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The Impact of Information Technology on Human Capacity, Interprofessional Practice and Management

Antti Syväjärvi, Jari Stenvall, Risto Harisalo, Hanna Jurvansuu

Abstract

The organizations in private and public sectors confront many challenges due to the break-through of information and communication technology (ICT). The technology has direct effect on both individual and collective organizational behavior. It modifies or even changes traditional organizational practices and thus activates people to scrutinize their own capacities as an individual worker and a group member. Information and communication technology is also a huge challenge for management. It challenges to find out solutions to execute successful human resource management (HRM) and e-governance. In this article, the most essential goal is to understand the impact of ICT on individual human capacity, collective interprofessional practice and especially on management. The empirical data is collected from public healthcare sector in Finland. A theoretical model was utilized along with methodological and data source triangulation. The ICT has brought major improvements in health care service co-production both for the benefit of the patients and inter-organizational practice. It was found that both individual and collective human capacities are needed in order to take control over the information technology. Especially the interprofessional collaboration and human resource management during the information technology change (or e-governance practices) have not met the actual requirements. Awareness of the general management instead of substance knowledge seems to be essential. Open interprofessional practices and supportive human resource management are thus of great importance at the information age.

Key words: Human capacity, Information technology, Interprofessional practice, Management.

Introduction

An information society (Webster, 1995; Bellamy & Taylor, 1998; Castells & Himanen, 2001) can be explained as a global network of separate unions supported by information technological solutions. The implementation of information and communication technology as a function of e-governance (Oliver & Sanders, 2004) can generate fundamental changes in the structure, operations and management of organizations. An information organization can be respectively recognized as a society with similar principles and needs, but networking will more strongly occur between humans. The information technology was until some years ago mainly studied on its own technological terms as human factors were almost completely discarded. However, the research in latest decades has had an increasing interest on a kind of socio-technical approach. The impact of information technology on people's organization, i.e. individuals, interprofessional workers and managers, has gradually been under increasing scientific interest. For example, Hirschheim, Klein and Lyytinen (1995) as well as Smith (1997) have stated that information systems should somehow consider both the social and technical aspects. As human factors have been slowly valued more explicitly, the humanization combined with technology has started to gain more attention.

Hence, the technological change in an organization has become a concern of individuals, the interprofessional work community and the general management. This is probably not surprising as the implementation of new technologies has been one of the main causes for uncertainty and turbulence in modern organizations. The concept of information technology in organizations has been studied and modeled by considering people's attitudes and expectations towards technology (Davis, Bagozzi & Warshaw, 1989; Szajna, 1996; Mathieson, Peacock & Chin, 2001). The information technology has also been studied from the point of innovative theories. Cooper and Zmud (1990) have presented a six-phase model of how a technological innovation is adopted in an organization. In addition, Gallivan (2001) has developed a frame of reference for merging a technical innovation into the operation of an organization. These studies claim that the success of infor-

mation technology in organizations also more generally reflects the systems' innovational advance for organizations.

As Turban, McLean and Wetherbe (1999) indicated some people believe that humankind is threatened by the evolution of technology at the same time we are in a symbiotic relationship with information technology. Humans and their capacity can be considered as one key feature in connection with new information and communication technologies. Human capacity (or competence) has sometimes an ambiguous meaning. We use the term to refer to behaviors and actions, but also to the abilities underlying human behavior and action. Human competence (Spencer & Spencer, 1993; Hamel & Prahalad, 1994; Syväjärvi & Stenvall, 2003) with technology is crucial factor for the whole information technology adaptation. Stone (2002) has argued that socio-technical enrichment, i.e. the relationship between technology and individual that aims to integrate people and technology, is very much the interest of the manager. Furthermore, the implementation phase of information technology process (e.g. Beynon-Davies, Carne, Mackay & Tudhope, 1999; Syväjärvi, Stenvall, Jurvansuu & Harisalo, 2003) can be seen fundamentally important for the further success with the information and communication technology.

By using information technology, the organization aspires to the work-design principles of creating and enhancing flexibility in human relations. The operating environment is usually so dynamic that information technology is at least partly seen as a key to gain efficiency and productivity (Solovy, 2001). In human relations obvious routes to flexibility are interprofessional or collaborative practice philosophy (e.g. Barr, 1998), but also the management of workforce diversity (Milliken & Martins, 1996; Jehn, Northcraft & Neale, 1999). If implemented properly, the information technology operates as a tool for interprofessional workforce cohesiveness. The information technology as a tool helps organization to create virtual teams (Solomon, 2001) to help to achieve the organizational objectives. The interprofessional virtual team is defined here as a diverse workforce unit that utilizes information technology to accomplish organizational goals regardless of physical distance. The highly cohesive, collaborative and professionally approachable groups can be seen as essential forces for successful organizational behavior.

