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Table of Contents

<i>Buychik, A.</i> Updating the parameters of the development of effective economic thought to motivate society to finance innovative activities	7
<i>Belanová, K.</i> Support measures for small and medium-sized enterprises in Slovakia in response to COVID-19	17
<i>Komissarov, P.V.</i> Determination of the centric rate of the economic stability domain for manufacturing enterprises	28
<i>Lavrentsov, N.A.</i> Optimization in warehouse for assembly and construction company	38

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Updating the parameters of the development of effective economic thought to motivate society to finance innovative activities

Abstract:

The article considers the intermediate research results on determining the parameters of effective economic thought development to motivate society to finance the innovative activities of researchers in various fields of science. Historical, comparative, inductive, and deductive methods were used to solve the problems set in the study. The research uses the works of well-known scientists in the field of studying the development of society and innovative thought, for example, J.A. Schumpeter, Henry W. Chesbrough, Lars Schweizer, R. Rothwell, and others. It is concluded that at the present stage of the society's evolution from industrial to informational, economic thought should form a fundamentally new financial approach to innovation, more complex and complex. It is necessary to develop a three-dimensional approach model to innovation. The study results can be used by specialists and researchers in the field of innovative economy, economic history and social economics.

Keywords: economic thought, innovation, innovation economy, economic efficiency.

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Aktualizace parametrů vývoje efektivního ekonomického myšlení s cílem motivovat společnost k financování inovativních aktivit

Anotace:

V článku jsou průběžné výsledky studie o stanovení parametrů rozvoje efektivního ekonomického myšlení s cílem motivace veřejnosti k financování inovací výzkumných

pracovníků v různých oblastech vědy. Historické, srovnávací, induktivní a deduktivní metody byly použity k řešení úkolů uvedených ve studii. V průběhu výzkumu jsou používány práce významných vědců v oblasti zkoumání vývoje společnosti a inovativní myšlenky, například, J. A. Schumpeter, Henry Podávají Chesbrough, Lars Schweizer, R. Rothwell a další. Ze zjištění vyplývá, že v dnešní fázi vývoje společnosti z industriálního na informační ekonomické myšlení by měl vzniknout zásadně nový finanční přístup k inovacím, složitější a komplexnější. Je zapotřebí vyvinout trojrozměrný model přístupu k inovacím. Výsledky studie mohou být použity odborníky a výzkumníky v oblasti inovativních úspor, ekonomické historie a sociální ekonomiky.

Klíčová slova: ekonomické myšlení, inovace, inovativní ekonomika, ekonomická efektivita.

Introduction

Economic thought develops in parallel with the social development of society, competing with it in the priority of being a social locomotive. Philosophy still finds it difficult to determine which sphere of human activity is primary and only secondary. Historically, discoveries and inventions are based on human ideas about the nature that surrounds us. However, they are impossible without social changes that provoke or motivate individuals to solve complex technical or scientific issues that are not standard for this time.

The economic thought is inseparable from social processes. It defines such human needs as self-development, improvement, and well-being. The desire of the individual and society for development and prosperity encourages to consider capabilities in the economic dimension in parallel with intellectual capabilities. In this regard, throughout mankind history, two parallel mutually exclusive processes are observed.

One of them is that society is interested in financing its economic development. Thus, researchers (scientists) receive financial support in various forms – grants, awards, administrative resources. This motivates you to get a unique result. An example of such scientific ‘leaps’ is the rapid development of genetic engineering in 2020 and 2021, which led to the emergence of many vaccines against the Covid-19 virus almost simultaneously in the United States, Europe, Russia and China.

The second process is to underestimate or ignore innovation. The consequence of this is the refusal to finance many technological or other scientific projects under the pretext of “an effective approach to financing scientific progress”. In this case, society is faced with the dilemma of determining the relevance of the innovation or its verification. Most often, the economic

justification depends on the opinion of the ‘scientific community’, which is represented by individual scientists in a separate research institute or a conglomerate of institutes. Consequently, society opinion is replaced by representation in the role of a particular scientific community opinion or its leaders. This leads to the loss of first the effectiveness of scientific development and then the increase in economic well-being. An example of this approach is the financing blocking by developed countries of innovative development in the energy sector. This is because financing the search for alternative energy requires tens and hundreds of billions of dollars (euros), which can afford to include in the country’s budget only particularly rich states that have at the same time a great scientific potential to solve problems of such complexity, e.g., the United States, Great Britain, and the EU. American capital is built to use mineral resources maximizing. It is directly interested in the extremely gradual development of alternative energy sources during oil, natural gas, and coal provide an opportunity to enrich themselves in the future for at least a hundred years.

Consequently, the economic development of society not only remains relevant but also fundamentally affects scientific and technological progress. In this regard, the development of economic thought, which can solve many fundamental problems of society, becomes particularly relevant:

- motivate a rethinking of the importance of scientific innovations in various spheres of society’s activity;
- change the system of priorities in the categorization of innovative thought, focusing on the understanding of the prospects and fundamental nature of discoveries;
- promote the development of productive forces that generate areas of profitability and profitability;
- contribute to the development of social forces, levelling the resulting skew of funding in the field of high technologies, which fundamentally distorts public relations.

Thus, the development of economic thought is one of the main engines of modern society in other areas, since the financing of innovative and promising projects in the social sciences and humanities is just as important as in the technical areas and natural sciences.

The study subject is the economics of innovation, the long-term development of all aspects of society.

The study purpose is to determine the parameters of the development of effective economic thought to motivate society to finance researchers' innovative activities in all science.

Based on the study purpose, the following tasks were set:

- analyze the leading hypotheses of the innovation process research methodology;
- determine the economic features of the society's attitude to Push and Pull models;
- justify a methodological approach to determining the development parameters of the effective economic thought to motivate society to finance the researchers' innovative activities in all science.

Historical, comparative, inductive, and deductive methods were used to solve the problems set in the study. The historical method is used to determine the main historical factors and events that can be a confirmation of theoretical postulates. The comparative method is used to determine the positive and negative characteristics of the hypotheses of the research of innovative processes. Inductive and deductive methods are used to generate logical conclusions based on the materials obtained during the application of historical and comparative methods.

The study uses the works of well-known scientists in the field of studying the development of society and innovative thought, for example, J.A. Schumpeter, Henry W. Chesbrough, Lars Schweizer, R. Rothwell, and others.

Methods and Materials

The modern methodology of innovative processes research is based on three hypotheses:

- the hypothesis of 'technological push', i.e., from science to the market;
- the hypothesis of 'market demand pressure', i.e., from market needs to science;
- the 'interactive model' hypothesis, i.e., a model combining the two previous approaches.

For the economic justification of innovation, it is necessary to analyze in more detail the main provisions of the 'technological push' hypothesis, which are as follows:

- the development of scientific thought is relatively independent of practice (market) and is expressed in an objectively predetermined change in scientific paradigms;
- the feedback between the economic environment (market needs) and scientific and technological development is not significant.

A retrospective analysis of science development allows us to state that four scientific revolutions took place in the world community. In the technological development of industrial countries, five technical structures have successively changed. Each scientific revolution is characterized by a pronounced tendency to increase the number of discoveries compared to the previous one. Thus, the development of science is objective, independent of the market.

Within the framework of this hypothesis, the innovation process is considered as a consistent transformation of an idea into a commercial product through the stages of fundamental, applied research, experimental design and technological development, marketing, production and sales.

Such a strict sequence of stages of the scientific idea implementation is described by a linear Push-model of the innovation process. According to this model, the developed fundamental idea is embodied in applied research, which serves as the basis for innovation and subsequent commercialization. This model establishes a direct linear relationship: the more basic research, the more applied research, therefore, the more innovations and more advanced technologies are 'introduced'. Leading institutions and enterprises primarily focus on scientific breakthroughs: "The more investment in R&D, newer products will appear." This strategy has been dubbed the 'strategy of hope', i.e., "Hire the best people, provide them with the best possible resources, and leave them alone."

In science and new technologies, therefore, they see a potential opportunity to solve social problems. This approach is reflected in government support for the supply side, i.e., the promotion of scientific research in universities and state laboratories, as well as the continuous supply of skilled labour and government support for key R&D programs in companies.

The practice of developed countries shows that such an 'evolution' from basic research to the commercialization of results has low efficiency. However, this model is typical for developing countries, especially states with strong central management and insignificant regional power units, e.g., the Soviet Union and at the present stage-Russia, Belarus, Kazakhstan. This symptom of the economic dependence on innovative development is also evident in the European Union,

especially in the countries of the second and third economic levels-Spain, Portugal, the Czech Republic, Slovakia, Bulgaria, Romania, Hungary, Greece, Estonia, Latvia, Lithuania in the last 20 years.

