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# Basics of general approach for technological systems analysis

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*Abstract. The article deals with the problem of analysis of technological system as a special kind of socio & economic & technological systems. General approach for technology concept is considered. Structure of technological system that allows its analyzing and developing proposed.*

*Keywords. Technological System, Technology, Cybernetics, System Analysis, Structure.*

## INTRODUCTION

Technology as organized practical activity in system nature is characterized by stable both internal (between its structural components) and external (with the environment) connections. Technologies are closely interrelated, have a mutual influence, form a system of technologies (technological system). Any well-established production (tangible or intangible) or complicated activity is a technological system.

One of characteristic features of modern science, industry and life is unthinkable earlier acceleration of development pace, caused by scientific progress, technical and technological innovations that requires improved methodological base of its analysis. So the aim of this article is to identify the frameworks of system analysis of technological systems.

## GENERAL APPROACH FOR TECHNOLOGICAL SYSTEM

According to Thomas Hughes [1] technological system consists of various physical parts and also includes network of political, social and economic relationships and forces that control and shape the technology.

So modern technology is an integrated dynamic system which includes:

1) products, operations and procedures, rules, standards and norms and technological activity and process control required for this:

- 2) information and knowledge;
- 3) energy, raw materials, personnel and other resources;
- 4) set of economic, social, environmental and other outcomes (effects) that affect and somehow change the environment of functioning of the system.

All these components are characterized by hierarchical position and stage of life cycle.

Any technological system is aimed at transformation of input materials into products and services, which are necessary for society and with minimal for conditions costs and time. Achieving this goal requires the preservation of integrity of technological system (stable structure) and increase the level of organization.

Technological system knowledge includes understanding of input and output, transformation processes, control and understanding of “black box”, particularly in sub-system design terms.

When we talk about modern technological systems we should understand that in it wide range of technologies are used which form network (networks).

Among basic functions which need to be served and analyzed within the technological system [2]:

- 1) knowledge creation and diffusion;
- 2) guidance of search among users and suppliers of technology directions;
- 3) supply of resources;
- 4) creation of positive external effects;
- 5) formation of new markets.

The necessity of using of system methodology for technological system research is based on the feasibility of this object study as a complex system that consists of list of

individual elements, which have multiple internal and external linkages.

In the context of objectives of system analysis and optimization technological system we consider as mechanism of complex transformation of wide range of initial resources into the final results using the complex of tools based on humanity-established knowledge, as well as adequate information, management system of necessary resources and sub-system of dissemination various economic, social, environmental and other results of this system.

From the standpoint of classical cybernetics technological system management should be considered as a function-oriented (i) for maintenance its basic properties (set of properties, the loss of which entails the destruction of system or its potential loss) in the environmental conditions change and (ii) for implementation certain actions, ensuring the stability of its functioning and development to achieve some target.

#### SYSTEM OF TECHNOLOGICAL LINKAGES

Any modern high-tech production is a complex technological system the most important features of which are multidisciplinary and cyclicity of development processes, presence a lot of processes types, high resource and capital intensive and high impact on environment (other technological systems) [3; 4].

Perspectives of intersectoral interconnections first of all deal with ability for further metallurgy technologies improvement. Potential of intersectoral linkages should be observed based on fact that any technological process has to be examined as a part of more complicated process and as a set of less complicated processes. Every of these processes can both to form unique competitive advantages of system in general and create advantages of processes.

Today together with specialization and differentiation of sectoral productions, cooperation and integration processes are developed, which lead to formation of sustainable producing relations between sectors and create intersectoral complexes. Practically every science-intensive sector can be observed

as intersectoral complex, which is integrative structure, characterized by interaction of various sectors and their elements, various stages of production and goods distribution.

One of reasons of innovation clusters appearing is formation of technological relations between producers in value chain and ability to form competitive advantages through clusters in interconnected economy areas. One competitive sector can lead to creation of another one in process to strengthen partnership relations through cluster mechanism. This sector may often be the most exacting purchaser of goods and service from sectors, on which it depends on. Its existing in country becomes important factor, determining competitiveness of sectors-suppliers.

#### CONCLUSION

System approach to the analysis of technological systems designed to implement consideration of all factors and objectives of the system (eg, products and related processes), providing from the beginning consideration of all the components are interconnected.

The technological system proposed to be considered based on broad components: the requirements specification (initial state), information model of the product (target, final state), steps for achieving the goal.

#### REFERENCES

- [1] Th. Hughes, "Networks of Power: Electrification in Western Society 2". JHU Press, 1993.
- [2] S. Jacobsson, A. Johnson, "The emergence of a growth industry – a comparative analysis of the German, Dutch and Swedish wind turbine industries. Department of Industrial Dynamics, Chalmers". University of Technology. Gothenburg, Sweden, 2001.
- [3] V. A. Omelyanenko, "Analysis of Potential of International Inter-Cluster Cooperation in High-Tech Industries", *Int. J. of Econometrics and Financial Management*, vol. 2, no. 4, pp. 141–147, 2014.
- [4] I. V. Krapyvny, V. A. Omelyanenko, N. O. Vermydub, "International innovation networks as new stage of innovation development", *Econ. Processes Mnt: Int. Scientific E-Journal*. no 1. – Available: [http://epm.fem.sumdu.edu.ua/download/2015\\_1/2015\\_1\\_17.pdf](http://epm.fem.sumdu.edu.ua/download/2015_1/2015_1_17.pdf), 2015.