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HOLISTIC APPROACH TO MANAGEMENT OF INNOVATION: A HOME CARE CASE STUDY.

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ABSTRACT

Introduction of information and communication technologies (ICT) in home care organizations is seen as a way of improving work efficiency and care quality. In recent years many research project have been undertaken in order to create models of existing processes and to design appropriate technological tools. This paper argues for the need of global and systemic approach for innovation management in home care in relation to the implementation of ICT devices. After describing the home care activity, we shortly present the industrial demand at the origin of our research project. We present as well some perspectives on introduction of ICT in home care organizations and on the innovation in health care. Next, basing our work on several theories of systemic approach to organizations and change, we argue for a systemic and holistic view of innovation, its design and management. We complete our theoretical proposal with results of a preliminary study about the perception of intended benefits of innovation. On the basis of field observations and interviews, we created a questionnaire in order to analyze this characteristic of innovation (Lansisalami, 2006) among diverse actors of the home care organization studied. To date we have obtained results from 30 participants belonging to 6 distinct profiles. It appears that different profiles have slightly disparate opinions about the significance of different advantages to be introduced with new devices, and that patients seem to differ the most from other profiles.

Keywords: Innovation, Change, ICT, Home care, Systemic approach, Management

INTRODUCTION

The development of home care in France started in the 50s and was encouraged on the one hand by the deficient number of places in hospitals, and on the other hand – by the emergency of technologies providing medical services outside the walls of hospitals. Since then, home care has established its position as an important and legally approved alternative to classical hospitalization, with lower costs of medical treatment. This is extremely important in a time when constant aging of population appears to be one of the biggest challenges of 21st century. This explains the growing emergence of national policies towards the development of the home care, illustrated for example by the creation of national structures supporting the progress in home care structures, or by the amount of national research projects in this domain.

Home care structures are an interesting example of a new way of providing health care, where the sharing of medical data is of utmost importance for the coordination of care, and where the patient occupies a special place in the health care activity. We think that home health care can be seen as an example of innovation in the healthcare system itself.

Even if home care is seen as promising, it has to face up to its own challenges. The diversity of actors, places and tools, provoke often a dull coordination of patient care processes, and can induce errors in data transmission and transcription. Introducing ICT technologies for mobile health actors and at patient's houses seems to be an important step for the improvement of existing processes and ways of working. It is not easy to anticipate new mobile forms of healthcare organizations. A satisfactory level of acceptability of new devices is not enough to ensure their adoption by diverse actors and patients. It is more about conducting a change between two different forms of organization, on all dimensions, including the collaboration with other health care structures. As stated by Coeira, "*if health care is to evolve at a pace that will meet the needs of society it will need to embrace this science of sociotechnical design, but ultimately it is our culture's beliefs and values that shape what we will create and what we dream*" (Coeira, 2004).

PRESENTATION OF THE CASE STUDY

Presentation of the home care organization

The partner of our study is a French home care organization founded in 1968 and offering two distinct services: hospital at home and nursing at home. The first activity, *hospital at home*, is an alternative to classical hospitalization and allows people with serious, acute or chronic diseases to stay in their family environment. Nurses do most of the tasks and patients require daily visits and heavy medical treatment. The second activity, *nursing at home*, involves tasks of lower complexity which are often executed by assistant nurses. In this activity patients are mostly elderly or disabled people that need help with basic daily activities, like washing, dressing, getting up from bed.

In order to ensure the global charge of patients from both services, the structure employs a diverse number of medical and paramedical actors: nurses, assistant nurses, coordinating nurses and senior nurses or coordinating physicians, social workers, psychologists, physiotherapists, and a dietician. There are also numerous administrative profiles such as secretaries, logisticians, HR and quality managers, or finally accountants and financial officers, responsible for the management of administrative activities. Finally, considering the geographical distribution of patients, the employees are organized in 6 groups corresponding to the geographical number of sectors. They are not actually assigned to one specific patient nor activity (hospital at home and nursing at home), and thus they need to collaborate in their groups to ensure the global vision of responsibilities for different patients.

