

In Cabitza, F., Lazazzara, A., Magni, M. and Za, S. (Eds), Organizing for Digital Economy: societies, communities and individuals. Roma: LUISS UNIVERSITY PRESS BOOK (Proceedings of the XIV Conference of the Italian Chapter of AIS (itAIS), Milano, 6-7 ottobre, 2017). ISBN 978-8-868-56129-1, pp. 1-16

M-App & Health Knowledge Management – Virtual Artifacts between Doctor & Patient-

Rocco Reina^{1,*}, Marzia Ventura¹ and Raimondo Ingrassia²

¹ “Magna Graecia” University of Catanzaro, Catanzaro 88100, Italy
{rreina, marziaventura}@unicz.it

² University of Palermo, Palermo 90133, Italy
raimondo.ingrassia@unipa.it

Abstract. Knowledge is more and more a strategic resource for health organizations while information and communication technology earns an important role for sharing knowledge and informations among people in and out organizations. These conditions satisfy specific demands related to the new emerging information needs, asking for a change in relationships and effective communication. So, the Medicine Apps represent an emerging and rapidly developing framework for health system, able to contribute to its quality and efficiency. The same Union European and U.S. Supervisory Authority activated in the last years an appropriate study in order to control the Medical Applications downloaded directly through mobile devices and able to influence health performance. This work presents the results of the descriptive studies in order to make clear the general dynamics and functionality of the Medicine categories Apps and their effective support in the relationship between doctors and patients; in addition, it will be possible to know how such a tool can create virtual communities that influence the same quality of patient care.

Keywords: Knowledge Management, Health Mobile Apps, Virtual communities.

1 Introduction

The concept of Health Technology [15] includes all that is made available by science and research for all those working in health. So, it refers not only about the necessary devices to medical practices but also the right procedures in order to obtain healthcare demand satisfaction. The new ICT technologies, however, require greater accuracy of the information because they support the patients in their sanitary procedures. To do this, however, they have certain characteristics, such as reliability, the commonality between different operating systems and therefore the availability in real time, everywhere. Day by day they develop increasingly sophisticated technologies to support

health workers, among these are becoming important tools the medical applications – Apps - like new technological systems of transmission, creation and sharing information. So, the increasingly use of such devices, linked to the use of the web, has allowed specific needs related particularly to the new emerging information needs, stimulating an innovative way of building relations and effects. This situation led to the exploration and analysis of the phenomenon with particular reference to mobile applications (medicine categories) available for download on mobile devices such as smartphones. Virtual environments, such as web, radically change the process and characteristics of interaction between doctors and patient-users during knowledge creation [18, 17, 11]. Typical phenomena of social media show that creation is more problematic in digital environments than in physical environments. An effective exploitation of the web able to create the virtual communities entails the implementation of various specialised managerial and technological competencies and knowledge, such as dialog, access, transparency and risk assessment [12]. On this basis, the research goal is the general understanding of the phenomenon and its dynamics, but in addition the comprehension of these applications in the effective support for the relationship between doctors and their patients; furthermore, it will be possible to know how such a tool can create virtual communities that influence the same quality of patient care.

2 Methodology

The mobile devices (smartphones, tablets ect) have become an integral part of our lives and in recent years mobile applications have spread and enable us to do a lot of business. Healthcare has also moved in this direction thanks to the use of smartphones and 3G and 4G networks that permit to provide new health care services. The same possibility given by information systems can determine new learning processes through Information Technology, and so Health Apps are an emerging and rapidly developing part of healthcare. So, patients are becoming more educated, empowered, informed and involved in decision-making processes related to their own health. In addition, professionals are engaging in designing new “forms” of knowledge structures for healthcare [46,47,10]. The Juniper Report [16] said that smartphones will "greatly expand the capabilities" of Health Apps and today more than 3.4 billion people worldwide have their own smartphone while half of them will be using Health Apps. Under these conditions, information technology earns an important role for sharing knowledge and information

