

Development of an ISO 9000 Implementation Quality Decision Support System

Kambiz Farahmand

Texas A&M University-Kingsville

Abstract

An expert system was developed to assist engineers, managers, and educators with ISO (International Standard Organization) 9000 series implementation. The decision support system is a viable learning tool for first time engineers and students involved with ISO 9000. ISO 9000 is an international quality system standard, which was released in 1987. Companies, which need greater access to the European Common market and other emerging global marketplace, must have a quality system certified to the ISO standards. By far, the most time consuming and costly step in ISO implementation is in documenting the quality system. Documentation must be performed first, before implementation, assessment, and registration. Documentation of a company's quality system is usually delegated among employees with little or no knowledge of the ISO 9000 standards. Most engineering curriculums do not include introduction to ISO standards and procedure for certification. Employees involved in the certification process must have a good understanding of the elements of ISO 9000 and the steps required to implement a quality system.

An instructional decision support system has been developed to:

- Familiarize the user with the ISO 9000 quality standard and its elements.
- Provide general guidelines regarding the implementation of an ISO 9000 quality system.
- Provide guidance and recommendations in all aspects of certification.
- Assist the user in documenting a quality system.
- Provide examples of quality system documentation.
- Give a contact list of registrars and other reference sources related to ISO 9000.

The Decision Support System will help to save time in the quality system implementation process, assist users in documentation of the quality system, and provide an ISO 9000 learning tool for engineers and managers. It could also be recognized as a viable teaching tool in academia.

I. Introduction

The International Organization for Standardization (ISO) is the international organization based in Geneva which released the ISO Series Standards in 1987. The ISO 9000 series standards describe the minimum organization requirements for a quality system. The standards were revised in July 1994. Five specifications of the ISO 9000 series include: two support documents (ISO 9000 and ISO 9004) and three quality system standards (ISO 9001, 9002, and 9003). An organization becomes certified to one of three ISO 9000 standards (ISO 9001, 9002, or 9003) by developing and documenting their quality system to the selected standard and then successfully completing an audit by a third party registrar. The twenty elements of the ISO 9000 standards fall into three major areas as shown in Figure 1. Figure 2 shows the details of the certification hierarchy.

II. Documenting the quality system

The ISO requirements dictate that all elements of the selected standard be documented. By far, the most time consuming and arguably the most costly step in ISO implementation is documenting the quality system. There are typically four tiers of quality system documentation:

- *Quality Manual (Level 1)* - This includes the organization's quality policy and formal statements on how each element of the ISO standard will be addressed by the quality system.
- *Operating Procedures (Level 2)* - These describe what is to be done by whom to perform functions or activities of the quality system. Operating procedures usually define common activities or those performed at a company level
- *Work Instructions (Level 3)* - These are detailed quality procedures, which define how tasks are to be completed.
- *Quality Records* - These are written evidence (in the form of checklists, reports, forms, etc.) that the quality system is functioning as documented.

III. Decision Support Systems

A decision support system (DSS) is a computer-based system that provides the user access to information, which assists them with a decision. DSS is categorized into seven types.

1. File Drawer System
2. Data Analysis System
3. Analysis Information System
4. Accounting Models
5. Representational Models
6. Optimization Models
7. Suggestion Models

The information provided by a DSS can be data and/or model-oriented. DSS's are often confused or grouped with expert systems (ES). One simple distinction between DSS and ES is

that a DSS assists with a decision and an ES makes one. One example of a data-oriented DSS is an information retrieval system, which consists of a database and a search utility.

