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Implementation of APQP-concept in design of QMS

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Abstract: General theory of systems gives general principles of study and reinstatement (design) of all types and varieties of systems. From this point of view it is possible to identify common design principles of technical and management systems. For designing, understanding and mastering product quality planning the APQP (Advanced Product Quality Planning) concept is often employed. This concept belongs to standardized quality management in automotive industry (QS 9000 demands). This contribution is an attempt to elaborate an analogy – with APQP-concept – in design and implementation of QMS (Quality Management Systems).

Keywords: Technological sciences, Industrial engineering, Quality Assessment

1. INTRODUCTION

Contemporary publications on organization and management theory emphasise the role of design approach to management systems, as it is common in technical systems. It is considered that the best way to learn a system is to design it. "The design methodology requires that designers learn how to use what they already know, learn how to realize what they do not know, and learn how to learn what they need to know." [1].

Within this we can at least identify parameters like: system and environment components, input-output vectors, objective function, system translation operator (process model), characteristics, and state vectors. The definition of these parameters and adequate design procedure enable sufficient data quantity for physical system realization and operation throughout its life cycle.

2. MODERN ORGANIZATION THEORY AND DESIGN APPROACH

Organisation systems designers can easily find the fundamental knowledge and tools in the principles of general system theory. The systemic approach has been following changes in organisation and management theory. The main focus of theoreticians today is the so-called *design approach to interactive management*, which could be applied in designing and research of *social model management*¹ structures. [2]. A valuable contribution to the

¹ Social model of management is preceded in theory by Taylor's and Ford's mechanical model, which describes organization as a machine, and biological model (since 1930 up to now) by which organization imitates human body structure.

affirmation of the role of organisation systems design is made by an existing trend in theory, practice and management standardisation in integrating all aspects of management in organisations. Comprehensive examination various concepts and trends in literature related to management systems integration is presented by Dale [3]. The results of the above examination are summarized into four areas of interest: a) Integration in organizational behaviour, b) Integration in systems concept, c) Integration in quality management, and d) Integration in management system standards. Integration systems, in whatever form, should always lead to a more effective system.

The main contribution of the systems approach to the design process of management system is in putting on a platform for effective use of applied engineer design logic and usage of usual engineering design methods and tools. The systems concept treats organizations as open systems, where the elements/parameters of the system are the input, and the process, output and feedback control. The concept indicates that the elements should be compatible with each other and both the elements and the boundary of the system should be defined [4]. The use of systems approach in management has been comprehensively elaborated in the earlier and contemporary literature about management. The intention of this article is to emphasize the contribution of this approach to the management system design methodology. Although there are certain weaknesses in the systems approach in organizational and management theory, especially regarding human behavioural role and influence of cultural traditions.

The role of using information technology in effective and efficient functioning of an organization system is very significant, especially in those aspects and modules related to the concept of management information system (MIS). However, information technologies related to structural system analysis (SSA) have a particular importance for the systems approach in management system design [5, 6]. One of the methodologies that contribute to this concept is the establishment of a process system model, with identification of all input-output connections and simulation of their interdependences by researching what-if events. In management theory and practice there are tools and software available, which efficiently support process network researching in organizational systems, like IDEF 0 methodologies.

Management system design methodology is recognizable in some management standards. Concrete and clear demands related to the management system design process are given in ISO 9001:2000. The requirement of standards which can be taken as relevant for the process of management system design is found in clause 4.1: "The organization shall establish, document, implement and maintain a quality management system and continually improve its effectiveness in accordance with the requirements of this International Standard." Clause 4.2 states detailed demands for creating QMS documentation. These demands are also explicitly formulated in other management standards, such as ISO 14000. From the aspect of design, QMS documentation appears as the result (output) of the system design process, analogous to the product project in the product design process. In this sense the designer of the management system has a very clear and precise requirement. What has not been satisfactorily articulated by management standards, or in management theory and practice, is the very procedure or process of management system design. ISO 9000:2001 uses terms such as "establish" and "document" for this process, leaving interpretation and use of these terms up to managers, consultants, experts and their teams. Authors believe that there is space for a more precise definition of the design process in management and organization systems by using appropriate scientific methods and practical expert experience. In the field of scientific method, the general system theory methodology comes, to the foreground, and in the field expert knowledge and experience it is methodology of teamwork and concurrent engineering. They also believe it is possible to use the logic of design and experience in general product design, which has been developed in automotive industry with all necessary details and processes. This logic is known as Advanced Product Quality Planning (APQP).

3. IMS DESIGN ACCORDING TO APQP METHODOLOGY

Product Quality Planning is a structured method of defining and establishing the steps necessary to assure that a product satisfies the customer. The goal of product quality planning is to facilitate communication with everyone involved to assure that all required steps are completed in time (Fig. 1).