among people in and out organizations [7], particularly through mobile applications. So Medicine Apps are useful tools for supporting the user's awareness of own health needs and for giving the ability to manage them. This paper proposes to highlight how in complex environments, like Health Systems, the use of Mobile Applications (Medicine categories) can create new virtual communities for the knowledge management between doctor and user-patient. The used approach is deductive and the starting point will be the general classification of words related to the category medicine in the most used systems like iOS and Android; then it will developed a descriptive studies in order to make clear the general dynamics of the phenomenon [19, 14]; the approach is based on two phases: a) on the desk phase it explores the existing literature on theme; b) on the job phase it analyses the App following these steps 1) Apps' identification (belonging to Medicine categories) on iOS and Android Italian system; 2) focus on specific Apps in order to analyse the aspects related to knowledge creation and diffusion; 3) the case study, with the mobile app "Ipertensione arteriosa"; this mobile apps (Medicine categories) are tools for the doctors and virtual support for patients.

3 Conceptual Framework

The health care sector is in deeply transformation. The potential of virtual communities is being discussed in the scientific literature. In fact, there are virtual communities that play an important role in the creation of value in different sectors. Our focus is the health care sector with its virtual communities between Doctors and Patients. The creation of value results from the content and knowledge that the participants bring into the community [20]. The term "virtual community" refers to communities in which electronic media - and in particular Internet - facilitate communication. Such contributions are, e.g., information, product reviews, recommendations, pieces of music, files to be shared or resources. Virtual communities have been characterized as people with shared interests or goals for whom electronic communication is a primary form of interaction [2] as groups of people who meet regularly to discuss a subject of interest to all members [3], and groups of people brought together by shared interests or a geographic bond [23]. Traditionally, the word "community" is linked to a geographic area such as a neighborhood [24], albeit in this case the "virtual" part of the term "virtual community" indicates without a related physical place [25]. The term "virtual" itself means that the primary interaction is electronic or enabled by technology. This type of

computer-mediated communication (CMC) allows people to locate and talk to others with similar interests, thereby forming and sustaining virtual communities [26]. Accordingly, another facet of the definition of a virtual community is the frequency with which its members participate in it; a virtual community refers generally to persistently interacting members [27]. Taylor and Licklider¹ [21] defined the virtual community as "...in most fields they will consist of geo-graphically separated members, sometimes grouped in small clusters and some-times working individually. They will be communities not of common location but of common interest...". Rheingold [21] defines the virtual community as "... social aggregations that emerge from the Net when enough people carry on those public discussions long enough, with sufficient human feeling, to form webs of personal relationships in cyberspace"... "Those relationships lead to interactions that bring value to members" [3]. Ridings et al. [28] offer a comprehensive definition of the term "virtual community" that embraces the attributes discussed above: "groups of people with common interests and practices that communicate regularly and for some duration in an organized way over the Internet through a common location or mechanism", Whittaker [13] "...members have a shared goal, interest, need,...engage in repeated, active participation,...have access to shared resources,...reciprocity of information, ... shared context of social conventions..." and Preece [10] "...an online community consists of: People, who want to interact socially..., a shared purpose...that provides a reason for the community, policies ...that guide people's interactions (and) computer systems, to support and mediate social interaction...". One important nature of virtual community is a type of relationship bonded by common interests among people on the Internet [2]. Hummel et al. [4,5], have analysed the various business purposes of virtual communities, the design of the social networks and the services that support the community in its goal. A virtual community is a social aggregation that emerges from the Internet when many people carry on public discussions long enough, an important motivation to join a virtual community is to exchange information [22]. Moreover, healthcare organizations, from both private and public sectors, have been facing profound changes over the past decades. The changes depend largely by the possibility given by the new role of knowledge in the organizations and by ICT like new tool able to guide change and to improve new performance in Health System.

¹ The Research directors for the ARPA (The Advanced Research Projects Agency), an agency of the United States Department of Defence responsible for the development of new technology for use by the military. In 1968 they set in motion ARPANET (The Advanced Research Projects Agency Network), which was the world's first operational network, the predecessor of the global internet, and for some, the first virtual community.