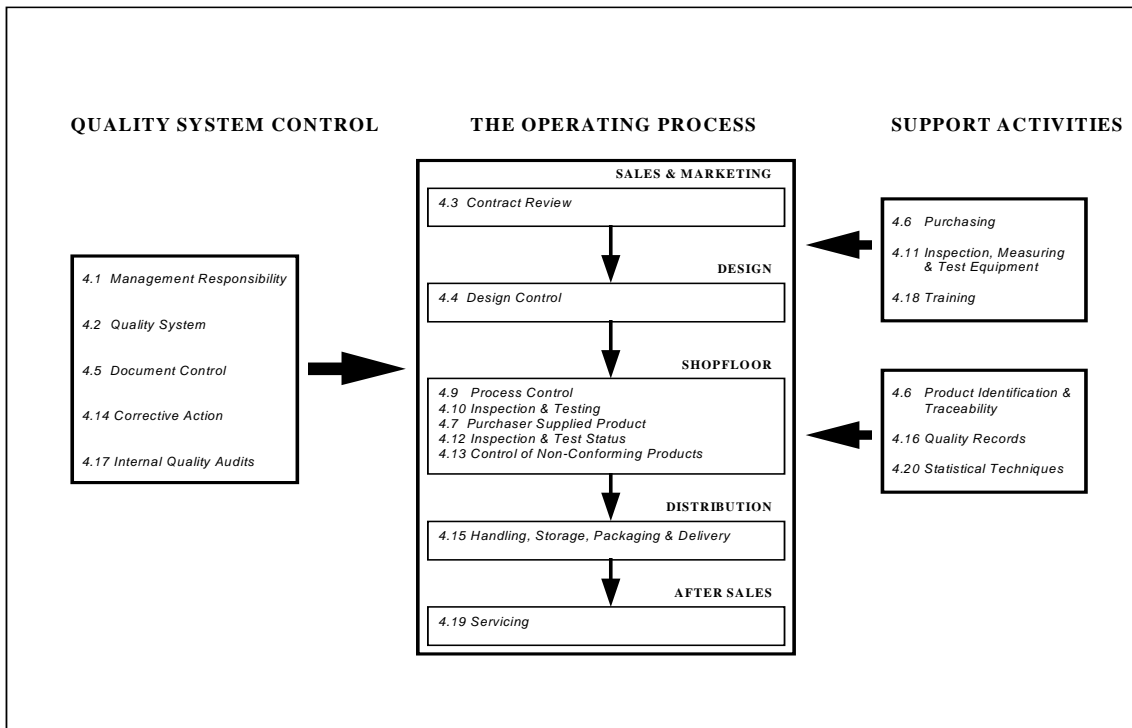


Figure 1: The three major components of ISO 9000

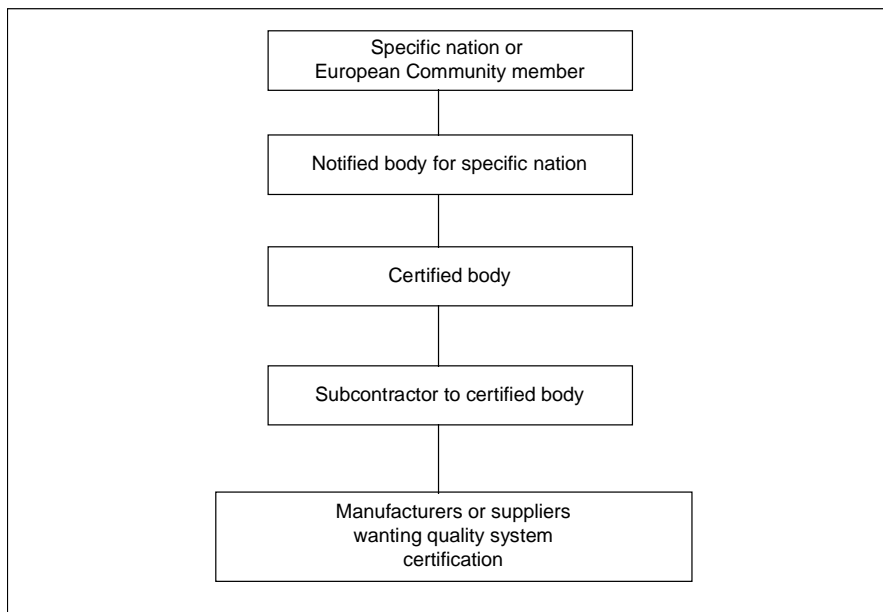


Figure 2: Hierarchy of certification

It is an investment program, which makes investment suggestion based on input from users. An instructional DSS is a system, which helps a user learn a specific skill. Figure 3 shows a Process Flow Diagram for a documentation procedure.

