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Creating an organizational design of a science-intensive enterprise oriented towards the digital economy

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Abstract: The intensive development of digital technologies and many years' experience in system analysis applied for forming organizational management systems suggest the feasibility of an organizational design adjustment of science-intensive enterprises by applying platform solutions of tensor structure creation.

To make the organizational design effective and to ensure the enterprises' adaptivity to constantly changing market conditions, the new structure should be "grown" on the basis of the existing one, by its adjustment through platform solutions, gradual replacement of priorities and through changing from the traditional management methods, focused on production, to the new methods, focused on the search for the zones of innovative attractiveness and the transfer of technology on the basis of digital technologies.

1. Introduction

The article considers the use of system analysis (SA) for the adjustment of organizational management system of an innovative enterprise in order to ensure the transfer of technologies. Russian industry was set a target of an accelerated innovative development, in this connection the managers of science-intensive enterprises search for new methods and tools, which can help them [1]. The transformation of economic environment, caused by the increased influence of intellectual capital and new technologies on economic growth, has led to the situation in which the existing methods of science-intensive enterprise management do not allow to increase intellectual capital of enterprises effectively and to involve technological innovations in their economic turnover [2]. The study of the problem led to the understanding of the need to adjust the organizational system and management structures of science-intensive enterprises [3] and to transition to tensor digital-oriented organizational structures [4].

2. Methods for adjusting the systems of organizational management

The development of information technology has fundamentally changed the methods of coordination and management in the organization, reducing the role of personal control, paperwork, formal procedures and hierarchical architecture [5].

The dynamics of some changes that have taken place in the organization over the past 30 years and are taking place now are presented in Figure 1.

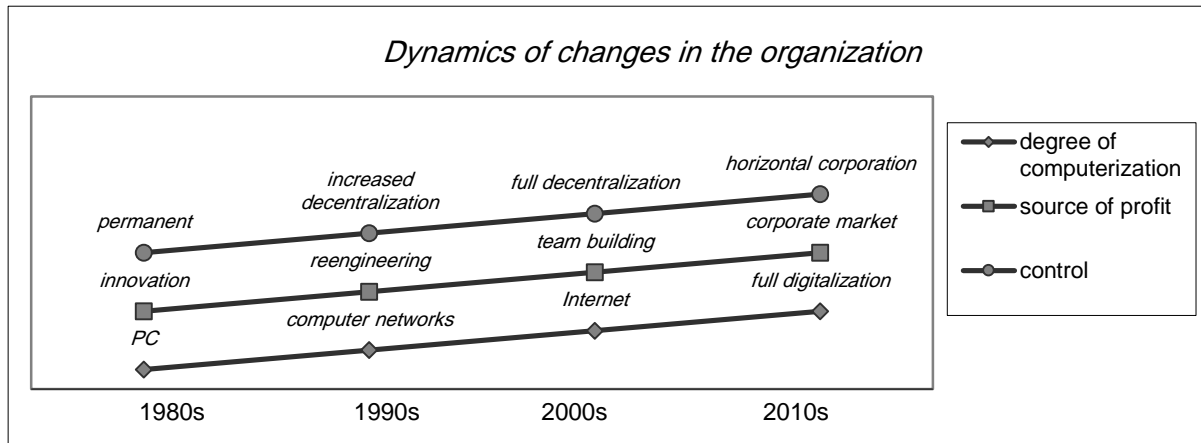
The most striking manifestations of digitalization in management and business practices are:

- The emergence of virtual organizations. The concept of a virtual organization (corporation) was formulated back in the 1990s by Jan Hopland [6].

Now, this term refers to such an organization of doing business in which business partners located in different geographical locations (sometimes in different countries) cooperate via the Internet, and the product (product of their activity) is also often virtual [7].



- “Virtual offices” became new phenomena in the organization, which increased the independence of employees, allowing them to unite people working on the principle of remote access into teams. This system is currently being actively developed, which makes it possible to introduce the



practice of a wider range of organizations such forms as outsourcing and downsizing. [8].

Figure 1. Dynamics of changes in the organization

- Formation of freelancing, as a form of remote employment, often incomplete. A freelancer usually searches for an order (production task) and labor relations via the Internet
- Development of startups and project management.

To design a new system of organizational management enterprises use different techniques and methods, among which are engineering and system analysis methods. They are aimed at the creation of competitive production [9]. Western scientists suggest a re-engineering method. In view of intensive dissemination by western companies of the re-engineering methodology among Russian industrial enterprises (more than half of which do not yield a positive result [10]), it becomes necessary to study this method and to compare it with the methods of system analysis, which have the same goal as the re-engineering. The limited results of a comparative analysis of re-engineering and system analysis methods are presented below (Table 1).

The comparative analysis shows that despite the differences in terminology, both re-engineering and system analysis methods are targeted at the adjustment (formation) of an organizational design of operating (new) science-intensive enterprises towards digitalization.

System analysis in management – is scientific-methodological discipline, aimed at the achievement of the following target – choosing the best management option which strengthens the market position of an enterprise. Having specific clearly defined goals we can identify and analyze factors, which are favorable for an enterprise in digital economy or impede quick and successful achievement of digitalization targets [11].

For system analysis, performed on a foundation of goals framework, the tasks are formulated at all management levels. The result of system analysis is represented by specific and consistent with the goals solutions, aimed at the adjustment of organizational design of a science-intensive enterprise.