In fact, knowledge is more and more a strategic resource for the improvement of health organizations, while information & communication technology earns an important role for sharing knowledge and information among people in and out organizations. So, the most updated technologies (e.g. mobile applications, cloud computing, etc...) allow the emergence of knowledge creation, facilitating new ways in which the relationships among actors of health system happen. Under these conditions, so, the same concept of virtual communities earns a wide meaning, as the relational, organizational, but also social and virtual place where new learning processes arise and knowledge creation and transfer processes can be established. In these situations, mHealth represents an emerging and rapidly developing framework for healthcare, able to contribute to its quality and efficiency. In this new changing context, a particular role plays the Apps (on mobile devices), like a new technological system able to transmit, create and share of knowledge. In particular, these Apps allow to create and to improve an open innovation model [29] where it is important the involvement of people to enhance co-creation of knowledge and inquiry thinking, therefore, its capability can become a pre-condition for generating new approaches to healthcare. In the complex health context, knowledge flow among actors is subject to several reciprocal interdependences; so, ICT experts and doctors combine their knowledge with the aim to produce innovative and easy-to-use Apps; patients - as device users - can learn new information on how prevent and cure their disease, even if the App isn't connected with healthcare operators [32]. The applications involved in the construction of a virtual community wants to promote the dissemination of knowledge through interpersonal communication not hierarchical but pulse and \ or experiential. In this way, App can be considered an interactive tool among patients and doctors, able to facilitate the monitoring and highlighting of alerts and to develop combinations of know-how among the nodes of healthcare networks. With the rise of virtual spaces, the nature of human communities has dramatically evolved. In the digital age, the identities and structures of virtual communities develop outside the traditional definitions of geography and physical constraints [33,34,35,36,37]. This phenomenon is particularly salient in immersive online virtual worlds, which offer new territories that can be often customised by users, and where rules and canons get more labile [34, 41, 40, 39, 37, 38].

4 New Technology for Health Knowledge Management

It's easy to detect the particular usefulness of Apps, available on the majority of mobile devices such as smartphones and / or tablets, and their ability to offer a wide range of

informations and solutions for different requirements. There are a vast number of virtual communities of patients in the Health care sector. On the other hand, it is clear that such situation depends largely by the same impact of this new technologies, which often modify in a non-conscious way skills, effects, and social relationships. Since we are in front of a citizen / patient increasingly computerized, the research question focuses in understanding whether the use of such mobile devices with the mobile apps by general practitioners can improve the relationship and the satisfaction of patient \ users' needs. The evolution of the application of Information and Communication Technology (ICT) has inevitably led to a new clinical management of information flows [1]. The relevance of information systems, depends on the availability of integrated information and it is confirmed by the constant research for synergies between the organizational system, management processes and information systems. More generally, in the world of health care, trends caused by the introduction of ICT and Web, can be summarize in: 1. more transparency and accountability in the public sector with new governance models (new partnerships, intermediaries involvement, recognition of new roles of stakeholders); 2. greater choice and accessibility of public services and focus on efficiency and quality; 3. a strengthening of policies based on data and evidence that allow us to make correct decisions; 4. an improvement of digital skills in health professionals. In addition, however, several complementary trends exist of "digital inclusivity" that tend to shift the paradigm from organizational aspects to customized health; in this way, E-Health Applications are able to securely process large amounts of data integrated, more and more essential for medicine and health management. The same report of Sole24Ore /Salute – Online – was dedicated to Apps Medicine categories, like a particular tool activated by searching of a series of keywords through which, in different ways, it's possible to access to specific health information. So, the starting point was the recognition of different keywords presented by special report of journal (Sole24Ore/ Salute, 2013), as shown in the following scheme (see Table 1).