The inconsistency of the linear model is that it does not consider the impact of the market on the development of events related to research and works, and it is not able to reflect the complexity of the relationship between science and production. Also, within the framework of such a model, the consumer and his requests are ignored, since innovation does not always occur as a result of fundamental research and scientific discoveries.

Economically, the needs of the market develop in a different way when it is the impetus for innovation. At the present stage, the sources of innovation are financially distributed as follows:

60% come from the market;

25% comes from technology;

15% comes from corporations.

This determines the significance of the second hypothesis that explains the causality of the innovation process-the model of the innovation process in the spirit of 'market demand pressure' (market pull model). This hypothesis links the growth of the innovative potential of the economy with the requirements of the market. The priority is the presence of certain market needs related to the trends in the economic development of the national and global economy. These trends may include the need to diversify production, the increasing level of competition, as a result, there are the 'battle for market shares', greater attention to marketing, the need to reduce the time to bring a new product to market.

Thus, innovations are actively attracted to production only when an increase in demand requires a sharp rise in production, i.e., the primary reason for the innovative activities' implementation, according to the second hypothesis, is economic conditions and, first of all, market factors. In this case, the economic effect is extracted, most often, by an economic entity that does not necessarily create innovation but applies it or has the right to own it. Gradually, the company comes to understand that the strategies of technology shocks and market pressure are two extreme examples of a more general process of interaction, on the one hand, technological capabilities and, on the other hand, market needs. The interactive model of the innovation process assumes that the innovation process is becoming more complex, nonlinear, showing that the equivalent sources of the innovation idea are both the logic of technological development and the potential

market. This means that the creation of innovations is possible directly, bypassing the stage of scientific research.

When an idea arises, the concept is worked out. Then the immediate development follows. Basic and applied research is addressed as difficulties appear on the main path. First, the results of applied research are analyzed. If they do not provide a solution to the problem, then the main study is conducted. Besides, new ideas can arise and be developed at any stage of the innovation process, and the design, development, production and marketing stages can be realized simultaneously. At the same time, researchers actively interact with the broad scientific community and the market.

During the analysis, it was necessary to determine the differences between the interactive model and the linear one. The analysis identified the following differences:

- New ideas arise and are developed at all stages of the innovation process; i.e., fundamental research is not considered as the only initiating force. Therefore, funding is required throughout the entire process.
- Interactive models imply that there are qualitatively new types of connections connecting its elements between the stages of the innovation process. Their task lies in the inadmissibility of dividing innovation processes into independent ones. Therefore, the funding becomes targeted and well verifiable with the result.
- Study results are used in various forms at all stages of the innovation process, i.e., the commercialization of technologies is possible at all stages of the innovation process. Therefore, financial efficiency is determined quite quickly in the coming years.
- The managed interactive model considers the role of innovation process managers and consumers of innovative products. The innovation manager deals with various stages of the innovation process and builds his management activities with this in mind. Therefore, the company entrusts them with financial activities within the funding framework and constant monitoring of the implementation and compliance with the financial efficiency of innovative development.

Thus, in modern conditions, the emphasis is on system integration and the creation of complex organic networks to guarantee flexibility and speed of development. Business processes are transformed into a virtual form through the use of information management systems. In the external environment, the focus

is on business ecosystems. Advanced strategic partnerships are being created for the joint conduct of market research and R&D.

Results

At the present stage of the world community development, the first two models – Push and Pull – are practically not suitable for economically developed countries. The effect of the development of either hardware thinking in the innovation economy on the example of Russia and European countries of the second and third economic levels or excessive commercialization of innovation processes on the example of the United States and Japan is observed.

At the same time, there is a clear symptom of the emergence of pseudo-innovation for the sake of financial support for activities. This is evident in the example of the British system. There researchers and scientists are forced to create projects that are extremely far from innovative. They can be categorized as leading science to stagnation. Elements of the British system of creating a scientific array are becoming more apparent in European countries including also the countries of Eastern Europe.

Therefore, it is necessary to create a new (fourth) model, which will radically change the systematic approach to innovative thought financing. The scientific criterion should be actualization instead of the citation index. The criterion of financial prospects should be determined by the social aspect, since any innovation is intended for social development, and not only for financial support. The criterion of financial efficiency should be differentiated by scientific areas, i.e., it is impossible to determine the same financial indicators for social and humanitarian innovations as for technical and natural areas. For social and humanitarian innovations, it is necessary to determine the significance of the results for the development of a particular society or global community.

Thus, at the present stage of society's evolution from industrial to informational, economic thought should form a fundamentally new financial approach to innovation, more complex and complex. It is not enough to use the principles of a flexible economy in financing promising areas. It is necessary to develop a three-dimensional model of the approach to innovation: the vector of relevance for society in the near future, the vector of social prospects in the distant future, and the vector of mobility, that is, the associated solution of a complex of other problems and tasks within the framework of an innovation project.

Discussion

Within the framework of this study of the problem of the economic approach to the implementation of innovative ideas in various fields of science, it is necessary to continue the discussion on the following issues:

- What economic parameters should be introduced to determine the vector of prospects for an innovative project?
- What economic indicators will be universal for determining the mobility vector of an innovation project?
- What methods can be applied to the calculation of social motivation to finance innovative projects?

Consideration of these issues will help to get closer to achieving the main study purpose, i.e., to determine the parameters of the development of effective economic thought to motivate society to finance researchers' innovative activities in science.

Conclusion

Thus, the study analyzes the leading hypotheses of the methodology for the study of innovative processes, which are designed to explain the historical aspects of the social reaction development to innovation thought, and identifies the economic features of society's attitude to Push and Pull models. It is concluded that at the present stage of the social evolution from industrial to informational, economic thought should form a fundamentally new financial approach to innovation, more complex and complex. It is necessary to develop a three-dimensional model of the approach to innovation:

- the vector of relevance for the society of the near future,
- the vector of prospects for the society of the distant future,
- the vector of mobility, e.g., the associated solution of a set of other problems and tasks within the framework of an innovative project.

To achieve the main goal of the research, during the study, the analysis of the leading hypotheses of the methodology for the study of innovation processes that are designed to explain the historical aspects of the development of social reaction to innovation thought is carried out and the economic features of the society's attitude to Push and Pull models are determined.

The study results can be used by specialists and researchers in innovative economy, economic history and social economics.

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Support measures for small and medium-sized enterprises in Slovakia in response to COVID-19

Abstract:

The current coronavirus crisis represents a severe external shock that threatens especially small and medium-sized enterprises. In their case, measures related to saving of human lives sometimes have an existential impact. Due to the economic and social importance of small and medium-sized enterprises for the Slovak economy, it is necessary to carefully monitor the impact of the crisis on small and medium-sized enterprises and to develop measures to its mitigation and fast recovery. The aim of the article is to evaluate the measures to help SMEs in the Slovak Republic through a comparison with selected EU countries and to evaluate the financial impact of these measures on the Slovak economy. To evaluate the measures to help small and medium-sized enterprises in the Slovak Republic due to COVID-19 pandemic, it was used a method of comparison, i.e., the measures taken in the SR with selected EU countries compared. The financial impact of these measures on the Slovak economy in a way of adjustment of public revenues and public expenditures was analyzed. The materials of the article are intended for economists who study national and regional economic structures and markets.

Keywords: SMEs, support measures, coronavirus crisis, covid-19.

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Opatrenia na podporu malých a stredných podnikov v SR v reakcii na COVID-19

Abstrakt:

Súčasná koronakríza predstavuje závažný externý šok, ktorý ohrozuje predovšetkým malé a stredné podniky. V ich prípade majú opatrenia vzťahujúce sa na záchranu ľudských životov často až existenčný dopad. Kvôli svojmu ekonomickému a sociálnemu významu, ktoré malé a

stredné podniky predstavujú pre ekonomiku SR, je potrebné monitorovať vplyv krízy na malé a stredné podniky a vyvíjať opatrenia pre jej prekonanie a obnovu. Cieľom článku je vyhodnotiť opatrenia na pomoc malým a stredným podnikom v SR prostredníctvom porovnania s vybranými krajinami EÚ a zhodnotiť finančný dopad týchto opatrení na ekonomiku SR. Na vyhodnotenie opatrení na pomoc malým a stredným podnikom v SR kvôli pandémie COVID-19, bola využitá metóda komparácie, t.j. opatrenia prijaté v SR boli porovnané s vybranými krajinami EÚ. Finančný dopad týchto opatrení na slovenskú ekonomiku bol zhodnotený prostredníctvom analýzy úprav verejných príjmov a verejných výdavkov. Článok je určený pre ekonómov zaoberajúcich sa národnými a regionálnymi ekonomickými štruktúrami a trhmi.