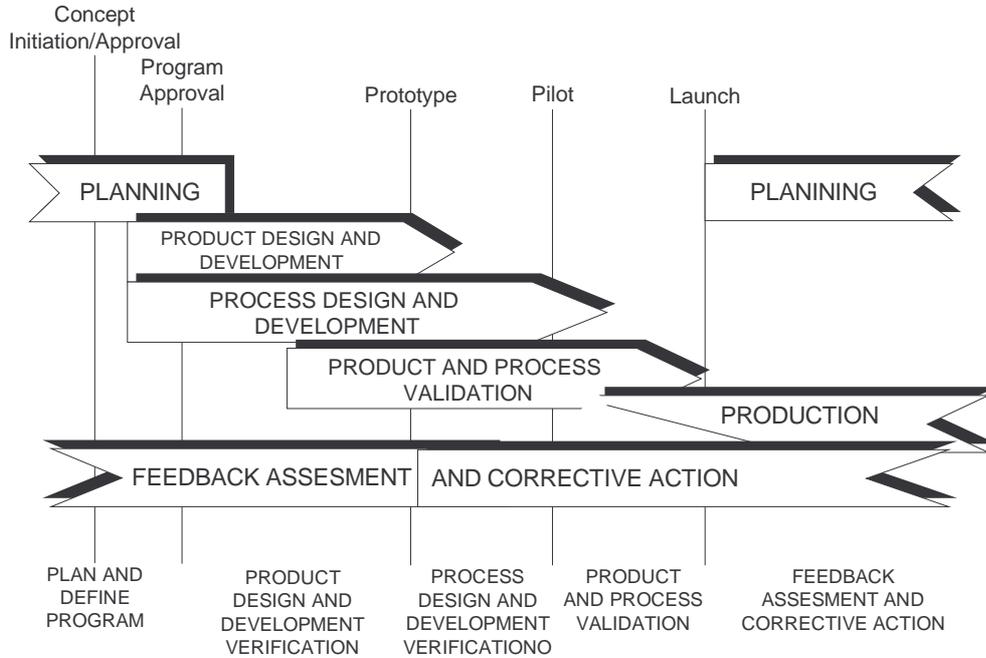


Figure 1: APQP Product quality planning timing chart.

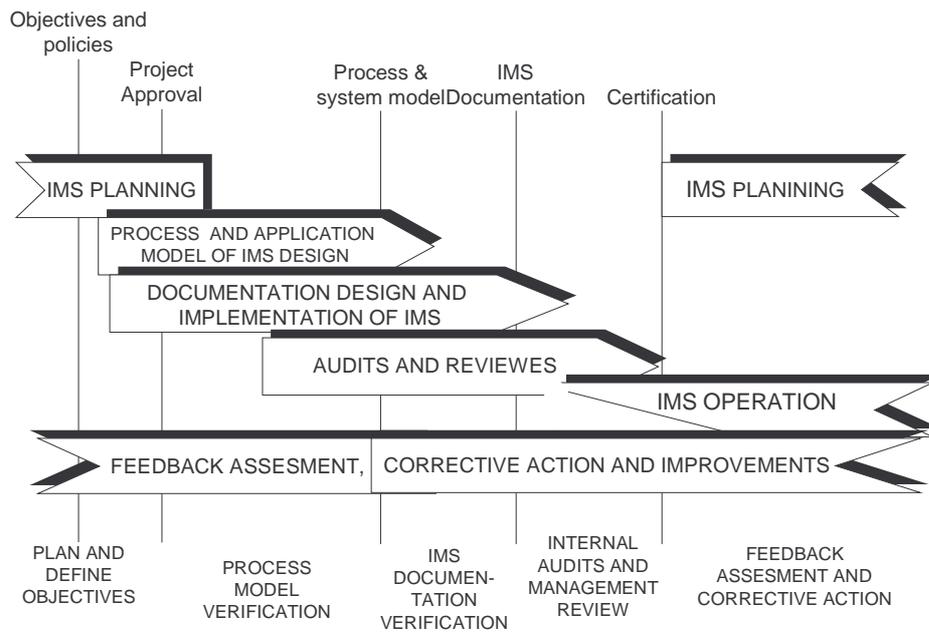


Figure 2: APQP IMS planning timing chart

For the design and development of new products in the car industry APQP methodology requirements (standard QS 9000) are widely known, and are compatible with VDA 6.1, EAQF and AVSQ and new ISO 16949 standards, respectively. The object of designing in the management system field is an unequivocal process structure of the business system and process model, respectively, as named in the management standards. This approach is founded by Deming in beginning of 70-ties throughout very well known 14 management principles, which are new ISO 9000:2000 standards condensed into 8 principles. The subject of this paper is especially related to two principles: *4-th - Process approach and 5-th - Systems approach to management.*

Based on these two principles it is possible to define design tasks for management systems design in the following manner [5, 6]: A) DESIGN BASE FOUNDATION B) PROCESS MODEL DESIGN C) DESIGN OF THE APLICATIVE MODEL OF THE MANAGEMENT SYSTEM

This design process can be led and control using of mentioned standards (IDEF 0). The whole implementation of the teamwork principles and concurrent engineering it is possible by using of computer aided tool (CASE), which involving technology of communication for interchange of project teams information in different design phases. Designed IMS documentation is a result of management system designer work.

The procedure of the control of management systems life cycles can be implemented completely according to the APQP model shown in the Figure 1. This is evident from Figure 2, where in particular phases of the APQP model it is possible to locate the procedure of the management systems design and operating. This conclusion is inferred also by the standard terminology (according ISO 9000:2000) used in the Figure 2.

4. CONCLUSIONS

The authors find that:

1. Adequacy theory, standards, and practical methods and tools for design of the organisational and managements systems exist.
2. Some corresponding computer aided tools also exist, which can substantially improve the design procedure effectiveness and efficiency.
3. Based on facts mentioned before it can be said that is possible to use APQP model as a basis for the standardisation of management systems design procedure.

Additional benefit by affirmation and involvement of the management systems design is particular definition of the frame inside business systems managers could be and must be act, and on this way increase management efficiency.

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