MODELLING IN INNOVATION PROCESS

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ABSTRACT: SME competitive advantage is the resultant of actions aimed at full adaptation to the changing demands of external and internal environments. It may be assumed that the process of shaping the basic SME success factors is determined by corporate activity in the fields of research and development, production, distribution and customer service. Integration of these actions demands constant market analyses as well as flexibility and organisational efficiency. Theorising and modelling of innovation activity is one of the most important factor of SME development.

Keywords: SME, innovation, modelling, economic development

JEL Codes: O31, O33

Modelling theory

A model is commonly defined as a graphical, mathematic or physical representation of a particular phenomenon or action. In case of organisation and management, a model is a logical construct playing an instrumental role in organisation theory and practice. There may be two approaches distinguished: a structural approach, in which a model is defined as a construct reflecting the real object with the use of abstraction and a functional approach, in which a model is a construct substituting the real, original object in cognitive and empirical operations[1].

Modelling phenomena in accordance with the structural approach enables one to simplify the observed relations and to present the classification grounds. An example may be a model of organisational structure identifying the logical relations between particular units and presenting the division of authority, work, etc.

Functional modelling is widely applied in organisation and management as it offers the possibility to present phenomena in a way facilitating their evaluation on the basis of the data introduced to the model.

The degree of materialisation of the phenomena presented by a model, understood as a degree to which it reflects reality is most frequently dependent on the character and complexity of the described phenomenon and is a resultant of demands and competences of business entities. Table no.1 presents an example of model classification.

Tabe no.1.

Example of model classification

Examples of groups						
Models	*Production system models*	*Models applied to analyse and design organisational solutions*	*General models*	*Production management models*	*Models applied in science and technology*	*Models with regard to the scope of phenomena*

[1] L. Pasieczny (ed. by), Encyclopedia of Organisation and Management, PWE, Warszawa 1981, (in:) M.W. Jerzak, Engineering Organisation Theory, Part 1: Methods and Techniques of Creative Thinking, Wydawnictwo Politechniki Częstochowskiej, Częstochowa 1994, p. 140.

technical focusing mostly on identifying technical parameters **economic** considering mostly time and money **technical-economic**	**mental (abstract):** <u>logical,</u> <u>mathematic,</u> (deductive, empirical, determinist, probabilistic, static, dynamic, normative and descriptive) **material (physical):** <u>reductive</u> (scale 1: n) <u>real</u> (scale 1:1)	**General design** **Detailed design of machinery, appliances and devices**	**Static** applied in material structure design: <u>flat models:</u> applied in case the relations are observed on a surface <u>spatial models</u> applied in case the relations are observed on a surface and in space **dynamic** applied in case it is necessary to analyse the principles or action and correlation of objects	**discrete** **continuous**	**Real** material reflections **abstract** non-symbolic **symbolic**	**elementary** isolated **complex homogenous** covering one category only **complex** covering different categories

Source: Own study on the basis of: M. Brzeziński (ed. by), Organisation of Basic Production Processes and Production Management, part III, Wydawnictwo Politechniki Lubelskiej, Lublin 1991, p. 101; M.W. Jerzak, Engineering Organisation Theory, Part 1: Methods and Techniques of Creative Thinking, Wydawnictwo Politechniki Częstochowskiej, Częstochowa 1994, p. 140, 149; Z. Martyniak (ed. by), Modern Production Management Methods, Wydawnictwo Akademii Górniczo-Hutniczej w Krakowie, Kraków 1996, p. 225; Cz. Bąbiński, Industrial Design Engineering, part 1, WNT, Warszawa 1964, p. 66; E. Burdziński, Organisation Techniques, Wydawnictwo Akademii Ekonomicznej w Katowicach, Katowice 1989, p. 217.

In organisation and management processes, modelling often takes the form of a research procedure characterised by various types of methodology of study. The following models are frequently enumerated among the discussed approaches: G. Nadler's models, models based on Altszuler's deduction and models developed on the basis of the D. Buschardt's block method.

