



Information Services for Supporting Quality Management in Healthcare

Petros Kostagiolas

Department of Archive and Library Science, Ionian University, Corfu.

ABSTRACT

In today's world, society and the economy are placing an increasing emphasis on information and its quality. Quality and information management are interrelated, and advances in information and communication technology have led to a re-assessment of many management practices. In this paper the role of information services in supporting quality management in healthcare is considered. The importance of information to quality in healthcare is examined and an analysis of the role of the international standard ISO 9001:2000 in supporting data, information and knowledge management is conducted. A framework is presented for quality management in healthcare through the support of information services.

INFORMATION AND QUALITY: TWO INTERRELATED CONCEPTS

In today's world, society and the economy are increasingly dependent on information and its quality, with users appreciating the value of information¹. The healthcare industry is no exception, with the need for effective information management growing within it. To meet the needs of individuals and to empower healthcare users an "open" system information services approach needs to be developed. This system² should make relevant information easily accessible to all interested parties, and at the same time sustain transparent decision-making procedures and be responsive to changes based on user-originated information.

Quality has been defined in many different ways³. It forms a complex and subjective concept, incorporating at any given moment the true (*expressed and implied*) needs of all those involved. Information services and communication technologies are important in ensuring information quality⁴. However, the manner in which this should be best achieved in practice is not established⁵. Two possible methods are integration of knowledge management actions within current quality management systems⁶, and the construction of novel quality management culture integrating

Correspondence and reprint requests: Petros Kostagiolas, Department of Archive and Library Science, Ionian University, Corfu 49100. E-mail: pkostagiolas@ionio.gr.

Table 1. *Presentation of data, information and knowledge requirements of ISO 9001:2000.*

ISO 9001:2000 Clauses	DATA	INFORMATION	KNOWLEDGE
Process approach	—	Monitoring of customer satisfaction requires the evaluation of information relating to customer perception of as to whether the organisation has met the customers requirements.	—
General requirements	—	The organisation shall ensure the availability of resources and information necessary to support the operation and monitoring of these processes	—
Review input	—	The input to management review shall contain information on a) results of audits, b) customer feedback, c) process performance and product conformity, d) status of preventive and corrective actions, e) follow-up actions from previous management reviews, f) changes that could affect the quality management system, and g) recommendations for improvement.	—
Review of requirements related to the product	—	In some situations, such as internet sales, a formal review is impractical of each order. Instead the review can cover relevant product information such as catalogues of advertising materials.	—
Customer communication	—	The organisation shall determine and implement effective arrangements for communicating with customers in relation to product information	—
Design and development inputs	—	Inputs relating to product requirements shall be determined and records maintained. These inputs shall include where applicable, information derived to previous similar designs	—

Design and development outputs	Design and development outputs provide appropriate information for purchasing, production and for service provision.
Control of production and service provision	The organisation shall plan and carry out production and service provision under controlled conditions. Controlled conditions shall include, as applicable, the availability of information that describes the characteristics of the products
Customer satisfaction	As one of the measurements of the performance of the quality management system, the organisation shall monitor information relating to customer perception as to whether the organisation has met the customers requirements. The methods of obtaining and using this information shall be determined.
Analysis of data	The analysis of data shall provide information regarding to a) customer satisfaction, b) conformity to product requirements, c) characteristics and trends of processes and products including opportunities for preventive action, and d) suppliers.
Continual improvement	The organisation shall determine, collect and analyse appropriate data to demonstrate the suitability and effectiveness of the quality management system and to evaluate where continual improvement of the effectiveness of the quality management system can be made. This shall include data generated as a result of monitoring and measurement and from other relevant sources. The organisation shall continually improve the effectiveness of the quality management system through the use of the quality policy, quality objectives, audit results, analysis of data, corrective and preventive actions and management review.

information services. Information services and knowledge management offer a new but essential challenge for quality in healthcare.

