

The Health Sector Towards the Information Age: The Telemedicine Virtual Organization

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In the early days of telemedicine, champions were doing the telemedicine work and the projects were numerous. With such a situation, it was fairly easy to succeed. However, after the project period, no continuation of telemedicine was seen time after time. Many were disappointed and found it difficult to make telemedicine work. For the future of health care, organizational issues will represent a challenge. More use of telemedicine means work is done by virtual organizations. Norwegian telemedicine projects, with more than 40 publications, have shown many organizational problems and many types of organizational problems. These results are now confirmed and corroborated by other researchers based on data from other countries with different organization of their health sectors. It is very important to notice that solutions to these problems can be designed and it is not necessarily especially difficult. Today, we have the right knowledge. Learning from the experience of others is important. Network organization, centralization, decentralization, and collaboration measures are important for telemedicine virtual organization. For organizations of planning telemedicine, work with organization should be done.

Keywords: telemedicine, virtual organization, network organization, centralization, decentralization, collaboration

Introduction

In many countries in the world, the information society is gradually replacing the industrial society (Aas, 2007). The changes are numerous and many sectors of the society see changes. Some sectors have already seen great organizational changes, for example, the bank sector. The health sector, however, is at early stage of the changes the future will bring. The information society means much work is done by virtual organizations. Telemedicine means working by virtual organizations or virtual teams. The word virtual is of Latin origin and means thought or potential, but not in fact. Virtual organizations are “almost organizations” and members can work across space, organizational boundaries, and even time (Aas, 2007; 2013). A telemedicine virtual organization can be operative without a formal organizational hierarchy and chain of command. No doubt, virtual organizations are fundamentally different from the traditional organization. It is not right to conclude that when telemedicine is practiced only now and then, it is not a virtual organization.

In two Norwegian telemedicine projects, organizational problems were identified and solutions to the problems designed. The identification of organizational problems and design of solutions to these problems are important traits of this research. More than 40 publications show numerous organizational consequences and numerous types of organizational consequences (Aas, 2007). More than 25 studies from several countries confirm and corroborate the findings (for example, Aas, 2011; May, Harrison, Finch, Macfarlane, Mair, &

Wallace, 2003; Nicolini, 2006).

This study aims to show the fundamental role organizational problems have for the telemedicine virtual organization and how they can be solved.

The Organizational Problems in Telemedicine

That an ordinary organization is found behind bricks and a telemedicine virtual organization is found “behind” clicks on a computer do not mean that a well functioning virtual organization is established without doing work with the organization itself. In the early days of telemedicine, champions of the technology do the work. When telemedicine is to become an ordinary activity, focus on the organizational problems is necessary. In the telemedicine community, this has not been fully understood.

In the Norwegian studies, a similarity in organizational problems was demonstrated across organizations and even across very different applications, like teleconsultations and teleradiology (Aas, 2007). Studies from other countries confirm and corroborate the Norwegian findings (Aas, 2011). The health service has different organization in different countries, but this does not dictate which organizational problems we find for telemedicine (Aas, 2011). The telemedicine work itself has organizational consequences.

The Telemedicine Virtual Organization for Several Providers

How to organize telemedicine for the providers in an area or for the providers of a health care corporation is a problem. The solution is network organization and centralization/decentralization.

Network Organization

Network organization is not a new term, but well known from private industry, outside of the health service. The concept of organizing health care around electronic networks is associated with the concept of network organization. Telecommunications can be an infrastructure around which single health care providers are distributed. Such network organization means a formation of alliances between organizations with purposes like: new distribution of hospital functions, increased flexibility in what single providers can do by competence complementation, shared investment in knowledge and human capital, improved capability to exploit new forms of knowledge, promotion of learning, strengthening of professional communities, and improved access to care and economies of scale (Aas, 2007). We can speak about networked regional organization, networked health enterprises, or cybercorps. A cybercorp is a virtual organization comprised of a network of separate sites for production (Aas, 2007). A new situation can be established with a complex combination of digital technology and new organization around the telecommunications infrastructure. Production done with the aid of new technology must then be integrated in (and interact with) a health service where most of the production is done with ordinary work processes.