Hitchcock and Willard (1995) indicated that critical elements for team success are management commitment, trust, sharing information, training, and union partnership. The use of information technology, management issues, virtual teams and collaborative practice indicate that several factors need to be considered. First, the information technology should fit to the purpose of the organizational goals. Second, people should have interdependent awareness to collaborative work so that their attitudes, individual competences (e.g. Barr, 1998; Syväjärvi & Stenvall, 2003), experience and interpersonal skills are not restrictive factors. Third, trust between people should be cultivated all the time and especially in the case of technology. For example, Harisalo and Stenvall (2003) indicated that the principles of trust and reciprocity include in social capital and thus can be considered as central factors in behavior. Trust is also critical when problem, disagreement or other stress factors are present. Finally, interprofessional teams need to develop a sense of purpose and shared goals, but also well organized human resources. The transition to open and effective collaborative team is not a smooth operation as successful interprofessional work team can take months even years to construct. However, Nurmi (1996) stated that leaders who encourage integrative or synergistic teamwork create bigger team outcome than the sum of individual contributions. Knight, Durham and Locke (2001) also indicated that superior performance can be achieved when teams are motivated to pursue clear and difficult goals.

Finally, as stated by numerous studies the management has a role with almost everything that concerns the organization environment. As new information and communication technology is implemented, the organizational change it normally causes should be managed entirely (McNish, 2002). That means technology itself is not enough to produce expected changes in organizational development. In order to make the most of information technology for organization, it is important that both human capacity and interprofessional work are simultaneously considered by management. For example, a person-environment fit deals with the extent to which the employee's capacity fits the demands and requirements of the employer (Edwards, 1996; Quick, Nelson, Quick & Orman, 2001). Again one key element that has a clear effect on human activity, for example the adoption of information technology, is the capable management (e.g. Sashkin & Sashkin, 2003).

The implementation of changes involving information technology often fails due to an excessively heavy emphasis on technology, and a shortage in participating leadership and the evaluation of social factors. Clark (1995) suggests that leaders have the main responsibility for development work. The problem in technological changes is frequently that people and technology do not meet and people do not participate. Walker and Whetton (2002) argue that clear and precise models of operation must be presented when a technology is introduced, and leading advocates should be recruited.

Research question and methodology

The research data was collected during so called TEL LAPPI III project. The project strives for a district information technology system for the Lapland Health Care District in Finland. The project both creates new ways to provide social and health care services and increases cooperation between the Central Hospital of Lapland and the 16 local Health Centers. Simultaneously the availability and quality of health care services are improved. This system consists of a joint information technology infrastructure for the 17 northernmost public Health Care organizations (i.e. hospitals) in Finland.

In its earlier phases, the TEL LAPPI project has created an inter-organizational information system (Turban et al., 1999) that involves information flow among these Health Care organizations. The system or the information network is mainly based on a videophone communication. In addition, an electronic referral and feedback system as well as digital imaging is being developed. The inter-organizational information system (IOS) is used in professional training, conferencing, consulting and also for nursing and patient guidance. The role of information technology is vital as in a quite sparsely populated Lapland the distance between Health Care organizations may be over 400 kilometers. The Health Care network by different IOS solutions can, for example, save expenses and time in many ways.

In current research we are investigating the impact of information technology on human capacity and interprofessional practice. The paper also focuses on the information technology management. Thus, the problems and perspectives in management due to the information technology are essential. The research question can be set as follows

How individual and interprofessional human capacity, work practice and management are influenced by information technology?

A comprehensive approach is usually needed when establishing information and communication technology in organizations. Syväjärvi et al. (2003) presented earlier a four-dimensional model for applying the information technology in organizations. The four dimensions of the model (Figure 1) are structure, cognition, capacity, and interaction. All these must be considered in information technology based organizational change. In this paper, we examine more deeply, and with new information technology perspective, the structural and capacity dimensions which both include the management. The model is now only a background frame.

The structural dimension includes resources and their use in organization. The organizational structures form the basis for the distribution of tasks in work society. The structural dimension also includes the cooperation in and between professions and organizations. In addition, the management perspective is mainly included in structural dimension. In this paper we focus on interprofessional cooperation, distribution of labor as one HRM function, and the technology management as a function of manager capacity and service co-production. The dimension of human capacity indicates personnel's ability to manage with new work practices. This dimension includes both professional capacity and technological skills. The capacity idea includes also human ability to behave with and confront the change, to handle work pressure and to learn. We concentrate mainly on usefulness of information technology and human ability to manage with the applied information and communication technology.