Table 1. Keyword (Source: Sole24ore /Salute, December 2013)

1. Psychology	2. Heart	3. Sport
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4. Diabetes	5. Kids	6. Flu
7. Heart attack	8. Obesity	9. Tumor
10. Antioxidant	11. Women	12. Skin
13. Diet	14. DNA	15. Cancer
16. Genetics	17. Psyche	18. Drugs
19. Ictus		

In this way, the use of keywords allows to access to a world of information related with the topics of the paper. For example, keywords related to medical context, can be represented (among others) by "heart", "diabetes", "obesity", "diet", "drugs", etc...; in this case the Apps give the opportunity to access to a range of information suitable to describe, measure, represent and support the user for knowledge and satisfaction. So, the mobile Applications (Medicine categories) for Health represent the organization able to interact directly with users to better manage their health (with or without an healthcare professional support [8]). The Apps - Medicine categories - are therefore tools to support the user's awareness for their own health and so the ability to self-health-management. The virtual communities through the mobile applications, build social relationships and are a place where patients feel secure with "doctor at home". Typically, a friendly culture and a friendly atmosphere, where patients feel that their pains are well understood, are important to community members. Thus, the possible objectives are related to the involvement of patient regarding his/her care process and the ability to check him/herself respect to specific pathology. So, the total number of active applications for Medicine categories - according to the keywords explained in

the iOS and Android platform – are several thousands. The two operating systems have different applications, both in quantity - the number of Apps in the Android world is greater than Mac world, both in quality and cost. In this way the phenomenon appears to be widely used with the new mobile devices opening new horizons of knowledge and usability. In fact new technologies based on web have profoundly changed the way with which people communicate and access to knowledge and a lot of people have access to data and information in ways never seen before. This allows satisfy specific and particular needs related to new emerging information, change relational models, although unfortunately often redundant, irrelevant or bad quality [31]. Specifically, the App can be immediately installed, without complex software and permits to create documents, editing photos and listening to music with an updated, cutting time between production and use of knowledge. So, the diffusion of these devices shows the possibility that the applications are an effective source for health information and a potential tool for self-management of users-patients. The National Institute of Health states that “mobile technology allows providers to help patients and improve their health in real time, allowing them to personalize health care and monitoring the progress[30]²”.

5 Results

The Applications-Medicine Category - are tools that support health care by improving the participation and the capacity of patient for self-management. Different objectives are linked to APPs in medicine, covering a variety of areas that support people to have a pro-active approach to health with self-monitoring programs associated. The following tables show the analysis on Android and iOS operating systems, through Play Store and iTunes, considering both mobile Smartphone and iPhone. The total number of mobile applications in Android operating system on smartphone was n°4525 in 2014 and n°4560 in 2016, while in the iOS operating system there was n°6009 in 2014 and n°6700 in the 2016. Successively, the research focused in specific way only on fee mApp, on the belief that the paid App are more reliable than the others; so, in the Tables 1 and 2 are given the number of fee apps available for the Medicine categories and other categories in the years 2014 and 2016. This research was carried out using as a tool the

² National Institute of Health is the nation’s medical research agency-supporting scientific studies that turn discovery into health.

smartphone with the Android and iOS operating systems, in order to follow the patients' way to solve their need for information..

Table 2. Fee Apps on Android operating system (Source: Our elaboration, 2016)

	Medicine		Other	
	Category		Category	
	2014	2016	2014	2016
Psychology	0	2	20	26
Heart	1	1	43	16
Diabetes	2	30	53	21
Flu	0	8	17	15
Heart Attack	4	28	35	22
Obesity	0	8	28	16
Cancer	1	18	14	13
Antioxidants	0	0	51	21
Diet	0	0	26	22
Drugs	7	17	42	4
Genetics	2	6	27	21
Ictus	3	14	33	20
Kids	0	0	9	5
Women	0	0	10	3
DNA	0	0	35	34
Psyche	0	2	30	28
Sports	0	0	4	7
Cancer	3	28	40	8
Skin	0	0	136	65
Total	19	114	653	367

Table 3. Fee Apps on iOS operating system (Source: Our elaboration, 2016)

