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BUSINESS PROCESS REENGINEERING IN THE CENTRALIZATION OF THE INDUSTRIAL ENTERPRISES MANAGEMENT

The main approaches to reengineering of business processes on the basis of centralization are generalized in the article. It is made the characteristic of advantages of its application at industrial enterprises. It is suggested the stages of reengineering for Ukrainian industrial enterprises. The role of re-engineering of business processes to increase efficiency of work organization on the example of JSK “Concern-Electron” is discussed (generalized approach to centralizing management of the industrial enterprise, algorithm of the centralized management of business processes, which involves identifying of business processes that are duplicated; the range of business processes for reengineering using the theory of fuzzy sets; decision-making on reengineering.

Keywords: re-engineering, business process, centralization, fuzzy set theory, management decision.

Statement of the problem in general. One of the important strategic directions of powerful independent state with a stable economy is the development of national economy, which requires the use of new upgraded tools that will enable to redesign and improve production and management activities of the enterprise and make it more productive and competitive, while providing the economy of financial, labor and other resources. However, this presupposes the use of partial restructuring and in some cases complete restructuring of business processes. In a globalized, noticeably more active processes of integration and consolidation of businesses that are important components of the modern global economic system and affect all areas of public life and development. Particular attention should be paid to the integration of processes of Ukrainian industrial enterprises, the most dynamically developing and has a significant impact on the relations between economic entities, the state of national consumer market, addressing the economic problems of society [1]. It is clear that so-called consolidation companies should provide financial opportunities for introduction of new technology and to ensure the highest resource savings through economies of scale. That is why in this period of unprecedented severity is the problem of adjustment as organizational structures and business processes in order to avoid duplication, saving labor and financial resources, increase of adapting production to changing market environment. The obvious is the need to introduce technology “profiling” business, one way of implementation of which is re-engineering of business processes in centralized management. Re-engineering is based on decentralization which reduces the risk associated with changes in technology or buying preferences, increases organizational flexibility and efficiency of decision-making, develops and reduces time to market for new products, reduces costs of coordination, allows the

1 Original data of the article: Чухрай Н.І. Реінжиніринг бізнес-процесів у централізації управління промисловим підприємством / Н.І. Чухрай, С.І. Матвій // Маркетинг і менеджмент інновацій. – 2015. – №3. – С. 172-181
company to focus on core business. In addition, it achieves organizational and management advantages, namely to reduce the size of the enterprise to more manageable level, to reduce staff, get rid of non-core functions that burden.

**Analysis of recent researches and publications.** The study of the nature and importance of re-engineering is initiated by M. Hammer and J. Champy [13] and was further developed in the works of foreign scientists (T. Davenport, M. Robson, D. Harrington, D. Short, A. Scheer, I. Jacobson) who proposed the concept of reengineering, adapting it to modern market requirements [2]. In turn, Ukrainian scientists are working on developing methodological approaches (O. Amosha, V. Andriienko, A. Bulieiev, A. Voronkov, L. Kuzmin, I. Melnyk, O. Trydid, V. Tupkalo, V. Khobta, A. Cherep, M. Chernenko) [2]. Different aspects of business process reengineering are explored in works of A. Kozachenko [8], O. Vinohradov [14], D. Harrington [12], O. Lysenko [7], V. Komandrovska [11], L. Fedulova [9], Yu. Kulyk [10].

**Unsolved questions which are the part of general problem.** However many problems associated with the process of re-engineering of business processes in domestic industry, are not sufficiently investigated. The main reason for this phenomenon is the lack of full theoretical and methodological developments in this sphere. In addition, the problem is not investigated by specific algorithm of enterprise restructuring and reengineering role in this process, an alternative mechanism for selecting business processes whether to centralize or outsource to transfer. Thus, insufficient degree of development of the subject, it is undeniable practical importance for the Ukrainian economy in modern terms the relevance of subjects led the study.

**The aim of the article** is the research of characteristics of business process reengineering at domestic enterprises and developing of algorithm procedures for business processes centralizing on the example of JSK “Concern-Electron”. To achieve this goal the following research objectives were stated:

- to summarize the main approaches to re-engineering of business processes on the basis of centralization;
- to characterize the main stages of re-engineering at industrial enterprise;
- to propose a mechanism of choice ancillary business processes for re-engineering;
- to identify the algorithm of centralization of business processes.

