POLISH ACADEMY OF SCIENCES - COMMITTEE OF MATERIALS SCIENCE
SILESIAN UNIVERSITY OF TECHNOLOGY OF GLIWICE
INSTITUTE OF ENGINEERING MATERIALS AND BIOMATERIALS
ASSOCIATION OF ALUMNI OF SILESIAN UNIVERSITY OF TECHNOLOGY

Conference Proceedings

12th INTERNATIONAL SCIENTIFIC CONFERENCE
ACHIEVEMENTS IN MECHANICAL & MATERIALS ENGINEERING

New tool for integrated management system design

M. Bobrek [a], M. Soković [b]

[a] Faculty of Mechanical Engineering, University of Banjaluka, Bosnia and Herzegovina

[b] Faculty of Mechanical Engineering, University of Ljubljana,
Aškerčeva 6, SI-1000 Ljubljana, Slovenia

Integrated management system (IMS) is term for the management system, which could achieve requirements of many ISO management standards and other specific goals of organization. Changes caused by modern organization functioning require application of new management theories, which can respond to modern business conditions. This paper emphasizes importance of design phase in developing and implementing IMS, and crutial contribution of three core principles for this phase: Process aproach, System approach to management and Factual approach to decision making.

1. MANAGEMENT RESEARCH TODAY

Human organization management research is as old as human society itself, because of human need for association in order to achieve variety of goals (wars, religions, trade, etc.). In the last century the management research was given a central place in the society and became the organization survival factor. Still in the last three decades an explosion of ideas, theories and management techniques occurred, so one is free to say that today we are living in a golden era of management.

In fact, various management theories was changed or substituted during historical development of society, according to existing economic systems and other influential factors. There is interesting view of J. Gharajedaghi [1] by which these changes and theories is named like *"Six Competitive Games"*. Each of the competitive games corresponds to a given paradigm in the following matrix (Fig. 1.). Together, these games have dominated the management scene for the better part of the past century, and each paradigm has its own unique mode of organization.

2. THE DESIGN APPROACH OF MANAGEMENT SYSTEM

Growing globalization and more complex business environment are conditions to which more and more organizations cannot adapt. Problem is not lack of competent resources, but lack of understanding changes and insufficient application of adequate management tools. In this new time constant management theory dilemma "*Is management skill or science?"* is not valid any more. Today, management stops to be a skill and more and more becomes science expressed in selection and application of available and adequate management tools.

Basic direction in selecting these management tools is the establishment of organizational structure, which is not supposed to be some non-integrated function and task for which the responsibility is upon individual managers with partial goals. Organization must be *integrated*

system where managers harmonize relations among partial elements and integrate strength of individual goals in creating future [2].

SHIFT OF PARADIGM	MINDLESS SYSTEM MACHINE MODEL	UNMINDLESS SYSTEM BIOLOGICAL MODEL	MULTIMINDED SYSTEM SOCIAL MODEL
ANALYTICAL APPROACH **INDEPENDENT VARIABLES**	INTERCHANGEABILITY OF PARTS & LABOR HENRY FORD'S MASS PRODUCTION SYSTEM	DIVERSITY & GROWTH ALFRED SLOAN'S DIVISIONAL STRUCTURE	PARTICIPATIVE MANAGEMENT SELF-ORGANIZING SYSTEMS TAVISTOCK INSTITUTES SOCIO-TECH MODEL
SYSTEM APPROACH **INTERDEPENDENT VARIABLES**	JOINT OPTIMIZATION FORD'S WHIZ KIDS OPERATIONAL RESEARSH	FLEXIBILITY & CONTROL OHNO'S LEAN PRODUCTION CYBERNETICS MODEL	REDESIGN ACKOF'S INTERACTIVE MANAGEMENT

Figure 1. Six competitive games

To achieve fully integration in management system, the design phase in creating and implementing them obtain the curtail role. Namely, social systems can be organized either by default or by design. In default, the beliefs, assumptions and expectations that underlie the system go unexamined. In design, the beliefs, assumptions and expectations are made explicit, being constantly examined and monitored.

The design approach is especially useful in creating management systems of organizations in economic field (business systems) and is fully accepted in international standards of management (ISO 9000, ISO 14000, ISO 18000, and SA 8000). Integration many requirements, techniques and tools in those standards lead to unique concept of management, which appears in term **Integrated Management System (IMPS)** [3].

3. THEORY CONCEPT OF IMPS

It seems that Deming, in discussing his well-known 14 points for management, founded basic of IMPS theory. They were base for establishing 8 principles of management in ISO 9000 series, and could be summarized in some core theoretic concepts, two of which are emphasised below.

Systematic approach. In accordance with the system definition: "*elements structure, their relations and processes that accomplish purpose of system existence"***,** within the general systems theory, a convention on their graphic model has been adopted (Fig. 2.), indicating that for a complete identification of a system it is necessary to define all of system quantities.

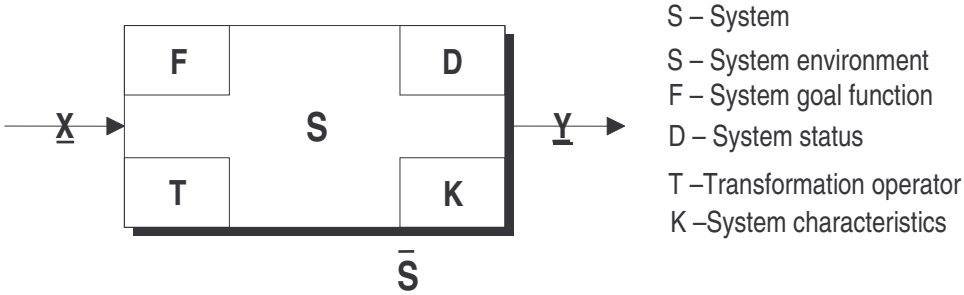

Figure 2. Graphic model of the system

SYSTEM GOAL FUNCTION determines the goal because of which the system exists and which the system should achieve at a determined point in time. Goal function for industrial systems depends on the identified interest of interested parties (stakeholders) at a given point in time, represented in the vision, mission and policies of the business system.

