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A modelling technique for re-engineering business processes controlled by ISO 9001

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Abstract

This paper discusses the principles of a modelling technique called $IDEF_{9000}$. $IDEF_{9000}$ takes a systems view of a Fulfil Order Process and allows the modelling of activities, functional relationships and data. Developed from the original $IDEF_0$ modelling technique, $IDEF_{9000}$ uses an extended syntax and semantics to identify the links to the ISO 9001 quality standard and visually highlights them for redesign. The paper describes the method and its application in a case study.

Keywords: Business process modelling; $IDEF_{9000}$; $IDEF_0$; ISO 9001:2000; Quality management system

1. Introduction

As organisations are increasingly focusing on flexibility, innovation and processes there appears to be a need to assess current approaches to the implementation of the ISO 9000 requirements. The ISO 9000 series is an international standard that can be used by organisations to develop and document their quality management systems. An effective quality management system allows an organisation to ensure that its products and services consistently conform to customers' requirements. The actual requirements for a quality management system are described in the standard ISO 9001:2000 [1] and organisations can be audited against these requirements to become ISO 9001 registered.

With over 400,000 certificates granted by the end of December 2000 [2] even its keenest supporters were surprised how quickly this standard achieved worldwide acceptance. However, ISO 9000 has had some very bad press. Much of the work undertaken in the field of ISO 9000 quality management has focused on complying with ISO 9000 requirements to get or maintain a certified quality management system which in many cases has resulted in very high levels of record-keeping and form-filling. Critics such as Seddon [3] reported it as being an expensive and in many cases, an irrelevant and inappropriate system for many businesses. The commonest criticism is excessive bureaucracy and the inflexibility it generates [4]. Jonker and Klaver [5] further argue that due to the lack of a proper methodology, the integration of such systems remains difficult.

Much of the development in the field of quality management has tended to focus on the design and documentation of quality management systems without taking the business processes of an organisation into account.

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Business process related literature recognises the need for process-oriented quality management systems. Authors such as Harrington and Marthers [6], Hoyle [7], Mertins and Jochem [8] or Tranmer [9] suggest that quality management systems should be aligned with business processes. There is however limited guidance on the design of business processes considering ISO 9001 requirements. Instead of focusing on overall business processes, the design of a quality management system usually consists of a set of separate quality processes. Such quality processes may be designed as part of a complete business process but restricted to the boundaries of the quality management system. To link these quality processes to the requirements of ISO 9001 they are usually correlated after the design stage with an ISO 9001 requirement matrix. Achieving this link is dependent on the expertise and experience of the team designing the system. This is generally only alluded to and insufficiently discussed in the literature. It is unclear how the design and redesign of a business process is carried out if analysis reveals that it is not conforming to all of the requirements of the standard.

Some enterprise architectures incorporate the automatic generation of a documented quality manual if the requirements of the ISO 9001 standard have been considered during the business modelling. Integrated approaches such as The Architecture of Integrated Information Systems (ARIS) by Scheer [10,11] or Graphe à Résultats et Activités Interliés (GRAI) by Doumeingts and Ducq [12] either strive to holistically describe an information system for supporting business processes or to support the decision flow within an organisation by using their comprehensive frameworks. When developing such integrated enterprise models, quality management and ISO 9001 can become part of the entire business. Companies that redesign their organisational structures and apply such frameworks usually have a different set of business objectives and consider that an ISO 9001 certification is not one of the main drivers. Other approaches such as the integrated enterprise modelling (IEM) by Mertins and Jochem [8,13] offer pre-modelled processes for a quality management system that can be amended for the organisations' individual needs. They are based, for example, on grouping relevant processes into *core*, *support* and *assurance processes* and each of the 20 sections of ISO 9001:1994 is linked to either one or more of these three types of processes.

With the findings from literature review and case studies it was concluded that current approaches to the design of quality management systems have the following key weaknesses:

- responding to the requirements of the ISO 9001, by simply documenting what a company does is still one of the most common approaches adopted. Such an approach can lead to increased bureaucracy and the associated additional work due to the minimal cognisance the quality management system takes of the existing organisational structure;
- the design of quality management systems often achieves the process-oriented character at the documentation stage but fails to create the corresponding organisational structure;
- the usefulness of business process-oriented organisational structures has been widely recognised. In the field of quality, the focus remains on the design of a certifiable quality management system, not on an overall systemic view of the entire business.

What seems to be missing is a modelling approach which does not necessarily document procedures and instructions but supports the modelling of business processes and establishes the links to the requirements of the standard. This would make clear the links between the standard and the parts of the process, which is essential when re-engineering the process or when dealing with a change to the standard.

The next sections discuss the principles of business processes from a systems viewpoint and present criteria for a modelling approach to design an order fulfilment business process taking into account the requirements of ISO 9001.

2. ISO 9001 in a Fulfil Order Process

Fig. 1 gives an overview showing that ISO 9001 addresses the entire business model and how, when broken down into greater detail, individual requirements of ISO 9001 can be linked to the different parts (operating and non-operating) of the business. In some areas, the ISO 9001 requirements are more directly relevant to *manage* or *support* processes than to *operate* processes. The CIMOSA standard [14] provides a