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Organizational effects of Information and Communication Technology (ICT) in elderly homecare: A case study

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Abstract

The use of information and communication technology (ICT) to support integrated healthcare services in elderly homecare is becoming a self-evident part of home healthcare services. Especially, when it comes to information exchange, knowledge sharing and documentation at the point-of-care (POC), ICT is an enabling technique. The aim of this study was to explore the effects from the use of the OLD@HOME-prototype.

The results shown that the OLD@HOME prototype was perceived to contribute in developing horizontal links for communication between individuals who work together, independent of geographical distance or organizational affiliation, and to contribute to increased work efficiency. The prototype was further seen to reduce professional isolation by providing a holistic overview of the care process. User centred design and implementation of the OLD@HOME prototype was considered a key issue to facilitate acceptance of organizational changes. Participation of care professionals not only led to a better understanding of the needs of involved organizations, it also increased end-users' involvement and commitment, stimulating them to test and improve the prototype until the final version.

Keywords: Elderly homecare, participatory design, organizational effects

Introduction

In contemporary elderly care organizations, the single healthcare personnel-patient relationship is beginning to be replaced by one in which the patient is managed by a team of healthcare professionals, each specialized in different aspects of healthcare and elderly homecare services [1]. Team members do not necessarily belong to the same organizational unit, and they may even provide care outside hospitals or elderly centres, for instance moving health and care services into the patient's own home.

The efficacy of such shared care depends partly on the interest from the individuals in self-managing their health and on individuals' preference for aging at home rather than in an institution [2]. But quite as much, it may depend on care providers' ability to easily share information and on the use of appropriate technology to transmit and communicate accurate information between involved actors. Indeed the present inability to automatically share information between care organizations using information and communication technology

(ICT) systems may represent one of the major impediments to progress toward shared care and increased inter-organizational collaboration [3] in the area of elderly homecare [4].

In most western countries and Japan, use of ICT in clinical settings allows broader access to expertise for patients with challenging illnesses or diseases without the need for travel or transfer of either patients or specialists [5, 6]. Already in the 1920s, ICT was used for accessing remote populations such as in the Arctic regions or mountainous areas [7-9]. Medical informatics has since then identified a wide range of opportunities for applying engineering and/or computer science skills to medicine and healthcare to provide medical expertise and healthcare services to distant locations [10,11]. A variety of applications are permanent today and e.g. virtual patient visits via video conference or vital sign monitoring are state of the art technologies today. Telehealth to the home is today mainly applied to patients with chronic diseases, such as cardiac and/or pulmonary diseases and managed by the hospital. Use of information systems in elderly homecare, as managed by the primary care, is still quite rare [4]. Especially, when it comes to systems that enable information exchange, knowledge sharing and documentation at the point-of-care (POC) or systems that allow integration and control of collaborating units involved in the same care process.

However, information systems or ICT by itself is not a sufficient condition for changes to take place. The potential benefits from ICT are realized only when organizations adopt new patterns of behaviour, exploiting new possibilities [12]. ICT applications to meet the needs of elderly homecare have been proposed during the last years. However, progress is slow and evaluations have often not yet been carried out or published [4].

The aim of this study is to explore the effects of use of an ICT tool for elderly homecare in Sweden, A case study was performed on OLD@HOME Virtual Health Record (VHR), developed and tested in the project OLD@HOME [13]. The application is used by healthcare professionals performing home visits, to access patient information from different care givers feeder systems, and to document at POC. The system allows further mobility and interaction with other care professionals at different locations involved in the decision making process of a patient.

Method

The OLD@HOME project was 3-year cooperation between a municipality, a county council, several companies and organizations, and two universities. This article is based on knowledge gained by the research group and practitioners who active participated in the project during this period of time.

We use interviews as our main tool to collect data. Interviews are a central methodological tool in qualitative research because they can help to gather facts, opinions and goals, plans and insights that may not be available from any other source [14]. The interview is a conversation where the interviewer creates the structure and the respondent provides answers. In open-ended interviews, key respondents are asked for the facts of a matter as well as for their opinions about events, allowing the respondents to describe the world as they experience it. In some situations, the respondents may even be asked to propose their own insights into certain occurrences. Interviews are therefore an essential source of evidence. However, despite the fact that interviews provide important insights into the situation, they produce verbal reports [15]. (Yin 1994 sp 85) and are, as such, subjects to problem of bias, as e.g. poor recall.