Kľúčové slová: MSP, podporné opatrenia, koronakríza, covid-19.

Introduction

Small and medium-sized enterprises (SMEs) play an important and irreplaceable role in the Slovak economy, which is reflected in particular in their share in total employment and value added. Despite their high flexibility and ability to fill market gaps, they have more difficult access to sources of finance and they are very vulnerable to environmental fluctuations and unexpected changes. The current economic recession caused by the COVID-19 pandemic has a more significant impact on the business sector than the crisis of 2008. As a result of various measures taken to prevent the spread of the disease, many companies have had to reduce or even to close their business, which has caused considerable problems for the economies of the affected countries. Insufficient demand, low liquidity and significant fixed costs represent a serious deterioration of the financial situation for many companies. According to the Slovak Business Agency's analysis (SBA. Analýza malých, 2020), a total of 53,243 SMEs operate in the sectors most affected by quarantine measures. The share of these most affected entities in the total number of active SMEs is up to 8.9%. Within this group, the most affected are micro-enterprises employing less than 10 employees, which account for up to 96.2%. In terms of legal form, the most vulnerable group is sole proprietors, who make up almost two thirds (59.7%) of the total number of vulnerable SMEs. The Government of the Slovak Republic, like the governments of other countries, has taken several measures for entrepreneurs to mitigate the negative effects of the crisis caused by the COVID-19 pandemic. However, it also faces the challenge of finding the optimal balance between measures to save lives and ensuring the basic functionality of the economic system.

Although strong economies and large enterprises have also been adversely affected by the COVID-19 pandemic, the most vulnerable small and medium-sized

enterprises have been affected the most. In their case, measures taken have sometimes a life-saving impact. They are also characterized by much lower capital strength than large multinational companies.

The size categorization of enterprises used in this article is in accordance with the recommendation of the European Commission no. 2003/361/EC valid from 1.1.2005. The SME category consists of enterprises with less than 250 employees and the large enterprise category includes enterprises with 250 or more employees. Within the SME category, a distinction between micro-enterprises (0-9 employees), small enterprises (10-49 employees) and medium-sized enterprises (50-249 employees) is made. In cases where the category of micro-enterprises is not distinguished separately, all enterprises with the number of employees 0-49 are included among small enterprises. The criterion of the number of employees is not the only one that characterizes SMEs. The criteria of turnover, asset value and ownership structure are also taken into account. However, due to the unavailability of current data in the classification according to all SME criteria, we take the number of employees as a relevant criterion.

For a more detailed specification of SMEs, we also use the division of companies according to the legal form. In this respect, unless otherwise stated, we understand SMEs as the sum of legal and natural persons meeting the above criteria.

The negative consequences of the pandemic for entrepreneurs are reflected on the supply as well as on the demand side.

Many small and medium-sized enterprises are currently struggling with a lack of liquidity, which results in subsequent insolvency.

As the impact of the prevailing pandemic is also felt in the financial sector, many commercial banks are now much more cautious in lending – some of them have responded by tightening of credit standards, making it much more difficult for businesses to access credit financing.

The aim of the article is to evaluate the measures to help SMEs in the Slovak Republic through a comparison with selected EU countries, as well as to evaluate the financial impact of these measures on the Slovak economy.

Our most important research tasks are:

1. Specify mitigation measures for COVID-19.
2. Compare the measures taken in the Slovak Republic with selected EU countries.
3. Evaluate the impact of the measures on the state budget.

To evaluate the measures to help small and medium-sized enterprises in the Slovak Republic due to COVID-19 pandemic, we used a method of comparison.

We compared the measures taken in the SR with selected EU countries. We analyzed the financial impact of these measures on the Slovak economy in a way of adjustment of public revenues and public expenditures.

For the reaching of the aim of the article we used the statistical data from the Statistical Office of the Slovak Republic, Ministry of Economy of the Slovak Republic, Ministry of Finance of the Slovak Republic, Slovak Business Agency.

We used the results from The Slovak Craft Industry Federation (2020) to present how SMEs themselves perceive the measures accepted by the Slovak government for the mitigation of the negative effects of COVID-19 pandemic.

Because it is a whole world problem, there are also international materials dealing with this issue, e.g., World Bank (2020), resp. OECD (2020).

1. COVID-19 mitigation measures

Due to coronavirus crisis, most countries have introduced measures to support SMEs – both legal persons and the self-employed persons, mainly concentrated on maintaining short-term liquidity and employment. These measures take various forms in the following areas:

- Employment,
- Deferment of payments,
- Financial instruments,
- Structural policies.

Deferred income taxes, loan guarantees, direct loans and wage subsidies were the most widely used measures by individual governments to support SMEs in times of pandemic. The use of grants, debt moratoriums or special measures for the self-employed persons varies considerably across OECD countries.

According to the World Bank's findings from April 2020 (World bank, 2020), a total of 1,071 measures have been taken to support SMEs in more than 120 countries around the world.

It should be emphasized that state aid in connection with the corona crisis is constantly evolving. The conditions for individual state contributions are being updated, and new laws regulating (not only) the financial area are being approved.

Measures taken to support SMEs in Slovakia are focused on three of the four defined areas:

- Employment,
- Deferral of payments,
- Financial instruments.

Compared to the data from the OECD study (OECD. Coronavirus, 2020), which analyzed the type of support as of March 2020, in Slovakia, as in other countries, there was another expansion in the scope of support for entrepreneurs in order to mitigate the effects of the pandemic in April 2020. Further measures to support employment, increase in liquidity through deferral of payments and increase in the availability of financing through financial instruments have been accepted.

Some countries have introduced specific structural policy measures aimed at accelerating digitization, adapting to new work processes or to finding of new markets. The aim of these policies is to adapt to urgent short-term challenges and thus contribute to strengthening the resilience of SMEs in a more structured way. Structural policy measures are of particular importance to SMEs, as they enable them to adopt new technologies and practices that will increase their competitiveness even in times after the crisis.

Measures in the area of structural policies have not been taken in Slovakia. Next, we will take a closer look at measures in the area of financial instruments, which are of particular importance for stabilizing the financial situation of SMEs.

Thus, most countries have introduced measures to support SMEs – LPs and the self-employed persons, mainly concentrated on maintaining short-term liquidity and employment. These measures take various forms. Deferred income taxes, loan guarantees, direct loans and wage subsidies were the most widely used measures by individual governments to support SMEs in times of pandemic. The use of grants, debt moratoriums or special measures for the self-employed persons varies considerably across OECD countries.

2. Measures in the area of financial tools

The Government of the Slovak Republic has taken several measures aimed at SMEs supporting through various financial instruments.

It provides guarantees for loans provided by the bank and/or interest payments of the loan provided by the bank. The provider of financial assistance is the Ministry of Finance of the Slovak Republic and the intermediaries are EXIMBANKA and SZRB. Since April 2020, SZRB has been providing an operating loan “Entrepreneur2020”, which is designed to mitigate the negative effects of a pandemic and to support sustainability of operations of SMEs in the form of a loan guarantee for the bank loan and the payment of interest of a loan provided by the bank (interest bonus).

In addition to what was stated above, the Ministry of Finance of the Slovak Republic and Slovak Investment Holding have launched a scheme of bank guarantees and interest subsidies under the name 'anti-corona guarantee'. The program consists of guarantees for financial institutions, which will then provide preferential bridging loans for SMEs and sole proprietors. They can also be combined with an interest rate subsidy to reduce interest rates. Another form of indirect financial assistance is the bridging 'COVID loan'.

As of 31 July, 2020, loans of EUR 136 mil. with a state guarantee for 1,437 companies were provided. In the first phase, only 3 de minimis guarantee schemes were available to companies, under which large companies were excluded from the beneficiaries. As a result, the main beneficiaries were mainly micro and small enterprises (cumulative 74% of the volume, but up to 93% of the number of enterprises). Of the total volume of newly granted loans for the period from May 2020 to July 2020 (micro-enterprises, small and medium-sized enterprises), loans with a state guarantee accounted for 14%. In July 2020, banks began to provide loans from the so-called large guarantee scheme.

