Features of the Management Process of Ambidextrous Companies

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Abstract – **The main purpose of this paper is devoted to studying economic factors within industrial production and development in the framework of concept Industry 4.0., all in the context features of the management process of ambidextrous companies. The economic factors regarding the development of enterprises under the conditions of digitization are systematized. Such factors as the need to develop a new type of intellectual value chain, production of individual and customized goods with reasonable prices and the use of learning factories have specific meaning in the framework of this problem. The results obtained can be used by business entities while implementing the decoded platform.**

Keywords – **dynamic ability, information society, globalization, network interaction**

1. Introduction

In the modern world, the degree of uncertainty is incomparably higher than 10 years ago, and changes occur more dynamically. Companies have to constantly find and use new opportunities for development of the organization in various directions. To succeed in the pace of change, organizations have to become more open for experiment and calculated risk. This may be the diversification of business models and the formation of an individual proposal for the client, based on existing data from previous experience. At the same time, it is necessary to provide a firm foundation for the company, namely: well-functioning processes and sufficient resources for further development. Companies have to experiment more than ever before, and even collaborate with their competitors.

Innovative products and business models are growing faster, the technology lag is getting shorter, and the need for business digitization is constantly increasing. Managers have to become experts in the international economy, while technology retains the right to operate the company, including responding to new challenges and making investment decisions that place technology at a critical pace.

The globalization of the world economy has made it necessary for companies to run their business on a large number of markets that are not similar to each other. There was a need for cooperation with many brands, with a large number of different suppliers, and to use a variety of management processes in the company. The most common management model for company executives in these conditions was a clear and simple strategy which is based on the principles of prioritization, rationalization and thrift. In the past, homogeneity has been effective, but today it can no longer be a long-term solution. The use of

information systems is the use of any kind of telecommunication networks, hardware and software for production, order processing and external interactions with customers and suppliers, thereby increasing the efficiency of the organization and cooperation between partners [1].

Dual companies are companies whose organizational structure allows them to profit equally successfully from current economic activities (operating activities), and simultaneously engage in research to create new activities through the production of consistent and radical innovations. A group of scientists [2] developed taxonomy for the management process of dual companies in two parameters: 1) a temporary, according to which duality can be consistent and simultaneous; 2) structural, by which an independent and interdependent duality is singled out. Independent duality is carried out within the framework of one business unit. Whereas interdependent duality combines operational activity with innovation, by way of organizing it in different business units; at the same time, these business units may belong to different companies.

The purpose of the research is to determine peculiarities of the management process in dual digging, to identify the advantages of the transformations of classical companies into dual, by developing a model for identifying the key elements of the success regarding the implementation of innovations. To achieve the goal, the following tasks were set:

- study the features of the management process in dual digging;
- propose a model of the process of management in dual digging, taking into account the efficiency of the implementation of innovations;
- identify and systematize the elemental components of the management process in dual digging to ensure the effectiveness of the implementation of innovations.

2. Literature Review and Problem Statement

A large amount of literature is related to the management process in a company, namely: strategic management, which deals in particular with the organizational aspects comprising the manifestation of duality [3], as well as opportunities for the company that are acquired through the introduction of this duality. The author's paper [4] proposes a wide range of mechanisms for achieving duality, but is not disclosed at the expense of what competences of employees are possible to implement. The core of the study is the empirical support of organizational duality. In the literature particular attention is paid to the effectiveness of using the duality strategy in the

company [5], [6], [7]. Attention was paid to the formation of a duality strategy in the company, as well as elements of control affecting efficiency [8]. The author emphasized that organizations would prefer to implement an explorative strategy than to use the duality strategy of the company [9]. Subsequent research showed that for the organization to operate successfully, it is necessary to synthesize strategies in order to achieve the transformation of the company into a dual one [10], [11]. To achieve duality, companies need to improve the process of management and motivation, through management dedication and attracting more resources. The problematic aspect of the work is the lack of managers' desire and motivation to start the transformation process in the company [12]. The authors of the paper consider the theory of dynamic possibilities, in which the main advantage is the resources that influence the company's competitiveness [13]. Taxonomy of organizational duality was developed in two parameters: 1) a temporary one, according to which duality can be consistent and simultaneous; 2) structural, by which an independent and interdependent duality is singled out. The research competence in dual companies is studied in the paper [14].