Systems of the kind we discuss here influence many different stakeholders; healthcare staff, patients, relatives, management of different healthcare organizations, industrial companies etc. In spite of this we limit our analysis to the effects identified by the collaborative teamwork participating during the development and testing phases of the prototype. For this reason, we have interviewed participants actively involved in the development process. They include:

- Three representatives from the home help personnel at the municipality. They are in charge of home help services for the elderly, but they also perform healthcare tasks on delegation from district nurses at the primary care. They are the real end-users of the system. All of them participated in all stages of the project.
- The academic project leader.
- One of two doctoral students involved in development, test and implementation of the ICT system in study, performing the practical project work.

Three individuals participated in the collection of data, the first and second author and a master student who worked at Linköping University at the Economic Information Systems research group. Notes about the system, its use and impact on work procedures, were taken during a two days demonstration of the prototype at a national exposition by the first author of this paper. By then, the interviewed personnel had been using the prototype in practice for three months. The data collectors also attended a one-day seminar mid-way in the OLD@HOME project, listened to presentations, taking notes and talking informally to some of the homecare personnel using the system and to the representatives from the companies involved in developing the technical application.

All the interviews were structured around open-ended questions concerning the role of the informants in the project, their areas of responsibility, the work-flow and inter-organizational changes or consequences they experienced from the use of the OLD@HOME VHR system. The interviews regarded especially the impact on teamwork in the care process and the effectiveness of the system for the production of services. Use of open-ended questions allowed the interviewees to describe experiences acquired from participating in the project, and especially from testing and using the prototype *in situ*. Additionally, it gave the informants the opportunity to discuss topics they felt were important to bring up. The doctoral student was also asked to comment on use of the system and potential benefits and restrictions identified for a generalization of the system. Each interview took approximately one hour. The same questions were asked in all interviews.

At the first level of the data analysis, personal experiences of the interviewees were studied in order to understand the situation. Only verbal descriptions and “lived experiences” described during individual interviews were considered. Each narrative unit was then grouped in different areas related to organizational and individual activities e.g. improving communication, work routine habits and communication patterns or the importance of being involved in the process, which expressed a general description of the situation.

The results were checked against current literature of participative approaches e.g. participatory design [16]. This was done both for validation purposes and to relate our results to results from similar studies.

All the interviewees had the opportunity to read and comment the obtained outcomes. We sent the manuscript to them to validate our results, and listened to their opinions about our interpretation of their reality.

Additional material, such as scientific publications describing the project methods and results [17-21] as well as other research work in the area and international publications in the area of home healthcare was reviewed and used to augment the understanding of the current situation with regard to the use of ICT for elderly home-care [22-28]. The fact that one of the co-authors acted also as academic leader of the project, may of course raise questions about its influence in the analysis of the data and in the presentation of the results. However, it is important to note that the academic leader of the project neither participated in the collection, nor in the analysis of the data or in the presentation of the results. Her role has been limited to act as informant, and as such to deliver information the first author considered relevant and important for this study; information about the methodology used to develop the prototype, project management, decisions of geographical test sites as well as information about industrial partners involved, the criteria to choose them and their participation in the development of the prototype. She has also on the first author request, delivered figures and technical information about the prototype. The same situation is valid for the doctoral student. Her participation has been limited to answer our questions and to comment the results of our findings. The present article represents our joint effort to describe the identified outcomes in a detached and neutral way.

Methodological considerations

The strengths of qualitative research methods lie in their helpfulness to understand the meaning and context of the phenomena studied and the particular events and processes that make up these phenomena over time in real-life natural settings. For this reason, the hallmark of qualitative methodology is its flexibility rather than its standardization. The point of the methodology is not that it can be applied and compared across all other similarly controlled situation, but that it can be modified and responds to the particularities of the situation as they arise in real-life social settings [15]. In our study, we have used case study methodology to explain and understand the processes studied. In doing so, the use of explorative methodology has allowed us to acquire knowledge of the importance of the human actions for the success or failure of the application of IT to home healthcare, as well to gain an understanding of how professionals in this area work. It also enabled us to ask questions about the daily work activities and thus about matters that are important to consider when IT is introduced or developed in such organizational.

