Methodological Foundations Of Flexible Management And Assessing The Flexibility Of An Enterprise Economic Security System

L. Liubokhnets, Ye. Rudnichenko, I. Dzhereliuk, O. Illiashenko, V. Kryvdyk, N. Havlovsk

Abstract: Minimizing the negative impact of destabilizing factors necessitates the use of various approaches and methods that allow enterprises to successfully resist them and develop steadily. An effective tool to minimize this negative impact is the introduction of a flexible management methodology for the organization as a whole and the economic security system in particular. The article explores the specifics and features of the use of flexible management methodologies that were used by enterprises in 2014 - 2018. The interconnection of lean manufacturing methodologies and flexible management methodologies is presented, which explains their adequacy to the requirements of ensuring the economic security of enterprises. A scientific and methodological approach to assessing the flexibility of the economic security system of an enterprise is proposed, which allows management of enterprises of different industries and forms of ownership to use it.

Index Terms: economic security, management methodology, flexible management, assessment, risk, economic security system

1. INTRODUCTION
The functioning of enterprises in modern conditions is unquestionably associated with the dangers, threats and risks of internal and external environment that determine the conditions for their activities and are directly reflected in economic security. The constant search for ways to eliminate destabilizing factors necessitates the use of various approaches and methods that will allow enterprises to successfully resist them and develop steadily. One of these management approaches is the so-called “flexible management” of the enterprise, which allows to quickly respond and withstand challenges and threats. And this "flexibility" should be applied when managing not only the enterprise, but also the economic security system. A significant number of scientists were engaged in the study of the economic security system, in contrast to the flexible management of an enterprise economic security system.

1) transparency and cooperation - team constantly exchanges information, knowledge, problems, etc. between its members;
2) team autonomy and high level of interaction between its members - team members are endowed with broad powers and make decisions themselves in the course of the project;
3) motivation by result and readiness for changes - all team members see their and common achievements every day, which stimulates them to better work on a project;

Among the publications of Ukrainian authors covering this topic, we can single out the researches by Havlovsk N.I. [8], [9], [10], Hryhoruk P. [12], Vasyltsiv T.H. [33], [34], Kozachenko H.V. Pohorelov Yu.S. [15], [17], Rudnichenko Ye.M. [21], [22], [23], [35], et al. Foreign approaches to the functioning of the economic security system were studied in [5], [13], [14].

However, in most studies, the authors do not pay attention to methodologies that can be used to determine the flexibility of an enterprise economic security system.

2. METHODOLOGY
The introduction of flexible management in an organization activity is based on the application of certain methodologies that require description and explanation. And given that the basis of the vast majority of the proposed methodologies is the effective practical experience of their use, it is worth considering which methodologies have been used by enterprises during 2013-2018 (Table 1). The methodologies used in an organization activity (Table 1) are divided into two groups: lean manufacturing methodologies and flexible management methodologies. As the data in Table 1 shows, the Scrum methodology is used most often in the practical activities of enterprises when introducing flexible management, from 55% to 58%, depending on the years of research. Such a high percentage of Scrum in practice is explained by its advantages, namely:

- L. Liubokhnets. Head of the Department, Khmelnytsky National University, Department of Economic Theory, Khmelnytsky, Ukraine.
- Ye. Rudnichenko. Professor, Khmelnytsky National University, Department of Management, Administration and Hotel & Catering Industry, Khmelnytsky, Ukraine. Corresponding author: E-mail: e.m.rudnichenko@gmail.com.
- Dzhereliuk, Professor, Kherson National Technical University, Department of Management and Marketing, Kherson, Ukraine.
- O. Illiashenko. Professor, O.M. Beketov National University of Urban Economy, Department of Financial and Economic Security, Accounting and Auditing, Kharkiv, Ukraine.
- V. Kryvdyk. Postgraduate student, Khmelnytsky National University, Department of Management, Administration and Hotel & Catering Industry, Khmelnytsky, Ukraine.
- N. Havlovsk. Professor, Khmelnytsky National University, Department of Management, Administration and Hotel & Catering Industry, Khmelnytsky, Ukraine.
TABLE 1.
Flexible management methodologies applied by enterprises during 2014-2018, % [28], [29], [30], [31], [32]