When evaluating the quality of information, a number of factors should be considered. The information should be complete, accurate, comprehensive, coherent, and structured. Information science can play a key role in helping achieve these aims. It provides a systematic way to investigate the rationale, methodology, goals, tools and services related to the production, assessment, dissemination, management and provision of information⁷. In keeping with this definition, information services are viewed as a technological infrastructure, that provides efficient access to and enables business exploitation of information. Information services include, libraries and publishing houses⁸, and a wide range of organisations, e.g. hospitals and general practices that call for specific management approaches⁹.

A key tool in the information services infrastructure is the Internet. The Internet and the information society are creating a new era in which information and knowledge are emerging as basic values, requiring novel management paradigms. With respect to healthcare, the internet provides a unique platform that enables the creation of important information systems such as the Electronic Patient Record (EPR)¹⁰ that can be accessed from anywhere and any time. However, this ubiquity, although undoubtedly beneficial, also creates risks with the potential for unauthorised access and modification of patient data¹¹. Society, information and quality are interrelated and to some extent are addressed by standards laid down by the International Organisation for Standardization (ISO). In particular the ISO 9000:2000 series (Table 1) addresses international quality management standards and can be used to provide a framework for "*information services support in healthcare quality management*".

INFORMATION REQUIREMENTS ANALYSIS OF ISO 9001:2000

In the context of quality management in healthcare services, national and international organisations have developed and introduced various approaches¹², that pertain to the implementation of process-orientated management systems,¹³ quality assurance standards^{14,15} and to the development of accreditation models and Total Quality Management (TQM) programmes¹⁶⁻²⁰. The International Organisation of Standardization developed the ISO 9000:2000 series of standards which together form a coherent set of quality management system standards. The standards can be applied in healthcare organisations, and serve as an overall framework for safety and quality management in healthcare²¹.

Hospitals that use ISO 9001:2000/HEALTHMARK must achieve and sustain customer satisfaction through continuous improvement of their quality management system. They must prove their capability to:

- Provide healthcare services, which cover the expectations and satisfy the true (*expressed and implied*) needs of users as well as requirements of regulating, normative or/and legislative authorities.

- Investigate user's satisfaction and also the consolidation of the role of information in healthcare services planning and provision.

The latter requirement is of note as it substantiates the need for research in information services. Over the last decade, the viewpoint that quality management is dynamically linked with information management has prevailed²²⁻²⁴ resulting in:

- (i) The role of information within existing quality management systems being reexamined²⁵.
- (ii) New quality management approaches being formed.

The analysis of ISO 9001:2000 quality management requirements can link data, information and knowledge to a documented quality system²⁶. However, in the standard, attention is mainly paid to information, and little attention is paid to data and almost none to knowledge.

Though clauses of ISO 9001:2000 specifically refer to data, information and knowledge (Table 1), quality management is linked to specific hospital processes. Hospitals incorporate in their operations, important information, either directly related to patients, e.g. patient medical records, instructions for treatments etc. or concerning the internal dispatch of their business processes (hospital admission and discharge, planning of operations, social service, units, clinics etc.). Methodology has been developed to enable analysis of quality management systems specifically related to healthcare. Service quality and quality management systems depend upon