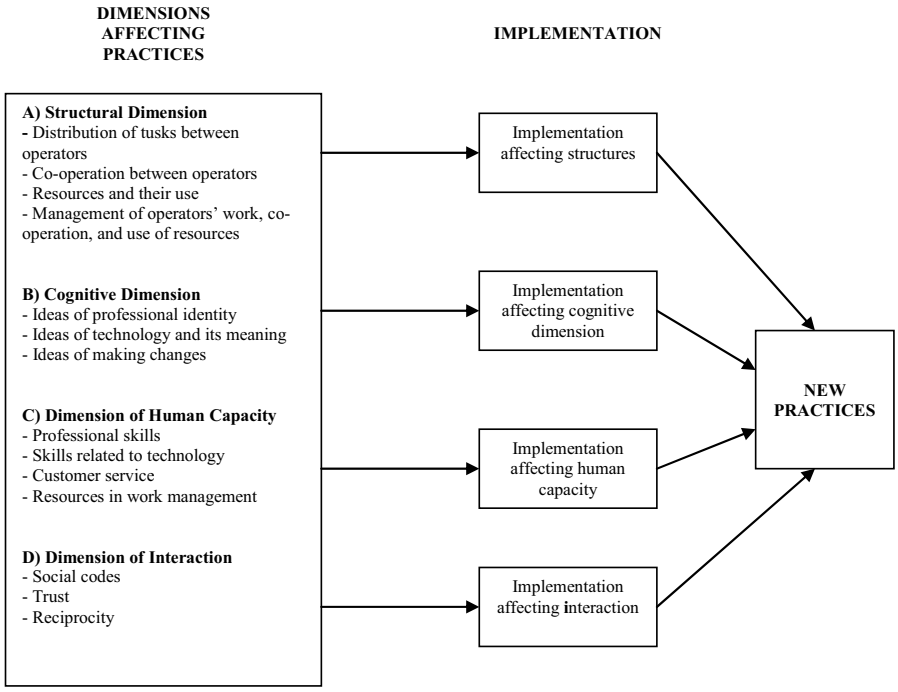

Fig. 1. Modeling the information technology implementation for organizations

Both methodological and data source triangulation were used (e.g. Patton, 2002). The research data was collected by interviews and by a sizeable questionnaire. Totally 22 people from different professional groups and organizations were interviewed (N1=22; all professional groups equally represented) and respectively 178 questionnaires (N2=178) were returned. The duration of an interview was always about one hour and had the same structure. The response rate was 53%. The information about respondents is now given by means of significant differences in the research data. Thus, the professional groups were doctors (or physicians), registered nurses, enrolled nurses, and other administrative or supportive staff. Majority of the respondents were nurses, 18% were doctors and 14% were other staff members (i.e. technical and administrative staff). Totally 29% of respondents hold a managerial position.

Results

The research results are presented by descriptive statistics and qualitative analysis in three different, but mutually synchronized dimensions. The figures shown are selected according to the main results and further explained with some supportive results. Firstly, the human capacity that indicates people's ability to manage with the practices involved by technology is presented. Secondly, the interprofessional dimension is scrutinized as it indicates the collaborative practice of diverse workforce during the introduction, implementation and utilization of technology. Finally, the general management concerning the earlier processes is investigated. In this paper, the management concerns mainly the area of human resource management and the aspect of information technology for management. The authors wanted firstly to study how competent people in different organizations are with the information technology and what kind of role has the attitude in information technology. The results concerning human capacity are presented according to the fact how the personnel have been qualified with the technology.

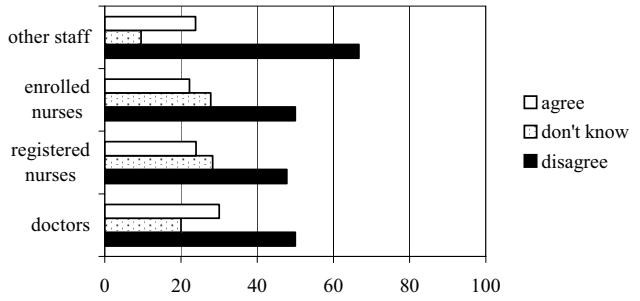

Fig. 2. The personnel have felt that they are competent with the technology. (N2=178)