In the study, the authors conducted research [15] strategies that use dual companies, and highlighted the main areas of products and processes affecting the market situation. The scientists [16] have identified opportunities for achieving lower cost in dual companies. The authors analyzed the prerequisites for the existence of dual companies and argued the need for continuous improvement of existing products and management processes [17]. In the paper [18] the necessity of using dynamic possibilities for transformation from a class company into a dualistic one is substantiated.

3. Research

Failure to achieve breakthrough innovations, and at the same time, make continuous improvement of the existing business so widespread - and so fascinating - that it has become a battlefield for managerial thought. For decades, scientists have unleashed theories to explain the riddle, and they offered advice on how to solve it. Some companies, in fact, were very successful both in using the present and in the study of the future, and when we studied them more closely, we found that they have important characteristics. Taking into account different processes, structures and cultures; at the same time, they maintain close links between divisions at the level of senior executives. In order to flourish in the long run, most companies need to support a variety of innovative efforts [19]. They

have to constantly strive for gradual innovation, with slight improvements in existing products, and operations that enable them to work more efficiently, and to increase value for customers as well. For example, an automaker can often set up a basic engine design to increase power, improve fuel efficiency or increase reliability. Companies have to make architectural innovations, use technological or technological advances to fundamentally change a component or element of their business.

It is also possible to develop this thesis; O'Reilly and Tushnman first introduced innovative flows that they considered to be incremental, discontinuous or architectural. Incremental innovations occur in a well-developed product or industry and lead to a slight improvement in functionality [11]. Continuous innovations usually use new technologies to implement the functionality of an existing product, but in a discontinuous or cardinal way.

We will construct an econometric model for the process of management comprising promising activity directions of dual companies taking into account the risks. The stable development of dual companies suggests the following two goals: maximizing the performance indicators of an enterprise by determining the optimal volumes of investment in various business activities of the enterprise, as well as minimizing the probable deviation from the planned results in the directions of activity [20]. It is advisable to use the quadratic form to determine the dependence of the index of the return on investment of an enterprise on the volume of investments in the directions of the enterprise's activity, as it can be described by the following functional:

$$
Q_{\Sigma} = (1\ q_1 \ldots \ldots q_n) \cdot \begin{Vmatrix} a_{00} & a_{01} & \ldots & a_{0n} \\ a_{10} & a_{11} & \ldots & a_{1n} \\ \ldots & \ldots & \ldots & \ldots \\ a_{n0} & a_{n1} & \ldots & a_{nn} \end{Vmatrix} \cdot \begin{bmatrix} 1 \\ q_1 \\ \ldots \\ q_n \end{bmatrix} \to \max \qquad (1)
$$

in which $Q\Sigma$ - index of the return on investment of the enterprise, relative to unit;

a_{ij} are indicators of a quadratic form that satisfy the condition aij = aji and are determined on the basis of correlation-regression analysis of statistical data of the enterprise's activity, 1 / UAH.2;

– the vector (l; q_1; q_2; ... .q_n) consists of an auxiliary unit of measurement and an unknown investment volume q_1; q_2; ... .q_n, UAH, n - number of directions of activity of the enterprise, units. The objective function (2) determines the dependence of the return on investment of the dual company on the volume of investing in the activities, i.e.