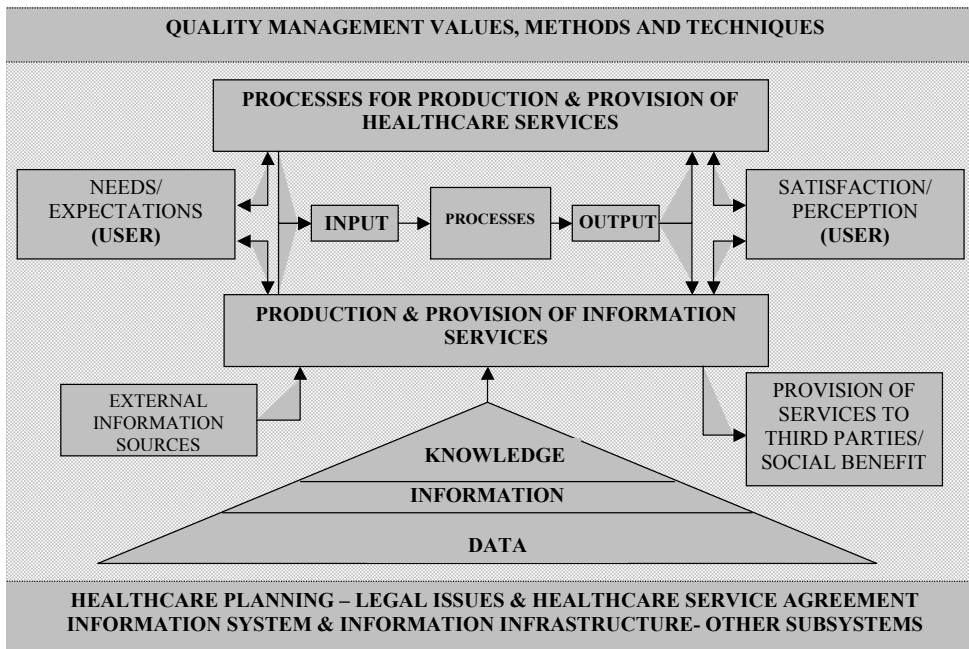


Figure 1. Quality management through the support of information services. A framework for supporting quality management in healthcare

efficient data and information management within the organisation²⁷ but none of the clauses in Table 1 incorporates any specific actions for knowledge management.

Information science can play an important role in shaping strategies for covering the information requirements of interested parties and hospital business processes²⁸. The investigation of the information requirements of ISO 9001:2000 has led to the proposal of a three-fold design of information services to accommodate this requirement:

- People needs
- Process needs
- Legal and service agreements

In Figure 1 a framework is proposed for the information support for quality management, based on an organisation's cognitive procedure²⁹, forming a continuum of interactions starting from the lowest point towards the highest:

Data → Information → Knowledge

Information services, are a vital element of this model since data, information and knowledge management, are essential for managing quality, especially, in a healthcare environment.

As mentioned previously the current version of ISO 9001:2000 makes no specific reference to knowledge management.

The production and provision of information services depends on the quality of data, information and knowledge. According to Ackoff³⁰, information is data with a specific meaning that may or may not be useful. However, the quality of data is a necessary but not efficient condition for assuring the quality of information. In a healthcare setting "useful" information depends on data quality³¹. Additionally, knowledge is defined in a similar manner and the idea that knowledge can be managed is fundamental to the related notion of knowledge-based healthcare. Although hospital processes are the key components to data and information management, healthcare professionals are the key components to knowledge management. Correspondingly, information quality consists of a necessary but not efficient condition for the assurance of knowledge quality. Indeed, someone who acquires information has the potential of combining it and thus possessing knowledge that may or may not be "useful". Therefore, in order to assure knowledge quality, one has to view it distinctively, with its own requirements when taking decisions in healthcare.

The starting and completion point for healthcare services in the methodological framework proposed in Figure 1, is the user. The information services form a key aspect in connection with the processes of the quality management system. The three major drivers for knowledge management are

- (i) Assuring patient safety and quality
- (ii) Empowering healthcare professionals
- (iii) Achieving cost savings

Data, information and knowledge are highly involved within hospital processes which are supported by specialised hospital information systems. An overall information service strategy may involve:

- Actions related to the management of healthcare data, information and knowledge including their quality
- Legal issues³² and issues concerning patient safety³³
- User communication and relationship to the healthcare provider

Information may be “dangerous” when it is wrong or not handled appropriately. For effective control of data and information, standards such as the ISO 17799 “Security Management” have been set up in order to provide long-term business value in an organisation, while, ISO 15489 includes a two-fold approach³⁴. The first part, ISO/TR 15489-1:2001, ensures that the proper records are created and managed appropriately, while the second part, ISO/TR 15489-2, consists of terms and instructions for the development and implementation of ISO 15489-1:2001. The centrepiece of information services rest upon the interrelation of the business processes to the quality assurance actions in every distinctive part of the cognitive procedure within the hospital.

