes beyond the scope of any organization that it can achieve on its own [11,12].

Far more challenging is the variety of connections among the members of a team towards a common entity and is an essential point for the organization or project; as result leading to the development of collective intelligence. Users are now able to engage themselves and more directly in various activities on the web and providing with collective power. This new behavior called Technology-mediated social/Civil Participation and shows in details the ability of masses to achieve common goals through active involvement and participation on the web and those goals before no other individual can achieve alone [13].

### **3 Definition of Social Network Benefits and Research Evidence**

Web 2.0 technologies are changing the way information and messages spread on the on-line world. A number of on-line tools, platforms, such as weblogs, social networking video casting are nowadays defining how people share their ideas perspectives thoughts and experiences, as well as building and exchanging knowledge [5,14].

Social Media is changing way of health care interaction between individuals and health organizations. The general public and health professionals are both using social media to communicate health issues or perform research projects [15].

By definition, a Social Network is a network of social interactions and personal relationships. Network theory is concerned with mapping the connections and the links between entities; on the other hand social network analysis is the application of the theory

to the social sciences. Social media functions as a communication channel that delivers a message; on the other hand, social networking has direct communication that includes sharing of information between several areas. Some examples of social media platforms are Facebook, Twitter, YouTube, Wikipedia, Second Life game etc. Research suggests that social relations play a key role in health and this is not surprising, since network theory teaches us that connections, even with the most complex systems or organizations, are not unpredictable. In the end, networks behave in ways that we can theorize model design; hence the network becomes more important and powerful than the individual entity [5,15].

A systematic review has shown that the main uses of social media for health communication include focusing on increasing interactions with others, sharing and obtaining health messages. The six key benefits were identified as (1) increased interactions with others, (2) more available, shared information, (3) increased accessibility and access to health information, (4) provide social and emotional support, (5) public health surveillance, and (6) potential to influence health policy. Some limitations were identified lack of reliability, confidentiality and privacy.

There is the potential that information and data on social media may help to formulate health care policy, thus making and shaping the future of health. Research has shown that the general public, health professionals, and researchers use social media for different various purposes with different benefits and limitations. Social media have been used for health education and health promotion and there were some opportunities for some professionals to have on-line consultations[15].

A strong capacity for both technological and social networking/innovation in countries represents the only truly sustainable means of improving the effectiveness of health care. Local public-private research and development partnerships, implementation research, and individual leadership are needed to achieve this goal. Collective intelligence and social media can work perfect together. People and computers need to find the best way to connect so that as a result, collectively, they act more intelligently than any other individual, group or computer. Using a crowd makes us smarter. There is great knowledge in the crowd and collective power of user contributions and interactions [16].

#### **4 Communities of Practice and Knowledge Transfer Activities and Interaction Mechanisms in Literature**

Already defined that collective intelligence is the capacity of human communication to enable their members to reach higher potentials through collaboration and innovation.

Collective intelligence emerges from the interplay of three phenomena, Collective intellect, communities of practice and co evolutionary technology. In detail, collective intellect refers to the power of people, combined and augmented by their communities and organizations. They share knowledge captured in digital libraries, knowledge ecologies, blogs, or self-organizing learning communities. The fastest growing type of knowledge sharing and building is the communities of practice. Communities of practice are group of people who share the same passion for something that they know how to do and interact in order to learn how to do it better [17].

Communities of practice organize around one or more of the following functions: peer-to-peer problem-solving, sharing best practices, updating and sharing knowledge for daily practice and generating new ideas and innovations. Communities of practice can range in size from several colleagues to a national community of hundreds of individuals. The communities of practice create value for their members and stakeholders through developing and spreading new knowledge, productive capabilities and innovation. The interplay of communities of practice, global collective intellect and co-evolutionary technologies has the potential to drive innovation[18].

Communities of practice create and share knowledge. Numerous activities and tools in knowledge transfer and communities of practice have been mentioned in the literature. New tools are now available for the next generation to transfer knowledge in a variety of ways [19].