<table>
<thead>
<tr>
<th>Years</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scrum</td>
<td>56%</td>
<td>58%</td>
<td>58%</td>
<td>56%</td>
<td>54%</td>
</tr>
<tr>
<td>Scrum/XP Hybrid</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>14%</td>
<td>14%</td>
</tr>
<tr>
<td>Custom Hybrid</td>
<td>8%</td>
<td>8%</td>
<td>8%</td>
<td>6%</td>
<td>8%</td>
</tr>
<tr>
<td>ScrumBan 6%</td>
<td>7%</td>
<td>8%</td>
<td>8%</td>
<td>ScrumBan Hybrid 8%</td>
<td>10%</td>
</tr>
<tr>
<td>Kanban 5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Iterative Development</td>
<td>4%</td>
<td>3%</td>
<td>5%</td>
<td>Kanban 5%</td>
<td>5%</td>
</tr>
<tr>
<td>Lean Development</td>
<td>2%</td>
<td>3%</td>
<td>3%</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Other methodologies 2%</td>
<td>Lean Development 2%</td>
<td>Lean Development 1%</td>
<td>Spoty model 1%</td>
<td>Lean Startup 2%</td>
<td></td>
</tr>
<tr>
<td>Agile Modeling 1%</td>
<td>Agile Modeling 1%</td>
<td>Lean Startup 1%</td>
<td>Lean Startup 1%</td>
<td>XP 1%</td>
<td></td>
</tr>
<tr>
<td>Feature driven development 1%</td>
<td>Feature driven development 1%</td>
<td>Feature driven development 1%</td>
<td>XP 1%</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Agile Unified Process 1%</td>
<td>XP 1%</td>
<td>DSDM/ Atern 1%</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>DSDM/ Atern 1%</td>
<td>Agile Unified Process 1%</td>
<td>XP 1%</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>XP 1%</td>
<td>–</td>
<td>Agile Unified Process 1%</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
</tbody>
</table>

1) minimization of market risks - due to direct interaction with a customer, a team has the ability to respond to changes in project requirements, which allows both to avoid unnecessary work and also to satisfy customer requirements;
2) minimization of financial risks - financial resources for processing and changes are not lost.

In addition to the Scrum methodology, other methodologies are also used, the relationship of new flexible management methodologies is presented in Fig. 1. The characteristics of the most common methodologies used in practice in the construction and functioning of flexible organizations are given in table. 2. Flexible management is increasingly being introduced into practical activities, and this is due to positive changes in organizations after its implementation.

3. RESULTS
At the first stage, introduction of flexible management approaches and application of the indicated methodologies in practical activities require an assessment of the organization flexibility and identification of problematic issues in their functioning.

Fig. 1. Interrelation of lean production methodologies and flexible management methodologies *
* created by the author using [1], [2], [3], [4], [6], [16], [19], [20], [25], [26], [27]

This is due to the fact that flexible management methodologies, as a rule, are introduced into individual components of an enterprise management system. Bain & Company offers interactive diagnostics to determine a flexibility of organizational management, which includes 12 questions, and allows to determine the coefficient of organization flexibility [11]. Interactive survey data allows to evaluate 4 components characterizing the level of flexible enterprise management, namely:

1) leadership and culture;
2) effectiveness of a flexible team;
3) volume and scale;
4) organization model.

The formation of a flexible system of enterprise economic security is not less important. After all, the tasks of an enterprise economic security system are the timely identification and elimination of threats to the security of business entities, the creation of conditions for an operational response to threats to economic security. Achieving the tasks set is possible due to the adaptive capabilities of an enterprise economic security system directly depends on its flexibility. And despite the fact that any system is developing, it is impossible to talk about its constant equilibrium state, but it is necessary to indicate its more flexible adaptability in such a state.
TABLE 2.