With respect to the interior environment of an organisation a useful methodological approach, has been presented focusing on the organisation processes³⁵. This approach assigns a “weight” for knowledge management actions in relation to their effect on business procedures and in turn on healthcare quality. The weighted criteria may be expanded to encompass data and information as well as knowledge, to encompass:

- The significance of *data, information and/or knowledge* to healthcare quality
- The extent of *data, information and/or knowledge* used in hospital processes
- The extent of *data, information and/or knowledge* used by healthcare professionals
- The time required for acquisition, assessment and management of *data, information and/or knowledge*

The “weight” of the criteria above can be calculated for specific hospital quality indicators, per data, per information and per knowledge. Empirical research involving healthcare professionals may provide values for the above-mentioned exploratory variables in weight measure scales. Through this empirical method a statistic can be derived, with which one may scale data, information and knowledge for the support of quality management. The next generation of quality management systems (*including the series of standards ISO 9000:2000*) may include requirements for information services that will be designed to support the quality of information in regard to people needs – process needs – legal and service agreements. Furthermore, knowledge management, which lies at the top of an organisation’s cognitive procedure, requires a novel culture, leadership and knowledge-intensive healthcare professionals that are able to adapt and change. Information scientists and librarians in hospital libraries may play an important role in developing and testing such approaches and processes.

CONCLUSIONS

Over the past decade, information and communication technology has resulted in management re-assessing decision making processes. Quality management, in particular, has been part of the “healthcare service” landscape for a long time now, incorporating novel social and economic demands. The qualitative research conducted endorsed the argument that information services can be employed in supporting healthcare quality, improving system responsiveness to individual needs and thus empowering healthcare users. In this work the ISO 9001:2000 standard has been analysed in terms of the specific requirements imposed for data, information and knowledge management, and found to be lacking with respect to knowledge management. A framework has been proposed based on a three-fold approach for information services development: *people needs – process needs – legal and service agreements*. The true value, however, of the use of systematic information services for quality management in healthcare remains to be demonstrated. Current quality management systems are not sufficiently knowledge-sensitive, placing most emphasis on data and information management. Information science may provide pathways in resolving issues such as the integration of knowledge management methodologies within quality management systems, management of integrated conventional and digital libraries with heterogeneous collections – in terms of structure and purpose – and may provide guidelines for the important supportive role that information services can perform taking full account of users’ true needs and expectations.

ACKNOWLEDGEMENT

The author would like to express his appreciation to I. Papadakis, Lecturer at the Archives and Library Sciences department, Ionian University for his invaluable comments.

REFERENCES

- 1 Elsner W, The “new” economy: complexity, coordination and a hybrid governance approach. *International Journal of Social Economics*, 2004; **31**: 1029–49.
- 2 Pfeffer N, Coote A, *Is quality Good For You: A Critical Review of Quality Assurance In Welfare Services*. Institute for Public Policy Report, London, 1996.
- 3 Reeves CA, Bednar DA. Defining quality: alternatives and implications. *The Academy of Management Review* 1994; **19**: 419-45.
- 4 Ward PL, Management and the management of information, knowledge-based and library services 2002. *Library Management* 2003; **24**:126-159.
- 5 Cragg PB. “The information systems content of the Baldrige and EFQM model. *Total Quality Management* 2005; **16**: 1001–8.
- 6 Adamson I. Knowledge management: the next generation of TQM? *Total Quality Management* 2005; **16**: 987–1000.