These include

- Web sites
- Virtual libraries, Encyclopedias
- Electronic newsletter, Bulletins, Listserv reminders
- Social media, Communities of practice, Social Marketing, Opinion Leaders
- Discussion forums, Networks
- Tailored messaging, Products
- Knowledge Brokers, Research exchange officers
- Round tables
- Media advisories
- Meetings, Conferences, workshops, working groups presentation symposiums,
- Training sessions, Training Schools
- Journals
- Knowledge Partnerships

For countries and the global community alike, initial recommendations for action are capacity development for KT focusing on knowledge-exchange, demand-side awareness, joint-learning platforms for KT, research on improved methodologies for knowledge synthesis and exchange best practices on KT [20]. Research has shown that passive dissemination of information is ineffectual if the goal is to change practice. Much of the research on effectiveness has focused on changing health professional practices, especially for physicians. If we consider and all agree that no knowledge translation method will be effective in every situation, many authors[19] have proposed guidelines of what can be used by researchers or individual users to enhance knowledge transfer and dissemination strategies. In an important virtual discussion in the John Hopkins knowledge management team is that expanding effective process publication (on line, on paper on CDs) and communication through various means (the project web site, partners web site including global Knowledge management or Knowledge transfer portals, list serves including the projects that monitor e-newsletters, participation in conferences and meetings can promote knowledge transfer and management[21]. Promoting and creating communities of practice or networks of people that identify issues, share approaches or make their solutions to problems available to others thus making data available, are all activities that promote knowledge translation and transfer. According to reference [22], Knowledge translation and knowledge transfer researchers and community-based organizations and their practitioners tend to value the process of knowledge transfer and collaboration. Hence, knowledge translation and knowledge transfer between communities, decision makers, and researchers, are beneficial when ensuring that the

evidence meets the needs of all stakeholders, and that the decisions are based on both research and community needs[23]. There is a strong possibility that collaborating with global health implementation partners and other units in developed and developing countries can assist them to better access relevant data for their work. Other key activities as mentioned on the map in community collaboration are the exchange of research and references through technology support and learning.

Getting the right information to the right person at the right time is an important element [21]. There are interaction and information mechanisms that are very important to ensure the success of knowledge transfer, especially in education where transfer requires tacit knowledge, experiences and competencies. Examples of information mechanisms are research reports, best practices guides, education tools, emails, blogs and so forth [25,26,27,28,]. On the other hand, the interactions mechanism is a way to obtain knowledge by relying on personal interactions with others. Examples of these include oral presentations, academic conferences, seminars, workshops, social activities, formal meetings, training sessions etc.[28,29,30,31].

This kind of transfer requires reflective and interactive processes. These opportunities allow practitioners not only to create a new knowledge but also to share their experience and develop new practices [32, 33].

In addition some have noted, however, that although policy makers and practitioners are adopting communities of practice as a vehicle for moving knowledge into action. In fact there is a lot of research to be done in this area and much of the work in Communities of practice has focused on how communities create new knowledge to solve the challenges and problems. Knowledge partnerships activities can indeed create knowledge transfer. These are associations and networks of individuals or organizations that share a purpose or a common goal and whose members contribute to the knowledge experience. Resources and connections and participate in two-way communication [24].

## **5 Knowledge Management and Collective Intelligence**

In general, the aim of learning is to create new knowledge and as result to turn this knowledge into life wisdom, and in which knowledge management plays more important roles. We can see many roles in virtual learning environments from four standpoints - Knowledge management learning, organization community, organization culture and organizational community memory[9].

Knowledge management is not only possible inside organizations but can be extended; that is, virtual communities or communities of practice offer the opportunity and the potential of generating knowledge with innovation. Innovation is an opportunity to develop knowledge management, collective intelligence in the environment of enterprise or health. If the knowledge management and the collective intelligence are used by the companies or health organizations as a support for innovation, the result can be achieved more efficiently and the resulting is time saving.[9,35]

Also knowledge management has a double value effect through knowledge sharing. Virtual learning communities and communities of practice are a most suitable environment where knowledge sharing and can be directly achieved. During the knowledge conversation in virtual communities or communities of practice, there is individual knowledge and collective knowledge. The knowledge conversation is based on

the knowledge conversations between individual knowledge and collective knowledge and interactions. [9,41].

In conclusion persons or organizations that collaborate have a tendency to be more productive, innovative, fast learners, creative and increase their capabilities and collective intelligence [37]. This is in order to solve complex and shared problems, to give new creative solutions. It is necessary to innovate, transfer knowledge and generate social capital through inter-organizational collaboration [36]. Collaborating learning networks are communities in which the main objective is to learn and interact with other users in order to share knowledge. Sometimes users may not have the same level of expertise, but there is interest for similar experiences knowledge and practices. On-line platforms are good examples because people learn through sharing, discussions team working, lectures and mentoring. Summarizing, collective intelligence and knowledge management input comes from users' conversation and discussions, This input with the use of social media or WEB2.0 technologies has already provided a type of intelligence in the form of recommendations presentations new knowledge creation[37].