The theoretical basis of scientific research is the works of domestic and foreign scientists, materials, periodicals, financial and management reports of enterprise and Internet resources. The following methods were used: synthesis, systematization, comparative analysis and synthesis.

**Main material.** Today more than half of modern foreign companies use reengineering for at least one business process. Reengineering in Ukraine is at an early stage of development and affects mainly the processes of IT market and restructuring of business entities, as evidenced by the analysis of scientific sources. Business process reengineering is a fundamental rethinking of business processes to achieve significant improvements in the key for modern business performance indicators like cost, quality, service and efficiency [3].

Reengineering in Ukraine has specific features associated with historical features of economic development of post-socialist countries reached domestic enterprises from administrative-command system of economic management. The organizational structure of most Ukrainian companies, regardless of industry sector and legal status, was directed to production; established hierarchical, authoritarian governance, opaque and often inadequate monitoring system that negates motivation. Disadvantages of this structure lie in [4]:

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- inconsistency of plans realities;
- difficulty adapting to environmental changes;
- difficulty of maintaining of the quality required by customer;
- duplication of functions of various departments, resulting in increased overhead and delay of decision-making.

However, in terms of complexity and dynamics of market processes the problem of rapid adaptation of business structures, including through major re-engineering of business and technological processes is actualized. That’s why the study of modern tools of business process of re-engineering at domestic enterprises is important.

The purpose of centralized management industry now is to eliminate possible duplication of different functions, ability to reduce to a single standard for all operations within organization, better control over the activities of organization, effective use of personnel, equipment, production facilities, introduction of computerization and mechanization of processes. The proposed algorithm is developed for centralization of management of business processes support of JSK “Concern-Electron”. It contains the following stages:

1. Identification of supporting business processes of JSK “Concern-Electron” which are duplicated at the enterprises of Concern.
2. Selecting of business processes for re-engineering basing on centralization, using the theory of fuzzy sets.
3. Management decisions on re-engineering of supporting business processes at JSK “Concern-Electron”.

Let’s reveal the essence of each stage:

1. Identification of supporting business processes of JSK “Concern-Electron” that are duplicated. We analyzed all business processes of JSK. The results of this analysis are shown in Table 1. As you can see from Table 1, the most recurring supporting business processes of JSC “Concern-Electron” are such as flow management, software, accounting, security services, current repairs and maintenance of equipment, repair and construction work, cleaning of premises and territories, provision of stationery.

2. Selecting business processes for re-engineering basing on centralization, using the theory of fuzzy sets. The criterion of functioning of enterprise in the language of fuzzy set theory has the form of maximizing the degree of efficiency of administrative decisions [5].

The algorithm of selection of auxiliary business processes of JSK “Concern-Electron” for reverse engineering using fuzzy sets can be represented as a sequence of the following stages: generation of vector patterns of readiness for reengineering supporting business process basing on the principles of centralization; formation of the vectors of the readiness of business processes for re-design on the principles of centralization; definition of indices of fuzziness for each auxiliary business processes; selecting according to the criterion of supporting business processes for reengineering on the basis of centralization.

The choice of this particular combination of components selection criteria reflects the most characteristic prerequisites for ensuring support of business processes and requirements generally accompany the activity of enterprises included at JSK “Concern-Electron”.

The study found that structure is ready for re-engineering supporting business processes on the basis of centralization:

\[
\mu_p (K) = (1 \ 0,8 \ 0,7 \ 0,6 \ 0,7),
\]

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where positionally economically justified reflection of requirements of the components of selection criteria for reengineering supporting business processes on the basis of centralization. In this case it means: cost savings – 1 (the highest); quality assurance perform business process – 1 (the highest); the availability of qualified specialists is 0,8 (above average); the use of technology – 0,7 (above average); the availability of labor is 0,6 (not much above average); ensuring the controllability of the process at the level of JSK“Concern-Electron” is 0,7 (above average). The results of selection algorithm steps of auxiliary business processes of JSK “Concern-Electron” for reengineering based on centralization is presented in Figure 1.