The most common methodologies that can be used to build and operate flexible organizations

<table>
<thead>
<tr>
<th>Methodology name</th>
<th>Developers</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profound Knowledge</td>
<td>W. Deming</td>
<td>A theory of profound knowledge arises in the form of closely related four components, as well as introduction and conclusion. Four components include: understanding the system, understanding the theory of variability, some knowledge in the field of psychology, the basics of knowledge theory</td>
</tr>
<tr>
<td>Kanban</td>
<td>D. Anderson, A. Carmichael</td>
<td>A method that demonstrates what happens during the working process. After having understood it, you can move on to improving tasks and processes</td>
</tr>
<tr>
<td>Lean Startup</td>
<td>E. Ries</td>
<td>Helps to use a scientific approach to build a growing business and avoid unnecessary costs</td>
</tr>
</tbody>
</table>

**LEAN MANUFACTURING METHODOLOGIES**

The New New Product Development Game

<table>
<thead>
<tr>
<th>Methodology name</th>
<th>Developers</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>H. Takeuchi, I. Nonaka</td>
<td>A ‘rugby’ approach—where a team tries to go the distance as a unit, passing the ball back and forth, that is, it is a methodology based on a team-oriented approach, which allows to implement more effective innovations by changing the design and development processes. This holistic approach has six characteristics: built-in instability; self-organizing project teams; overlapping development phases; multi learning; subtle control; organizational transfer of learning</td>
<td></td>
</tr>
<tr>
<td>Scrum</td>
<td>J. Sutherland, K. Schwaber</td>
<td>A framework (a set of basic elements and rules - a kind of framework on which the development process is based), which provides a range of opportunities for productive and creative product development with the highest possible value and solving non-trivial tasks in the process</td>
</tr>
<tr>
<td>Spotify model</td>
<td>Developed by Spotify</td>
<td>A software development framework that allows to scale the principles of flexible management, and the result of a long experiment conducted inside the company</td>
</tr>
</tbody>
</table>

**AGILE MANAGEMENT METHODOLOGIES**

Methodologies for building and functioning of flexible organizations

<table>
<thead>
<tr>
<th>Methodology name</th>
<th>Developers</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystal family of methodologies</td>
<td>A. Cockburn</td>
<td>Used by teams of 5-8 people who are in one place and work on the creation of software systems that are not critical to the lives of users</td>
</tr>
<tr>
<td>Dynamic Systems Development Method, DSDM</td>
<td>Designed by consortium</td>
<td>Independent framework for rapid application development using lessons learned, based on the concept of rapid application development (Rapid Application Development, RAD)</td>
</tr>
<tr>
<td>Design Patterns</td>
<td>E. Gamma, R. Helm, R. Johnson, J. Vissides</td>
<td>Based on software engineering, describes a design pattern. Design patterns can be divided into three groups: Creational Patterns, Structural Patterns and Behavioral Patterns</td>
</tr>
<tr>
<td>Feature driven development, FDD</td>
<td>J. De Luca, P. Coad</td>
<td>Represents an attempt to unite methodologies that are most recognized in the software development industry. They take as a basis an important functionality (properties) of a software developed for a customer. The main goal of this methodology is to develop real, working software systematically on time</td>
</tr>
<tr>
<td>Adaptive Software Development, ASD</td>
<td>J. Highsmith, S. Beyer</td>
<td>It is a software development process that was invented during the rapid development of applications. They proposed three phases of the life cycle: 1) speculation; 2) cooperation; 3) training. The methodology is based on the conceptual basis of the theory of complex adaptive systems</td>
</tr>
<tr>
<td>eXtreme Programming, XP</td>
<td>K. Beck</td>
<td>The main goal of the methodology is to take into account the changing requirements that are constantly changing for software products and to improve the quality of their development. It is built around four processes: coding, testing, design, and listening. In addition, extreme programming has such values as simplicity, communication, feedback, courage and respect</td>
</tr>
</tbody>
</table>

