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**A WALK INTO THE DIGITAL WORLD
– A LONG AND WINDING ROAD**

AKADEMISK AVHANDLING

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ABSTRACT

Radiology departments are changing rapidly due to the implementation of digital image management and PACS (Picture Archiving and Communication Systems). When new information and communication technologies are implemented, there are organizational effects. PACS have been implemented not only within radiology but also within the orthopedic and other healthcare contexts, affecting healthcare services more broadly. To improve the usefulness of PACS in health care, we need to understand how it affects different aspects of health care, and the underlying reasons for these changes.

The aim of this research was to inform health care management of change processes relating to digital image management and PACS use through an understanding of its effect on professional roles, work practice and technology in use, as well as highlighting accelerators and decelerators in change processes associated with the use of PACS in health care.

This is a longitudinal study with a qualitative approach. Data were collected by means of semi-structured and open-ended interviews. The interviews were transcribed, analyzed, and coded using grounded theory as an organizing principle. The trends of change in the professional role over time indicate that radiologists shifted from a role which emphasized their individual professional expertise to becoming more of an actor in a network. Their diagnostic practice changed. Reading x-ray films was seen as an art form in 1999, requiring years of training; but once other clinicians had easy access to view digital images, including those generated using 3-dimensional technology, it became easier for clinicians in other disciplines to see and interpret the images, and the skills of interpretation became more widespread. The change in technology associated with the use of digital imagery has led to an increased level of specialization in the work of the radiologist.

The changing trends within the radiographer's professional role indicated that radiographers, as image producers, have shifted their focus from simply producing an optimal image for diagnosis to becoming expert in a much wider range of activities.. The implementation of PACS gave rise to marked changes in the processes associated with image production. Radiographers became early adopters of the new technology; new practices and routines were soon implemented, enabling radiographers to find new ways of collaborating with colleagues. When using PACS technology, medical staff had little control over the organization of image production and its workflow, so that radiographers experienced PACS as a more technical, deterministic system, allowing little human control in the organization of work

The scope of orthopedics has shifted from a single specialty to one with a diverse range of subspecialty expertise, and from a relatively static practice in the interpretation of images to a more flexible practice, where every orthopedic surgeon could view and access images from anywhere at any time, including 3-dimensional images. It became easier for surgeons to see and interpret the images, and their diagnostic skills became accessible to their colleagues. The use of PACS also improved the quality of communication with patients, according to the respondents interviewed in this study. Clinicians refer to the digital images when discussing diagnosis and treatment options with the patient. PACS therefore acts as an information and communications technology, and users acquired new knowledge and skills in this area.

The findings of this study indicate that at least four aspects of improvisation are key factors in the implementation and use of information and communication technologies (ICT). These factors are vision, time, negotiations and information technology use. It was demonstrated that the work practice in the healthcare process needs to have a vision (direction). In the health facilities in this study, the vision developed into a commitment to enable access to images at "anytime – any place". In a process without a direction, individuals cannot differentiate between responsive strategic action and action that is purely ad hoc. This study also illustrates that the implementation and constructive use of new ICT takes a long time, about six years. The reason is that the use of new ICT is a healthcare development process, in the course of which new professional roles and new work practices must be developed. In practice, many meetings need to take place, and problems at hand need to be considered from a wide variety of perspectives. There has to be scope for negotiations to achieve a stable and robust work practice. Negotiated changes lead to a step-by-step innovation and development process. The development process occurs hand in hand with the use of the new ICT. This means that there should be a focus on the technology, with regard to its use and its capacity to support actors through the provision of relevant information and other kinds of support, in a variety of contexts.

It may be postulated that the success of PACS is mainly due to the professionals' improvised adaptation of the PACS technology. Digital imaging and communications systems are not predetermined products that can simply be implemented according to a rigid plan; rather, the adoption of PACS entails the introduction of a set of new processes, with unpredictable effects, in which the trajectory of events cannot be foreseen. The results affect people, their professional roles, work practice, communication, spaces and information technology — i.e. the entire organization. PACS thus represent a tool for healthcare development rather than simply an ICT tool. When organizations adopt this view of ICT innovation, we have reached the point when the real potential of the ICT can be realized.