Table 1 – Identification of duplication of auxiliary business processes of JSK “Concern-Electron” (developed by authors)

<table>
<thead>
<tr>
<th>Enterprise</th>
<th>Coordination of national, inter-sectoral and sectoral programs</th>
<th>Introduction of accounting documents and software</th>
<th>Security activities</th>
<th>Current repair and maintenance of equipment</th>
<th>Repairs and building work</th>
<th>Product sales</th>
<th>Recycling products</th>
<th>Providing specialized training</th>
<th>Cleaning of apartments and territories</th>
<th>Provision of stationery</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Scientific research company “Karat”</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>2. LLC JV “Electrotrans”</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3. Factory “Electronmash”</td>
<td>–</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>4. Television plant “Electron”</td>
<td>–</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>5. JV LLC “Sferos-Electron”</td>
<td>–</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>6. Plant “Polimer-Electron”</td>
<td>–</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>7. Financial and leasing company “Electron-leasing”</td>
<td>–</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>8. LLC “Zavod Electronpobutylad”</td>
<td>–</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>9. Special design bureau “Tekon-Electron”</td>
<td>–</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>10. Consumer food company “Electron”</td>
<td>–</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>8</td>
<td>7</td>
<td>1</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

In our opinion, it is necessary to consider the following elements of the selection criteria for reengineering supporting business processes at JSK “Concern-Electron”: cost savings, quality assurance of work; availability of qualified staff; the use of technology; availability of...
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labor; control of the process at the level of JSK “Concern-Electron”.

**Step 1**
Vector formation of the structure of readiness to support re-engineering business process basing on centralization

**Step 2**
Formation of vectors of readiness of business processes for re-engineering on the principles of centralization:

- \( \mu_1(K) = (1, 0.7, 0.7, 0.6, 0.6) \) – document management and software;
- \( \mu_2(K) = (1, 0.9, 0.8, 0.7, 0.5, 0.7) \) – accounting;
- \( \mu_3(K) = (0.9, 0.8, 0.7, 0.6, 0.5, 0.7) \) – security activities;
- \( \mu_4(K) = (0.8, 0.6, 0.4, 0.5, 0.5) \) – current repair and service of equipment;
- \( \mu_5(K) = (0.8, 0.7, 0.6, 0.4, 0.5, 0.5) \) – repair and construction works;
- \( \mu_6(K) = (0.7, 0.6, 0.5, 0.4, 0.5, 0.5) \) – cleaning of rooms and territories;
- \( \mu_7(K) = (0.9, 0.8, 0.8, 0.7, 0.5, 0.7) \) – recruitment

**Step 3**
Ambiguity indices definition \( v(C) = d(IP, K) / N \)
For each of ancillary business processes we have:

- \( v(C_1) = 0.68 \);
- \( v(C_2) = 0.77 \);
- \( v(C_3) = 0.7 \);
- \( v(C_4) = 0.57 \);
- \( v(C_5) = 0.58 \);
- \( v(C_6) = 0.55 \);
- \( v(C_7) = 0.73 \)

**Step 4**
Selection by the criteria of ancillary business processes for re-engineering basing on centralization:

\[ f(i) = \max_j v \]

- \( v(C_1) = 0.77 \);
- \( v(C_2) = 0.7 \);
- \( v(C_3) = 0.73 \).

*Figure 1 – The algorithm of selection of auxiliary business processes of JSK “Concern-Electron” for reverse engineering using fuzzy sets (developed by authors)*

3. Management decisions on re-engineering supporting business processes of JSK “Concern-Electron”.

For JSK “Concern-Electron” it is proposed three managerial decisions on re-engineering of some support functions (accounting, security, recruiting). Maintenance of accounting requires 295102,56 UAH for 1 year (Table 2) and it is only in the parent company. Also it should be noted that JSK “Concern-Electron” each subsidiary has its own accounting department, so the costs are much more. So it is proposed to create Joint service center (JSC) and to translate the accounts of all companies in the group to service this center.