The disadvantages usually related to interviews are e.g. whether conclusions extracted from interviews in uncontrolled field situations and in the absence of formal testable hypothesis can be considered valid scientific findings. Conscious of this problem, we have used triangulation (multiple sources of evidence) to validate our results. In addition to this we have taken an outsider's perspective, avoiding close involvement with participants, trying to stay clear of presenting data in an objective assessment of the situation.

The caseⁱ study – OLD@HOME

In Sweden, homecare of the elderly today is performed by different types of care professionals: medical personnel such as general practitioners, district nurses or physiotherapists and home help service personnel in charge of non-medical services as e.g. the patient's daily hygiene.

Even though these care professionals, especially the home help service personnel, have a very mobile work situation, they very rarely have any mobile ICT tools supporting their work. Usually, they document on their stationary PC system when they return to the office, or just on paper, or sometimes even in both systems. In addition, different users document in different, often incompatible, base systems. The lack of adequate mobile information access and communication tools clearly hampers the care professionals when it comes to documenting new information, comparing it in the context of existing information and sharing information within the care providing team [17].

In Hudiksvall, a mainly non-urban, remote region with a population of about 37,000 inhabitants whereof 5.5% aged over 80, the Old@Home project was introduced to improve and guarantee quality-oriented homecare for elderly patients by providing the right information to the right person at the right place and at the right time. System design was approached in a user-centred way that actively involved staff, patients and relatives in interdisciplinary working groups together with specialists in medical informatics and human-computer interaction. The objective was to develop usable ICT support tools for shared homecare [13], and to obtain a seamless and consistent information flow between home healthcare and primary healthcare, giving a holistic overview of the entire work/care process, better mutual understanding, exchange of knowledge and experiences, and a continuous educational effect [12].

The project resulted in a number of working prototypes to be used in clinical practice such as a virtual health record, a virtual care plan and a web-service to elderly patients and their relatives (figure 1). Patient-oriented information stored in different electronic health records (= feeder systems) was integrated and made available for different users in a holistic way at the POC. When accessing information, each user category has its own view on the entire patient information, depending on their information and documentation needs in respect to different work situations. Depending on their role and work situation, end-users apply a PDA, a tablet PC, a Laptop or a workstation. A fibre-optic infrastructure connecting primary healthcare centres, Old @Home units and a residential home for the elderly were used as a test bed.