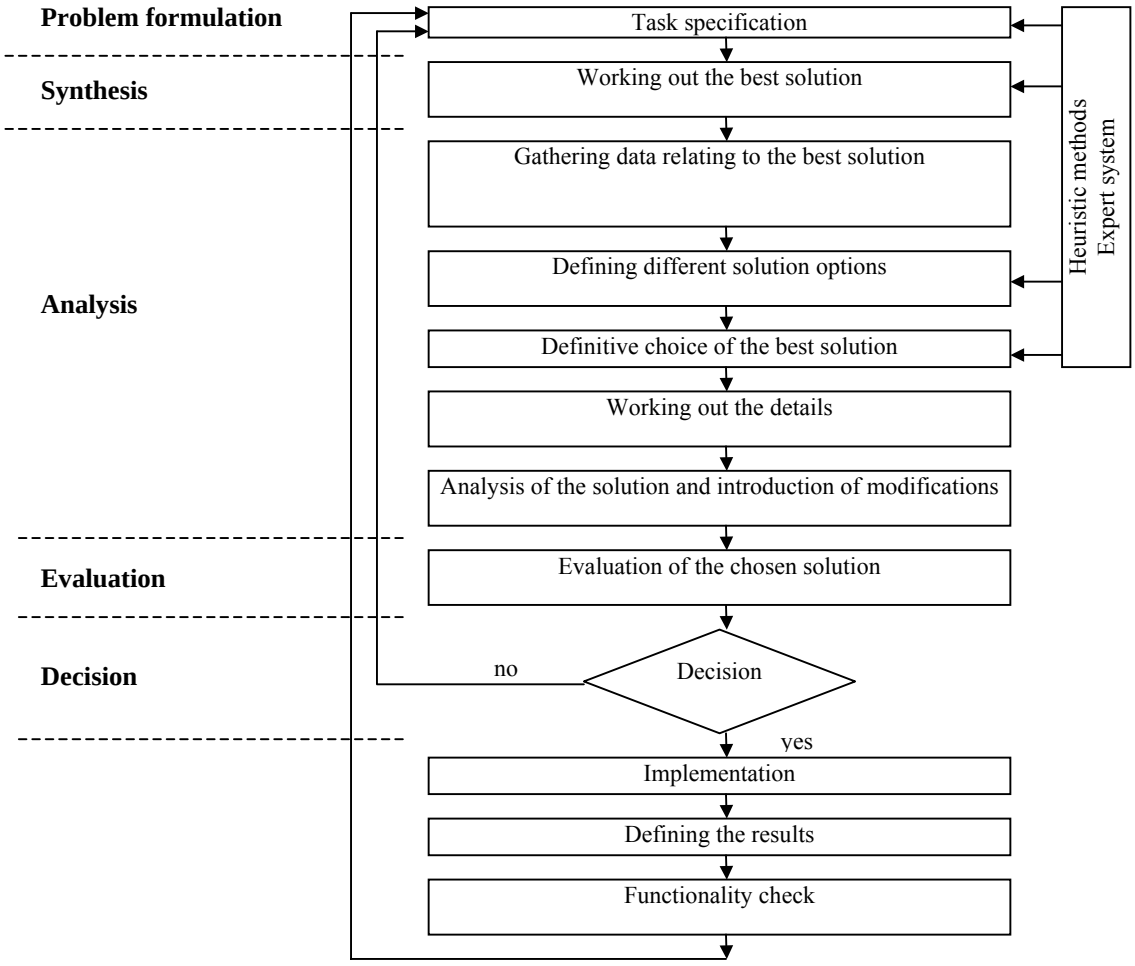

Fig. no. 1 Nadler' algorithm (prognostic problem solving method)

Source: Durlik I., Restructuring Business Processes. Reengineering, Theory and Practice, Agencja Wydawnicza Placet, Warszawa 1998, p. 96.

G. Nadler's method of ideal concept, identical with the IDEALS[2] concept consists in[3]:

- considering the designed (improved) object as a system whose constituents are: system functions: input and output, sequence of steps between input and output, system environment, physical catalysts and human beings,
- application of a design procedure consisting in the search for the ideal solution and idea materialisation during the implementation stage,
- dependence of the design procedure on the people involved in the process.

This approach necessitates the adoption of a prognostic strategy in the process of problem solving. The concept of search for the ideal is primarily focused on the synthesis of the best solution, working out the details of the one to be implemented and search for possible implementation problems (Figure no. 1).

[2] IDEALS - Ideal Design of Effective and Logical Systems.
[3] M.W. Jerzak, Engineering Organisation Theory, Part 1: Methods and Techniques of Creative Thinking, Wydawnictwo Politechniki Częstochowskiej, Częstochowa 1994, p. 141.