It is established that the throughput of JSK is determined by the number of employees of the JSC in carrying out accounting functions, and their load (the number of processed documents in a certain period of time), and the increase in average load of employees, frequency of mistakes that they make. Ensuring optimal throughput of the JSC has to do with finding a balance between the need to reduce costs to process a single document (to minimize the number of employees) and the need to ensure proper quality of functioning of JSC (to minimize the number of errors) [6]. To solve the problem of calculating the optimum load of the proposed scientific and methodical approach, brought to the level of the corresponding optimization economic and mathematical model, which allows to take into account the dependencies between error rate and number of processed staff documents to determine

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the optimal number of personnel of JSC, which is employed in performing accounting functions and, accordingly, the load on one worker [6]. Calculation of the economic effects given in Table 3.

Table 2 – Calculation of annual expenditure for the maintenance of accounting at JSK “Concern-Electron”

<table>
<thead>
<tr>
<th>Article of Cost</th>
<th>Monthly calculation of the budget of the accounting department, UAH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>chief accountant (1 person)</td>
</tr>
<tr>
<td>Pay of job</td>
<td>4 540</td>
</tr>
<tr>
<td>Deductions to social funds (%)</td>
<td>1 643,48</td>
</tr>
<tr>
<td>Depreciation of computer and office equipment</td>
<td>86</td>
</tr>
<tr>
<td>Total expenses (per month)</td>
<td>6 269,48</td>
</tr>
<tr>
<td>Total cost (per year)</td>
<td>75 233,76</td>
</tr>
<tr>
<td>Total cost</td>
<td>295102,56</td>
</tr>
<tr>
<td>Total processed documents for 1 year</td>
<td>6 879</td>
</tr>
<tr>
<td>The average cost of processing a single document</td>
<td>42,9</td>
</tr>
</tbody>
</table>

Table 3 – Calculation of the annual economic effect from re-design of the accounting functions on the basis of JSC “Concern-Electron”

<table>
<thead>
<tr>
<th>Index</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total processed document, price</td>
<td>311 316</td>
</tr>
<tr>
<td>The average cost of processing a single document for the redesign, UAH</td>
<td>34,5</td>
</tr>
<tr>
<td>The average cost of processing a single document after the redesign, UAH</td>
<td>23,77</td>
</tr>
<tr>
<td>Actual expenditures, thousand, UAH</td>
<td>10 740,4</td>
</tr>
<tr>
<td>Estimated costs without redesign, thousand, UAH</td>
<td>7 399,98</td>
</tr>
<tr>
<td>The cost of establishing SPCS and the transfer of functions, thousand, UAH</td>
<td>2 201</td>
</tr>
<tr>
<td>The total economic effect, thousand, UAH</td>
<td>1 139,42</td>
</tr>
</tbody>
</table>

Below is the final result of centralization of Concern management (Figure 2). Calculations using the theory of fuzzy sets has shown that the most viable options for reengineering supporting business processes at JSK “Concern-Electron” on the basis of centralization of accounting, security services and security recruitment. In order of priority and importance above all is to change the project such subsidiary is a business process like accounting. The results of the research should establish Joint service center for all subsidiaries of JSK “Concern-Electron”. Security services would be outsourced.

In addition, it will provide a re-design of accounting on the basis of centralization and the Joint service center that, in turn, has the following advantages [6]: control of the process; no risk of losing access to the implementation of accounting functions or control thereof; minimization of the risk of confidential information disclosure; the possibility of introducing common standards of implementation of accounting functions; the ability to improve
the process of implementation of accounting functions both at the level of the JSC and at the enterprise level; minimizing of organizational resistance in the implementation process; possibility of long-term planning; facilitating the integration of new companies.

Conclusions. On the basis of theoretical researches generalization and own author approaches the algorithm for the centralized management of business processes of industrial enterprise, which provides: identification of supporting business processes that are duplicated; the choice of auxiliary business processes for re-engineering basing on centralization, using the theory of fuzzy sets. It is developed mechanism of acceptance of administrative decisions on reengineering supporting business processes at JSK “Concern-Electron”. These achievements can be used as a basis for further research, namely: should focus on the development of mechanism for alternative selection of business processes for centralization, outsourcing and so on, and also the implementation of activities at modern industrial enterprises.


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Section 4 Problems of Management of Innovation Development


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