Preface

Information technology application in healthcare has a long history, triggered from two separate areas of interest. On the one hand, the development of medical instruments has incorporated information technology in a vast number of instances, varying from monitor equipment to CT and MRI scanners. On the other hand, requirements on the registration and processing of medical services and hospital bills, often imposed by government or insurance companies, have led to extensive Electronic Data Processing facilities (EDP), Hospital Information Systems (HIS) and ancillary registration systems.

These two areas of information technology applications in healthcare, are rapidly integrating, starting with local integration between, for example, Laboratory Information Management Systems, which interface and integrate different kinds of analyzers, and laboratory registration systems which keep track of patients, orders, results, and bills. Increasingly, clinical workstations are being developed which interface with variety of systems (HIS, Lab, Radiology, Medical Records, ATD, etc.), and should be accessible to number of different users (physicians, nurses, etc.).

This wide variety of platforms, data needs to support the medical decision-making processes, ethical and legal aspects, various kinds of application and users, poses an enormous challenge to the field of healthcare information technology and promises to keep it at the edge of the information innovation revolution.

Given the tremendous increase in the amount of data and computerization of information resources, competence is no longer characterized by the amount of knowledge held in the memory of the clinician, but as the ability to properly utilize databases and other on-line electronic data sources. The book consists of 10 excellent chapters covering the main issues leading the innovation revolution in information technology in medicine. Among those issues the reader may find a wide coverage of the following fields:

Information Security

This chapter outlines the major issues related to the security of the medical information systems. Medical information systems are unique in this sense that integrity of the records and privacy issues are dominant. The presentation includes the formulation of the basic medical information security tenets as well as the discussion of the major components of the security subsytem: patient identification, access mechanism, reference monitor, communication subsystem and database subsystem. Also examples of privacy law are quoted and discussed.

Success and Failure of Healthcare Information Systems

Some healthcare information systems do succeed, but the majority are likely to fail in some way. New information systems have a powerful potential to improve the functioning of healthcare organizations. However, that potential can only be realized if healthcare information systems can be successfully developed and implemented. To explain why this happens and how failure rates may be reduced, the chapter describes a model of conception—reality gaps. This argues that the greater the change gap between current realities and the design conceptions (i.e. requirements and assumptions) of a new healthcare information system, the greater the risk of failure.

Three archetypal large design-reality gaps affect the healthcare information systems domain and are associated with an increased risk of failure:

- Rationality-reality gaps: that arise from the formal, rational way in which many healthcare information systems are conceived, which mismatches the behavioral realities of some healthcare organizations.
- Private-public sector gaps: that arise from application in public sector contexts of healthcare information systems developed for the private sector.
- Country gaps: that arise from application in one country of healthcare information systems developed in a different country.

Some generic conclusions can be drawn about successful approaches to healthcare information systems development.

Telemedicine

Health systems take on new meaning in the midst of the international communication revolution going on. Health services are a natural candidate to join and even become an integral part of the "Information Highway." Terms such as telemedicine, telehealth, teleradiology, teledermatology, etc., have been integrated into technical and academic jargon and have become the object of research and organization.

The two central components effect the success of telemedicine assimilation are the cost of the service and the quality of service. Acceptance of telemedicine in the life of the individual and the organisation will demand a substantial change in clinical and organisational conceptions, and will result in a revolution in the existing accepted health organisation structure, in treatment and diagnosis procedures, and in the health system policy as a whole.

Methods for Handling Complexity in Hospital Information Systems

Anyone working in the area of hospital information systems is sooner or later amazed about the intrinsic complexity of the field. Finding ways to handle this complexity seems utterly important. In this chapter the author presents a user-oriented, document-based approach being developed and proven in cooperation projects with hospitals. The advantage of the proposed approach lies in the provision of means for handling different sources of complexity. The approach is characterized by an intended continuous switch between an organizational and workplace perspective in order to reduce complexity by changing the levels of detail.

Artificial Intelligence in Medicine

In recent years we have witnessed sweeping developments in information technology. Currently, the most promising and interesting

domain seemed to be the artificial intelligence. Within this field we see now a growing interest in the medical applications. The purpose of this article is to present a general review of the main areas of artificial intelligence and its applications to the medical domain. The review will focus on artificial intelligence applications to radiology, robotically-operated surgical procedures and different kinds of expert systems.

Knowledge acquisition and the evaluation of retrieved probabilities
The chapter examines the behavior of the human decision-maker. It surveys research in which about 90 physicians specializing in various fields and with different degrees of seniority participated. It tackles the question of whether it is possible to found the majority of the knowledge bases of the expert systems on the Bayesian theory. We will discuss the way of decision making conforming to the probabilities evaluated according to the Bayesian theory.

I am sure that this book offers a significant contribution to the physicians, information systems experts and for all personnel that uses healthcare information technology.

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