SYSTEM CHARACTERISTICS are the characteristics of the system and its elements by which they are identified and because of which they are mutually different and compared with other systems of the same class.

Regardless of the system kind, type and size, two main principles originate from the systematic approach:

1. The most important factor for system success is not partial success of each element (each element plays its role), but good and successful interaction.
2. Each partial measurment of success can lead to a wrong impresion. Correct understanding and leading to success is possible only by monitoring carefully selected group of measurments and their mutual corelations. [2]

SYSTEM TRANSFORMATION OPERATOR (T) represents the rule based on which the input into a system turns into an output. Transformation operator is, as a rule, represented by an adequate mathematic – logic relation.

In management theory and practice there are tools and software available which efficiently support process network researching in organizational systems, like IDEF 0 methodology (Fig. 3), supported by various software tool (BP WIN).

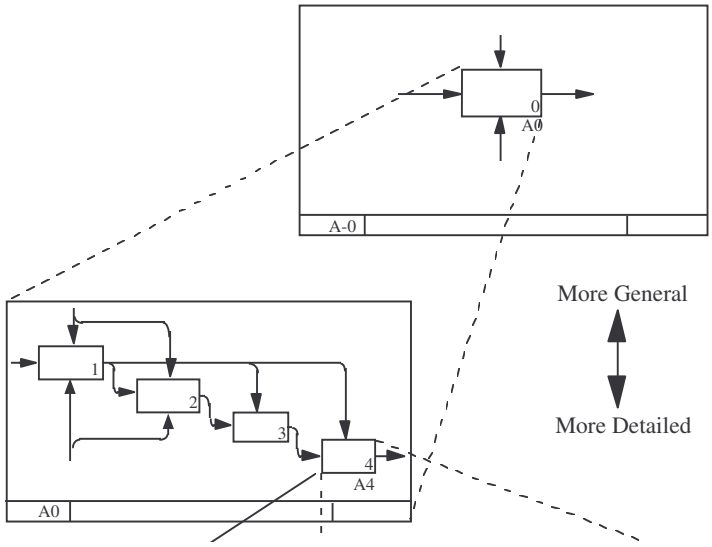

Figure 3. IDEF 0 methodology

IDEF0 may be used to model a wide variety of automated and non-automated systems. For new systems, IDEF0 may be used first to define the requirements and specify the functions, and then to design an implementation that meets the requirements and performs the functions. For existing systems, IDEF0 can be used to analyze the functions the system performs and to record the mechanisms (means) by which these are done.

SYSTEM STATUS can be understood as the capability of the system to perform certain process or not, i.e. to perform the system goals defined by the goal function. The structure of the system status in general terms indicates the information on the *"chaos quantity",* i.e. *"order quantity"* in the system, for which the system theory has a universal measure –

SYSTEM ENTROPY, which in practice has limited possibilities of application. In business practice are used measurement methods like efficiency and effectiveness, ABC (activity based costing), BSC (balanced scorecard), etc.

Scientific approach to management. Systems cannot be improved by some recipes or in advance issued techniques, but by processes of iterative researches, measurements and regulatory–corrective activities. These are typical management processes and growing number of authors agree about their scientific core. Wide range of tools has been developed, which managers and designers efficiently use in these processes. However, incompetent application of management tools and techniques usually result in reduced effects, and often leads to counterproductive effects. Good management methods should not be mutually competitive, but should integrate organization functioning. To solve these problems, it is the best to apply scientific management approach:

1. Measuring and researching of existing state of all important system features,
2. Analysis and identification of factors that influence negative trends,
3. Setting of hypothesis and selection of methods which could get better trends,
4. Hypothesis testing through experimental application of new methods,
5. Method validation, modifying or confirming of hypothesis and new method implementation [2].

4. IMPS DESIGN TOOL

In preliminary considerations it is obviously that modern management theory has a comprehensive number of techniques and tools, which could be effectively used to design management systems, especially those described by the international management standards. Many of them are supported by adequate computer applications, which contribute to effectiveness of design process. Modern computers and communications technology gives opportunity to integrate these separate applications in the unique application, which could be named like computer, added design of management systems (IMPS CAD).

By practical experience of authors of these article, for that purpose could be effectively used these computer applications for integration:

- SOFTWARE for developing of process model of management system (process mapping),
- SOFTWARE for developing and monitoring balanced scorecard,
- SOFTWARE for developing information systems (CASE tools),
- SOFTWARE for control of non-conformance and corrective actions,
- SOFTWARE for document management,
- SOFTWARE for statistical techniques and others.

All these software's are available on software market in various configurations and various level of integration. Using some of them is represented in reference [4].

REFERENCES

1. Gharajedaghi, J: System thinking – Managing chaos and complexity, Buttereworth Heinemann, 1999.
2. Lee, T.H., Shiba, S., Wood, R.C: Integrated management systems – A Practical Approach to Transforming Organizations, John Wiley & Sons, Inc., New York, 1999.
3. Majstorović, V: Development standards for integrated management systems, Kvalitet 1-2, Poslovna politika, Beograd, 2003.
4. Bobrek, M: QMS design, Faculty of Mechanical Engineering, Banjaluka, 2000.