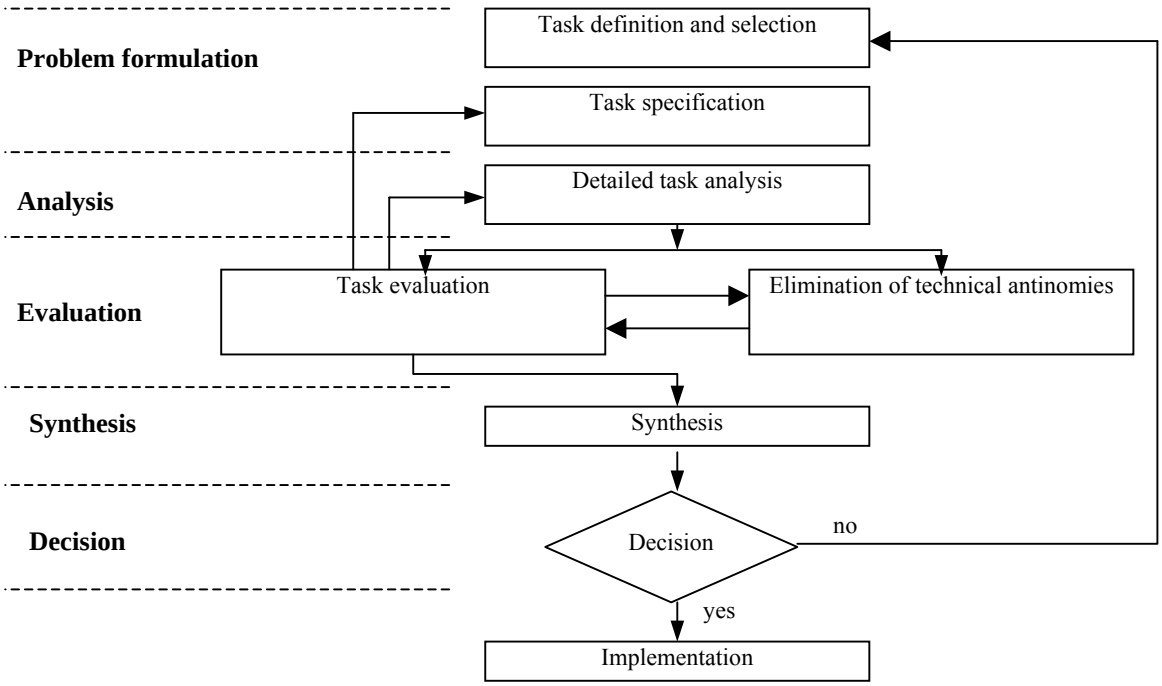

Fig. no. 2 Altszuler's invention algorithm (diagnostic method of problem solving)
Source:Durlik I., Restructuring Business Processes. Reengineering, Theory and Practice, Agencja Wydawnicza Placet, Warszawa 1998, p. 95.

The process of modelling based on the Altszuler's concept approach identifies the necessity of problem definition. According to the above discussed procedure, a problem is identified and working hypotheses concerning its solution possibilities are tested. The Altszuler's implementation procedure covers the following stages (Figure no. 2):

- problem formulation,
- search for potential solutions,
- evaluation of particular options,
- solution selection,
- implementation decision.

D. Buschardt's organisation method consists in the following stages[4]:

- arbitrary isolation of model subsystems and definition of relations between them,
- definition of tasks performed by subsystems and their local objectives,
- definition of agendas responsible for the implementation of particular tasks,
- graphic design of the model achieved by drafting a scheme of the designed subsystem elements,
- verification of the model's internal compatibility with regard to e.g. occurrence of all necessary blocks, supplies and carriers of information, solution correctness, etc.,
- definition of the aspects differing the designed model from the present state,
- practical implementation and verification.

Complexity and variety of problems observed in enterprises, including those operating in the SME sector necessitate frequent application of prognostic methods of their solution. The demands of competitive markets and the possibilities offered by modern information technology necessitate transformations of the already existing structures and procedures. Due to the fact, one of the transformation option seems to be the application of methods consisting in creating ideal solutions..

[4] M.W. Jerzak, Engineering Organisation Theory, Part 1: Methods and Techniques of Creative Thinking, Wydawnictwo Politechniki Częstochowskiej, Częstochowa 1994, pp. 142-143.

Conclusion

Technological progress, achieved thanks to innovative activity, is commonly considered the basic indicator and stimulus of economic growth. Complexity and dynamics of social, economic and political phenomena influence the innovative potential in its global, international, cross-regional and regional scale.

Intensification of innovative undertakings necessitates coordination of particular subsystems of a company, that is the technical (product or technology), information, economic, marketing and human resources management subsystems. Efficiency of innovative activity depends more and more often on external conditions such as for example technology and know – how transfer. In the light of changing external and internal conditions, the degree of corporate innovativeness is frequently determined by a number of exogenous and endogenous factors.

References

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