	Medicine		Other	
	Category		Category	
	2014	2016	2014	2016

Psychology	1	4	34	42
Heart	3	3	12	26
Diabetes	70	23	125	29
Flu	3	13	2	20
Heart Attack	5	4	0	2
Obesity	0	0	5	13
Cancer	6	7	9	17
Antioxidants	0	0	0	0
Diet	2	1	110	51
Drugs	20	35	5	16
Genetics	0	11	0	37
Ictus	0	5	6	9
Kids	4	0	0	172
Women	2	14	13	136
DNA	10	20	21	149
Psyche	16	1	90	3
Sports	0	3	306	146
Cancer	4	3	72	2
Skin	2	4	548	50
Total	148	151	1358	920

Data analysis clears that with regard to the Medicine categories, for the Android system the keywords that have changed in the period are "cancer" that in 2014 had only n°1 app, while in 2016 it obtained n°18; and the keyword "Heart attack" which in 2014 had n°4 apps that become n°28 in 2016. With reference to the operating system IOS keywords that have undergone changes are "Drugs", which in 2014 had n°20 apps that become n°35 in 2016, and "Diabetes" which in 2014 had n°70 apps which fell in 2016 to n°23. In addition, another aspect investigated was the presence of some informations exchanged overtime through the use of specific App; in order to find this, the analysis focus on the presence of the comments in the App, without considering the technical but only the qualitative comments. In fact, through the comments the user can leave a piece of information freely available for the developer on one hand and on the other

hand for the community. In addition, the comments are free, therefore, by depending on the users' availability and their will; for this reason – on our opinion - the comment gives more strength and pushes better the development of information and knowledge among users. In this way maybe, it would be possible to contribute to exchange information and create new knowledge for the whole networks. So, by recalling the interdependence relationship presented before, it's possible to observe the relationship among developer and different users of mApps, who download and use the medical application. The following figures identify the different comments present in the Apps. So, the total number of comments obtained by the research was n°74 in Android System and n°132 in iOS System. The figures 1 and 2 show the presence of comments (%) divided in two main form: technical comments and the others.

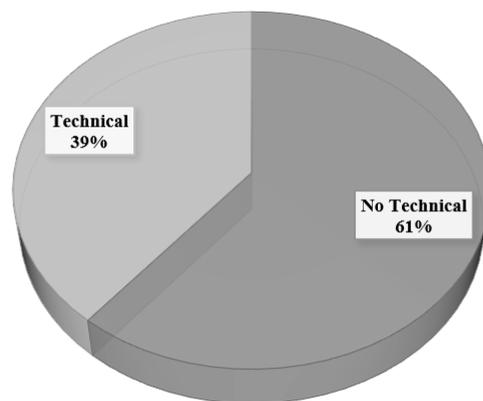


Fig. 1. Android System (Source: our elaboration, 2016)

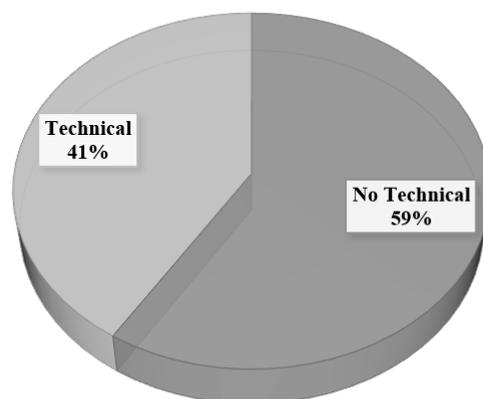


Fig. 2. iOS System (Source: our elaboration, 2016)