Regarding the adaptation of the economic security system of the enterprise, it is worth adding that the presence of crisis phenomena in the economy as a whole, rapid changes in the fiscal sphere, and a significant deficit in the state budget determine the creation of an unfavorable external environment for the functioning of enterprises due to the "pressure" of institutional structures. In such a situation, the adaptation of medium and small businesses in Ukraine today resembles the situation of the classic Darwinian idea of "struggle for survival". All this necessitates determining the flexibility of an enterprise economic security system. To determine the flexibility of an enterprise economic security system, it is necessary to obtain an assessment of each parameter characterizing its flexibility. So, parameter $p_i$ (so far, without its real assessment) has weight $\lambda_i$. For the weight $\{\lambda_i\}_{i=1}^n$, which should be found for the given parameters, we put the following properties:

$$\sum_{i=1}^n \lambda_i = 1, \lambda_i > 0 \text{ for all } i = 1, n$$

(1)

The given characteristics are a condition of standardization (reduction of weights to a single interval). Thus, instead of direct $i$-th parameter of $p_i$, we should consider the weighted parameter $\tilde{\lambda}_i p_i$. Further we will denote the estimate of the parameter $\tilde{\lambda}_i p_i$ as $s_i$. Unlike the parameter $p_i$ as an abstract category, the value $\tilde{s}_i$ is a normal estimate (a true nonnegative number) of that category. Therefore, the estimate of the weighted parameter is the product $\tilde{s}_i \tilde{\lambda}_i$:

$$\sum_{i=1}^n \tilde{s}_i \tilde{\lambda}_i$$

(2)

To determine the level of flexibility of an enterprise economic security system, it is necessary to obtain estimates of the parameters $\{\tilde{s}_i\}_{i=1}^n$ together with their weights $\{\tilde{\lambda}_i\}_{i=1}^n$. While the weights can still be taken equivalent, parameter estimation is a non-trivial process that requires the strengthening of two components: determining a list of parameters characterizing the flexibility of an enterprise economic security system and introducing a team of qualified experts. Determining the list of parameters characterizing the flexibility of an enterprise economic security system is possible by adapting the Bain & Company interactive survey to determine the flexibility of organizational management. An analysis of the work of domestic and foreign scientists on economic security issues
allows us to conclude that flexibility is one of the key principles in building an economic security system at an enterprise. Namely, the principles are the basis for the formation of determining characteristics and parameters of the economic security system. The determination of the flexibility of the economic security system of an enterprise should be carried out in 2 directions:

1) parameters characterizing the flexibility of the economic security system as a whole;
2) parameters characterizing the flexibility of the components of the economic security system.

Determining the flexibility of the economic security system will allow us to determine its adaptive capabilities to changing environmental conditions and to identify the problematic issues on the basis of the obtained results and to determine the ways of their elimination. We plan to evaluate the parameters characterizing the flexibility of the economic security system of the enterprise in the following way - the estimates will be discrete, as this is the most common practice for a quick obtaining reliable estimates with a high degree of expert coordination. The number and composition of expert groups that will conduct the examination will not be changed while it is as possible. Let Q denote the number of experts. They should evaluate both the parameters characterizing the flexibility of the economic security system and their respective weights. We determine the weight $\lambda_i$ and the estimate of the parameter $s_i$ on the basis of the corresponding (acceptable) estimate $w_i$ of this weight. The weights of the parameters that characterize the flexibility of an enterprise economic security system may initially be estimated on a more conventional and convenient scale, for example, from 1 to 10. There can also be zero weight. And getting used to the 10-step assessment will be easy for experts.