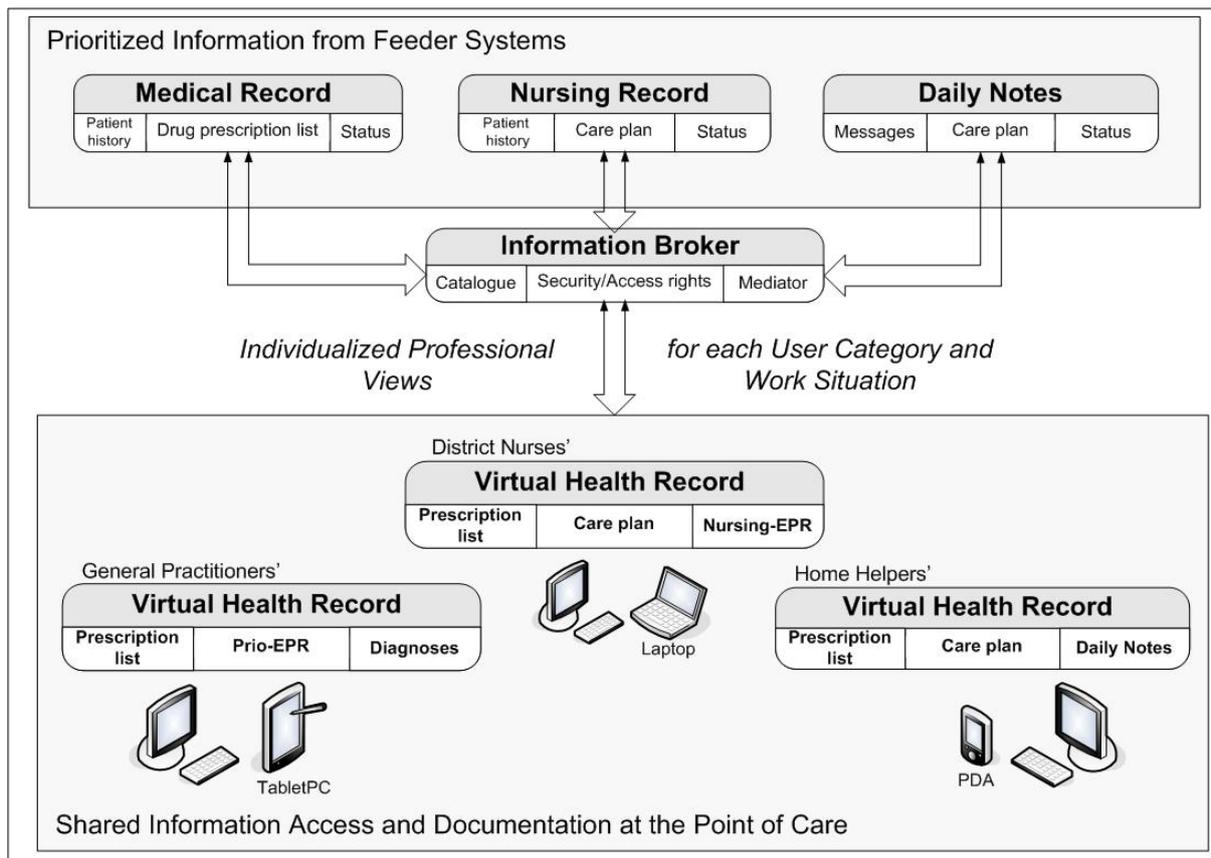


Figure 1: Prioritized information is selected from different feeder systems and presented as individualized views, depending on healthcare profession and work situation.

Interpretation of the results, discussion and lessons learned

Improving communication through real-time information

The Old@Home VHR prototype was perceived by the interviewees to have developed horizontal links that permit different subsystems of communication between individuals who work together, independent of geographical distance, and in this manner contribute to increased work efficiency. The use of the system was seen not only as a tool for mitigating pressure on staffing levels and other resources but also as an alternative for reducing waiting time for the delivery of services. Use of the Old@Home VHR was therefore perceived to reduce lead-times and thus to introduce more efficient work procedures with positive consequences for the organization.

The Old@Home VHR prototype was further seen to reduce professional isolation by providing peer and specialist contact as well as a holistic overview of the process for patient contacts and production of services at home. Real-time information access was further considered an important factor for achieving an improved relationship between specialists at the primary healthcare centres, district nurses, elderly homecare personnel as well as patients and their relatives. This relationship was perceived as a gain in efficiency for the homecare personnel, and a clear improvement in the way services were carried out at a patient's home. Individuals expressed a belief that the benefits obtained from these internal "re-engineering processes" were, first of all, the improvement in work routines that occurred in the internal

organizations, an increase in the quality of services, and the elimination of effects related to lack of information. Specialists' specific knowledge now becomes available to all involved caregivers in need of this knowledge in a more natural way, when personnel at different levels and from different organizations interchange information through the ICT system. The supplier of the specialized information is now accessible, which decreases the transaction costs expressed in time and effort of obtaining knowledge about specific issues of strategic significance for a treatment procedure that in other circumstances is not available to all caregivers.

Work routines, habits and communication patterns

Elderly homecare includes a large variety of care modes including therapy, nursing, and home services such as shopping, cleaning, personal assistance etc. These are traditionally performed by different groups of people. Using the new information system when planning and programming work routines, raises issues of shifting tasks to other actors, and the possibility to outsource production of some work tasks outside of the classical care units, reorganizing the teamwork's work habits, routines and communication patterns.

When Old@Home VHR was introduced, former routines for coordinating activities were to be replaced by new ones. For instance, the new system avoids repetitive documentation when all involved actors now have access to the same information. However, implementation and use of the system also illustrates the necessity for cooperative activities to be clearly defined between all the different actors involved, and the necessity to limit access to different levels of information. Using an integrated system, where all provide information for their colleagues, was viewed as the constitution of a virtual network, through which personnel from primary healthcare centres, assistant nurses at the elderly centres, as well as patients and relatives are included and will have the possibility to interact with each other. Further data stored was viewed as easily accessed by team-care members, providing instant answers to issues related to patients health, welfare and utility. Daily non-efficient routines were identified and new ones were suggested allowing new forms of communications and developing new and more efficient work routines.