Nowadays, the organization counts around 250 employees and takes care of 500 patients every day (with a distribution of 20% for the home hospitalization and 80% for the home nursing).

The complexity of the home care

We define home care as providing different types of medical and paramedical services to patients at their homes. It exists in many countries and is called under different names (Chached, 08): *home health care* (United States/ United Kingdom), *hospitalization at home and nursing at home* (France), *assistance at home and treatment at home* (Italy), or *hospital in the home* (Australia).

Home care is often presented as a highly complex domain. As explained by Bricon-Souf et al., it takes place on a complex system that is organized in four main sectors: "*COMMUNITY: politicians, patients, hospitals, board of directors; CONTROL: managers of hospitals, of home care organisations; CURE: acute hospitals, physicians, community of physicians; and CARE: nurses, other professionals, and a strong collaboration is needed between, but also within, each of these sectors*" (Bricon-Souf, 2005). In this context each actor is brought to work with other people from the same sector or profession, but also with the representatives of others sectors and professions. The high quality coordination and communication of information between all these actors are crucial to ensure the patient's safety and a high level of care (see Figure 1 below).

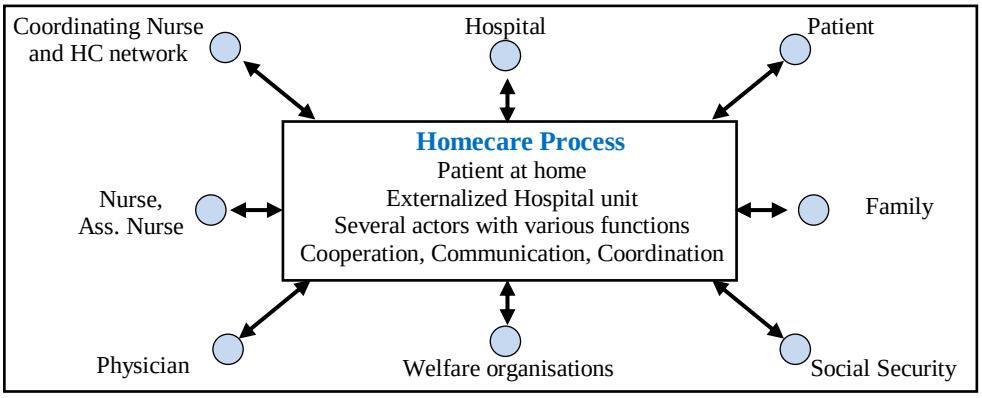

Figure 1. Actors of the Home care system (Beuscart, 2004).

Secondly, home care is organized around two different, but highly interdependent processes: the logistic process and the health care process (Bricon-Souf, 2002).The *health care process* concerns the provision of care by actors to the patient at his home, as well as the supervision and control of the evolution of his health through the measurement of his vital data, but also during exchanges between actors outside the patient's home. The *logistic process* is linked with the management of patient's admission to the structure and the organization of personnel and material necessary for his care.

Thirdly, the patient himself is the central actor in home care activities. He is not simply a "customer", but also participates actively in the care process. He can have his own preferences of certain caregivers; he can refuse some care activities. The patient (or his family) is also in charge of pharmaceuticals delivery (from pharmacy to home) and can be responsible for some of the care tasks. Finally, the patient and his relatives are often the best source of knowledge about the evolution of care. The complexity of home care is thus linked with the diversity of actors, the spatial and temporal distribution of different activities, and the central role of the patient and his family. To ensure a good coordination, collaboration and exchange of data that make all of these processes fluent, the home care organization is based on the use of several tools. Nowadays there exist many both material and intangible "tools", like paper supports (paper patient's record situated at his home), mobile phones (i.e. for exchanges between nurses in mobility and physicians), home care specific computer systems (i.e. professional software for management), or regular meetings of stuff at the headquarters. The amount of written and oral exchanges is considerable, and the fact that they use a specific common vocabulary is crucial for an efficient collaboration (Minel, 2003). This diversity of tools and the perseverance of paper documents generate a dull coordination and a complex running. Indeed, we can observe many difficulties: problems of loss, lack or error in data; and too much time dedicated to documentation and information transmission. Next this has considerable consequences on daily work processes. We present some of them in the table below.