From the point of view of international comparison, Slovakia does not belong to the active countries in the overall allocation nor in the drawing of this form of aid to GDP. However, it should be mentioned that the use of this instrument is relatively modest among EU countries. Italy, Poland and Spain are among the most active countries in the use of this instrument.

The possibility of deferring loan repayments is undoubtedly an important measure in the area of financial instruments.

To the end of July, 2020, the deferral of repayments was approved for 12% of corporate loans. The deferral of repayments was used to the greatest extent by companies from the most affected economic sectors.

In an international comparison of EEA countries, Slovakia, with the volume of deferred loans to the total loan portfolio at the level of approximately 7.5% to the end of the first quarter of 2020, ranked slightly above the EU average. Countries that make much greater use of this instrument include Cyprus, Hungary, Portugal, Malta, Italy, Croatia and Greece.

The nature of the setting and use of the deferral instrument varies across EU countries. Among the countries that have published the parameters of this instrument, the deferral lasting from 3 to 6 months is the most widespread, while in Slovakia almost half of deferred loans had an approved deferral of 6 to 9 months (MH SR. Prehľad a porovnanie, 2020).

However, more than half (56.1%) of small and medium-sized entrepreneurs consider the package of economic measures of the state to mitigate the economic effects of the corona crisis to be insufficient. This resulted from the results of a survey on state aid, where 1,043 respondents from the environment of small and medium-sized enterprises and sole proprietors took part (SBA. Výsledky prieskumu, 2020).

Measures taken are the most critically perceived by entrepreneurs from the catering sector (76.1%), accommodation (69.2%) and arts, entertainment and recreation (63.9%), which include, e.g., sports activities or realization of events. On the contrary, they are the least critically perceived by entrepreneurs in the construction industry.

Addressed entrepreneurs, who applied for state aid criticize in particular the complexity of support measures and the problematic orientation in them (22.9%). Another problem is the ambiguity of the information provided on the possibilities of using the support (16.9%).

Representatives of SMEs call for the need to adopt several changes to the current support system. Entrepreneurs would especially welcome the simplification of the conditions for obtaining support (23.5%), the simplification of applications for support (18.1%) and the improvement of awareness of the possibilities and ways of support drawing (15.2%).

Thus, The Government of the Slovak Republic has taken several measures aimed at SMEs supporting through various financial instruments. Measures taken to support SMEs in Slovakia are focused on three of the four defined areas. Measures in the area of structural policies have not been taken in Slovakia. Regarding the measures in the financial area, which are of special importance to SMEs, it provides guarantees for loans provided by the bank and/or interest payments of the loan provided by the bank. The possibility of deferring loan repayments is undoubtedly an important measure in the area of financial instruments. However, more than half (56.1%) of small and medium-sized entrepreneurs considers the package of economic measures of the state to mitigate the economic effects of the corona crisis to be insufficient.

3. Financial impacts of adapted measures on the Slovak economy

The COVID-19 pandemic has significant financial implications for economies of all affected countries. In order to preserve jobs as well as to promote entrepreneurship sector, the Slovak government has also taken a number of measures to mitigate the adverse effects of the pandemic.

The adopted measures were reflected in the budget of the public administration of the Slovak Republic in expenditure, as well as in the revenue side. The negative economic impact and the reduction in economic activity thus caused the need to reassess the already compiled state budget for 2020. This was amended in July 2020.

The basic change introduced by the amendment to the State Budget Act is a change in the amounts of: (1) total state budget revenues for 2020, (2) total state budget expenditures for 2020, and (3) state budget deficit for 2020.

1. The original amount of total state budget revenues for 2020 is reduced from the original EUR 15,792,695,566 to EUR 14,366,446,802.
2. On the other hand, the amount of total state budget expenditures for 2020 increases from the original EUR 18,560,877,994 to EUR 26,319,080,528, while expenditures directly related to the new coronavirus pandemic amount to EUR 4.9 billion.
3. As results from the above mentioned, the amendment increased the state budget deficit from the original EUR 2,768,182,428 to EUR 11,952,633,726. The reason for the reduction of total state budget revenues is the negative consequences of the COVID-19 pandemic, and the reason for the increase in total state budget expenditures is, in turn, is the provision of coverage of necessary expenditures.

According to the data of the Ministry of Finance of the Slovak Republic (MF SR. Bilancia štátneho rozpočtu SR, 2021), the state budget for 2020 reached a deficit of EUR 7,758 billion. Compared to the planned deficit from the adjusted budget of EUR 11.953 billion, the deficit was lower by more than EUR 4 billion.

At the end of December 2020, the budget reached revenues totaling almost EUR 15.75 billion. Expenditures amounted to EUR 23.5 billion.

The state's total tax revenues reached EUR 11.872 billion last year. Most of it was value added tax - EUR 6.8 billion. Legal entities paid income tax of EUR 2.355 billion.

Excise taxes totaled EUR 2.265 billion.

Thus, the adopted measures were reflected in the budget of the public administration of the Slovak Republic in expenditure, as well as in the revenue side. Concerning the economic impact of the measures taken, the pandemic has led to a reduction in total state budget revenues and an increase in total state budget expenditures. We evaluate positively the fact that the actual state budget deficit was lower than the expected deficit from the adjusted budget.

Conclusion

Thus, the COVID-19 pandemic has affected the health and economy of countries around the world. Many countries as well as businesses were not prepared for a pandemic. The adverse impact has fully exposed the fragile economies of the countries and of the companies. Governments around the world have been forced to intervene to protect the health of their citizens. The result was a number of measures that have been taken to prevent the spread of the disease and to mitigate the adverse effects of the pandemic on the economy. The scope and form of the measures taken vary from country to country. Some countries focus mainly on employment promotion, others on deferral of payments or financial instruments. However, most countries (as well as Slovakia) use a combination of support measures focused on different areas. The amount of aid as well as the extent of the measures taken depend to a large extent on the current state of the country's economy.

The most widespread measures in connection with the pandemic taken by the governments include measures relating to income tax, direct loans and wage contributions. Measures in the area of structural policies have been implemented only to a limited extent. According to the World Bank, which examined measures in 121 countries, 1,071 measures were taken to support SMEs. More than 80% of them were focused on debt financing, employment support and taxes. During the months of March-May 2020, Slovakia took several measures to support SMEs in the field of employment, deferral of payments as well as financial instruments. Measures in the field of structural policies have not been taken in Slovakia. Concerning the economic impact of the measures taken, the pandemic has led to a reduction in total state budget revenues and an increase in total state budget expenditures. We evaluate positively the fact that the actual state budget deficit was lower than the expected deficit from the adjusted budget.