The problem is reduced to the definition of unknowns {q_1} (_i = 1 ^ K). Typical additional constraints for this task are available investment volumes and the like. In order to ensure maximum

stability through the activities of the dual company it is expedient to minimize the possible divergence of the indices of the return on investment in the directions of the enterprise's activities. In this case, it is advisable to use the properties of the covariance analysis, which is used in the planning and statistical processing for the results of experiments as a way to reduce the error of the experiment, which cannot be directly measured. On the whole, the task of minimizing risk-based uncertainty in an integrated form across all declared directions of a dual company can be reduced to finding a minimum of a quadratic functional:

$$
v^2 = \frac{1}{\|q^2\|}(q_1 \ldots \ldots q_n) \cdot \begin{Vmatrix} \tilde{v}_{11} & \ldots & \tilde{v}_{ln} \\ \ldots & \ldots & \ldots \\ \tilde{v}_{n1} & \ldots & \tilde{v}_{nn} \end{Vmatrix} \cdot \begin{bmatrix} q_1 \\ \ldots \\ q_n \end{bmatrix} \to
$$
min $\qquad (2)$,

in which V^2 is a functional that determines the magnitude of the spread of indices of the return on investment by activity direction,

v_{ij} is a modified coefficient of covariance, which is calculated by the formula:

$$
^{\wedge}\tilde{v}_{ij} = \frac{cov_{ij}}{\bar{Q}_i \times \bar{Q}_j} \cdot \tilde{Q}_k \begin{cases} \overline{Q_k, \bar{Q}_k} \geq Q_k^{const}; \\ Q_k^{const}, Q_{k,} \leq Q_k^{const}; \end{cases} \qquad (3)
$$
$$
cov_{ij} = \frac{\sum_{k=1}^{k}((\bar{Q}_i - \bar{Q}_{i.k}) \times (\bar{Q}_j - \bar{Q}_{j.k}))}{k-1};
$$
$$
\|q^2\| = \frac{(\sum_{j=1}^{n} q_i^2)}{n},
$$

Q_k^{const}- is a predetermined amount of profitability of investments, less than this value is insignificant for dual companies, UAH,

$\bar{Q}_i = \frac{1}{n} \sum_{k=1}^{n} Q_{ik}$, - the average value of the return on investment in the i-th direction of the dual company, UAH;

$\{\bar{Q}_i = Q_{ik}{}_{k=1}^{K}\}$ - data of statistical research on the index of profitability of investments in the i-th line of activity, vst.ed .;

k - number of points of statistical observation, units.

To determine the optimal structure of investment in the development of the innovative direction of the dual company, it is proposed to apply such a functional:

$$
F = \frac{Q_{max}}{v^2}, \to max, \qquad (4)
$$

in which F is a functional which logically combines the requirements of maximizing the functional Q_max and minimizing v ^ 2, whose calculation formulas are given respectively in formulas (1) and (2).

Functional F given in (4) displays the cumulative dependence of maximizing the generalized index of return on investment and minimizing the average scatter of private indicators in the areas of innovative

activity of a dual company. Thus, the two-criterion problem is reduced to a single-criterion one, for the solution of which it is recommended to use the method of convex nonlinear programming in a limited range of admissible values. Thus, the two-criterion problem is reduced to a one-criterion, for which solution it is recommended to use the method of convex nonlinear programming in a limited domain of admissible values.

In order to find the optimal value of the functional F in (4), it is recommended to use the following algorithm:

1. Collection and processing of statistical data on the enterprise under study for investing in certain areas of the innovation activity within the dual company and, accordingly, the income received.

2. The construction of the quadratic functional Q_Σ, given in (1), for calculating the return on investment of an enterprise depending on the volume of investment in the directions of its activity. To determine the unknown coefficients of the desired multifactorial equation, we have to apply the classical methods of correlation-regression analysis in the collected statistical data.

3. Construction of the quadratic functional $v \wedge 2$, given in (2), for estimating the spread of the indices of the return on investment in the directions of the enterprise's activity, for which the matrix of covariance is calculated on the basis of the collected statistical data.

4. Find the maximum of the functional F given in (4) by applying an iterative optimization algorithm, namely, the gradient method of the fastest descent.