LOGISTIC PROCESS	HEALTH CARE PROCESS
▪ Nurses need to come to the headquarters to get their planning on paper twice a week, and in the case of unexpected changes the new list of patients are communicated by phone; ▪ Nurses, nursing assistants and other care employees mark their working hours and kilometers every day on paper, then medical secretaries fulfill these data in the organization on the software.	▪ Care actors rarely have access to specific patient data before a visit, especially the physician; ▪ Medical patient data is distributed between people, tools, and places, thus can be the cause of important errors during data transmission; ▪ Nurses and nursing aides gather medical data and mark them in the paper binder at home, but in order to communicate them to their medical superiors, they recopy them as well in their notebooks.

Table 1. Influence of the use of paper on working practices in the home care organization.

The need for the introduction of technological devices

Many of activities described above could be eliminated or facilitated thanks to the introduction of new working supports that allow both the automation of repetitive tasks, and the instant sharing of medical and organizational data. That's why the computerization of patient's record in his house and providing mobile health actors with technological devices have become of great interest for many home care organizations. Our investigation team was contacted by a home care organization in order to evaluate the quality of use of a new device developed by an IT company, and to help it to adapt the device to its internal functioning.

In order to meet the demand it appeared necessary to understand the health care organization. Firstly we collected data on the working processes of different actors of the structure. We have studied the written rules and procedures and followed several employees during their working day in order to catch important details that cannot be learned from the documentation. We have also organized several meetings with the policymakers during which we learned about their expectations concerning the introduction of the IC. This phase of the study helped us to get an accurate understanding of the present home care activities and the role that the ICTs were supposed to play in improving the quality of existing services. This analysis resulted in two major statements: (1) introduction of the ICT tools in the home care organization is subject to many constraints, and (2) evaluation of the quality of use, and the co-design of interface aren't enough to respond appropriately to the organizations' demand.

Indeed the medical organization has a lot of different requirements concerning the introduction of new technological tools. In order to make their adoption easier, the different devices have to respect the current uses and specific vocabulary of the organization. An intuitive interface is also essential to reduce the time of formation and the amount of potential errors. On the technical level, the devices have to work regardless of the patient/actor location and all along the working day, which means that both the type of network connection and the power supply are crucial points. From the financial

perspective, the solution has to be cost effective. Moreover for the devices that will remind at patient's home, it is imperative to consider their impact on the wellbeing of the concerned inhabitants and to prevent it from being damaged and used for non-medical purposes. Finally, all these requirements have to be fulfilled in compliance with the current and future regulations concerning the health information systems, for example by providing a satisfactory level of security of the data.

TOWARDS INNOVATION IN HOME CARE

Introduction of ICT in home care

The introduction of ICT devices for mobility in the home care, considered as a significant step towards the resolution of present challenges in this domain, has been subject to many research projects. Petrakou for example analyses the actual use of a paper binder for communication between family members and diverse actors involved in the care, in order to seek for cues for the design of ICT (Petrakou, 2007). Bricon-Souf et al., based on a cognitive analysis of work between different actors, propose a technical platform to improve communication (Bricon-Souf, 2005), and Koch et al. develop a "virtual health record" for mobile access and documentation (Koch, 2004). Latortue et al. explore the impact of the introduction of technologies on the spatio-temporal characteristics of information and perceive its impact on collaboration (Latortue, 2013b).

These studies indeed show interest in analyzing the existing practice for the development of future devices which are to replace existing tools, in order to improve their use and promote their adoption. However they do not mention the role of the technology as a factor of change and innovation in the home care. As state Johansson and Sandblad, it is "*not enough to use modern IT-systems to support work in the way it is currently performed, instead it is more important to see the potential in how the new technology can contribute to a positive development of the work and the organization as a whole.*" (Johansson, 2005). In the same direction, Hamek states that with the emergence of new technologies, new tools, concepts, computer networks the care itself is being reorganized, with a new place for mobility and collaboration of healthcare professionals, and with a growth of electronic exchanges between actors, families and patients (Hamek, 2005).