The individual level

At the beginning of the project, many end-users lacked specific knowledge in computers and computer technology. As the end-users familiarized themselves with the new system, they gained more confidence in how to share and access information with the personnel involved in the care process. Key logistic processes had often been managed from elderly centres, where the home care office is located, including the decision for how homecare services were organized, how to monitor and report changes in patients' health status, or how to stimulate and support integration of therapeutic activities. However, with the implementation and use of the new system the two processes, the care process and the logistic one, became tightly interwoven. The care team together as well as every individual in the team, could evaluate and more flexible plan their use of resources. Through this, interviewees claim to have accomplished several current goals in elderly care, getting the possibility to introduce customer-adapted care processes but also make work-activities principally between nurses, nurse assistants more transparent and even reducing constraints related to geographical locations and organizational cultural related differences.

and... the importance of being involved

Being involved in the specification of requirements and in the entire design and evaluation process was considered a key issue to accept to test and use the final prototype but also the

organizational and work related changes that the use of system introduce. Interviewees meant that participation in the development and implementation process had allowed them to acquire a better disposition for adapting to the new work situation, even reducing the transaction costs for adapting to the new organizational challenges of being a team that supplies and exchanges information asynchronously throughout the entire team.

Moreover, acquiring experience through participating in the project was seen as “on-the-job training” that gave them new comparative advantages i.e., the possibility to learn how technology works, or how to develop a specification of the system. As incentives become greater and the use of ICT increases, coordination with all personnel attending to the same patient becomes easier, and it also stimulates the use of networks for developing and transferring information and knowledge. Individuals expressed increased incentives to continue participating in the project because of its positive effects as e.g. the feeling of being more competent, to acquire and use new competence, and to increase their job responsibilities and undertake new and more specialized work tasks.

Discussion

It can be argued that it is too early to see such effects from the introduction of Old@Home VHR, but there are some indications that they may occur in homecare for the elderly as similar systems become common. Learning needs may change, posing challenges to all personnel involved, and increasing the need for broadening the competences among the professions involved. When expert advice can be accessed directly using the system, it may become natural for the healthcare giver in an elderly person’s home to support her in other ways also, if some acute need arises. This is because the accessibility to correct and up-to-date information and improved quality of information delivery supports them in handling urgent situations in an optimal way.

Individuals that increase or acquire new knowledge through on-the job training upgrade not only their own competence but also the collective competence of the workforce, allowing the creation of new and alternative work routines that can make their organizations more flexible and learning-oriented. At the same time this may create an organization where personnel develop expertise in new and different areas, and also specialize in new ways. The joint use of intellectual resources creates further and increasing possibilities for competitive advantage for any given participant in the process [30].

End-users participation in the development process may also influence perceptions of who is important in organizations providing health and social services. The new organizational communication and interaction structure will contain a mix of employees who traditionally have high status (doctors), and some with a much lower status (home service employees). However, to what extent will their perceived status and real influence change because of the system has not been studied in this article. For this reason we are not able to answer such a question. What initially is usually an asymmetric relationship between the primary healthcare personnel and the homecare personnel may, as a consequence of the use of Old@Home, turn into a relationship of mutual interdependence where the actors have access to extensive information about the situation, how to work in order to reduce lead-times for decision-making, how to develop customer-adapted processes, and thus how to optimize resources flow and strategic flexibility. To achieve this result demand however the involvement of all members of the care team in the process. This is because, decisions on the right of access to information will have an impact on how roles develop and consequently will even influence the power structure of the team.

In parallel to these effects, a more fundamental transformation is seen to take place for the organizations involved: the possibility to go global and integrate the production of homecare services. In this situation, the Old@Home system should even contribute to change organizational structures, demanding new working methods, and thereby enabling intra-organizational cooperative activities free of time-and-space boundaries. In this new collaborative scenario, information could be distributed instantly to a wide range of locations, making it unnecessary for people who need to work together and share knowledge to be physically located in the same place.

At the macro level, when compared with conventional ways to deliver services, the Old@Home VHR system should lead to a reduction of hospital referrals and more transparency in communication.

Lessons learned

Old@Home VHR was introduced as a rather obvious – although still not very common – application of modern ICT to a very practical need: sharing information among people working separately to serve elderly clients. End-users came from different organizations, and so the new system has encouraged teamwork that may be discussed in terms of a new organization similar to “virtual organizations”. That is to say a decentralized organization, not hierarchical there a network of individuals coupled together by advanced communications technologies overcome the constraints of time and distance, stimulating creativity and tacit knowledge exchange. [31-32].

Indeed, it was recognized early that to reap the full benefits of the system, adaptation of work processes involving all the actors may be necessary.