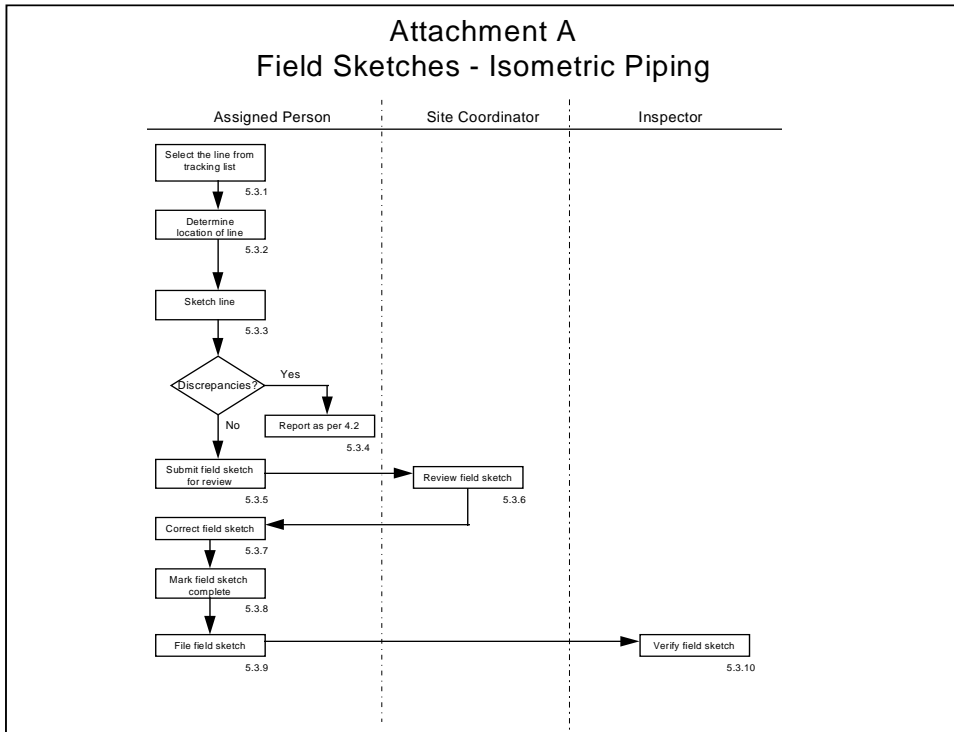


Figure 3: A process flow diagram for field sketching piping indicating procedure steps, decisions, and who is responsible for each step. (note the step numbers which provide correlation to the written procedure)

IV. ISO 9000 DSS

An instructional DSS called “QDOC” has been developed for Windows to benefit an organization involved in quality system documentation and implementation in the following ways:

1. Save time in the implementation process of ISO 9000

The ISO 9000 decision support system is an “on-line” reference source which helps meet the reference needs of the employee delegated the task of writing quality system documentation. Assuming the employee is writing documentation in the Windows operating environment, he/she will have on-line access to summaries of ISO 9000 elements, their application, and samples of each level of quality system documentation. The elimination or reduction of research and acquisition of reference materials will greatly shorten the time required by the employee to produce quality system documents.

2. Assist users in the documentation of the company’s quality system

Requirements for each level of quality system documentation are explained in the ISO 9000 decision support system and examples are provided to give guidance to the user.

3. *Provide an ISO 9000 learning tool for managers and engineers*

Managers, engineers and employees with little or no understanding of the purpose or intent of ISO 9000 and implementation of a quality system can use the ISO 9000 decision support system software as a learning tool. It provides the details of ISO 9000, the steps required to implement the quality system, and practical hints regarding documentation and implementation. Employees educated on the purpose, intent, and potential benefits of the quality system will be more likely to be cooperative and more involved in quality system implementation activities.

4. *Provide overview of implementation steps*

The ISO 9000 DSS provides a list of steps which can be followed from the time the decision has been made to seek certification until certification and registration is complete.

5. *Provide implementation guidelines and recommendations*

The DSS includes a “hint list” which gives practical examples and advice on implementation and documentation of the quality system.