Table 1. Results of innovation activity of the dual company "Regional Clusters ICC" for 2004-2018

Indicators		Volume of investments in I-th direction, thousand UAH	Volume of investments in II-th direction, thousand UAH	Profit in the first direction, thousand UAH	Profit in the first direction, thousand UAH
Year	2004	395,9	678,7	14,9	266,4
	2005	508,2	564,7	193,2	27,1
	2006	481,1	841,9	106,5	536,7
	2007	963,8	783,1	766,8	413
	2008	813,8	871,9	652	630,2
	2009	987,4	603,4	681,8	140,4
	2010	360	1020	-61,5	835
	2011	720,9	961,2	509,9	752,7
	2012	601,1	1322,4	309	824,2
	2013	864,9	1383,9	701,3	513,6
	2014	1012,3	1250,5	764,7	890,5
	2015	1045,3	1045,3	627,9	852
	2016	1322	1081,7	240,7	897
	2017	1170,4	1114,7	405,5	865
	2018	1204,9	1385,6	585,6	706,2

Source: compiled by the authors

An example of the calculation for the dual company "Regional cluster MCC" is presented for two innovative directions of the dual company. For calculation, the statistical data on two directions of activity within the enterprise for 2002-2016 were used, corrected by the level of inflation in accordance with the last year of observation. In the case of considering only two innovative directions of the activity of a dual company, functional can be represented by the formula:

$$F = \frac{a_{00}+2a_{01}q_1+2a_{02}q_2+a_{11}q_1^2+2a_{12}q_1q_2+a_{22}q_2^2}{(\tilde{v}_{11}q_1^2+2\tilde{v}_{12}q_1q_2+\tilde{v}_{22}q_2^2)\Big/(q_1^2+q_2^2)} \to max, \qquad (5),$$

in which F is the functional calculated according to the statistical data of Table 1, q_1, q_2 - volume of investments in two innovative directions of activity of the dual company. According to the algorithm discussed above, the calculation of the coefficients of the functional F:

$$F = \frac{-1{,}979501+0{,}25607q_1+0{,}036732q_2-0{,}000138q_1^2-0{,}000045q_1q_2-0{,}000174q_2^2}{(q_1^2\pm0{,}1838q_1q_2+q_2^2)\Big/(q_1^2+q_2^2)} \to max, (6)$$

Additional limitations of the task reflect the requirements for investment volumes; $125 \le q_1 \le 500$; $250 \le q_2 \le 625$; $q_1+q_2 \le 1000$.

The application of the gradient method for the fastest solution to the problem of conditional optimization allowed us to obtain the following results: the maximum value of the functional F = 1.82, the profitability index of investments in the innovation of the dual company is 0.77, the recommended volumes of investments in the first direction make 427.9 thousand UAH, and in the second 522.6 thousand UAH. It should be noted that the above approach can be moved to a number of similar tasks, for example, to optimize the profit of the enterprise. This approach is used to optimize the choice of the main directions of innovation in the dual company "Regional cluster MCC", which will ensure an increase in revenue by an average of 3.2%. The application of the proposed efficiency criterion (4) for various tasks of choosing optimal solutions under uncertainty conditions shows that the proposed approach is effective.

The management of dual enterprises using the simulation of system transformations at bifurcation points combines the two main mechanisms, such as: the loss of the system of stability and resttabilization, that is, the fixing of a new steady state. The mechanism of the loss of a system of stability can be initiated by such factors as exceeding certain critical levels of permissible loads, narrowing the field of possible solutions to effective work, reducing the threshold level of adaptability of the system, and the like [21]. At the point of bifurcation, the potential of enterprise growth is completely exhausted. At this