The importance of knowledge in organizations for their success, for their identity and way of operating, has been widely recognized and discussed. During the past 15 years an extensive literature has emerged ranging from highly conceptual views of the relation between information and organizations [33] to practical advice for managers [34], often directed to functional experts in HR or IT. We will not go into the debate about the nature of organizational knowledge, but accept that a system like Old@Home VHR is not just a tool for individual team members to share information. It is also a way of changing the capabilities of their organization, and in this case maybe creating a new, organization more agile and with the capacity to serve the customer (elderly) more efficient.

Organizational knowledge results from the particular history of internal and external interaction and adaptation undergone by the organization. It represents the point that has been reached by the organization’s learning processes at a given time and is thus intrinsically valuable for its activity [35]. According to Nonaka [36], organizational knowledge emerges from a series of ongoing transformations among different types of knowledge, which requires that the ideas and skills of different individuals be divulged and combined into collective routines and shared knowledge bases. Only in this way can encoded knowledge be internalized by individuals, and individuals share their skills with one another.

Nahapiet and Ghoshal [37] argued that knowledge creation is the result of a double process of combination and exchange. Gradual knowledge creation requires the combination of previously unconnected pieces of knowledge, whereas radical innovations are based on novel conceptual distinctions, or novel ways of combining elements that might already have been associated. Either way, since the pieces of knowledge to be combined may reside in different parties, the exchange of information becomes a requisite for combination and thus for

collective knowledge creation. However, unlike standard economic transactions, information can be transacted over and over again without the transacting party ever giving up the value of the item being transacted, thus creating the possibility of endless returns.

Creating a culture that values creativity, continuous improvement and the sharing of ideas is necessary for knowledge management initiatives to succeed [38, 39]. For an organization to manage its knowledge assets effectively, it needs to have:

- employees who are motivated to explore new market opportunities, new work procedures or new products, and who are willing to apply new ideas to their own work
- structures and work systems that are flexible enough to admit innovative changes, and job definitions that grant employees a fair level of autonomy
- mechanisms by which new ideas are shared.

Old@Home VHR is an example of all this critical issues, and the way it was developed and introduced seems to have included an attention to the issues indicated above. We find it interesting that employees mention increased motivation as an outcome of the process, suggesting that it may come about or be reinforced through the successful introduction of new mechanisms. Can we expect Old@Home VHR to have a continued impact, and an equally large effect on organizations adopting the system in the future? Its influence so far has been similar to the effects from similar technologies in industry [40]. While in some instances, ICT will support collaboration without geographical restrictions, in other cases it contributes to developing new learning methods, such as ICT-mediated distance learning

The influence of Participatory Design as a research method to develop Old@home

Participatory Design has been presented as a "philosophy" which encompasses the lifecycle of the whole system. The approach incorporates users, not only as experimental subjects but also as key members of the actual design team [41], emphasizing their participation and collaboration in the whole development process of an information system. Furthermore, Participatory Design focuses principally on the relationships between technology and human activity and is concerned with the way in which current technologies support work activities [42, 43].

Originally, Participatory Design was introduced to increase the democratization of working life through the active incorporation and participation of the individuals (workers/users) in the design process and implies discussion, criticism and compromise between users and system developers. Further, users were to redesign and evaluate their work routines by applying the experience obtained during the participation process, and even be provided with an opportunity to improve their understanding of computers [44]. However, and other objective for participating in the process of Participatory Design is based on the recognition of the fact that it gives designers new and better ways of gaining an understanding of the user's everyday working practices.

Additionally, users are expected to be more willing to accept the final system once it is introduced when they assist developers to arrive at a more accurate and realistic model, and reduces the risk of being adverse to the new system. The final overall effect of this participation can be considered to be the main incentive to improve work efficiency and

productivity. The argument is that participation helps users to increase their skills and thereby increase the quality of the service they provide [43].

The results of this study shown that, according to the fundamental principles of participatory design, each participant in the process receives inducements from the collaboration in return for which he makes contributions to the team contributing in this manner to a successful design. From the interviews we have also seen that end-users involved in the process were willing to participate and contributed to identify benefits from the knowledge acquire. They were also willing to update work routines and accept changes and challenges demanded by Old@home.