## **6 COST Action IS0907 Communities of Practice Example**

Social network sites have changed today the way of human communication. There is a revolution in the way people interact and communicate. The participatory web, include social networking sites such as Facebook, YouTube, wikis blogs tweets that allow individuals to establish networks and share their information. Social media are technologies that increase social interaction, make collaboration, across key stake holders [38].

Communities of practice and social media are useful as communication tools within a project team, especially if this communication happens publicly through social networks. Our research team in Cost action IS0907, childbirth Cultures, Concerns and Consequences: creating a dynamic EU framework for Optimal Maternity Care, had the opportunity to exchange information and valuable resources as well as engage with experts outside the project. These project activities were beneficial to the project at the level of shared knowledge constructions, and also to the target groups, since this knowledge construction occurs publicly and not behind closed doors.

Communities of practice and collective intelligence have been used in the project IS0907. During our research project, the IS0907 team wanted to identify web sites and social media in Europe that speaks about mother and baby. We started off by agreeing as a team that country members will be involved in both the collection of web sites links and social media links about mother and baby, in order to create country lists. As a result, through communities of practice, social media and collective intelligence, the COST IS0907 team helped the survey team to reach more than 10,000 people in Europe and gain essential knowledge for the project.

The steps below were followed:

A concept for understanding knowledge sharing, management and creation, in our communities of practice has to identify:

- How knowledge flows in iresearch4birth Communities of practice (CoP) and define a maternity Community of practice (Cop).

- Determine the characteristics of our Community of practice (CoP). We identify practitioners, policy makers, service user networks/CoP's with an interest in maternity care.
- Locate the currently existing communities of practice (virtual and/or real) in the current cost countries and service user/ professional.
- Identify websites/chats rooms and other public social media used by women in Europe to talk about their maternity care experience, and map the existing Communities of practice geographically.
- We manage to provide a summary of all the web links in all countries Europe and Worldwide, and to link these up into a stakeholder network and to support survey group and survey development.
- During the project Working group 5.1, leaves the Communities of practice for some months to see if they make links over time spontaneously, and we went back to observe if any changes happen or their positions were improved.
- In the end, we managed to have the formation of effective Community of practice with clinical, strategic, and policy-making contributors and with maternity service users. Levels of usage of the action website and dissemination vehicles by clinical, strategic, and policy making staff, and maternity services users must be checked.
- We achieve knowledge transfer and organizational change includes the formation of Community of practice in EU countries where stakeholders want to learn from the best. Working group 5.1 identifies social interaction among members, knowledge sharing, knowledge creation, and relationship building. They are also continuing their work on Community of practice as methods of dissemination looking at small virtual Communities and I research 4birth website in order to look how knowledge flows and is used.

In summary, communities of practice activities developed relationships of trust, respect and commitment to build a strong community of practice. During the project we learnt and developed a shared practice based on an existing body of Knowledge. Wg5.1 took purposeful action to carry out tasks and projects, create generate and discover new knowledge. Furthermore working groups members go beyond current practice to explore and innovate. Future research should explore the different roles and responsibilities of members and their interactions in different types of Communities of practice (CoP's). Communities of practices are not limited by formal structures: they create connections among people across organizational and geographic boundaries. Also, Communities of practice can range in size from several colleagues to a national or international community of many individuals.

Through communities of practice and social media, we were trying to find out about women's views and experiences relating to maternity care in a number of different European countries. This information will be used by our research group (COST Action IS0907) to identify areas of best practice in maternity care across Europe. This was a general survey examining the provision of healthcare across Europe. We encourage people to promote the survey in every country network

There were a maximum of 20 questions and these took less than 10 minutes to answer the survey[39].

Research4Birth (COST ACTION IS0907) explain that is an EU-Funded Research Project designed to advance scientific knowledge about ways of improving maternity care provision and outcomes for mothers, babies and families across Europe. By understanding



what works, for whom, and in what circumstances, the project expects to gain insight from best practice in the European landscape.

As a group of around 100 academics, midwives, doctors, policy makers, and healthcare specialists, the iResearch4Birth team has launched a pan-European Survey to examine the views and experiences of women who have given birth in the last 5 years. The survey called the Babies Born Better Survey. The survey has been promoted heavily online through social media including Twitter (@ir4b) and Facebook (iResearch4Birth). As of the end of March 2014, the survey had received over 10,000 responses across 20 countries[39]

People from the management committee search through social media experts all the countries web sites that speak about mother and baby. 458 web sites (Facebook pages twitter linked-in identified) the community of practice from cost action team helps the survey team to gain knowledge through survey 'babies born better'. The Management committee and working group members spread the word and social media with the survey and at the end the project reach more than 10,000 people across Europe to gain answers about the maternity health system (table 1).

