Chapter XXXI
Achieving Effective Health Information Systems

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ABSTRACT

In this chapter we aim to promote an understanding of the complexity of healthcare as a setting for information systems and how this complexity influences the achievement of successful implementations. We define health informatics and examine its role as an enabler in the delivery of healthcare. Then we look at the knowledge commodity culture of healthcare, with the gold standard of systematic reviews and its hierarchy of evidence. We examine the different forms of quantitative and qualitative research that are most commonly found in healthcare and how they influence the requirements for health information systems. We also examine some domain-specific issues that must be considered by health information systems developers, including those around clinical decision support systems and clinical classification and coding systems. We conclude with a discussion of the challenges that must be balanced by the health systems implementer in delivering robust systems that support evidence-based healthcare processes.

INTRODUCTION

Effective health information systems are ones that improve health outcomes and/or reduce healthcare delivery costs. To implement these health information systems successfully we must have some understanding of the healthcare domain and adopt techniques that are attuned to managing the innate complexity of health information and healthcare in general.

Health can be viewed as a complex adaptive system (Dooley, 1997), in which many parts of the system interact interdependently in varying and unpredictable degrees with one another and their environment (Plesk & Greenhalgh, 2001a; Plesk & Wilson, 2001b; Tan, Wen, & Awad, 2005). We usually function well when most of our world is reasonably certain and predictable, fairly unambiguous, familiar, mostly known and knowable, and

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where interdependencies and relationships are fairly simple (Plesk et al., 2001a). Once we move out of this apparently less complex environment, we find ourselves in the zone of complexity as described by Langdon (as cited by Plesk et al., 2001a). Decisions are no longer straight forward and we are in a situation that is somewhere between simple and chaotic. Our natural tendency is to reduce ambiguity and uncertainty by attempting to create firm plans from which to work, or to strip some of the paradoxes around us by simply ignoring them. Others have found that it may be more productive to work with ambiguity and uncertainty by being reflective, learning from the consequences of our actions as we go, or creating a cycle of plan, act, review and modify as used in action research and in quality improvement practice (Waterman, Tillen, Dickson, & de Koning, 2001).

We tend to move in and out of the zone of complexity as we work through the day, acting out agreements between ourselves and others, working according to habits and pre-existing accepted patterns of activity. In healthcare we spend a high proportion of our time in the zone of complexity. For example, when a doctor calls the IS support service about a problem he is calling from a complex situation in which patient care is demanding his attention, his IT skills are limited and his capacity to describe his computer problem is not as efficient as his medical skills. Although for the most part the IT person who takes the call is able to wade through the ambiguous descriptions given by the doctor, there is still a high degree of complexity where the two worlds of medicine and IT meet, where jargon and terminology are dissimilar, and the demands of their respective worlds differ greatly. It is in this context that health informatics plays a role in supporting the delivery of safe, effective healthcare.

WHAT IS HEALTH INFORMATICS?

Health information systems stand apart from the mainstream of endeavour in computer-based information systems. To some extent, it is just an issue of a large sector with its own specific demands—in this sense defence information systems equally stand apart from business information systems. However, with health, things have gone a step farther. A field known as *Health Informatics*, has emerged. It is also called *Medical Informatics*, and one will find frequent reference to significant sub-domains such as *Nursing Informatics, Primary Care Informatics* and *Public Health Informatics*. For the purpose of this chapter we will refer to *Health Informatics.*

The field can be defined, as "the science of using system-analytic tools… to develop procedures (algorithms) for management, process control, decision making and scientific analysis of medical knowledge" (Shortliffe, 1984, p. 185). Alternatively, van Bemmel (1984, p. 175) defines the field as comprising "the theoretical and practical aspects of information processing and communication, based on knowledge and experience derived from processes in medicine and health care." This second definition appears to be less specifically clinical; each definition reflects a key aspect of the field in practice. The unusual term 'informatics' itself derives from the French 'informatique médicale', and provides a useful reminder that the field is not just IT for health. The name *Medical Informatics* is historically entrenched, but *Health Informatics* is the preferred term to indicate:

a. That professions alongside of medicine (e.g., nurses, pharmacists, dieticians) are equally relevant, and
b. The somewhat broader goal of health, inclusive of the well members of populations.

Degrees in *Health Informatics* are available from many universities around the world, with the programmes at Stanford, Columbia and Oregon Health & Science University being some of the most historically prominent in the US. There are numerous journals and conferences in the field, with *Journal of the American Medical Informatics Association* having the highest impact factor, while

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