Innovation in health organizations

West defined innovation as "*the intentional introduction and application within a role, group, or organization, of ideas, processes, products or procedures, new to the relevant unit of adoption, designed to significantly benefit the individual, the group, or wider society*" (West, 1990). Adapting this definition to the healthcare domain, Omanchonu proposes that healthcare innovation is "*the introduction of a new concept, idea, service, process, or product aimed at improving treatment, diagnosis, education, outreach, prevention and research, and with the long term goals of improving quality, safety, outcomes, efficiency and costs*" (Omachonu, 2010). For the healthcare organizations the innovation often means the development of new services, introduction of new ways of working and/or new technologies (Lansisalami, 2006). For the patients, the intended benefit is often improved health or reduced suffering from the illness (Faulkner, 2001). Despite the presence of many different approaches to the innovation, we believe that the three most important characteristics are: novelty, an application component and an intended benefit (Lansisalami, 2006).

As stated by Berg, overlooking the fact that technology implementation will affect the healthcare organization as a whole, including its structures and process, is a core reason for the failure of innovation (Berg, 2001). He argues that this implementation involves "*the mutual transformation of the organization by the technology and of the system by the organization*", and that is a two-way process (Berg, 1997; 2001). In our case study this means that with the introduction of ICT devices, it will be important to change existing practices for example by starting to use different technologies or develop new services for the employees, partners or customers. Dematerialization of patient's medical data will modify the way in which every actor will access the information, allowing some of them to follow the evolution of patient's health remotely and in "real-time", or to automatize and therefore phase out some repetitive activities. On the other hand this will also result in creating new activities, will require new definition of responsibilities and knowledge-sharing, and will influence existing relations between all actors. Similarly, the computerization of some management activities (like human resources or supply management) will modify the organization and task allocation for the employees.

Thus, even if according to Gupta (2008) the technology may be seen as a key driver for innovation in healthcare, we think that a global and systemic approach is needed to fully manage the innovation (Latortue, 2013a). This way of thinking leads us to consider the innovation itself in a global though multi-dimensional way, not as centered on products, processes, marketing or organizations (Unesco, 2005), but involving all elements of the system at the same time; and referring to the change at individual, group, inter-group and organizational levels (Burnes, 1996).

MANAGING INNOVATION

"*The concept of a system is central in the conceptualization of the current problems and solutions, particularly in innovation and design*" (Lizzaralde, 2011). To manage innovation in a global way in our case study, we propose to adapt a systemic approach to organizations.

Systemic approach to organizations and change

According to Leavitt's vision of organization as a system, it is composed of Tasks, Technology, People and Structure, which are interrelated and mutually adjusting (Leavitt, 1965). When Technology is changing, other components adjust to damp out the impact of innovation. Similarly, Cao proposes a systemic approach to change (Cao, 2003) and identifies four types of organizational change – political, process, structural, and cultural – that interact with each other and thus are interdependent (see Figure 2 below, at left). Specific to the health care domain, Sitting and Sing (Sitting, 2010) propose a multi-dimensional model to address the socio-technical challenges involved in design, development, implementation, use, and evaluation of HIT (Health Information Systems) within complex adaptive healthcare systems. Finally, on a practical level of activity in health care organizations, Berg argues that to ensure a good implementation of technology in a health care organization, there should be a synergy between the mutual transformations of three elements (see Figure 2, at right): the information system itself, the primary work processes and the secondary work processes (Berg, 2001).
Thus in our case study the new ICT devices should be seen as a source of transformation of the health care process and the logistic process of the home care activity. This will bring the tasks to new levels of quality, efficiency, and satisfaction of medical actors and patients and their families.