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Appendix

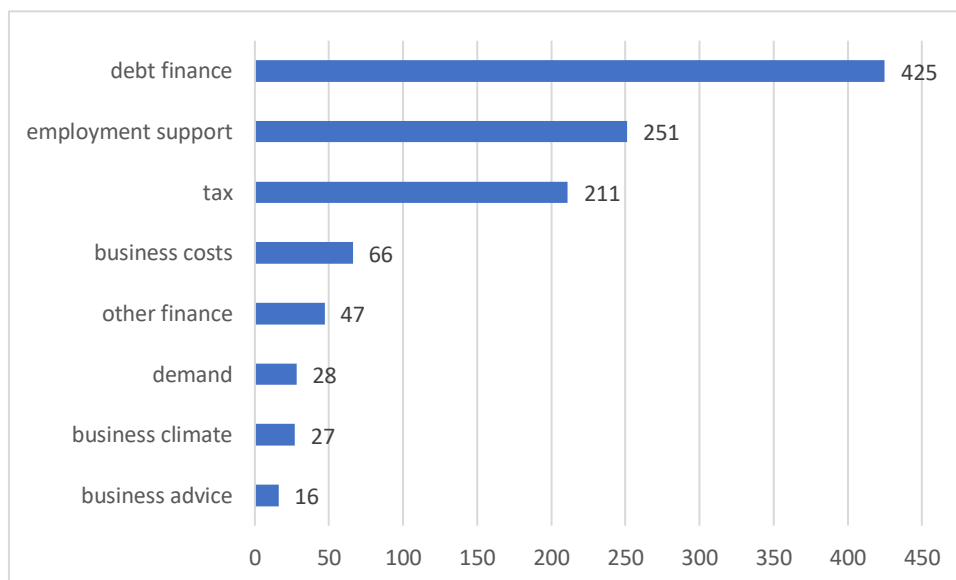


Figure 1. Number of SME support measures according to support type

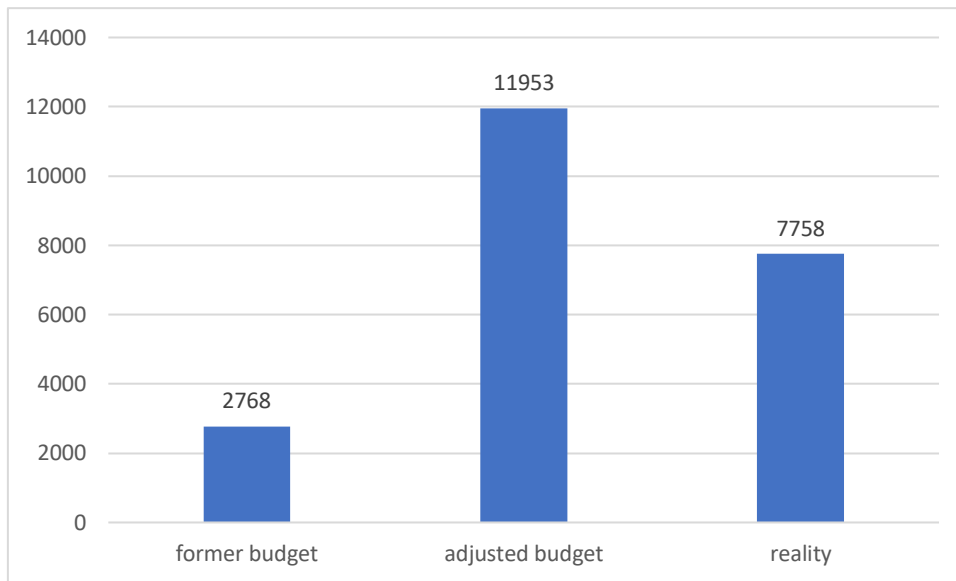


Figure 2. Overview of expected and real deficit of state budget for 2020 (eur billion)

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Determination of the centric rate of the economic stability domain for manufacturing enterprises

Abstract:

The relevance of the topic is related to the problem of determining the strategic stability reserve for production cycles. The study object was economic and production relations transformed into the economic rates of the enterprise. The study aimed to determine the centric indicator of the stability domain. To implement this study, methods of statistical analysis, data grouping, sample ranking, and methods for studying time series components were used. Scientific materials of leading researchers in the space of economic and economic-mathematical analysis were used during the study. The results of the study are intended for specialists and researchers in the field of development and application of mathematical methods in the modelling of economic rates of technological processes at enterprises.

Keywords: economic stability domain, centric rate, production stability rate, strategic security.

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Определение центрического показателя области экономической стабильности для производственных предприятий

Аннотация:

Актуальность темы связана с проблемой определения стратегического запаса стабильности для производственных циклов. Объектом исследования стали экономико-производственные отношения, которые преобразуются в экономические показатели предприятия. Целью исследования являлось определение центрического показателя области стабильности. Для реализации данного исследования были применены методы статистического анализа, группировка данных, ранжирование выборки, методы исследования компонент временного ряда. В ходе исследования были использованы научные материалы ведущих исследователей в области экономического и экономико-

математического анализа. Результаты исследования предназначаются для специалистов и исследователей в области разработки и применения математических методов в моделировании экономических показателей технологических процессов на предприятиях.

Ключевые слова: область экономической стабильности, центрический показатель, показатель производственной стабильности, стратегическая безопасность.

Introduction

The meaning of opening and running any business is to make a profit. Entrepreneurs and companies need to assess the prospects of the industry before investing in a startup. It is also necessary when developing and bringing new products or services to the market. Understanding the profitability of different types of products, a specialist can correctly reallocate the company's resources to more promising areas and remove unprofitable positions.

The stability domain in this aspect becomes one of the most important indicators. It indicates at what volume of production an industrial company will get the most effective results for sustainable development. In this area, the profit has a certain distance from the break-even point indicators.

This indicator is necessary to understand the range of output volume or revenue size. There the company can operate normally. It does not only cover costs but also acquires additional resources for its stable development. If the indicators are below the critical point of the stability area, it means that the financial indicators are rushing to the break-even point (BEP), which means an increase in the risk of bankruptcy.

The stability domain should be calculated before launching a new business project and at each stage of its development. This will increase the elasticity of economic indicators and become a tool to prevent particularly significant risks for the enterprise.

A comprehensive calculation of the stability domain allows:

- more accurately determine the profitability of a new product, taking into account what equipment and technologies are used by this company, what volume of products can be produced and sold;
- exclude maximum risk indices from the operation (0.65-1);
- correctly allocate the set of prospective indicators by taking into account medium (0.35-0.64) and small (0.1-0.34) risks;

- enter a set of these indicators into a set of key indicators in any project feasibility study;
- plan production volumes taking into account changes in both external and internal factors without a sharp change in production indicators, which increases the risk of disruption of production chains;
- form the delta (range) of the cost price and, consequently, the selling value of the product of production taking into account the needs of the enterprise and the formation of a reserve;
- optimize production chains and business processes without compromising final targets.

To calculate the area of economic stability of an enterprise's production, it is necessary to calculate a centric indicator (the centrally directed domain point), which will later form the function of determining the area of production stability taking into account additional indicators including the stability point (Komissarov, 2020).

The study subject was the indicators allowing to determine their totality as an economic stability domain of production.

The study object was the economic and production relations transformed into the economic indicators of the enterprise.

The study aimed to determine the general parameters of the stability domain.

Based on the purpose of the study, the following tasks were set:

- give the concept of the area of stability;
- develop a method for determining the stability parameters of a manufacturing enterprise;
- determine the centric parameter of the stability domain for production-type enterprises.

To implement this study, mathematical and statistical analysis, data grouping, sample ranking, and methods for studying time series components are used.

The research used scientific materials of R.E. Bellman, E. Polak, L.A. Zadeh, and other leading researchers in the field of fuzzy sets and mathematical methods for calculating various components.

The study results are targeted at specialists and researchers in the field of development and application of mathematical methods in the modelling of economic indicators of technological processes at enterprises.

Methods and Materials

The stability domain is a set of economic indicators of the volume of production and sales of products, in which expenses will be offset by income in a certain positive proportion, called income, which allows the enterprise to maintain a balance between the costs of development and the costs of current production.

Consequently, the stability domain is represented as a range of economic indicators, which remains distinctive from the break-even point in its lowest dimension and does not tend to maximize production turnover, i.e., to marginal income point, in the highest dimension.

The stability indicators set is concentrated around the stability point, which is the most correct indicator of the desired calculus for the product under study. The stability domain concept is based on the calculations of the stability point. However, it is a new economic concept firstly published in the results of these studies.

The stability domain can include an indefinite set of stability indicators having various combinations of the following indicators:

- production stability rate (PSR);
- production innovation rate (PIR);
- effective product growth rate (EPGR);
- product components cost rate (PCCR);
- effective wage fund rate (EWFR).

Thus, the stability domain provides an innovative view of production and expands the possibilities of a comprehensive analysis of production increasing the correctness and competence of the final research results.

Solving a practical problem

As part of the study of determining the centric indicator of the stability area for manufacturing enterprises, the parameters of stability indicators were determined based on such conditions as ease of use, the brevity of the indicator and breadth in use.

The production stability rate (PSR) is an indicator of trends in the correlation of the general parameters of annual or quarterly production indicators, i.e., the breadth of the range is an approximation to the average median indicator of this set. The coefficient exists in the range from 0.0001 to 2. The closer the coefficient is to 1, the more stable production is economical. The innovation sustainability levels can be interpreted as quarts:

from 0,950 to 1,050 are very high rate,
 from 0,901 to 0,949 or from 1,051 to 1,099 are high rate,
 from 0,851 to 0,900 or from 1,100 to 1,149 are average rate
 from 0,85 and below or from 1,15 and above are low rate.

Let's consider an example of interpreting the performance indicators of the plan in the factor of production sustainability using quarterly parameters for two years.

Table 1. Quarterly performance rate of the financial production plan

Year	2019				2020			
Quarter	1	2	3	4	1	2	3	4
Execution	0,94	0,98	0,97	1,09	1,07	1,05	0,96	0,99

The average plan implementation rate is 1,014.

The plan implementation delta is 13%.

Production stability factor is

$$1,014 * (1 - 0,13) = 1,014 * 0,87 = 0,88.$$

Therefore, in this case, the production stability rate is 0.88, i.e., it shows the average stability of production.