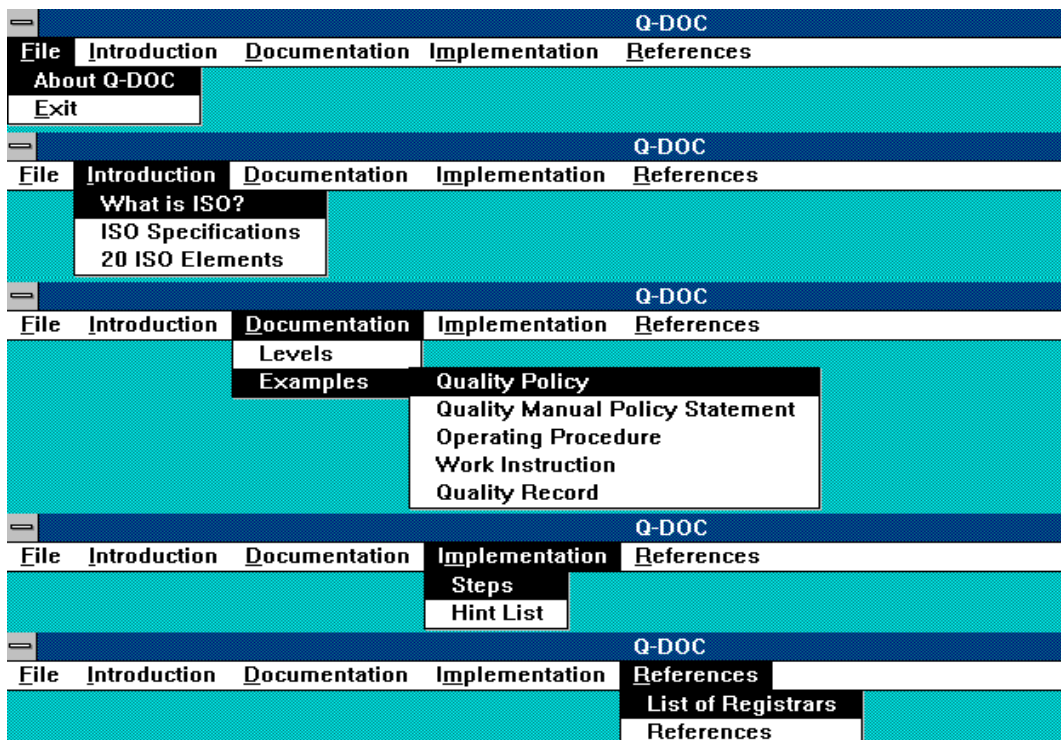


Figure 4: Menu structure for “QDOC” DSS software

6. *Provide a teaching tool for colleges, universities, and certification institutions*

The ISO 9000 DSS provides the basic procedures in teaching the documentation and certification process. It allows for a better understanding of the procedure and organization of the entire operation. It could be utilized as assistant software to the current quality textbooks discussing ISO certification.

As shown by the menu structure in Figure 4 above, the QDOC software includes the following features:

- Description and discussion of ISO 9000 and its specifications and elements.
- Explanation of the levels of quality system documentation
- Brief discussion of the requirements for each level of quality system documentation
- Examples of quality system documentation
- General implementation steps for ISO 9000 quality system.
- Practical hints for implementing and documenting quality systems
- List of third-party registrars and other reference sources related to ISO 9000.

V. Conclusions

The DSS will help companies and employees save time in the quality system implementation process and provide an ISO 9000 learning tool for managers and engineers. It could be used as both educational and a training tool. To assist the quality system documentation process, the decision support system for ISO 9000 addresses both documentation and implementation. The software does both because it is based on practical quality system implementation experience and development of the quality documentation. In addition, it is a good example of how a DSS could be used for teaching and or gaining a better understanding of a specific subject.

Bibliography

1. Ashton, D., Jackson, P., and Voehl, F. ISO 9000: An Implementation Guide for Small to Mid-Sized Businesses. *St. Lucie Press*, (1994).
2. Farahmand, K., Greene, JR, and, Becerra. R. ISO 9000 Certification: Johnson Controls' Inside Story. *Industrial Engineering*, September (1994).
3. Despres, S., and Rosenthal-Sabroux, C. Designing Decision Support Systems and Expert Systems with a better end-use involvement: A promising approach. *European Journal of Operational Research*, Vol. 61, (1992).
4. Edwards, J. Expert Systems in management and administration - Are they really different from Decision Support Systems? *European Journal of Operational Research*, Vol. 61, (1992).

KAMBIZ FARAHMAND

Kambiz Farahmand is currently an Associate Professor of Industrial Engineering at Texas A&M University-Kingsville. He is the Graduate Coordinator and the Director of the Maquiladora manufacturing program at the department of Mechanical & Industrial Engineering. His primary teaching and research activities are in the areas of design, simulation, implementation, and control of manufacturing systems. He is involved in joint research and consulting with NAVY and industry. He earned a B.S. in Petroleum Engineering from University of Oklahoma. He completed his M.S. and Ph.D. in Industrial Engineering at University of Texas at Arlington. He has 10 years of industrial experience with several fortune 500 companies. He is a registered professional engineer in the state of Texas and the president of IIE Coastal Bend Chapter 182 the IIE's campus advisor at TAMUK. He is currently a member of HFES, IIE, and ASEE.