The feedback from the Developers goes to enhance trust in users/patients who download the application, becoming a new way to attract customers by themselves. The user through the feedback is aware of being connected anytime he wants with the developer and this helps to increase the level of participation and involvement and to make him/her always feel in touch. So, through the Apps the relationships among people (users-patients) becomes more direct and personalized and for this way it's possible to improve the level of reliability and confidence regarding this new electronic tool and in parallel to raise the level of self-care for all users involved. In the first step, the on the job phase analyses the Apps Medicine categories on iOS and Android Italian system. Moreover, in the second step, the case study investigates the mobile app "SIIA", in order to test the virtual relationship between Doctor and patients. Below, the pathway illustrates how the preferred choice was to use as case study the App called "SIIA" that was made by a scientific community specialized on the hypertension. The Hypertension "SIIA" records the maximum (systolic) and minimum (diastolic) blood pressure values, heart rate, body weight, which can be stored and visible in the form of graphs that are easy to consult and show to your doctor. The choice was on this specific App because in-depth analysis has made it possible to verify that it belongs to the Medicine categories (for both stores), it can be downloaded free of charge and the used language by the developer is Italian. Average ratings given by users \ patients who downloaded the app (more than n°10,000 downloads for Android and n°27 views for Mc iOS) is 3.8 and it has n°127 comments / reviews released by users (overall). It is also the first Italian App that is conceived by an Italian Society for Hypertension Arterial (SIIA), a Scientific Society of Reference in Italy for this Chronic Illness. The App is available for tablet and smartphone and can be downloaded from both patient and doctor. So, it represents a real tool for physicians and patient support. The SIIA App today records from 10,000 to 50,000 Android installations today, indicating an ever-growing interest in the population. This is not tested for iTunes users since the installations are only n° 27. Now, the success of virtual communities is typically measured by indicators like number of members and frequency of interaction, growth, and, in particular, even distribution of contributions, regular and long term participation [42, 43, 44, 45]. The goal of "SIIA" is to *"improve awareness of arterial hypertension issues and to become a modern tool to improve the interaction between the physician and the patient and to optimize the management of hypertensive subjects"* (Hypertension App "SIIA"), providing easy, intuitive, and totally free support to patients in Italy. The application development team

is not only composed of an IT team (Momento Medico), but it brings together the experience of the Italian Society for Arterial Hypertension, providing a complete and effective service. Not all comments and reviews (n°105 total for the Android operating system), released voluntarily by users on Hypertension “SIIA”, determine new knowledge for the communities. In addition, other information tell us that 47% of comments from users / patients are positive vs the remaining 53% negative (Android System); instead in MciOS 99% of comments submitted by users / patients are positive vs the remaining 1% negative. Expert team feedback enhances trust in those who use the app, increasing the level of participation and involvement of the app in the care path. Thus, through applications, the relationship between users and doctor becomes more direct and personalized, improving the level of trust and confidence in the new tool, with parallel understanding of diagnosis and self-care for all involved users.

6 First consideration

The development of Web is a particular event that in a short period of time has completely modified not only the relationship between doctor and patients, but also habits and patients' lifestyles, so that it is very difficult to imagine living without it [6]. In this context, Mobile Health can offer a wide range of smart modalities that allows patients to interact directly with health professionals and systems in order to obtain helpful real time feedback along the continuum care from prevention to diagnosis, treatment and monitoring. Specifically, mHealth offers a particular value for health treatment in those situations where continuous interaction is important. The research made it possible to emphasize the simple and practical use of the app, linked to the ability to access information and to create virtual communities (as Mobile App "SIIA"). So, while caution is clearly needed in extrapolating data from this exploratory study, the first results suggest that virtual communities may be filling in the social void in conventional communities. The case study shows that a main reason why people join a specific virtual community is for information exchange. All this, therefore, suggests the sensitivity of the object in question requires more attention to their practical use. In fact, since the technical aspects of designing the application up to those relating to its usability, more attention is required. They are highly motivated, and they are interested in all new research results in their disease. Responsible patients expect to be involved in the management of their own disease and are anxious to optimize the quality of the health care in all possible aspects (e.g. information, research and therapy). Virtual communities mean benefits to community members. Figallo [3] suggests that virtual communities

are those where members feel part of a larger social group, by sensing an interwoven web of relationships with other members. In this way, it will be possible to know the impact that the use of these new technologies has in the new processes of creation and transfer of knowledge among doctor - patient actors. For further research, it remains to understand the level of confidence that such virtual communities (linked to the MApp) develop inside, while on the other hand the capacity of attraction and the automatic reputation mechanisms developed regarding other users/patients outside of the network.