As Figure 2 indicates, the information technology is seen somehow rather difficult to adopt for professional use. About 51% of the respondents felt that they are not competent with the implemented information technology, i.e. with electronic and digital tools and methods. There were not significant differences between professions. However, people who do not actively utilize information technology in their work have problems with actual competence and also with their attitudes. It seems that individual competencies and attitudes are the most essential factors for human technological capacity. This was also supported by the result (N1=22, N2=178) that the personnel who felt that they are competent with the technology had overall more innovative and comprehensive attitude to professional capacity. Learning is also involved as human capacity and new information technology are combined and totally 76% felt that learning new things is part of professional capacity. Thus it seems that technological competence is not purely attached to professional capacity as it is more closely seen like an additional competence that helps to execute professional core processes. In addition, totally 84% of those having positive feelings regarding technology indicated that information technology is indeed professionally useful. Finally, some kind of common professional motive should be found to activate the organizational behavior of diversely enriched workforce. In this research case, it seemed to be the benefit of information technology for patients. Hence, even 74% of the personnel that were not competent with the technology saw technology as a valuable instrument for customer service.

The hospital, as a work environment of experts, is very interprofessional society where workforce diversity has different appearances. This diversity exhibits in forms of informational, social and cultural standards. Informational diversity indicates the differences in knowledge bases and perspectives that professionals bring to a work society. Social diversity shows differences among workers in terms of gender, ethnicity, race, motive, etc. Finally, the value diversity indicates differences concerning work society's task, goal, mission and cultural tradition. As the information technology is introduced in organizations, it is thus vital to understand the factors of collaborative practice in diverse work community. In this paper, we don't make distinction between the above mentioned diversity areas. However, the main emphasis is given both to informational and to value diversity. Therefore the idea of interprofessional or collaborative practice concerning the information technology was investigated as the sum of diversities.

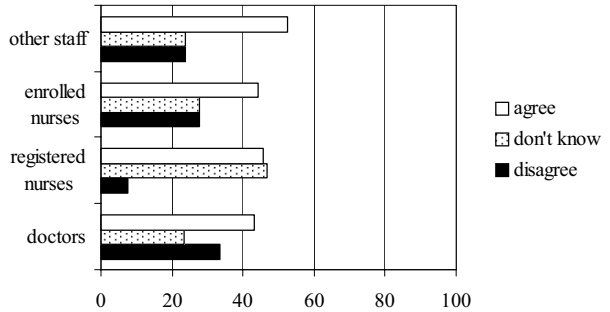

Fig. 3. The personnel have adopted the broad interprofessionalism in work practice. (N2=178)

The Figure 3 indicates that interprofessional or collaborative idea in work practice is missing to some extent as on average only 46% has adopted the idea of interprofessionalism. It seems that people are simply too much focused on their own professional needs and processes. This indicates that both informational diversity and cultural tradition as a part of value diversity are strongly affecting to work practice. For example, there has been discussion of labor division between doctors and registered nurses. Traditionally the registered nurses have been seen as assistants for doctors. The value diversity in interprofessional practice is indicated quite clearly by Figure 3 as totally 57% of doctors disagree or hesitate (i.e. don't know) and thus do not feel comfortable with these new collaborative practices. At the same time only 8% of registered nurses disagree with the idea of interprofessional work practice and, furthermore, totally 48% hesitate probably due to the hierarchical position or informational diversity difference between doctors and nurses.

It was shown in our earlier research (Syväjärvi et al., 2003) that majority of the health care professionals (i.e. 59%) take the information technology as opportunity to develop their professional work. The information technology is seen to some extent as a tool to collaborate. However, the information technology causes change to professional practice. It is therefore important to scrutinize how these information technology changes affect interprofessional practice in the work society. The main results can be introduced as follows (Figure 4).

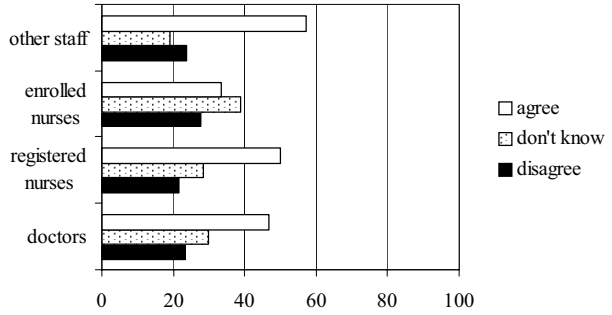

Fig. 4. The workload caused by information technology has not become excessive. (N2=178)

