

Chapter 2

Medico Ergonomics: A Human Centered Approach for Developing Smart Health Care Applications

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ABSTRACT

The importance of technology for the medical sector is steadily growing. Potentials for rationalization that can help to overcome the problems of an ageing population exist. So far these expectations could not be fulfilled because some devices lack a sufficient usability concept and do not fulfill the user demands. This chapter will illustrate problems that can arise when developing user-centered and task-oriented “health care applications.” The “medico ergonomics approach” is introduced as a possibility to overcome these problems. The applicability of the developed approach is demonstrated with the help of a case study. Content of this case study is a usability context analysis of a web-based patient record. The case study shows the suitability of the medico ergonomic models to illustrate complex interrelations of patient treatment. Based on these results requirements are defined and task-supporting functions are derived. The models support the development of a “common ground of understanding” between the potential user and the developers of the product. This is a crucial condition for developing integrated and utilizable (software) products and therewith for developing ergonomic working systems.

INTRODUCTION

The goal of using technology to support treatment processes is to increase quality, safety and efficiency (Carayon & Friesdorf, 2006). Potentials

for rationalization that can help to overcome the trade-off between the increasing demand and the limited resources of an ageing population exist. Another benefit of technology is that people can be supported in leading a self-determined, independent life in their familiar environment (Jäckl, 2004; VDE, 2008).

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If the technology lacks sufficient usability or a consequent adjustment to task fulfillment however, errors can occur that can lead to inefficiency or even jeopardize the patient's safety (Backhaus, 2010, Backhaus & Friesdorf, 2007). Different studies show that the anticipated benefit of information and communication technology (ICT) systems (improving quality of care and reducing costs) could only partly be realized (Friedrich-Ebert-Stiftung, 2006; Haas, 2005; Himmelstein, Wright & Woolhandler, 2010; Warda & Noelle, 2002). Products that are not very user-friendly are one of the reasons for this failure. In most cases existing systems are only partly or not at all compatible and/or linked with other systems. Overall the prevalence rate of available (medical) information systems as well as their range of functions is still below satisfactory (Haas, 2005; Warda & Noelle, 2002).

Due to (technical) progress the possibilities for support have become more and more extensive. The importance of the familiar environment as a place of action for medical technology is continuously increasing i.e. the way how this technology is used varies strongly and changes quickly. The group of potential users (e.g. patient or care giving relative) therefore expands and the customer's requirements become more heterogeneous. These aspects combine to increase the complexity in a user-oriented development process and make the process of developing task-supporting and user-friendly products and services with a reasonable development effort difficult. (Baggen & Hemmerling, 2002; Glende, Podtschaske & Friesdorf, 2009).

The ergonomic design of systems, products and services is a success factor. With the use of technology it is possible to achieve potentials for rationalization (Backhaus, 2010; Glende et al., 2009).

However, in most cases developing utilizable software products is not an easy task, especially when it comes to developing smart healthcare ap-

plications. The goal of this chapter is to illustrate the issues related to the ergonomic development of healthcare applications and to introduce an approach for solving these problems. The general ergonomics approach and corresponding International Standards are the starting points for the description. Following this the general approach for the field "health care working systems" is discussed. The high complexity of these systems has therefore been discussed. To complement the general ergonomic approach, domain specific models are then developed in the latter stages of the chapter. The enlargement of this domain specific concept is summarized and named the "medico ergonomics approach." Finally the applicability of the developed models is demonstrated with the help of a case study. The content of this case study is a usability context analysis of a web-based patient record.

Ergonomics Approach and Corresponding International Standards

According to the definition of the International Ergonomic Association (IEA) the term "Ergonomics" refers to "the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance" (IEA, 2000).

"System ergonomics" observes the use of humans and machines in the working process and has the goal of improving the productivity and reliability of the entire system. Based on this approach it is necessary to understand and analyze the working system as an indivisible entity. Within this system the working task, the working human and the working equipment interact with each other. For that reason it is necessary to consider their mutual relationships when analyz-

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