Table 1, gives the numbers of web sites and social media that identified across countries.

Table 1: Number of web sites and social media that speaks about mother and baby

Country	Facebook	Twitter	Website/Blog	Google Plus	Sum in every social Media		
<b>All Countries</b>	1	1	5	1	8		
<b>Belgium</b>	2	0	27	0	29		
<b>Croatia</b>	0	0	2	0	2		
<b>Czech Republic</b>	1	0	58	0	59		
<b>Denmark</b>	10	0	3	0	13		
<b>Greece</b>	58	9	56	0	123		
<b>Iceland</b>	0	0	2	0	2		
<b>Ireland</b>	0	0	10	0	10		
<b>Lithuania</b>	0	0	4	0	4		
<b>Malta</b>	0	0	4	0	4		
<b>Norway</b>	0	0	6	0	6		
<b>Portugal</b>	5	0	2	0	7		
<b>Slovakia</b>	0	0	30	0	30		
<b>Spain</b>	0	0	8	0	8		
<b>Sweden</b>	0	0	5	0	5		
<b>UK</b>	19	21	24	1	65		
<b>Sum</b>	96	31	246	2	375		
<b>Final</b>	186	61	458	3			

In details (Figure 1, Figure 2) proved the percentage of web sites across countries. In Particular 64 % of the social media was web sites 27% of the social network media was

from Facebook and only 9 % was from Twitter. All these social networks and media succeeded in reaching more than 20 countries (figure 1) and more than 10,000 people in Europe; collective intelligence builds knowledge and real time data shared helps research to build knowledge faster and accurate.