Figure 4 shows that different professional groups have similar estimations concerning the change and workload produced by information technology. The information and communication technology can be seen as a common issue for the working society. This was also supported by the result that showed how 52% of all respondents claimed the information technology has not taken time away from the basic professional work. Anyway it should be reminded, as indicated earlier in Figure 3, how the information technology is still quite differently dealt with separate professions. The doctors are probably more enthusiastic about the ICT than nurses, but not about interprofessional practices. The interviews (N1=22) clarified further the Figure 4. Thus it seems that people are following, at least to some extent, the theory of reasoned action. This means that if the information technology is seen professionally helpful then it is more easily accepted for everyday practice. Also pre-knowledge concerning the technology was seen (N1=22) as a positive factor. The managers have a key role in workload and in information technology supervision. In view of Figure 4, it was also asked how well the managers are familiar and able to manage with the technology. It was indicated by 27% of all interprofessional respondents (N2=178) that managers do not cope with technology, 31% did not know or hesitated, and 42% reflected that the managers are doing well with the ICT. There were not significant differences between the opinions of different professional groups.

The final section of results includes data from the third area of this paper, i.e. from the general management. This result section is probably the most important one as the management plays a crucial role in organizational structures. It can be claimed that the problems and perspectives of management have a kind of linkage to many incidents in organization. Hence, as information technology is introduced some changes are caused to the previous collaborative practices. As stated earlier the management concerns here primarily the area of human resource management. But the effect of in-

formation technology for management is also analyzed. This kind of conclusion was done purely due to the current results which indicated how important HRM functions, information technology attitudes and capacities are for the general management. Hence, we firstly concentrate on human resource management as a function of labor division since it was found to be a critical factor.

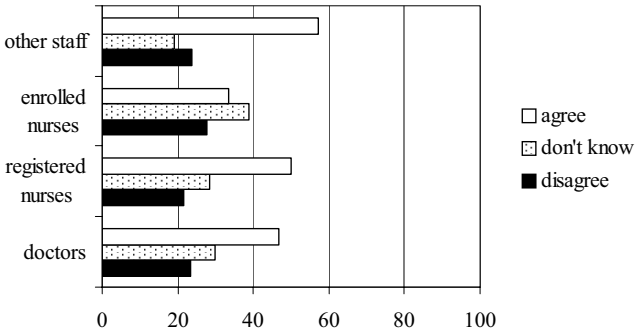

Fig. 5. It has not been difficult to change the division of labor. (N2=178)

According to Figure 5 it is obvious that the interprofessional work society is not delighted with the executed human resource management. On average only one third believes that the division of labor has been done successfully during the introduction of information technology project at workplaces. However, at the same time is was shown by the interviews (N1=22) that people are still hopeful for the possibilities of human resource management as they stated that something can be done, for example, for their endless rush at workplace. A direct quotation from one interview:

"...during this information technology trial some things should have been clarified in this organization since things have not run as desired."

These mean that either more or better divided human resources are indeed needed. This is mainly a challenge for management. However, the managers or people in responsible position had more positive perspective as 40% reported that the division of labor is not difficult to change and 43% indicated that the division of labor has been suitable. According to our results (N1=22, N2=178), there has not been enough interprofessional collaboration. In this context there were, however, four Health Centers having opposite results. In those organizations, at least 50% of their personnel indicated that it is not difficult to execute the division of labor. This shows simply that there are possibilities for better professional collaboration, but it also indicates that human resource management indeed varies between similar organizations and with suitable human resource management the information technology change can be controlled. With information technology it is thus important to perceive that new collaborative practices are implemented in order to replace previous practices. The managers should ensure that two or more parallel and competing approaches are avoided. Finally, the humans who are on behalf of more interprofessional work practice (see Figure 3) also indicated more positive attitude towards human resource management than humans against the interprofessional practice; i.e. 49% vs. 29%, respectively. It was also shown that people with better technological capacity (see Figure 2) had more constructive attitude to human resource management.

Many studies have shown that the management is very important when organizational change is executed. This is also the case in public Health Care organizations as we had totally 17 under investigation. The management of information technology is demanding and still fairly unfamiliar topic for managers in public health care. The managers in these organizations are not full-time professional ones and their core competence is founded on substance knowledge, for example, on medicine or nursing science. The systematic development of general management in these public organizations is simply a quite new issue. In this paper, we are thus discussing about management that considers digital co-production governance in health care sector. Our focus is on new approaches to public policy formation, health service integration and development that locates these activities within networked organizational and formations actor (cf. human capacity and interprofessionalism). Besides previously presented human resource management function, it was studied how general

management approach has supported information and communication technology government (i.e. e-governance practices). In addition, it was studied how competent and familiar the managers are with the information technology and its utilization in service co-production. Now the nurses form one professional group due to the enormous similarity in corresponding research data.