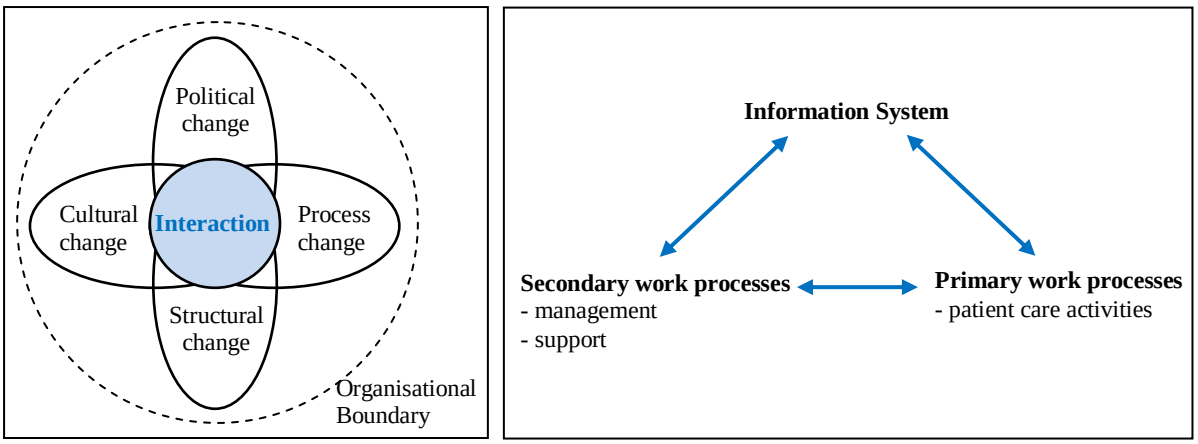

Figure 2. Four types of organizational change (at left; Cao, 2003) and change as striving for synergy (at right; Berg, 2001).

Adopting a multi-dimensional and systemic approach to change has two major consequences for the management of change. Firstly, the change on different levels of the system has to be managed together as a whole, because they are interdependent and interacting. Secondly, the change (or in our case – innovation) on each of these dimensions, needs to be managed differently; "*there is no one best way to manage change*" (Cao, 2003).

Design of innovation

The subject of introduction of new technological tools for home care has often been treated on the level of design of interfaces adapted to existing work routines and contexts. For example, Hägglund et al. use an interdisciplinary approach to create scenarios in order to represent existing working processes and create recommendations for the ICT development (Hägglund, 2010). Furthermore

Scandurra et al. use a multi-disciplinary approach, where both usability specialists and divers clinical experts participate in seminars in order to the design new health information systems (Scandurra, 2008), and Bossen et al. included family members to the process of design of ICT to support the communication between the relatives of elderly persons and the home care workers (Bossen, 2012).
We maintain that a satisfactory level of acceptability of new devices is not enough to ensure their adoption by diverse actors. Yet it is not easy to anticipate new forms of healthcare organizations in mobility. It is more about conducting a change between two different forms of organization, on all dimensions, including the collaboration with other health care structures. In order to make this change easier, the new organization could be designed, the same as the technology to support it. As stated by Coeira, the evolution and innovation in healthcare should be seen as *sociotechnical design*, because of the strong link between technology and people, where *"technical systems have social consequences, and social systems have technical consequences"* (Coeira, 2004). We believe that this kind of design of innovation should, in connection to the systemic approach, take advantage of methodologies like user centered design (ISO, 2010); user experience design (Hassenzahl, 2006) or design thinking (Brown, 2008).
We understand this kind of holistic approach to innovation design and management at three levels: (1) as referring to all elements of the home care system, including external partners like physicians or pharmacies; (2) as involving the participation of all actors, including patients and family members; and finally (3) as relevant to all stages of the process.

QUESTIONNAIRE TO ANALYSE THE PERCEPTION OF INTENDED BENEFIT

As stated before, we consider that one of three essential characteristics of innovation is its intended benefit. We decided to analyze whether different actors of the organization share the same perception of benefit on their daily work. That's why, on the basis of interviews and field observations, we constructed a questionnaire about the benefits expected from computerizing patient's health record and from equipping caregivers with Smartphones for mobile access to data (planning, patient medical information).