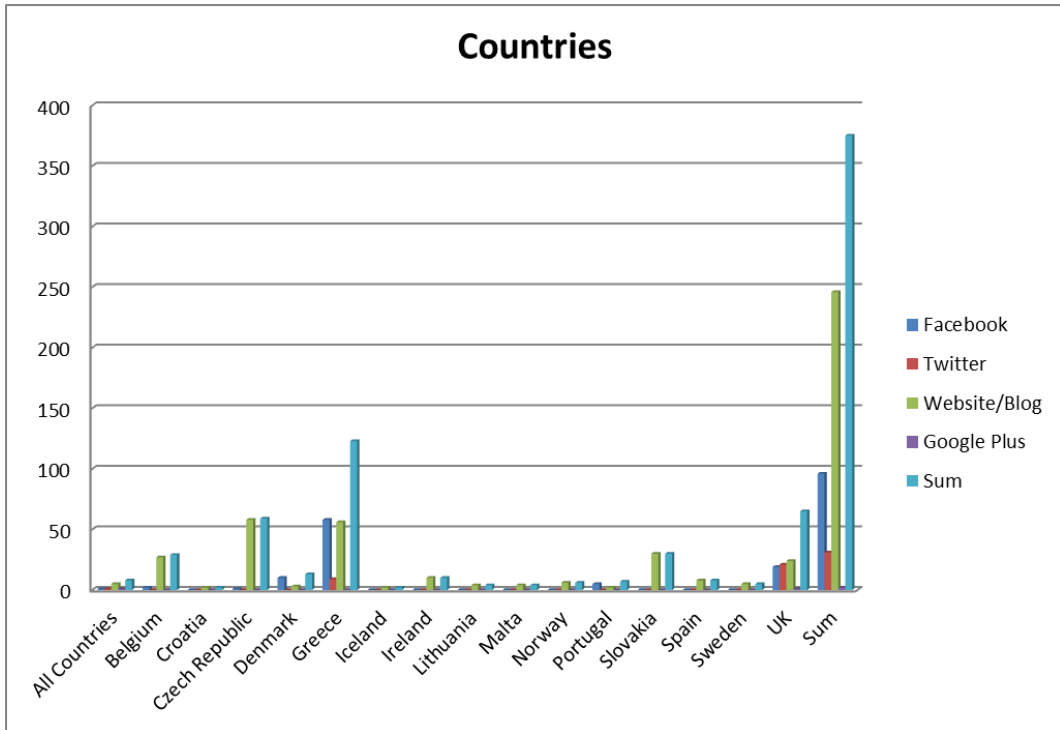


Figure 1: Countries web sites and social media

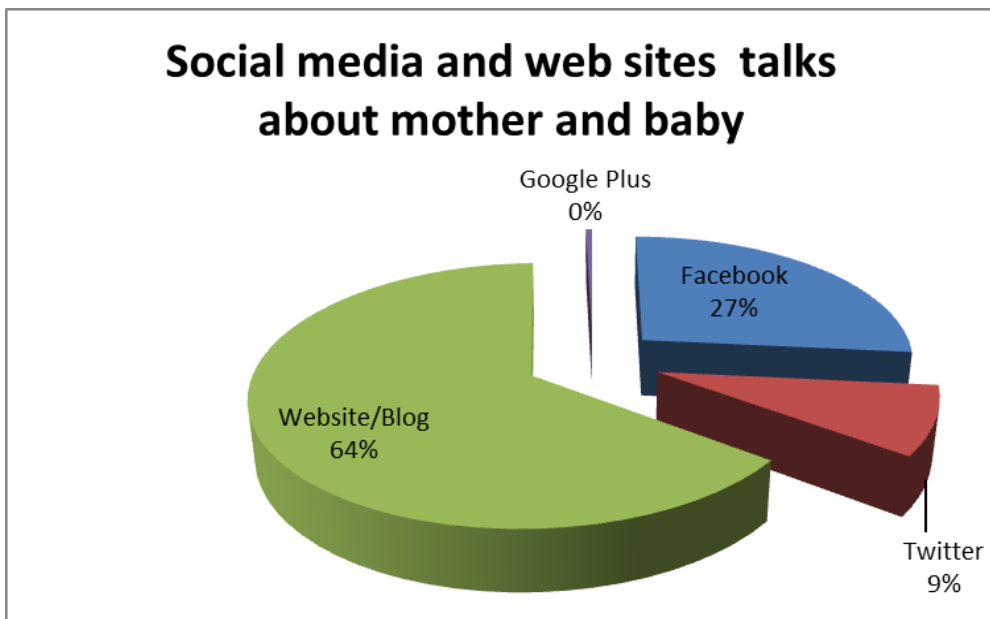


Figure 2: social media and web sites talks about Mother And Baby

Finally network creates mostly informal relationship between diverse agents who share information and engage collaboration. Further up a group create new products or ideas that bring together a collection of components. Social media is powerful with the collaboration of communities of practice and open innovation. This study further enhances the value of realistic evaluations and effectiveness of communities of practice, social media in maternity/health systems and dissemination strategies. By identifying key mechanisms and contexts that optimize the effectiveness of Communities of practice , network media and open innovation, this study will contribute to creating knowledge that will guide future establishment and evaluation of Communities of practice in maternal health systems and healthcare in general. The increased user interaction and participation gives rise to data that can be translated into intelligence in application and knowledge. Because the web is a highly-connected network of sites, web pages, blogs, this circle of influence groups may shape the thoughts of everybody [40,43].

## **7 Directions for Future Research**

As health professionals we must find answers to questions in health and how to improve health maternity systems and projects. However, it seems appropriate to understand that the greatest values in networks lie in what they can tell us about taking action. Collaboration and sharing knowledge is a way of the future. The world is facing a multitude of environmental, social health and economic issues, and it will require the help and innovation of various key stakeholders to find solutions. The number of organizations that seek to do good in the world need to mobilize their key stakeholders in innovative ways. International organizations, academic research, teaching institutions, donors, foundations, health care professionals, Non government organizations, partner countries, private/public sectors, communities of practice, civil society networks can utilise the imagination of people and through collective intelligence can move the world to a better future.

### **7.1 Implications for research and practice**

Organizations running projects can use the power of collective intelligence, social media and communities of practice in order to foster the culture of information sharing and learning from each other. Data collection from surveys and social media provide real-time data and is emerging as a useful tool. Projects stakeholders are now turning to more experts in social media networks and communities of practice [14 ,42 ]. A collective intelligent group will manipulate information from its environment, formulate, plans, strategies use resources to achieve it goal learn from the best practices and reflects its activities. Looking at the institution and organizational evolution of virtual communities can help to identify drivers of success, challenges and the best strategies in order to address these challenges [42].

### **7.2 Conclusion**

Social Media, Communities of practice and collective intelligence bring a new dimension to health care and maternity care projects, offering new knowledge creation, management

and improving health. With increasing use of social media, communities of practice there will be further opportunities in health care and a creation of a powerful tool that offers collaboration and create collective intelligence between users and create social interaction mechanism between individuals and teams. Moreover collective intelligence can help understand what organizations team, can share and technological platform can improve the flow of information inspiration and resources, across innovation ecosystems. Also well-validated information may be more important than greater flows and connections. Further research is essential to investigate whether social media communities of practice and collective intelligence improve research, knowledge building and communication in health projects.

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