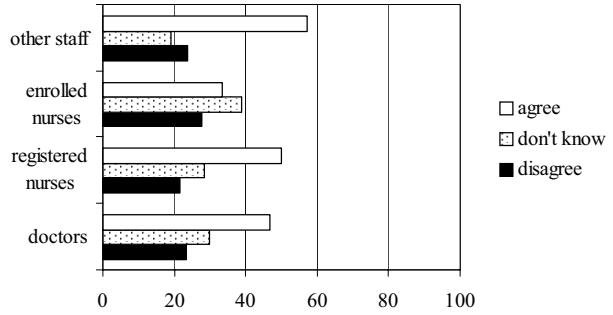

Fig. 6. Management style has supported the government of information technology. (N2=178)

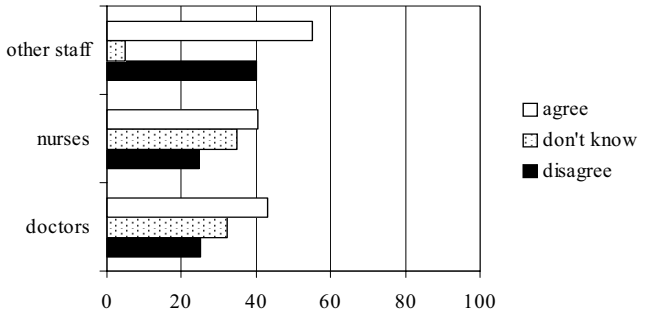

Fig. 7. Managers are familiar with the ICT and able to utilize it in health services. (N2=178)

Figure 6 shows no great differences between professional groups. However, in respect of management it is noteworthy that totally 58% disagree or hesitate about supportive management. This was further clarified by the result concerning those who think the government of the information technology was successful. In this group, about 55% agreed with the supportive management style. Those who claimed that the government of ICT was not successful still 30% reported that the management style itself is good. Finally, there was a significant difference between the managers and other staff concerning this issue. Thus 53% of managers agreed with supportive management style, while the percentage was 37% among the operational staff. The methodological triangulation increased the reliability of results, i.e. the interviews (N1=22) yielded parallel conclusions. For example, some considered that they even don't not know on what is based the management in their work society. All the above means that the management really matters, but does not explain everything. In current case, we also need to take into account previously processed human capacity both individually and collectively.

According to Figure 7, on average 43% of all respondents indicate that managers are competent and able to utilize ICT in health service co-production. The result was the same regardless of being a subordinate or a manager. Totally 45% of managers indicated that they really can not cope with the technology. In addition, the earlier results indicated that interprofessional collaboration has been somewhat absent. The information and communication technology could be recognized indeed as one solution to improve individual, team and organizational performance in order to yield better services. The result data (N1=22, N2=178) indicated that service co-production between the regional Central Hospital and the local Health Centers has increased. Thus collaboration has taken place in form of the inter-organizational practice. However, it should be remembered how some organizations are run by experts of specific professional field, i.e. in this

case medicine and nursing. The health care organizations are traditional organizations and the highest efficiency is probably obtained by the management that also supports human capacity and both professional and interprofessional collaborative practice.

Discussion

Organizations are composed of different but interrelated components. One component in modern and future organizations is the information and communication technology. The increased competitiveness and cost effectiveness, for example, have placed a special emphasis on technological advances for products, processes and service innovations. The information and communication technology as one complex element of e-governance practice has brought many changes to organizations and this process will be continuing in the future. In the information age (Bellamy & Taylor, 1998), the ICT plays also a significant role in sense of human capacity. This leads to analyze both how human capacity confronts this change and also what ICT has to do with job content. It was shown that individual competencies, attitudes and learning are probably the main factors for the human technology capacity. The current result agrees with studies concerning technology acceptance in organizations (Davis et al., 1989; Mathieson et al., 2001). Hence, people accept the technology if they can find rational reasons for the usefulness of the information technology. In our case, technology was seen for the benefit of customers in service co-production. This result is in accordance with the data from hospital organizations (Borzo, 1992; Solovy, 2001) when the information technology has worked as a tool for restructuring operations and renovating facilities to provide patient-focused care. However, it is also reported how difficult it is, for example, to disentangle the relationship between ICT investment and profitability (Parente & Dunbar, 2001). The whole issue, as the concept of e-governance, is thus genuine and multi-controversial.