The production innovation rate (PIR) is an economic indicator of the trend in the share of financing of innovative developments, modernization of production and its management, and staff training. According to the condition, the financing share is determined by the enterprise itself based on the specifics of the production industry and the indicators of the last 10-15 years.

This percentage rate is taken as 1. The rate exists from 0.001 to 2. If the rate is closer to 1, the innovation of production is more stable. The innovation sustainability levels can be interpreted in quarts:

from 0,950 to 1,050 are very high rate,
 from 0,901 to 0,949 or from 1,051 to 1,099 are high rate,
 from 0,851 to 0,900 or from 1,100 to 1,149 are average rate,
 from 0,85 and below or from 1,15 and above are low rate.

Table 2. Annual performance rate of the average financing share of enterprise's innovative activity

Year	2017	2018	2019	2020
Execution	0,995	0,984	1,074	1,086

The production innovation rate is 1.035. Therefore, in this case, the rate shows very good innovation stability.

The effective product growth rate (EPGR) is an economic indicator of the trend in the yield per unit of production, calculated from the difference between the selling price and the cost of a production unit. For the economic growth of an enterprise to be elastic, the profitability growth of a production unit should not be predominantly higher than the growth of inflation, i.e., it should be as close as possible to 1 when calculating the ratio of the profitability growth to the annual rate of inflation.

The rate exists from 0.001 to 2. If the rate is closer to 1, the product growth is more efficient. Efficiency levels can be interpreted in quarts:

- from 0,950 to 1,050 are very high rate,
- from 0,901 to 0,949 or from 1,051 to 1,099 are high rate,
- from 0,851 to 0,900 or from 1,100 to 1,149 are average rate,
- from 0,85 and below or from 1,15 and above are low rate.

Table 3. Annual indicators for calculating the unit yield rate

Year	2017	2018	2019	2020
Inflation rate	2,03%	2,10%	2,25%	2,19%
Yield per unit of output	2,17%	2,08%	2,22%	2,35%
Execution	1,069	0,990	0,987	1,073

The effective product growth rate is 1,03. Therefore, in this case, the rate shows a very high efficiency.

The product components cost rate (PCCR) is an economic indicator of the trend in the cost of all components of the final product that are purchased from the external environment of the enterprise, taking into account the inflation rate. For the economic growth of an enterprise to be elastic, the growth in the cost of production components must mathematically consider the ratio with inflation indicators, that is, be as close as possible to 1 when calculating the ratio of the growth of profitability to the annual inflation rate.

The rate exists from 0.001 to 2. If the rate is closer to 1, the product growth is more efficient. Efficiency levels can be interpreted in quarts:

- from 0,950 to 1,050 are very high rate,
- from 0,901 to 0,949 or from 1,051 to 1,099 are high rate,
- from 0,851 to 0,900 or from 1,100 to 1,149 are average rate,
- from 0,85 and below or from 1,15 and above are low rate.

Table 4. Annual indicators for calculating the cost rate of components of a manufactured product unit

Year	2017	2018	2019	2020
Inflation rate	2,03%	2,10%	2,25%	2,19%
Increasing the cost of components	2,21%	2,12%	2,18%	2,27%
Execution	1,089	1,001	0,969	1,037

The product components cost is 1,024. Therefore, in this case, the rate shows very high efficiency.

The effective wage fund rate (EWFR) is an economic indicator of the trend in the cost of labour of all employees of the enterprise taking into account the inflation rate. For the economic growth of an enterprise to be elastic, the growth in the cost of labour should mathematically consider the ratio with inflationary indicators, i.e., be as close as possible to 1 when calculating the ratio of the growth of the wage fund to the annual inflation rate.

The rate exists from 0.001 to 2. If the coefficient is closer to 1, the wage fund is more efficient. Efficiency levels can be interpreted in quarts:

- from 0,950 to 1,050 are very high rate,
- from 0,901 to 0,949 or from 1,051 to 1,099 are high rate,
- from 0,851 to 0,900 or from 1,100 to 1,149 are average rate,
- from 0,85 and below or from 1,15 and above are low rate.

Table 5. Annual indicators for calculating the efficiency coefficient of the wage fund rate

Year	2017	2018	2019	2020
Inflation rate	2,03%	2,10%	2,25%	2,19%
Increasing the cost of components	2,20%	2,10%	2,30%	2,20%
Execution	1,083	1,000	1,022	1,005

The effective wage fund rate is 1,028. Therefore, in this case, the rate shows very high efficiency.

Results

Based on the methods developed in the course of the study for calculating the five developed rates to determine the stability domain for production enterprises, a formula to calculate the centric rate (CR) of the production stability domain was developed:

$$CR = PSR * PIR * EPGR * PCCR * EWFR$$

There:

PSR – production stability rate,

PIR – production innovation rate,

EPGR – effective product growth rate,

PCCR – product components cost rate,

EWFR – effective wage fund rate.

According to the definition of the equation components, the CR should tend to 1. If this rate is closer to 1, the production enterprise work is more stable. Efficiency levels can also be interpreted in quarts:

from 0,950 to 1,050 are very high rate,

from 0,901 to 0,949 or from 1,051 to 1,099 are high rate,

from 0,851 to 0,900 or from 1,100 to 1,149 are average rate,

from 0,85 and below or from 1,15 and above are low rate.

During the study, the simulated rate of the average production organization was considered by means of the developed formula:

$$CR = 0.88 * 1,035 * 1,03 * 1,024 * 1,028$$

$$CR = 0,9875.$$

Thus, the simulated enterprise exhibits very high production stability and the stability domain is quite far from the break-even point (BEP).

Based on the developed rates and the method for determining the centric parameter of economic stability, the centric rate of the economic stability domain for manufacturing enterprises was verified.

Discussion

The developed rates are not final. Other areas of the company's activities may also be considered, or this method may be extrapolated to service companies. Therefore, the formula for determining the centric rate of the stability domain can be used to analyze the economic activity of enterprises in various fields of entrepreneurship, as well as state and municipal financing.

It is proposed to consider the following issues:

1. Can additional rates of the enterprise's economic state be determined that are applicable in the developed method for calculating the centric parameter of the stability area?

2. What economic and other rates can be analyzed using this method for service enterprises?

Conclusion

Thus, during the study course, the stability domain concept was given as a set of economic rates of the production volume and sales of products, in which expenses will be compensated by income in a certain positive proportion, called income. It allows the enterprise to maintain a balance between the development costs and the current production costs.

A method for determining the manufacturing enterprise's stability rates was developed and presented. It includes five general weighted rates: production stability rate, production innovation rate, effective product growth rate, product components cost rate, and effective wage fund rate.

Based on the developed parameters of the production enterprise's stability, a formula for determining the centric rate of the production-type enterprises' stability domain was developed. So, the effectiveness of this solution method was proved.

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Optimization in warehouse for assembly and construction company

Abstract:

Optimization of warehouse for assembly and construction company is actual in modern stage of logistics development in the cities and urban regions. One of the most important criteria during dynamical logistic development is to be guarantee of quality for company's clients. In the research, logistic complex issues on the example of the "Aria TV" company were studied. Comparative, mathematical methods and methods of spatial analysis were used to reach the purposes. The materials of specific documentation and regulations, and research works of leading specialists in the field of logistics as D. Cattaruzza, W. Yu, C. Harland and others were used in the research. There is conclusion that it is necessary to include international standards of ISO 9000 family to optimize professional activities of the company and support high level of the quality. It is offered to separate main warehouse by creating of additional warehouses in the megapolis districts actualized for the company. The research results are intended for specialists from huge logistics companies operating in the area of the cities.

Keywords: ISO 9000, warehouse, driven-data logistic, logistic process.

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Оптимизация склада для монтажно-строительной компании

Аннотация:

Тема оптимизации складов монтажно-строительных компаний является актуальной на современном этапе развития логистики в крупных городах и городских агломерациях. Один из важнейших критериев во время динамического развития логистики – это оставаться гарантом качества для клиентов компании. В ходе исследования были изучены

комплексные вопросы логистики на примере компании “Ария ТВ”. Для достижения поставленных задач были использованы сравнительные, математические методы и методы пространственного анализа. Были использованы материалы специализированной документации и регламентов, а также исследовательских работ в области логистики, например, Д. Каттаруззы, В. Ю, К. Харланда и других. Были сделаны выводы о том, что в компании необходимо внедрить и поддерживать международный стандарт семьи ISO 9000 с целью оптимизации профессиональной деятельности компании и поддержания высокого уровня качества. Предложено произвести сепарацию основного склада путем открытия дополнительных складов в актуализированных для фирмы в районах мегаполиса. Результаты исследования предназначены для специалистов крупных логистических компаний, работающих в зоне крупных городов.

