Preface

The whole of science is nothing more than a refinement of everyday thinking.
- Albert Einstein

There is widespread agreement that the very nature of healthcare has been unalterably changed within the last fifty years. The cause of this massive revolution in the nature of healthcare can be traced to the coming together of the twin revolutions of information technology and telecommunications, revolutions which together have synergistically opened new vistas for healthcare. The comparison between the evolution of the information handling ability between humanity and information technology is an indicator that reveals the impact of the high growth rates of information technology (IT) on the quality of life. It has been pointed out that the rate of growth in the information handling capacity in computers has been approximately ten million times faster in comparison to the evolution of the information handling capacity in mankind (Dwivedi, Wickramasinghe, Bali & Naguib, 2008). This statistic becomes truly astounding in light of the fact that the origins of the information technology revolution can be traced to the onset of the 20th century and can thus be stated to be less than a century old. The changes in information technology described above and in particular in the telecommunications technology have brought about fundamental changes throughout the healthcare process (Applebaum & Wohl, 2000). An approximation of the change process that the healthcare industry has undergone in the recent years is confirmed by a research that has stated that in the period 1997-2000, 85% of healthcare organizations have gone through some sort of transformation (Sherer, 1995).

One of the most important technological changes in electronics has been the ability to convert signals from an analogue to a digital medium (images or signals are converted into digital code by using an analogue-to-digital conversion device)–a process referred to as digitization. Digitization in healthcare has meant that it is now possible to take healthcare related information in different formats (audio, video, sound) and deliver the same at high speeds in the same basic format. Simultaneously there has been a change in technology (from simple copper wires to optical fibres) via which information is transmitted. This in turn has exponentially increased the bandwidth (the quantity of data that can be transmitted in a specified time-period). The phenomenon of multimedia has made possible to exchange information–information that can be combined from different formats (sound, video, animation, text, and graphics) and presented in an interactive manner. This in turn is fast making multimedia technology the “technology of choice” for the delivery of information (Wallace, 1997; Dwivedi, Bali, James, Naguib & Johnston, 2002; Dwivedi, Wickramasinghe, Bali, et al., 2008).

In the healthcare sector, different information technology applications such as clinical information systems, electronic patient records, and telemedicine have been used successfully, thereby demonstrating their potential to greatly improve the standard of medical care and healthcare administration (Rao, 2001; Dwivedi, Bali, Naguib & Nassar, 2006; Dwivedi, Bali & Naguib, 2007). In recent years, advances
in information technology applications have resulted in an “accelerated pace of innovations” (Johns, 1997). These innovations have resulted in the creation of new opportunities and healthcare concepts such as healthcare information—a term indicating the combined synergistic application of “a science of information, technology, and knowledge…to ‘healthcare” (Johns, 1997). With advances in technologies, (telecommunications, multimedia, and IT healthcare applications) telemedicine has the potential to transform the delivery of healthcare permanently. Countries like Malaysia have already integrated telemedicine with the electronic health record concept and there is a national telemedicine strategy in place. Teleconsultations are being carried out on a regular basis in Malaysia. In Sweden, telemedicine is being used to reduce the stay of children in hospital. This is being achieved by using local telecommunications to connect to the health monitoring equipment (for heart rate, rhythm, and blood pressure) and is installed at the residence of the child (patient) (Dwivedi, Bali, Naguib, et al., 2006; Dwivedi, Wickramasinghe, Bali, et al., 2007).

Advances in technology have been the hallmark of the healthcare sector, particularly with regard to advances in biomedical sciences. Today there are “10,000 known diseases, 3,000 drugs, 1,100 lab tests, 300 radiology procedures, 1,000 new drugs and technology medicines in development and 2,000 individual risk factors” (Pavia, 2001; Dwivedi, Wickramasinghe, Bali, et al., 2008). This has had an enormous impact on healthcare and in particular has rendered the concept of an expert in a particular domain in healthcare irrelevant, simply because, as shown above it is just not possible for one human being to have all the relevant knowledge in his domain of speciality (Rockefeller, 1999; Pavia, 2001; Dwivedi, Wickramasinghe, Bali, et al., 2008). For example today, “Organ and tissue scanning speed is doubling every 26 months, making tests both faster and cheaper…image resolution is doubling every 12 months…the increase in computer power (four-fold over the next 20 years) and the availability of inexpensive bandwidth.” All of the above is likely to change our own perception of what information is available and even possible for one human being to acquire. Advances in modern day genetic sciences have increased the number of potential drug compositions from a mere 400 to over 4,000 (Pavia, 2001; Dwivedi, Wickramasinghe, Bali, et al., 2008). This has happened despite the fact that the rate of adoption of computer applications in healthcare is slower in comparison to other industries (Johns, 1997; Dwivedi, Wickramasinghe, Bali, et al., 2008). The pace of discovery of new drugs may well undergo an exponential leap when the above observation is seen in context of the forecasted increase in computing power. Perhaps the biggest tragedy in the history of modern science was the fact that the announcement regarding the completion of the Human Genome project (mapping of the entire human genetic code) did not create any ripples in the mindset of healthcare decision-makers and academics or propel a new wave of healthcare discoveries. The impact of the completion of the Human Genome project will profoundly change the concept of healthcare itself within the next 25 years (Jones, 2001). Most dramatic of all is the statistic that a majority of physicians practicing in U.S. community hospitals are not able to understand the impact of biomedical sciences as they have been “trained in the germ theory of disease, not molecular medicine… and that in a recent nationwide survey, it was found that of all the incidents of advice on genetics given by primary care physicians, the advice was wrong 85% of the time” (Jones, 2001; Dwivedi, Wickramasinghe, Bali, et al., 2008).

In this book, an attempt has been made to bring to the forefront these important technologies and processes in healthcare, and consider the implications of their advances. It is contended that if the impact of these healthcare technologies and processes are seen together, then the conclusion from a healthcare informatics perspective is clear. 21st century clinical practitioners have to acquire proficiency in understanding and interpreting clinical information so as to attain knowledge and wisdom whilst dealing with large amounts of clinical data—clinical data that will be dynamic in nature and would call for the ability
to interpret context-based healthcare information. This challenge cannot be met by an IT led solution. The solution has to come from a domain that supports all three integral healthcare system components (i.e., people, processes, and technology) of the future. This book is an attempt in this direction.

I have managed to solicit chapters, which we hope validates the coming of age of information technology application in the healthcare diagnosis and prognosis. I hope that academics, clinical and non-clinical practitioners, managers, and students will find some issues of interest and value, to take our discipline forward.

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REFERENCES