References

1. Buccoliero, L., Nasi G.: Il sistema informativo delle aziende sanitarie: stato dell'arte e prospettive evolutive dell'area clinica. Rapporto OASI 2004. L'aziendalizzazione della sanità in Italia. Anessi Pessina E. , Cantù E., Egea, Milano, pp. 559-578 (2004).
2. Dennis, A. R., Poothari, S. K., Natarajan, V. L.: Lessons from the early adopters of Web groupware. *Journal of Management Information Systems*, 14 (4), 65–86 (1998).
3. Figallo, C.: *Hosting Web Communities: Building Relationships, Increasing Customer Loyalty, and Maintaining a Competitive Edge*, Wiley Computer Publishing (1998).
4. Hummel, J.: *Virtuelle Geschäftsgemeinschaften*. To appear (2004).
5. Hummel, J. , Lechner, U.: Social Profiles of Virtual Communities. In R. Sprague, (ed), Proc. of the Int. Hawaii Conference on System Sciences (HICSS 2002). 10 Pages on CD-Rom. IEEE Press (2002).
6. Kaplan A.M. , Haenlein M. :Users of the world, unite! The challenges and opportunities of social media. *Business Horizons*, Vol. 53: 59-68 (2010).
7. Mei Huang, Shu-Sheng Liaw : The Framework of Knowledge Creation for Online Learning Environments, *Canadian Journal of Learning and Technology* Volume 30(1) Winter / hiver (2004).
8. Parsons T.: Consumer Electronics can Help Improve Patient Health. Testo disponibile al sito: <http://www.pewinternet.org>. (2011) last accessed 2017/02/18.
9. Preece, J.: *Online Communities*, 1 edn. New York (2000).
10. Reina R.: *Organizzare i sistemi informativi*, Giuffrè Editore, Soveria Mannelli (2015).
11. Sawhney, M. , Prandelli, E.: Communities of creation: managing distributed innovation in turbulent markets', *California Management Review*, Vol. 42, No. 4, pp.24–35(2000).
12. Schiavone F., Metallo C. , Agrifoglio R. :Extending the Dart model for social media, *Int. J. Technology Management*, Vol.66, N.4, pp. 271- 287 (2014).
13. Whittaker, I. , O'Day: Widening the web. Workshop report on the theory and practice of physical and Network communities. Report from ACM CHI (Computer Human Interaction) (1997).
14. Yin R. K.: *Case Study Research: Design and methods*", SAGE Publication, Thousand Oaks (2009).
15. Francesconi A.: *Innovazione organizzativa e Tecnologia in sanità*, Franco Angeli Editore, Milano (2007).
16. Juniper Research: *Mobile Healthcare opportunities. Smartphone Apps, Monitoring & mhealth Strategies 2011-2016* (2011).