Method

The questionnaire was composed of 12 statements concerning the anticipated benefits (see Table 2). Each person was asked to evaluate her personal perception of importance of these perceived benefits on a 5-point Likert scale (1 – not important at all, 5 – extremely important).

Results

To date we have obtained results from 30 participants, including 5 nurses (N), 10 assistant nurses (AN), 4 coordinating and senior nurses (CN), 2 coordinating physicians (CP), 4 medical secretaries (MS), and 5 patients (P). Their age varied between 24 and 51 years (MED= 37.10). Table 2 on the next page contains the average scores obtained for every statement and for each actor category, as well as average scores for all actors mixed together (TOT ALL), and for all medical actors (TOT MED, the value of standard deviation for every score is given between brackets).
The obtained results show that indeed some of the intended benefits are perceived as more important than others. Reducing number of errors and omissions seems to be of utmost value, independently of the actor category. The medical actors seem also to give a lot of value to the possibility of decreasing the action of rewriting the information between home and office. Then, even if one's access to his/her planning is seen as very important, the access to the planning of other colleagues seems to be important especially for assistant nurses. On the other hand, medical actors seem to agree about the importance of intended benefits concerning the access to medical data for actors outside the patients' home – physicians and coordinating physicians, coordinating nurses and senior nurses, or pharmacies.
Finally, patients seem to have a different vision of priorities than medical actors. One could argue that we should have included some patient-centered items to our questionnaire. However, as stated before, our choice of items dependent strictly from the data provided by the home care organization, for whom the benefits should firstly impact the medical actors.
Generally, our results show that medical actors share the perception of importance of intended benefits linked with the introduction of ICT tools. In the future, we plan to extend our study to other profiles, especially by questioning physicians and freelance nurses, but also other employees of the structure.