Centralization and Decentralization

Centralization and decentralization are important terms for all organizations. Centralization and decentralization are opposite trends on the same scale. Decentralization means “away from the centre” and centralization “towards the centre”. New technology makes the questions of centralization or decentralization relevant. Health institutions can be connected together with great capacity electronic networks. But, where should the different tasks be performed? In the telemedicine community, centralization of professional competence and decentralization of supply have often been mentioned.

The teleradiology case. Radiology can be used to illustrate the more general principle. The production

process in radiology has two completely necessary elements, i.e., capturing of images and interpretation of images. Centralization can be defined as performing all, or parts, of the radiology image interpretation at fewer organizational units than before digitalization of radiology and teleradiology. An example is that a region centralizes image interpretation for one type of radiology to a larger radiology department. Decentralization can be defined as performing all, or parts, of the radiology image interpretation at more organizational units than before digitalization of radiology and teleradiology.

For radiology, we have a number of types of centralization. There are two extremes: (1) Complete centralization is done with radiologists only at one hospital in an area covering all interpretation needs; and (2) No centralization, i.e., all hospitals have radiologists covering all interpretation needs of their own hospital. There are many relevant intermediate solutions. In the literature, a cross-table has been used to ease the overview (Aas, 2007; 2013). Centralization types are put in two main categories: geographic centralization (with three subcategories) and centralization according to function (with seven subcategories). The subcategories of geographic centralization can be combined with the subcategories of centralization according to function, and the cross-table has 21 (7×3) theoretically possible combinations (Aas, 2007; 2013).

Teleradiology represents a possibility for building up centralized specialized competence. For sites, with few radiologists, having top competence in all areas of radiology is difficult. With teleradiology, existing specialized competence can be exploited better, more specialized competence can be developed, teams with specialized competence can be put together of persons who are not co-located, and qualified second opinion and discussion of rare and difficult cases can be obtained more easily. The result may well be improved quality of image interpretations (Aas, 2007; 2006a). Also, images from several sites can be stored in one common computer. Such archives can be used for pathology comparisons, to follow a patient's history of disease, for learning and teaching purposes. The archives can play a role for quality (Aas, 2013). With teleradiology, rethinking of the distribution of work tasks, for larger regions or in larger enterprises, is possible. Teleradiology enables a better exploitation of capacity for image interpretation. We can re-evaluate which location should perform which radiology with which workforce. Reconsidering the organization of 24 hours duties in-between hospitals, of a larger area or larger enterprise, could include who should take care of the duties (for example, centralization of 24 hour duties to one hospital, rotation of the duties in-between some hospitals), the question of avoiding duplication of duties, and specialization of duties (for example, all neuroradiology taken care of by one hospital in a larger area).

For decentralization, we find fewer types than for centralization. Decentralization is considered less relevant for radiology than centralization. Decentralization to a higher number of organizational units could drain small departments for radiologists. Fragmentation of care requires coordination. Many small organizations can be more difficult to coordinate for improved exploitation of total regional resources and measures needed to obtain good cooperation and become more encompassing (Aas, 2007; 2006b). Good information systems, with information available independent of location, will be required. Also, small organizations are more vulnerable to, for example, sick leaves. Decentralization may still imply advantages like, capturing of radiology images in new locations (for example, at islands and ski resorts). This can mean earlier diagnosis, earlier good quality care, and the advantage of a shorter travel.

Extension of the Concept for the Teleradiology Virtual Organization to Other Telemedicine Applications

Telemedicine has a number of other applications, for example, telepsychiatry, teledermatology,

telehomecare (virtual visits to the home and monitoring in the home), teleotolaryngology, teledialysis, wound care, postoperative care, endoscopic gastroenterology, and rehabilitation. When it comes to the organization of telemedicine in geographic areas or in larger corporations, the radiology case is a useful model. Analysis of future organization of telemedicine, in general, can be based on network organization, centralization, and decentralization. For the full realization of the telemedicine potential, reorganization with network organization, centralization, and decentralization is important. Application specific definitions for centralization and decentralization must then be made (Aas, 2007).