3. Approaches to the innovation management system

With the development of digital economy an organizational design acquires specific forms. It becomes possible to apply tensor (multi-dimensional) structures to implement fully-fledged innovation activity and stimulate innovation activity on the basis of innovation processes initiation and to transfer technologies, including the creation of organizational design of the system in the form of blocks, connected by digital-tools. To solve the set targets enterprises, need to develop an innovation development strategy, covering as fully as possible all aspects of their activity [12].

Table 1. Comparative analysis of re-engineering and system analysis methods

Techniques	Characteristics of the technique	
	in re-engineering	in system analysis
Combining of processes	The adjustment of business processes is aimed at the replacement of a low-qualified staff with a highly qualified staff, which helps to reduce the number of intermediate stages in the manufacturing process and to enhance the quality of work through assigning responsibility for it to one person	The implementation of functions is simplified: a number of organizational and technological procedures, describing small functions, are eliminated, others are grouped in the extended organizational and technical procedures, representing the technology of extended function implementation
Decision-making	The leader controls only the final stage of work, subordinate employees can choose the way they achieve their goals	The simplification of technology of function implementation lowers the level at which it is implemented. Thereby the specialists of higher level save time for creative work and for the development of alternative solutions to problems. The availability of ready-to-use solutions creates the possibility to choose and consequently improves the quality of decision-making.
Steps in the process are implemented in their natural order	The sequence of steps is determined by employees themselves according to the course of work. The projects' time frame is reduced if steps are implemented simultaneously.	The sequence of routine procedures is strictly fixed, which simplifies the work of junior staff and reduces the need for specialists' assistance. Therefore the specialists are not distracted and explore the solutions to market problems more carefully.
Benchmarks and volumes	Taking into account the risk of losing of control over the course of work, experts in re-engineering rely on the consciousness and high qualification of staff and the use of latest information technologies.	Benchmarks are documents, submitted to leaders for their approval; the number of documents doesn't depend on the method of enterprise management. The quality improves. The volume of management efforts decreases due to the reduced time for function implementation.

Source: Prepared by the article's authors

Implementing the strategy – is a continuous process. To make it efficient enterprises should develop the organizational design, adaptable to constantly changing market conditions [13]. It's feasible to “grow” a new organizational structure on the basis of the existing one by adjusting and supplementing it, gradually setting new priorities and changing traditional management methods, focused on production, to new methods, focused on the search of zones of innovation attractiveness [14] and forming the model of innovative behaviour.

From the accepted in international practice four types of strategies of organizational change (gradual, rapid, containing and blocking) - the second – rapid – is more useful for our purposes, as it provides a rapid forming of organizational management system and includes innovation management structures [15]. The forming of organizational innovative management structure shall have the following stages [16]:

- at the first stage in the framework of marketing orientation program [17] of an enterprise industry-functional, market-functional and commodity-functional sub-structures are created;
- with the development and improvement of its marketing system, enterprises can advance to commodity, market or industry sub-structures, which can ensure the sustainable innovative development of marketing management methods;
- the next stage is the transformation of organizational structure of an enterprise into a matrix one, which includes industry, market and commodity sub-structures of digital orientation.

Then on the basis of the developed digital-oriented organizational structure, the transition to tensor structure is carried out, which by the efforts of own staff enables the access to previously inaccessible market possibilities and becomes the driver of innovative development [18].

The usage of tensor organizational structure, which is characterized by high level of management decentralization, ensures the highest efficiency of innovative and marketing activity. This is achieved, on the one hand, by two-level system of marketing management, where functional units report information on the issues of general planning of marketing actions, their deadlines and their results to the Chief of Marketing, and on the remaining issues of marketing activity to their functional supervisor in accordance with the company hierarchy. On the other hand, this is achieved by the introduction of a “technological broker” element in the organizational structure of an enterprise, which together with companies-users of innovative technologies, creates the damping effect.

As a basis for innovative activity management it is feasible to use the innovative programmes of market development and competitive products creation [19]. Overall management of the programmes is implemented by a relevant manager, who is fully authorized to develop the general marketing strategy, allocate resources and supervise the staff, participating in the programme development. He is reported to by functional supervisors, responsible for the development of separate parts of innovative programmes and manage them.

The main task of a marketing service is to focus the efforts on long-term development programmes, which improve competitiveness and maximize economic benefits of innovative activity of companies at all stages of preparation and implementation of innovative programmes. The main task of an innovative programme supervisor – is to focus on managing the particular programme, ensuring its success and progress [20].

Taking into account the matrix character of the previously formed organizational structure of a science-intensive enterprise, the specialists of scientific and technical, production, financial and other leading units are subject to a double subordination: in relation to the innovative programme development within the time-frame of its implementation they are subordinate to the Chief of Marketing; in relation to current issues – they are subordinate to their functional supervisors [21]. Professional marketers are either included in groups, which implement separate programmes, or help them, remaining within the functional units of marketing service. Besides them the groups consist of specialists in different fields, ready to work “as a team”, creative and energetic, open for fruitful cooperation with marketers.

4. Conclusions

Tensor structure ensures a clear division of managerial and professional responsibilities for the implemented programmes, which contributes to the successful supporting and expanding of business, guarantees the adherence to company’s goals in short- and long-term perspectives.

Taking into account a temporary nature of tensor formations, it is possible to apply an alternative solution to the problem of mediation between innovative supply and demand by outsourcing some of the participants’ functions (selectable).

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