↓ STATEMENT CATEGORY→	N	AN	CN	CP	MS	P	TOT ALL	TOT MED
1. Reduce time spent on paperwork during a visit at patients home.	4.40 *(0.89)*	4.80 *(0.42)*	5.00 *(0.00)*	4.00 *(0.00)*	4.50 *(0.58)*	4.00 *(0.71)*	**4.53** *(0.63)*	**4.64** *(0.57)*
2. Facilitate remote access to medical data for monitoring patient's health by medical actors (coord. physician, coord. nurses, and doctors).	4.80 *(0.45)*	4.80 *(0.42)*	4.75 *(0.50)*	5.00 *(0.00)*	4.50 *(0.58)*	3.20 *(0.84)*	**4.50** *(0.78)*	**4.76** *(0.44)*
3. Give nurses and assistant nurses access to their colleague's schedules.	3.20 *(1.30)*	4.60 *(0.97)*	4.25 *(0.50)*	3.00 *(0.00)*	4.00 *(0.00)*	3.60 *(0.55)*	**3.97** *(0.96)*	**4.04** *(1.02)*
4. Give nurses access to pharmaceutical drug dispensation and recommendations for the appropriate use of medicines.	4.60 *(0.55)*	4.80 *(0.42)*	4.50 *(0.58)*	4.50 *(0.71)*	4.00 *(0.82)*	2.75 *(0.96)*	**4.31** *(0.89)*	**4.56** *(0.58)*
5. During a visit increase the proportion of time dedicated to care.	4.80 *(0.45)*	5.00 *(0.00)*	4.50 *(0.58)*	4.50 *(0.71)*	4.75 *(0.50)*	4.60 *(0.55)*	**4.77** *(0.43)*	**4.80** *(0.41)*
6. Give nurses and aides access to care plan before visiting the home.	4.60 *(0.89)*	5.00 *(0.00)*	4.25 *(0.50)*	2.50 *(0.71)*	4.25 *(0.50)*	3.60 *0.89)*	**4.33** *(0.88)*	**4.48** *(0.82)*
7. Give coordinating and senior nurses, and coordinating physicians, access to patient medical records for better coordination of the care.	4.80 *(0.45)*	4.80 *(0.42)*	4.50 *(0.58)*	5.00 *(0.00)*	4.25 *(0.50)*	4.00 *(0.71)*	**4.57** *(0.57)*	**4.68** *(0.48)*
8. Reduce the number of errors and omissions in the transcription and transmission of information.	5.00 *(0.00)*	5.00 *(0.00)*	4.75 *(0.50)*	5.00 *(0.00)*	4.75 *(0.50)*	5.00 *(0.00)*	**4.93** *(0.25)*	**4.92** *(0.28)*
9. Decrease the rewriting of information drawn at home to forward it to the office (i.e. for monitoring pain).	5.00 *(0.00)*	5.00 *(0.00)*	5.00 *(0.00)*	5.00 *(0.00)*	4.75 *(0.50)*	3.00 *(0.71)*	**4.63** *(0.81)*	**4.96** *(0.20)*
10. Give the pharmacy access to patient medical records to facilitate the analysis of prescription.	4.40 *(0.55)*	4.70 *(0.48)*	4.50 *(0.58)*	5.00 *(0.00)*	4.00 *(1.15)*	4.00 *(0.71)*	**4.43** *(0.68)*	**4.52** *(0.65)*
11. Give the doctor the possibility of prescribing drugs remotely in case of an emergency.	4.60 *(0.89)*	4.90 *(0.32)*	4.67 *(0.58)*	5.00 *(0.00)*	4.25 *(0.50)*	4.60 *(0.89)*	**4.69** *(0.60)*	**4.71** *(0.55)*
12. Provide remote access (no need to go the headquarters) to the schedule (work round, but also meetings or training) to the caregivers.	4.80 *(0.45)*	5.00 *(0.00)*	3.50 *(1.00)*	4.00 *(0.00)*	4.25 *(0.50)*	3.00 *(1.00)*	**4.27** *(0.94)*	**4.52** *(0.71)*
TOTAL	**4.58** *(0.77)*	**4.87** *(0.41)*	**4.51** *(0.62)*	**4.38** *(0.88)*	**4.35** *(0.60)*	**3.80** *(0.96)*	**4.49** *(0.76)*	**4.63** *(0.63)*

Table 2. Average scores by statement and by category of actor.

CONCLUSION AND PERSPECTIVES

In this paper we have presented an ongoing research project which is based on an industrial demand. Based on systemic approach to change, we argue that the introduction of ICTs in a home care organization should be considered as a multi-dimensional process towards the innovation. We believe that this kind of approach will help us to anticipate potential problems and to improve the design of the future system, and thus to facilitate its adoption as well as the change. Systemic view on organizations provides a better understanding of complex relations between its different components, and can help in identification of factors facilitating the innovation.

The results of our preliminary study show that different actors have different points of view and needs about their activities that are to be changed by the introduction of ICT. It is difficult to ponder the respective importance of the diverse needs or beliefs of all actors involved and whether some of them are more important than others. Therefore it seems appropriate to believe that the final solution will be a compromise between these diverse perceptions, however further studies are needed to understand the arguments at the source of differences. In this context, more importance should be assigned to the opinions and needs of patients and their relatives. Nowadays the strategic decisions in the home care organization studied are made by the management (Merlo, 2004), according to its perception of patient's wellbeing, but without a consultation with the patient themselves. This kind of Top-Down approach seems improper to the creation of value and services actually focused on the patients.

We agree that it is difficult to anticipate the final "best" solution from the very beginning of the project, as the ICT introduction is an iterative process and it is crucial to consider the multiplicity of the actors. Moreover some factors of success will remain inevitably unpredictable and it would be interesting to identify them by producing further analysis of the new processes throughout the evolution of the industrial project. This issue leads us to the question of measuring the success of implementation of the solution, and when is the change considered satisfactory. We agree with Berg (2001) that the concept of success of an implementation is multidimensional, evolves over time and depends on the viewpoint, and we hope to continue our future research in order to provide a better understanding for the innovation adoption in new forms of health care organizations.

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