It has therefore gradually become clear that participation, not only induces a better understanding of the organizations needs, it also increases the individual's welfare, stimulates efficiency and permits a better disposition for adapting situations to today's higher flexible homecare. Furthermore, end-users and in accordance to the theory of cognitive dissonance, end-users prefer to believe that their own decisions are the correct ones. Information that conflicts with the self- image tends to be ignored and sources likely to confirm 'desired' beliefs are selected. Negative effect or the identification of potential risks for to develop a system do not optimal to all the actors involved in the process should contradict already establish beliefs, or mismatch the original idea and solutions proposed. For this reason negative outputs have probably been ignored and do not express during the interviews and seminars.

Even though today there are strong existential reasons for increasing participation in system designs. especially in the Scandinavian countries, there a democratic structure for participation has been introduced as an attempt to stabilize labour relations, the use of participatory design as approach to develop the Old@home prototype can have influence the results of this study, making the respondents blind for the fact that changes as a consequences of the use of the system will make work habits obsoletes and probably could interfere with important aspects of clinical practice, causing negative consequences, al least over a time, because the formation the formation of a new habit costs time, diligence, supervision and decision-making, specially for the individuals that do not were represented in the process. These issues can contribute to make the project fail in the sense that the systems should not being implemented and incorporated at the involved organizations.

Concluding remarks

Several studies have reported that for elderly care, the use of ICT is expected to reduce both the importance of traditional constraints of distance and time, and the cost of consultations and specialized services [45, 46]. This study shows that there are some key issues that are important to take into consideration when designing, developing and implementing IT.

One issue is the importance of obtaining knowledge and skills in computer technology when developing systems and the necessity to diminish the knowledge asymmetry that usually exists between technical and practical teams.

Another important issue is the necessity to involve end-users in developing the new work routines that any technical innovation demand, and – even more important – to accept and form the new routines in a rational manner.

One more issue is the positive effects of the acquisition of “on the work knowledge through training” that participation of end-users allow. Active participation in the whole process

further gives individuals the chance to acquire comparative knowledge advantages that remain with the organization, at least for a period, and that can stimulate efficacy and productivity.

In addition to this, this study has shown that an interactive network among homecare and healthcare centres enabled through ICT significantly should modify elderly homecare and service production processes. We interpret this outcome as a learning organization that can retain and improve competitiveness, productivity and innovation. Even more important, it permits the creation of a learning chain that increases information sharing, communication, understanding, and the quality of decisions made in the work-teams [47], and thus creates possibilities for work rotation in a near future.

Today, the most advanced and successful companies share information and develop cross-functional and even cross-divisional imperatives of communication, integration and joint knowledge creation in order to create and maintain a competitive advantage [30]. This study has shown that elderly homecare organizations can actively exploit the advantages of shared knowledge using technology to develop existing linkages between activities to create new interrelationships among units. The results also show that intensive communication – rich, frequent and bi-directional information flows between participants at all stages in a product development process – is crucial for service development costs and time, creating effective logistic system, and the resulting quality of service.

However, this study showed also that positive effects seem directly related to the use of participation in running projects in the area of home healthcare. This is because IT does not exist in a vacuum. It is designed by people for people and the effects it causes are a consequence of the interactions between information technology and a number of social and organizational dimensions. In addition to this, allowing end-users to participate and identify requirements helps to ensure that the system will promote, rather than interfere with, important aspects of home healthcare practice. If the new systems are not totally dissimilar to the old one, or if they are adapted to work routines, the technological changes are less likely to interfere with the care production. In other circumstances, changes in work habits will inevitable cause negative consequences and thus economic consequences to the involved organizations.

Finally, mediators such as ICT, in all its forms, are necessary from a national and global perspective for rapidly moving knowledge in order to make the exchange more robust and inexpensive. This is essential, because many times the resources available to the providers of homecare services for elderly depend directly on the total means available to this sector in each country [3]. Therefore the results obtained in this study are important, as they show that integration of the knowledge infrastructure can be used to overcome psychological and formal barriers in the problem-solving atmosphere, eg asymmetry, scarcity, and monopoly of knowledge.

As similar applications become more common, it will be important in future studies to describe their likely effects both before and after they are implemented. The experiences in Old@Home reinforce the view we have developed elsewhere [48, 49]. (Vimarlund and Olve; Olve and Vimarlund) that there is a need for evaluations that identify the impact on the several actors who use a new system, and whose work processes may change as the system enables them to work in new and more efficient ways.

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