15. Design methodolgy

Design methodology

Actions aimed at achieving a chosen goal can be carried out in many ways. Hierarchizing **models of action**, starting from the weakest and least effective, we get the following division:

Chaotic model - based on initial targeting and often changing under the influence of emotions and additional information from the environment. Most often it concerns solving problems that we have not yet dealt with (previous knowledge and experience are completely insufficient, the person solving the problem does not work on it systematically). Action from the methodological point of view, not very effective and burdened with high risk.

Design methodology (cont.)

Intuitive model - based on the intuition (but also experience) of the person solving the problem, requiring experience and knowledge in a given subject. At the cost of a certain risk, it allows to shorten the process of problem solving. Useful in solving critical situations.

Planned model - based on experience, but working even in situations where knowledge and experience are insufficient. The next step requires the completion of the previous step. In difficult cases, it definitely reduces costs and reduces the risk of failure.

Design and human life

Planning and setting goals in our lives can serve as an example. Planning occupies an important position in human life.

Design allows us to achieve our goals through the use of the knowledge and experience of many people. The effectiveness of action based on appropriate planning is much greater than in other cases. The creation of a design process should include elements of knowledge and experience of the people who make it up, from all the disciplines with which it is connected and on which it is based.

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Definitions of the design process

There are many definitions of design. Selected definitions are presented below:

- an iterative decision-making process aimed at formulating plans according to which resources are transformed into systems or devices that meet human needs (T. T. Woodson, 1966);
- the next steps, from the identification of the problem to the development of a functionally, economically satisfactory solution, etc. (E. V. Krick, 1969);
- the chief work of practical sciences (T. Kotarbiński, 1961);
- decision making in conditions of uncertainty and high punishment for error (M. Asimov, 1962);
- decision-making process (R. L. Ackoff, 1970);

Definitions of the design process (cont.)

Subsequent definitions:

- process of applying various scientific techniques and principles in order to describe a device, process or system in such a way that it can be implemented (E. S. Taylor, 1959);
- creating an appropriate system to satisfy such a need or to fulfil such a function (G. Nadler, 1975);
- creative decision making aimed at satisfying human needs (G. C. Beakley, 1967);

There are many more definitions of design. All, however, are linked by a planned action to achieve the goal.

Planning stages

Steps in the planning process:

1. The first step in the planning process is to raise awareness and define the goal (need).
2. The next step is to detail the problem and collect data.
3. On the basis of the collected data, the designer (guided by his own hierarchy of values, having at his disposal a certain amount of information and economic resources) creates a solution, which is then verified.

Individual steps are linked by **iterative loops** - if you do not get a satisfactory result at any of the stages, you can go back to any of the previous steps and continue the procedure.

Planning stages (cont.)

Sometimes, the last phase of design is considered to be the "life" phase of a product, because it is only then that the verification and final determination of the degree of usefulness of the achieved design goal takes place.

Regardless of the number and complexity of the planning stages, there must always be **three elements** in the process:

- planner - designer,
- object - purpose (design object),
- surroundings of the facility.

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A sequence of basic design activities

The sequence of basic activities by selected authors is presented in the table below.

E.V. Krick	M. Asimov	G. Nadler
General formulation of the problem	-	Determination of purpose and destination
Analysis and detailed formulation of the problem	Analysis	Searching for the ideal system, collecting information
Designation of solutions	Synthesis solutions	Draft synthesis
Assessment of solutions and decision	Assessment and decision, optimisation and verification	Evaluation and decision
Description Solutions	Implementation	Project synthesis and verification

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Plan of action for solving a project problem

One of the most eminent Polish praxeologists, **Tadeusz Kotarbiński**, set out a framework plan of action, important in solving each project problem:

1) defining the functions to be performed by the designed object,
2) drawing a preliminary diagram of the object,
3) gathering the necessary knowledge,
4) outline possible variants of the facility solution,
5) selecting the solution that is best suited for implementation,
6) determination of details of the chosen solution,
7) examination of the constructed object model,
8) checking the functioning of parts and subassemblies of the facility,
9) define the conditions under which the facility must be installed and operated,
10) taking measures necessary for the implementation of the facility.

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Procedure plan for solving a project problem

Proceeding according to the presented scheme works well in solving each problem, but inevitably requires the investment of several factors:

- knowledge,
- skills,
- experience,
- an appropriate hierarchy of values,
- economic resources,
- time. and often technological, human and many other resources,
- and often technological, human and many other resources.

Procedure plan for solving a project problem (cont.)

Taking into account all these elements of the process brings the designer closer to achieving the optimal solution, minimizing the risk of failure.

It might seem that it is a waste of time to take into account some of the points of the plans shown. Years of practice and systematization of knowledge show, however, the undoubted advantages of holding to the plan and succumbing to emotions only to a minimal extent.

A good plan is the best guarantee of success.