Ключевые слова: ISO 9000, склад, логистика на основе данных, логистический процесс.

Introduction

This topic has a high level of relevance to the modern stage of business development. Nowadays the warehouse becomes one of the main logistic system stages. Thousands of companies in the field of assembly and construction use a warehouse as an essential part of business processing. There are some important problems in warehouse logistics. These problems are usually decided on a local level. Therefore, the problem can have a multi-variation of solutions.

In the cities, companies may have a problem with urban traffic. It forms additional outlay in time management, managing budget and customers relationship. Moreover, these problems of enterprise management motivate customers to change a statue of a client or prefer another competitor. Therefore, this actualizes the need for a company to modernize or optimize its traffic system by using more quantities of a warehouse in the cities.

Nowadays, the streets are the venus of the city. In the level of the state, the roads also are one of the most important lines of business connection. Additionally, the roads are the ways of connection between neighbouring states in general and far states regionally. There are many challenges for the logistics industry mainly with the integration of E-commerce and new sources of data such as smartphones, sensors, GPS and other devices. Those new data sources generate a daily huge quantity of unstructured data, to deal with such complex data, the use of big data analytic tools becomes an obligation (Ben Ayed et al., 2015).

Vehicle routing problems define a class of combinatorial optimization problems that allow optimizing itineraries of a fleet of vehicles, when these vehicles operate round trips, that is, have multiple stops along their itinerary. This

situation represents a large part of the flow of vehicles for good distribution in cities. However, route optimization in cities presents some peculiarities that should foster the development of new models (Cattaruzza et al., 2015). The correct construction of logistics gives to the reduction of self-cost and an increase in profit. Since universal digital programs to calculate a roadmap to the supply chain have not existed. So, it is actually necessary to create a new logistic solution in the digital sphere or create it in the manual. The variants are discussed in the paper.

The subject of the paper was warehouse optimization for assembly and construction.

The object of the paper was “Aria TV”, which makes activity in the field of assembly and construction.

The main purpose was to optimize warehouse logistic system of the company.

According to the purpose, there were created tasks:

- Analyze current logistic system of the company.
- Actualize the problems of warehouse logistics in the field of assembly and construction on example of the company.
- Develop solutions of logistic system’s optimization.
- Model a variant of the logistic system of the company depending on the developed solutions.

Data-driven logistics is the use of logistics and data management to create a smart and efficient way of running a business, this may include components like AI, blockchain, big data, machine learning etc.

1. Context of the chosen logistics process

The full name of the company is “Aria TV” Limited Liability Company, also has an English name “Aria TV”. The company was founded by two individuals with equal shares in the company in 2004. In 2006, the Board of Shareholders doubled by exchanging equal shares in the authorized capital with the Telecommunication Company “Prometey” LLC. Later, Aria TV and Prometey were incorporated. The holding existed until 2019 when Prometey was sold to Rostelecom.

The company was established for the construction of fibre-optic communication lines (hereinafter FOCL).

Aria TV as construction and operating company is a recognized leader in the regional market for the construction and operation of overhead fibre-optic

communication lines throughout St Petersburg and Leningrad region. This company is dynamically developing, increasing the area of coverage of the city with its optical fibre to supply its services to as many residential buildings as possible. The customers of the company are not only commercial enterprises or individuals but also state enterprises that need an Internet connection or recording of territories from cameras. Thanks to Aria TV, its customers can easily establish a connection to the Internet to use cloud technologies, be in direct communication with each other or with customers, as well as for personal use. In addition, video surveillance can allow securing the places needed by the customer by directly viewing the territory.

The company Aria TV has been providing its services for the construction of fibre-optic communication lines, installation and maintenance of equipment for Internet connection and video communication in the Russian market for over fifteen years. During this time, a lot of experience has been accumulated, a qualified team of specialists has been formed, and a reliable partner's reputation has been earned. Aria TV provides for its customers the installation of equipment and laying of fibre-optic cables for their subsequent use to connect to the Internet or use as a video signal transmission using video cameras.

The company also has long-term partnerships with Internet supply companies such as Rostelecom and Prometey, which provides its equipment, and in turn, Prometey helps with IT services.

The main idea is about separating the warehouse in some parts, it is actually necessary for the optimization of logistic service of the company. The company still has a main warehouse and rented small warehouses additionally. There are two variants where warehouses can be rented. The first variant is to locate warehouses in downtown or near it. The second one is to locate warehouses in Petrogradskaya district.

Due to this system of separated warehouses, the company can avoid time losses, which was a cause of traffic jams. That means the mechanics can fix outside damage for cables or cameras. Also, the product can be delivered from the main warehouse to additional ones at the "jam-free days" like Saturday or Sunday. In St Petersburg, Saturday evening and Sunday morning is the preferred time for cross-warehouses to deliver.

Thus, St Petersburg is one of the old cities, so there are the usual traffic problems with this type of megapolis. The streets are very narrow, which mainly consist of only two reverse lines. In other words, this creates additional problems

for oversized transport to deliver. So, the company can rent additional warehouses in the different districts of the city to escape a problem with long-time traffic.

2. Description and analysis of the chosen process

Company has a united warehouse near its office. The warehouse stored common equipment from suppliers or a unique one from the company itself. There are four ways there, which is shown in Figure 1. In the first three ways, the construction team starts from warehouses. They can go to the problem address, to the new client or to check an address. In every of three ways, the construction team should use different equipment from the warehouse.

The first way assumes to work with problem addresses. It is the rarest way because all situations with such an address are special and unique. Every time the team should use a specific way to find and fix a problem. Gradually, the company creates and updates databases for all these situations and their solutions.

The second way is about work with new customers or sometimes new addresses from old customers. In this way, the construction team uses equipment to take metric information. However, sometimes before using metric equipment, the team needs to clean up a place where they want to use it.

The third way describes the address used by the company client where some problem was detected by a monitoring programme or when the client sends or phones call to the company with the request to check. Such addresses are not problematic, and usually can be solved by basic activities, like reloading a soft with a reconnection to the power supply system or using a keyboard to reload it manually.

The fourth way is special because the construction team is already outside of the warehouse and has numerous equipment. However, sometimes it is not enough and the construction team should ignore the address or back to the warehouse to add equipment, which the team needs to complete their task.

Thus, it needs to note that in all described ways, the construction team using a different staff solves its tasks. Most of the staff are too huge to be stored in the construction team cars, so the company should change its warehouse system by renting more places to store staff.

3. How the logistics process can be improved

To improve the logistic process of a company, the Standard ISO 9001-2015 Quality Management System was used. For organizations asking how to improve the quality of their products and services and consistently meet their customers'

expectations, ISO has an answer. Addressing various aspects of quality management and containing some of ISO's best-known standards, there is the ISO 9000 family (ISO 9000, 2020). ISO 9001 sets out the criteria for a quality management system and is the only standard in the family that can be certified to (although this is not a requirement). It can be used by any organization, large or small, regardless of its field of activity. In fact, there are over one million companies and organizations in over 170 countries certified to ISO 9001 (What is ISO 9001, 2013).

ISO 9001-2015 verifies five criteria:

1. Client orientation, which is the main target improved in the frame of this project. Changing warehouse logistics should decrease delay before the company starts to work with a client's problem.
2. To do easier the way of partnership in the field of construction and staff service. With this standard, the company can simply sign a contract with companies like Rostelecom to construct new points for it or add a new customer in the building with the system already done.
3. According to the Standard, it results in manufacturing development and the evolution of workers. The new experience, which is earned by the workers of the company, helps to perfect their personal skills.
4. Creation of the new logistic system or updating of existing one uses permanent analytical monitoring for modernization of manufacturing and staff policy. This solves some problems in highlight spheres.
5. New system of reaction for customer's reports is created or updated to this Standard criterion. This new system lets effectively analyze solutions and gives a company to take resultative measures to eliminate issues.

Thus, ISO quality orientation is one of the most important features to work effectively. This will allow a company to expand their influence zone by working with other companies, which have already used ISO standards, in other cities or regions. The high standards of quality provided by ISO 9000 family helps a company to improve not only business communications but work with a client base.