So, formally $w_i \in \{1, 10\}$. In this case, the j-th expert will submit his version of the weight $w_j$ as $w_{ij} \in \{1, 10\}$, where $d = j = \{1, Q\}$. Not all experts can be equally qualified, when evaluating the parameters characterizing the flexibility of the economic security system and their weights. Therefore, in the general case, the j-th expert needs to assign weight $\xi_j$, indicating the level of his qualifications. This is important for our assessment, because it is proposed to involve experts of various qualifications in the assessment. Thus, a survey is conducted among managers, specialists and workers in order to determine the level of flexibility of an enterprise economic security system. This is due to the fact that in order to obtain the most truthful answers, it is necessary to conduct a survey among all categories of enterprise employees. In addition, to get reliable answers, the number of managers in the survey should be 50%, specialists - 30% and workers - 20%. It is not connected with the competencies of experts, but with access to information and knowledge of the situation in the enterprise.

We put forward requirements similar to properties (1) for weights $\{\xi_j\}_{j=1}^Q$:

$$\sum_{j=1}^Q \xi_j = 1, \xi_j > 0 \text{ for all } j = \{1, Q\} \quad (3)$$

Having the Q of expert estimates $\{w_{ij}\}_{j=1}^Q$ of each weight $w_i$, the weight $\lambda_i$ is found by the weighted average method [7]:

$$\lambda_i = \frac{\sum_{j=1}^Q \xi_j w_{ij}}{\sum_{j=1}^Q \xi_j} \quad (4)$$

When assessing the flexibility of an enterprise economic security system, the j-th expert will submit his own version of the parameter characterizing its flexibility $p_i$, as $s_{ij} \in \{1, S_j\}$, where $j = \{1, Q\}$. In the general case, the weights $\{\xi_j\}_{j=1}^Q$ of the qualifications of experts are taken into account, and the i-th type of the parameter characterizing the flexibility of an enterprise economic security system is the weighted sum of all expert estimates:

$$s_i = \sum_{j=1}^Q \xi_j s_{ij} \quad (5)$$

Now, despite the availability of estimates of the weights of the parameters (4) and estimates of the parameters themselves, which characterize the flexibility of an enterprise economic security system (5), before moving on to solving problem (2), we must find out how relevant these estimates are in the aggregate. Here we are talking about the so-called consistency of expert assessments. In case of inconsistency (which we will not exclude), we will contact the experts with the requirement to perform the expert procedure again. In order to assess the consistency of expert opinions in determining the parameters characterizing the flexibility of an enterprise economic security system, we will use the well-known approach, according to which expert assessments should be relatively compact. When assessing the weight of the i-th parameter characterizing the flexibility of an enterprise economic security system, the relative error of the j-th expert is calculated as follows:

$$\delta_{ij} = \left| \frac{w_{ij} - \sum_{a=1}^Q \xi_{ia} w_{ia}}{\sum_{a=1}^Q \xi_{ia} w_{ia}} \right| \quad (6)$$

Its relative error in evaluating the parameter itself is equal to:

$$\epsilon_{ij} = \left| \frac{s_{ij} - \bar{s}_i}{\bar{s}_i} \right| \quad (7)$$

The presented approach to assessing the flexibility of an enterprise economic security management system will be useful for practical use, as enterprise management can take into account its specific parameters of the existing economic security system and get results taking into account the specifics of doing business in specific markets and in current conditions.

4. CONCLUSIONS
The study of existing flexible management methodologies is
useful for an enterprise management of any form of ownership, since modern competitive conditions for doing business require new approaches to management and adaptation. A significant number of scientists and various institutional structures are exploring the relationship between lean manufacturing methodologies and flexible management methodologies, and generating new management tools and ways of doing business. The approach to assessing the flexibility of the economic security management system of an enterprise is developed and presented in the article. It is based on modern approaches to the formation of flexible management of organizations and their individual functional activities and allows the selection of the most effective management methods to ensure the achievement of the proper state of economic security of specific enterprises. At the same time, the prospect of research in this direction is not in doubt, since the industry-specific features of the flexible management of organizations and the consideration of specific dangers, threats and risks inherent in the institutional environment of their functioning need to be clarified.

5. REFERENCES