

## Chapter 12

# Developments in Modelling Organisational Issues in Healthcare: Multi Method Modelling

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### **ABSTRACT**

*Healthcare organisations increasingly use simulation and modelling techniques to analyse their procedures and policies. Modelling activities attempt to help meet the challenges, constraints and requirements for efficiency encountered in the modern healthcare environment. A variety of techniques are used, often applied in different roles and by different functions in the organisation. Recent research has investigated the benefits of considering multiple approaches in the analysis of problems. This chapter briefly introduces the use of simulation and modelling in healthcare and the factors driving the increasingly widespread use of these techniques. Simple examples show how individual methods may be applied to model healthcare problems. The recent emergence of multi method approaches to modelling is examined and, focusing specifically on healthcare, examples of how these new ideas may also be applied in healthcare modelling are presented. Finally the challenges to implementing such new approaches effectively in a healthcare environment are discussed.*

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## **INTRODUCTION**

Studies in Healthcare Informatics propose a wide range of new technologies and techniques for use in modern healthcare environments. Many applications of Information and Communications Technology (ICT) in healthcare focus on using information systems, innovative devices, and specialised learning environments for medical practitioners to support the delivery of healthcare services. An area occasionally overlooked in healthcare informatics literature however is the use of computer based modelling to investigate the organisational and policy issues which underlie effective healthcare service delivery. In 2006 the UK organisation the Royal Society produced a report on the future impact of ICT in UK healthcare (The Royal Society 2006). Among the available technologies and changing trends, the report identified simulation and modelling as an effective tool that may be used to predict demand, evaluate costs and improve service overall. This chapter highlights the use of computer based modelling on organisational problems in healthcare and focuses on how a recently proposed approach to developing models, multi method modelling, can enhance the effectiveness of their application.

Until recently the subject of organisational and policy modelling has enjoyed a low profile in healthcare informatics literature. Some older texts such as Sheaff & Peel (1995) and van Bemmel & Musen et al. (1997) make no reference to the topic at all, however, as Eldabi & Paul et al. (2007) indicates, the number of published studies in this area has grown rapidly in recent years. In some health informatics texts, such as Davies & Bensley (2005), modelling is grouped in the wider category of decision support techniques. This has sometimes served to obscure the role of organisational modelling and the particular differences between the methods applied. Some common approaches used in modelling the problems of healthcare organisations include Econometrics, Discrete Event Simulation, System Dynamics

and Markov Modelling. While each is individually effective, recent developments in modelling methodology propose that an integrated perspective of the methods may address the challenges of healthcare modelling particularly well.

This chapter provides an introduction to organisational modelling techniques for readers of healthcare informatics literature who are unfamiliar them. By way of illustration, two simple examples of how organisational healthcare issues may be formulated for analysis using simulation techniques are presented. For those familiar with such studies an emerging strand in modelling methodology, multi method modelling, is introduced with a review of key literature and results in this area. The application of multi method modelling to healthcare issues is discussed in detail. Factors which make this approach particularly appropriate for healthcare problems are presented as well as how features of the models may influence their effective deployment. Five examples of recent healthcare studies which have used multi method approaches successfully are briefly reviewed. Finally the future challenges to applying this approach in healthcare modelling are presented. References to key literature are provided throughout to support the reader in further research.

## **THE CHANGING PROFILE OF MODELLING IN HEALTHCARE**

Using abstract models to understand the behaviour of a subject is common in disciplines such as economics and engineering, as a result where these disciplines overlap with healthcare, models are often used. Increasingly however models are also being applied to issues of process, organisation and cost in healthcare using a wide range of techniques. Briggs & Claxton et al. (2006) presents some approaches for evaluating costs including decision trees, Markov modelling and simulation techniques. Morris & Devlin et al. (2007) discusses economic and statistical models.

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