



Chapter VIII

On the Ontology of a Decision Support System in Health Informatics

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ABSTRACT

A decision support system can be approached from two major disciplinary perspectives, those of information systems science (ISS) and artificial intelligence (AI). We present in this chapter an extended ontology for a decision support system in health informatics. The extended ontology is founded on related research in ISS and AI and on performed case studies in health informatics. The ontology explicates relevant constructs and presents a vocabulary for a decision support system, and emphasises the need to cover environmental and contextual variables as an integral part of decision support system development and evaluation methodologies. These results help the system developers to take the system's context into account through the set of defined variables that are linked to the application domain. This implies that domain and application characteristics, as well as knowledge creation and sharing aspects, are considered at every phase of development. With these extensions the focus in decision support systems development shifts from a task ontology towards a domain ontology. This extended ontology gives better support for development because from it follows that a more thorough problem analysis will be performed.

INTRODUCTION

Our current information society makes extensive use of information systems and technology. In the field of health care, information technology has been applied as long as computers have existed, and many types of information technology applications have been developed. The early applications in health care were restricted in scope, and they had an impact on only a few professionals. They were mostly targeted at automation of existing routines, rationing resources and ensuring quality. The shift to an information society has brought a qualitative change in this respect: The focus is now on the development of new information technology service products that can improve health care processes and their outcome. Current health care information systems and networks are large and they have wide-ranging impacts on people and organisations (Lorenzi, Riley, Southon, & Dixon, 1997).

An example of information technology applications in health care is decision support systems. Since the 1960s decision support systems have been developed in health care for such purposes as interpretation of findings and test results in patient care, selection of treatments, choice of tests or protocols for the patient case at hand, management of data and information, control of work flows and monitoring of patient care processes and their outcomes. Despite of the long history of availability and the type and amount of resources used, the results achieved have been rather low and dissemination of systems into health care practices has progressed slowly (Barahona & Christensen, 1994; Reisman, 1996). Numerous prototypical decision support systems exist, but very few of them have entered routine use. Some studies (Lundsgaarde, 1987; Pothoff 1988; Wyatt, Rothermund, Schwebel, Engelbrecht, & van Eimeren, 1987) showed that little more than 10% of medical decision support systems developed so far had been sufficiently developed to enter clinical use. In 1992 the 600 subscribers to the “artificial intelligence in medicine” mailing list reported only six systems to be in routine use (Heathfield & Wyatt, 1993).

This chapter deals with decision support systems in health care context. We are searching for answers to the following research questions:

- What are decision support systems (DSS) in a health informatics context? Are they somehow different from information systems (IS) or knowledge-based systems (KBS)?
- Do we need a special conceptualisation for a decision support system in health informatics as compared to those presented in related research areas?
- Is health informatics a special field for application of decision support systems? Do we need special approaches and methodologies to develop and evaluate decision support systems in a health care context?

To find answers to the questions above, we analyse our case studies with decision support systems, and we use in the analysis conceptual definitions of a DSS and a KBS as presented in information systems science (ISS) and in artificial intelligence (AI). The purpose of this analysis is to identify relations between the theoretical approaches applied and practical implementations that could help to explain the successes and failures of decision support systems in health care.

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