For a health service with extensive virtual organization, we can speak about a networked health sector. How well a network organization works can depend on the ability to coordinate the production process, the feeling of shared goals, and skill and knowledge development. Managers must develop competence in what it means to manage a network. Network organization has the potential to provide intangible benefits, like extension of employee networks, exchange of information about new developments, and create broader knowledge, and different and more experience.

Telemedicine Collaboration

Telemedicine requires collaboration between participating parties. Obtaining the benefits of telemedicine is dependent on implementing the right collaboration measures (Aas, 2013; 2001a; 2005). Collaboration measures can be defined as actions important for good telemedicine collaboration. When telemedicine is planned to be a routine activity, rather than just a project run by champions, implementation of measures of collaboration is required, not at least when a larger volume is planned (Aas, 2007).

Research has identified collaboration measures for telemedicine, both for teleconsultations (telepsychiatry, teledermatology, teleotolaryngology, and telepathology frozen-section service) and teleradiology. For teleconsultations, 10 collaboration measures were identified and for teleradiology 17 collaboration measures (Aas, 2007). Teleradiology and teleconsultations are pretty different forms of telemedicine, but we find obvious similarities (and differences) in measures for improved collaboration. Nearly half of the collaboration measures for teleradiology and teleconsultations are either similar or have some similarity. The differences in collaboration measures can be due to differences in the nature of the work (teleradiology and teleconsultations are different work processes) and their synchronous and asynchronous nature. Three measures for improved collaboration are the same both in teleradiology and remote consultations: Making someone responsible and distribute tasks, organizing face-to-face meetings (knowing each other plays a positive role), telemedicine should be organized, so participants get more experience with telemedicine (the collaboration works better when the volume is larger) (Aas, 2007).

Factors Other Than Network Organization and Centralization/Decentralization

Organizational self-interest is important and an obvious motivator for telemedicine participation. Management at different levels should involve itself in the inter-organizational collaboration, including top management. Managers close to the telemedicine activity may fear loss of power and control when employees work externally to own organization. Cross-professional working groups can decide procedures and guidelines for the telemedicine work. It can be necessary to perform a conscious selection of individuals and organizational partners. Participants must be motivated for telemedicine and the job to be done. Selection of organizational partners can be done on the basis of complementarity of resources, similarity in values and

culture, and relative strength and size (Aas, 2007). From research, organizational consequences of telemedicine internally in participating organizations are known to be very common (Aas, 2007; 2001b). Changes in internal organization can be done together with implementation of collaboration measures.

Ordinary Organizations vs. Virtual Organizations

In the early days of telemedicine, champions were doing the telemedicine work and the projects were many. With such a situation, it is easier to succeed. After the project period, no continuation of telemedicine has been seen time after time. Many have been disappointed and found it difficult to make telemedicine work.

However, this does not necessarily need to continue. Ordinary organizations are found behind bricks and virtual organizations behind clicks on a computer. If we have an empty building to move people into the building and nothing else is done, we do not have an organization and clearly not a well functioning ordinary organization. Work must be done to have an organization and a well functioning organization. All understand that. If we only click on a computer, we do not have a well functioning virtual organization. Work must be done to have a well functioning virtual organization. With the knowledge we have today, all should understand that work must be done to have a well functioning telemedicine virtual organization. It is wise to learn from the experience others have.

Conclusions

There are problems with virtual organizations, but solutions to these problems exist. Organizations planning telemedicine, as an ordinary activity rather than just a project run by champions, have a job to do. None of the problems with virtual organization and telemedicine collaboration are large enough to prevent effective collaboration. We have basic knowledge about telemedicine virtual organization and collaboration. For the future of telemedicine, it is considered important that research includes investigations on collaboration for applications not treated here.

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