The positive attitude works only as one step for the routine utilization (Cooper & Zmud, 1990). The technology acceptance also includes the idea of technological usability (e.g. Hirschheim et al., 1995; Mayhew, 1999). The result indicated clearly that usability also explains acceptance as a great deal of respondents had a qualitative overload as people felt that they lack the capacity to complete with the technology. This result is understandable since the personnel has to have positive experience about the technology before they really accept and use it (Szajna 1996). Unfortunately this was not the situation in all organizations of the current study. New technological system will be accepted if: its meaning is correctly understood, the users believe that it will support their capacity, and people have had encouraging learning experiences.

The supportive socio-technical enrichment is also needed as a function of human capacity. The capacity and thus human centered ideology also assumes that information technology and communication technology should support human behavior and activity (Preece, 1994; Friedman, 1997; Syväjärvi & Stenvall, 2003). Thus, it is claimed that new technology has to have some additional value for the individual or interprofessional human behavior. The human capacity based approach with technology requires simply that the personnel is adequately familiar and competent with the demands (Quick et al., 2001). They should also understand both individually and interprofessionally the meaning of the technology and, finally, how it is part of the normal procedure in the organization. The latter is supported, for example, by Paré and Elam (1999) who stated that the introduction of a new technology will take time, and the change should be managed carefully phase by phase.

The implementation of information technology causes multiple, but rather closely related organizational changes. As an example, Parente and Dunbar (2001) found that hospitals with integrated information systems have higher total and operating margins than those that do not have integrated information systems. By having another perspective, our study concentrated on the ICT and humans. We found that with information systems work has to be redesigned up to some extent. With the ICT the job content seems to be important not only because it is related to other organizational changes (e.g. in economic terms), but also because it is closely interrelated with human capacity, satisfaction, compensation, status, and productivity. Our data indicated that the information technology systems caused role ambiguity among health care professionals. Hence, the combination between information system and human capacity should be carefully managed. The

information and communication systems may cause power reduction of certain professional groups as knowledge and capacity will be offered for the public domain. Thus individuals who have competence (Spencer & Spencer, 1993; Hamel & Prahalad, 1994) on both professional and interprofessional levels and also control ICT applications may gain considerable prestige, knowledge, power and status. As a conclusion, there is a kind of human capacity redistribution going on along with the ICT change and information technology systems are a potential risk for human conflicts.

Human capacity redistribution has link to knowledge exchange. Work practice in medicine and health care is based on specialization. The specialization places a corresponding need for interprofessional co-ordination. It was shown that interprofessional integration was difficult and mainly caused by substance orientated human behavior, formal barriers and ineffective management. According to Shortliffe, Patel, Cimino, Barnet and Greenes (1998), successful collaboration necessitates that all involved groups have distinct and complementary skills, domain knowledge and technical expertise that can be shared at any moment in an effective way. In accordance, we do not believe that information and communication technology solves interprofessional problems by itself, but it allows interprofessional collaboration for parallel processes. Our data indicated that this already was the case between the health care organizations as ICT allowed the service co-production, for example, without geographical restrictions. It is obvious that coordination of interdisciplinary groups by management is needed in these organizations. Furthermore, the interprofessional practice suggests (Barr, 1998; Mitchell, Harvey & Rolls, 1998) that a common language, assist dialogue, interprofessional learning and collaborative approaches are essential. Thus all groups need to support the interprofessional flexibility and responsiveness without compromising overall goals. For this, the attitude, training and knowledge of the personnel (practitioners, managers, etc.) are indeed essential.

Conflict is inevitable in organizations and it may have either a positive or a negative impact on organizational performance, depending on the nature of the conflict and how it is managed. In good accordance with Jehn et al. (1999), our current result suggests that rather diverse professional groups contribute unique information and perspectives, which do enhance group functioning under certain conditions. It was found that professionals are too much focused on their own professional needs and processes. Thus both informational diversity and cultural tradition as a part of value diversity are, indeed, strongly affecting work practice. It was found that those organizations who have successfully utilized interprofessional diversity are the most advantageous not only in ICT utilization, but also in general management. Milliken and Martins (1996) have claimed how members with dissimilar backgrounds, different interests, values and mental scripts enhance the information base in the team. This also agrees with Jehn et al. (1999), but not with Jackson (1992) who found opposite effect with diversity. However, the empirical data from public hospitals suggested that work interdependence is one high point to solve problems in collaborative practice. This factor showed that the inter-organizational service co-production worked probably due to pooled or sequential interdependence and general public need, but among interprofessional society reciprocal interdependence did not succeed that well. In sense of e-governance the ICT function between external stakeholders, i.e. between customers and service co-producers and among service co-producers, seems to work quite well as the problems are on internal professional operations. Thus, it should be noted again that human interdependence requires effective management.