17. Rothwell, R. : Towards the fifth-generation innovation process”, *International Marketing Review*, Vol. 11 No. 1, pp. 7-31(1994).
18. Ortt J.R., Smits R.: Innovation management: different approaches to cope with the same trends, *Int. J. Technology Management*, Vol. 34, Nos.3/4 (2006). DOI:10.1504/IJTM.2006.009461.
19. Eisenhardt, K. M. : Building Theories From Case Study *Research Academy of Management”*. *The Academy of Management Review*, Vol. 14, No.4, pp.532-550 (1989).
20. Timmer P.: Business Models for electronic Markets”, *Electronic Markets*, Vol. 8, No.2, pp. 3-8 (1998).
21. Rheingold H.: Virtual communities -exchanging ideas through computer bulletin boards” *Journal of Virtual Worlds Research*, Vol. 1, No 1(2008).
22. Ridings C.M., Gefen D.: Virtual Community Attraction: Why People Hang Out Online, *Journal of Computer- Mediated Communicatin*, Volume 10, Issue 1(2004).
23. Kilsheimer, J.: Virtual communities: Cyberpals keep in touch online. *The Arizona Republic*, p. E3 (1997)
24. Wellman, B., Gulia, M. : Virtual communities as communities. In. Smith M. A , Kollock P. (Eds.), *Communities in cyberspace*, New York: Routledge, pp. 167–194, (1999).
25. Handy, C.: Trust and the virtual organization. *Harvard Business Review*, 73 (3), 40–48 (1995).
26. Hiltz, S. R, Wellman, B. : Asynchronous learning networks as a virtual classroom. *Communications of the ACM*, 40 (9), 44–49 (1997).
27. Smith, A. D. : Problems of conflict management in virtual communities. In Smith M. A., Kollock P. (Eds.), *Communities in cyberspace* (pp. 134–163). New York : Routledge (1999).
28. Ridings, C., Gefen, D., Arinze, B.: Some antecedents and effects of trust in virtual communities. *Journal of Strategic Information Systems*, 11 (3–4), 271–295. (2002).
29. Chesbrough, H.: *Open innovation. The new imperative for creating and profiting from technology*. Harvard Business School Press, Boston (2003).
30. National Institutes of Health (2011). <http://health.nih.gov>.
31. Albano M.: Le nuove professioni....*Notizie Gidif-rbm* ,Vol. 20 (4), p. 3, (2011).
32. Kogut B., Zander U.: Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science*, Vol. 3 No 3, pp. 383-397 (1992). <https://doi.org/10.1287/orsc.3.3.383>.
33. Kozinets, R. V. : E-tribalized marketing? The strategic implications of virtual communities of consumption. *European Management Journal*, 17(3), 252–264 (1999).
34. Taylor, T. L. : Living digitally: Embodiment in virtual worlds. In R. Schroeder (Ed.), *The social life of avatars: Presence and interaction in shared virtual environments*, London: Springer, pp. 40–62 (2002).
35. Blanchard, A. L.: Testing a model of sense of virtual community. *Computers in Human Behavior*, 24(5), 2107–2123 (2008).
36. Jung, Y., Kang, H.: User goals in social virtual worlds: A means-end chain approach. *Computers in Human Behavior*, 26(2), 218–225 (2010).
37. Guitton, M. J. : Living in the Hutt Space: Immersive process in the Star Wars role play community of Second Life. *Computers in Human Behavior*, 28(5), 1681–1691(2012).
38. Guitton, M. J. : The immersive impact of meta-media in a virtual world. *Computers in Human Behavior*, 28(2), 450–455 (2012).
39. Shelton, A. K. : Second Life sells, but who’s buying? *Computers in Human Behavior*, 26(6), 1223–1227 (2010).
40. Bruns, A.: *Blogs, Wikipedia, Second Life and beyond: From production to produsage*. Bern: Peter Lang (2008).
41. Boellstorff, T. : *Coming of age in Second Life*. Princeton: Princeton University Press (2008).

42. Leimeister, J.M.; Sidiras, P., Kremer, H. : Success Factors of Virtual Communities from the Perspective of Members and Operators - an Empirical Study", In R. Sprague (ed). Proc. of the Hawaiian Int. Conference on System Sciences (HICSS 2004), IEEE (2004).
43. Schoberth, Th.; Preece, J. , Heinzl, A. : Online Communities: A Longitudinal Analysis of Communication Activities. In R. Sprague (ed).Proceedings of the Hawaiian Int. Conference on System Sciences (HICSS 2003), IEEE (2003).
44. Adar, E., Huberman, B.: Freeriding on Gnutella. Firstmonday 5 (2000).
45. Josefsson, U. : Patients creating self-help on the Internet - lessons for future design of Internet based healthcare resources", In R. Sprague (ed). Proc. of the Hawaiian Int. Conference on System Sciences (HICSS 2004), IEEE (2004).
46. Martinez M, Galdiero C : New Organizational Forms in the Italian Health care sector. In: (a cura di): Hasan I, 10th EBES Conference. Istanbul: EBES Publication, Sazak Ofset (2013).
47. Martinez M, Galdiero C : Public Private partnerships in Italian Health Care Management. In: (a cura di): Nancarrow S, Proceedings, III International Conference Global Health Care Conference GHC 2014. p. 25-31, SINGAPORE:GSTF, Singapore, (2014). Doi: 10.5176/2251-3833_GHC14.34.