moment, it is necessary to transform the enterprise, which ensures its transition to a new quality state. System transformation is associated with the transformation of traditional stereotypes of behavior or outdated organizational structures and the formation of new ones. The classical bifurcation model is graphically represented as a diagram in Fig. 1, where the dependence of the indicator of the activity of the enterprise F on time t is reflected.
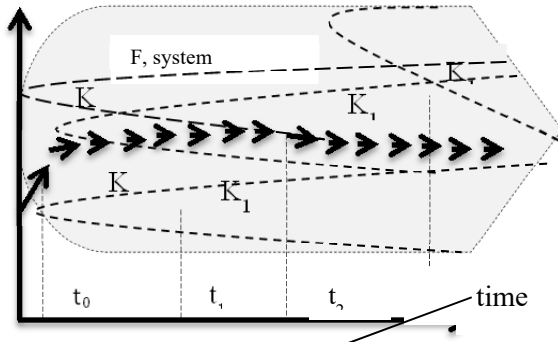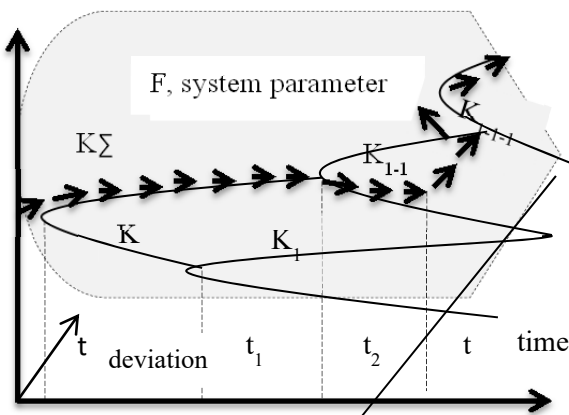

Probable path of development

Figure 1. Bifurcation diagram of the development of dual enterprises (Source: compiled by the authors)

In practice, the process of self-organization of a dual enterprise is able to bring the enterprise out of a negative path of development. The key factors that intensively use the process of managing dual-business enterprises at such critical times are the ability of the enterprise to adapt to innovate transformations. The spatial bifurcation model of the enterprise development is shown in Fig. 2.

The entered parameter of the system F reflects the level of direction for the final result and satisfaction with regards to the specific needs of the consumer. At bifurcation points, we observe branching directions of development, that is, there is ambiguity in one case, synergistic growth of the efficiency of management by dual enterprises is possible, and in the other, its degeneration.

Probable path of development

Figure 2. Spatial bifurcation control model of a dual enterprise (Source: compiled by the authors)

At present, the enterprise appears before the elaboration of development trajectories and should be consolidated in a new direction. The ups and downs characterize the figurative nature regarding the development of dual enterprises, and the upper and lower "points of inflection" cover the period of change in each cycle. However, in practice, after passing the point of bifurcation, both the increase in the efficiency of the company's activity and degradation are possible. A synergistic effect arises at the point of bifurcation or at the points of intersection of two cones. The development of the enterprise on the upper part of the cone can be interpreted as a positive synergetic effect of the development, on the lower one - negative. The most effective way to accelerate organizational processes is to choose the optimal path for the development of a dual enterprise.

When it came to launching revolutionary products or services, dual companies were much more successful than the other three structures. Although none of the cross-functional or unsupported teams and only a quarter of the functional projects have led to real innovation, more than 90% of dual-purpose companies have achieved their goals. The exception was breakthrough innovations intended for direct replacement of existing products; in these cases both functional and double structures were performed.

Five principles are formulated in order to help and promote the development of a dual company: the visualization of aspirations, which connects emotionally; iteration and interaction with the organization for the creation and development of the strategy; experiments and tests affecting the study of external and internal factors contributing to growth; top-down and bottom-up engagement, which contributes to stimulating the upgrade; allocating resources, time and effort to upgrade.

4. Conclusion

As a result of the study, it can be concluded that the implementation of digitalization into the activities of enterprises is rather slow, and it should be accompanied by the formation of new knowledge bases and the development of such innovations. Indisputably, industrial enterprises regarding the economically developed countries are more adaptable to the conditions of the fourth industrial revolution, since they open up possibilities for radical modernization production, and, consequently, the economy. Up to the present time, enterprises assume stable development of dual companies as the achievement of the following two goals: maximizing the performance indicators of an enterprise by determining the optimal volumes of investment in

various business activities of the enterprise, as well as minimizing the probable deviation from the planned results in the directions of activity. It is advisable to use the quadratic form to determine dependence of the index of return on investment within the enterprise on the volume of investments in directions of the enterprise, which can be described by the following functional. At the same time, the management of the company is protected from distracting factors, and they are engaged in launching new enterprises; they can continue to concentrate all their attention and energy on improving their activities, improving their products and servicing their customers.

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