Despite the increasing interest in information and communication technology among health care service providers, little has been discussed about its importance for management and vice versa. Walker and Whetton (2002) have pointed out that technology utilization needs clear and exact procedures as voluntary base or loose strategy will not work out. Strategic transaction occurs when an organization produces a product or provides a service. These transactions in public health care are complex and originate here from technological change. Need for proper professional service team management is obvious (Smith, 2004). For example, it was surprisingly common that the personnel did not know or hesitated with the information technology procedures. McNish (2002) has argued that people should be informed about the change itself and also about positive experiences with it. The result considering innovative information technology and management indicated that the work society was not pleased with the general management. Problems or defects were especially found in human resource management as, for example, only one third

found the highly important division of labor successfully organized. The current results showed how the management must be able to set a vision for the team and be able to resolve possible conflicts and assist people in overcoming obstacles (Solomon, 2001). In order to control the problems and perspectives of management, it should be recognized that professional and interprofessional work depends on massive planning, intense and prompt access to human (and other) resources, innovative attitude, and often the physical redesigning of work.

The traditional identity of professional grouping rests on what can now be identified as modern foundations. For example, medicine and nursing have drawn heavily on technical/scientific knowledge to justify their expert status (Biggs, 1999). However, interprofessionalism is seen here as a positive development to improve service co-production and it requires a well managed balance among the professional contributors. Tachakra, Habashy and Dawood (2001) have stated that the biggest change caused by health care technology (telemedicine) is probably the relationship between doctors and nurses. Thus the managers still have a key role both in work design and information technology manipulation (Syväjärvi et al., 2003). Hence, interprofessional practice should be interpreted to mean that boundaries of disciplines will become more blurred and the members of personnel are willing to change roles and responsibilities according to situation and local legislation. In administrative science, this means that human resource management should include the ideas of boundary management (e.g. Bacharach, Bamberger & McKinney, 2000) and cross-functional teams (Parker, 2002).

In addition, knowledge sharing among employees and cooperation partners has a huge potential payoff in improved customer service and increased collaboration. How knowledge sharing works? Kakabadse (2003) identified three core capabilities required of today's corporate and public service leaders: visioning, dialogue, and the quality of communication. These are core areas of human resource management (e.g. Stone, 2002) and absolutely vital according to current research. The use of ICT suggests that clear vision is necessity in the future health service co-production. Dialogue and communication refer to managers' capability to reduce tension among collaborative workers, and between subordinates and managers, in order to shift towards cohesive work society. The ICT gives managers the ability to better use information within the organization. But in an environment of diversity, effectively communicating across complex interprofessional and organizational structures the entire context is not an easy topic.

Our study also showed that managers are not familiar enough with the ICT and its utilization in respect of e-governance practices (cf. Oliver & Sanders, 2004). Responsiveness to context requires a mindset of continuous development, in which the individual, in conjunction with his or her colleagues, needs to be ready to adjust and change skills and approaches according to the need and demands of all associates. This will also lead managers to such leadership profile that managers are capable in various dimensions (Sashkin & Sashkin, 2003). Thus, human resource management also means that leaders are equipped with skills (incl. technological) needed in service process redesign and improvement (Turban et al., 1999; Ham, 2003; Smith, 2004). However, during technology based change the managers need followers to be effective. The development of cognitive capability is probably as a big challenge in health care organizations as development of skilful human resource management.

Summary

Our research has reviewed important factors like human capacity, interprofessional practice and human resource management that are critical when information and communication technology is introduced in public health care organizations. The personnel actually need guidance, long-term training in the interprofessional, individual, technical, and administrative competence that may counteract attitudes, habits, and work styles and design left over from years of employment in a more traditionally run organizations. In terms of organizational success, the shift from an era when professionals work very substance orientated to one where people are more dependent on others and indeed work strategically together is indeed possible. However, a rational and professional motive is also needed so that professionals share information and truly co-operate with each other.

Somewhat inadequate professional and organizational performance throughout the information technology change is at least partly due to the general management's neglect of the structural, human capacity and behavioral characteristics. These must be noticed during the ICT change and, for example, attached to the overall e-governance practices. It was shown that human resource management has to be considered with the information and communication technology issue. The ICT in public organizations, as a tool to carry out health care service co-production, needs human resource management that includes a wide-ranging reflection of work design and human activity especially in the field of labor division. General development of the internal ICT policy or e-governance practice is necessary and considers a number of overlapping areas like human capacity, interprofessional practice and management. Finally, at the same time the activity between governance and citizens as well as among separate organizations should be under scrutiny.

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