- 7 Bokos GD. *Introduction to Information Science*. Athens: Papisotiriou Publications [in Greek], 2001.
- 8 Banou C. Money and taste – new roles for the Greek publishers in a changing era: a case-study of small publishing markets. *International Journal of the Book* [in publication], 2006.
- 9 Chlomoudis C, Kostagiolas PA. *Modern Libraries-Information Centres: Organisation and New Trends*. Athens: J&J Hellas Publishing [in Greek], 2004.
- 10 Wreder K, Beznosov K, Bramblett A, *et al.* Architecting a computerized patient record with distributed objects. *HIMMS Proceedings*, 1998.
- 11 Papadakis I, Chrissikopoulos V, Polemi D. Secure medical digital libraries. *International Journal of Medical Informatics*, 2001; **64**: 417–28.
- 12 Bohigas L, Heaton C. Methods for external evaluation of health care institutions. *International Journal for Quality in Health Care*, 2000; **12**: 231–38.
- 13 Casey J. Into battle with total quality management. *International Journal of Health Care Quality Assurance* 1993; **6**: 12–47.
- 14 Irvine D, Donaldson L. Quality and standards in health care. *Proceedings of the Royal Society of Edinburgh* 1993; **1 (101B)**: 1–30.
- 15 Morgan J, Everett T. Introducing quality management in the NHS. *International Journal of Health Care Quality Assurance*, 1990; **3**: 23–36.
- 16 Roberts I. Quality management in health care environments. *International Journal of Health Care Quality Assurance*, 1993; **6**: 25–35.
- 17 Moody D, Motwani J, Kumar A. Implementing quality initiatives in the human resources department of a hospital: a case study. *Managing Service Quality* 1998; **8**: 320–26.
- 18 Maynard A. Competition and quality, rhetoric and reality. *International Journal for Quality in Health Care* 2000; **10**: 379–84.
- 19 Lari A, Kaynama S. Information management of ISO 9001. *Proceedings of Biennial International Conference of Eastern Academy of Management*, San Jose, Costa Rica, 2001.
- 20 Nwabueze U. The Implementation of TQM for the NHS manager. *Total Quality Management* 2001; **12**: 657–75.
- 21 Kostagiolas PA, Platis C, Apostolakis J. A quality management strategy through the healthcare information systems development in Greece. *International Journal of Quality & Life Science* 2004; **2**: 80–84.
- 22 Grobe SJ. Informatics: the infrastructure for quality assessment and quality improvement. Editorial comment. *Journal of the Am. Med. Inform. Assoc.* 1995; **2**: 267–68.
- 23 Fitzmaurice JM, Adams K, Eisenberg JM. Three decades of research on computer applications in healthcare: medical informatics support at the agency for healthcare research and quality. *Journal of the Am. Med. Inform. Assoc.* 2002; **9**: 144–60.
- 24 Srdoc A, Sluga A, Bratko I. A quality management model based on the “deep quality concept”. *International Journal of Quality and Reliability Management* 2005; **22**: 278–302.
- 25 Cragg PB. The information systems content of the Baldrige and EFQM models. *Total Quality Management*, 2005; **16**: 1001–8.
- 26 Lari A. An integrated information system for quality management. *Business Process Management Journal*, 2002; **8**:169–82.
- 27 Srdoc A, Sluga A, Bratko I. A quality management model based on the “deep quality concept”. *International Journal of Quality and Reliability Management* 2005; **22**: 278–302.
- 28 Kostagiolas PA, Chlomoudis C. A reformation tool: a semi dynamic web based management information system in the service of the regional health & welfare system of the Ionian Islands. *Proceedings of 1st International Conference on Information Communication Technologies in Health*, Samos Island, Greece, 2003.

-
- 29 Bokos G D. *Introduction to Information Science*. Athens: Papatotiriou Publications [in Greek], 2001.
 - 30 Ackoff RL. From data to wisdom. *Journal of Applied Systems Analysis* 1989; **16**: 3–9.
 - 31 Brown JB, Sonksen P. Evaluation of the quality of information retrieval of clinical findings from a computerized patient database using a semantic terminological model. *Journal of Am. Inform. Assoc.* 2000; **7**: 392–403.
 - 32 Botti-Kanellopoulou M. *Information Law*. Athens: Legal Library Publications [in Greek], 2004.
 - 33 Papadakis I, Chrissikopoulos V, Polemi D. A secure web-based medical digital library architecture based on TTPs. *Proceedings of the 16th International Conference of Medical Infobahn in Europe – XVI MIE 2000*, 2000, pp. 610–16.
 - 34 McLeod J. Assessing the impact of ISO 15489—a preliminary investigation. *Records Management Journal* 2003; **13**: 70–82.
 - 35 Srdoc A, Sluga A, Bratko I. A quality management model based on the “deep quality concept”. *International Journal of Quality and Reliability Management*, 2005; **22**: 278–302.