4. Description of the 'to be' applied technology

According to service logistics, supply chain management is the management of the flow of products and services, involves the movement and storage of primary tools, work-in-process inventory, and finished results as well as end-to-end order fulfilment from point of generation to consumption (Harland, 2015).

Supply chain management is a crucial process because an optimized supply chain results in lower costs and a faster production cycle (Kenton, 2020). Supply Chain Management (SCM) is an important part of every organization, whether small or large. SCM also deals with the movement and storing of materials needed to create a product, as well as inventory management, and keeping track of finished goods from where they were created to who they go to. Bottom line: there is no overstating the importance of Supply Chain Management (Handfield et al., 2020).

Many logistics sectors can profit from data-driven innovations, such as container transport, construction industry logistics, urban logistics and transport of perishable products. For example, the container transporters can have their trucks at the ready and the recipient of the shipment will know exactly when their goods will arrive. The advantages go without saying: improved efficiency and lower costs. In addition, implementing data-driven innovations can result in new earning models. It also allows companies further down the chain to structure their work more efficiently, which they will be happy to pay for. As the number of kilometres travelled is reduced, the costs to society fall and so data-driven logistics are more sustainable too (Data-driven logistics, 2020).

Despite the importance and relevance of data-driven supply chains, there has been very limited empirical research that investigates how big data-driven supply chains affect supply chain capabilities. The results indicate that a data-driven supply chain has a significant positive effect on the dimensions of supply chain capabilities. Coordination and supply chain responsiveness is positively and significantly related to financial performance (Yu et al., 2018).

Thus, this complex of activities helps a company to improve its profit. However, it is important to remember that Supply Chain Management technology can be always re-used to rise. As this technology can be used multiple times, it is important to know when it should stop.

5. Implementation, cost benefit analysis, and break-even point

Using technology, which had been described before, it was saluted to separate the warehouse into the main one and the satellites. (Fig. 2) The main idea of this separation is about taking less cost per driving and taking more money with emergency calls. The faster a construction team comes and fixes any problem; the company will have more money. Thus, traffic jams are one of St Petersburg most problematic (Perova, 2017). A lot of time was spent by construction teams, which cannot reach their goal, because of jams and a lot of money was lost with it.

Satellite warehouses should be rented near an agglomeration of customers, where the way from the main warehouse is always blocked by jams, e.i., it is relevant to rent a warehouse in downtown or near it. In another way, it can be not downtown, but a hard to enter streets, like Petrogradsky district. It is the island part of the city that has four bridges to enter this district can be only used by construction teams, which is always in jams for rush hour. Therefore, if the company has the warehouse, already located in this district, jams will become a less problem. If jams have a rate of nine or ten with google rating, the construction team can go to address by their feet or use a bicycle, tool cart, etc. Construction teams' work functionally stays the same but becomes easier to complete.

To prove benefits, the table depending on the calculation of information, which company provided to use, was done. In the table, there are two ways. The first of them, the warehouse is located downtown or near it. To calculate its rental costs, a place near downtown was selected. The second one, the warehouse located in Petrogradsky district. The place must be taken near the Vasileostrovsky district. According to Table 1, rent cost depends on the place where the company rents a warehouse.

Using counting information of the company and rental cost in St Petersburg in actual districts, there were two results for every scenario. The first scenario is about a warehouse in downtown or near it, and the second scenario is about a warehouse located in Petrogradsky district. The first conclusion exists when the company rents a warehouse in the selected district. The second one is the variant when the company does not do so. In nowadays, the company works with a second variant.

According to calculation, the company will have more profit with the result, when the warehouse was rented for both scenarios. Despite the rent costs, results with renting a warehouse are more profitable. Money value is not big, but existing, that declares the effectiveness of offering logistic improvement. In Table 1, there is no inflation rate, because the economical effectiveness of both variants is higher than in Russia.

Conclusion

Based on the research provided in “Aria TV” company, a logistic system, which became more customer-oriented and competitive, was developed.

Aria TV was established for the construction of fibre-optic communication lines. The customers of the company are not only commercial enterprises or individuals but also state enterprises that need an Internet connection or recording

of territories from cameras. The company also has long-term partnerships with Internet supply companies such as Rostelecom and Prometey, which provides its equipment. The main idea is about separating the warehouse in some parts. The company still has a main warehouse and rented small warehouses additionally. There are two variants where warehouses can be rented. The first variant is to locate warehouses in downtown or near it. The second one is to locate warehouses in Petrogradskaya district. Due to this system of separated warehouses, the company can avoid time losses, which was a cause of traffic jams.

Company has a united warehouse near its office. The warehouse stored common equipment from suppliers or a unique one from the company itself. There are four ways there. The first way assumes to work with problem addresses. The second way is about work with new customers or sometimes new addresses from old customers. The third way describes the address used by the company client where some problem was detected by a monitoring programme or when the client sends or phones call to the company with the request to check. The fourth way is special because the construction team is already outside of the warehouse and has numerous equipment. So, it needs to note that in all described ways, the construction team using a different staff solves its tasks - most of the staff are too huge to be stored in the construction team cars, so the company should change its warehouse system by renting more places to store staff.

To improve the logistic process of a company, the Standard ISO 9001-2015 Quality Management System was used. Addressing various aspects of quality management and containing some of ISO's best-known standards, there is the ISO 9000 family. ISO 9001 sets out the criteria for a quality management system and is the only standard in the family that can be certified to (although this is not a requirement). ISO 9001-2015 verifies five main criteria such as Client orientation, simplification of partnership, manufacturing development and the evolution of workers, creation of the new logistic system, and new system of reaction for customer's reports.

According to service logistics, supply chain management is the management of the flow of products and services, involves the movement and storage of primary tools, work-in-process inventory, and finished results as well as end-to-end order fulfilment from point of generation to consumption. SCM also deals with the movement and storing of materials needed to create a product, as well as inventory management, and keeping track of finished goods from where they were created to who they go to.

The main idea of this separation is about taking less cost per driving and taking more money with emergency calls. The faster a construction team comes and fixes any problem; the company will have more money. Satellite warehouses should be rented near an agglomeration of customers, where the way from the main warehouse is always blocked by jams. In another way, it can be not downtown, but a hard to enter streets, like Petrogradsky district. Therefore, if the company has the warehouse, already located in this district, jams will become a less problem. According to calculation, the company will have more profit with the result, when the warehouse was rented for both ways.

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Appendix

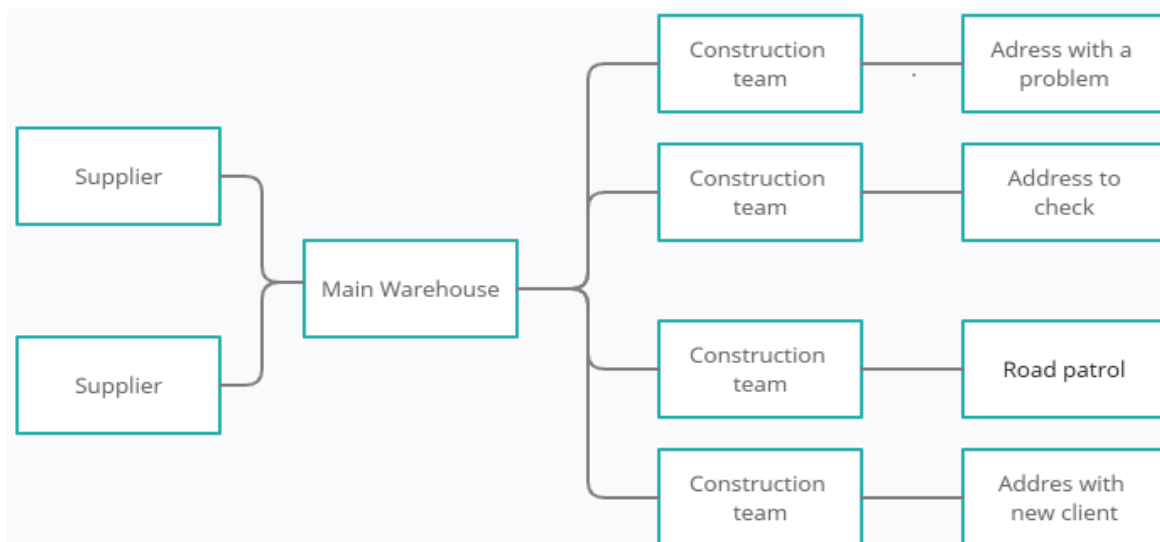


Figure 1. Scheme 'As is' of the analyzing company

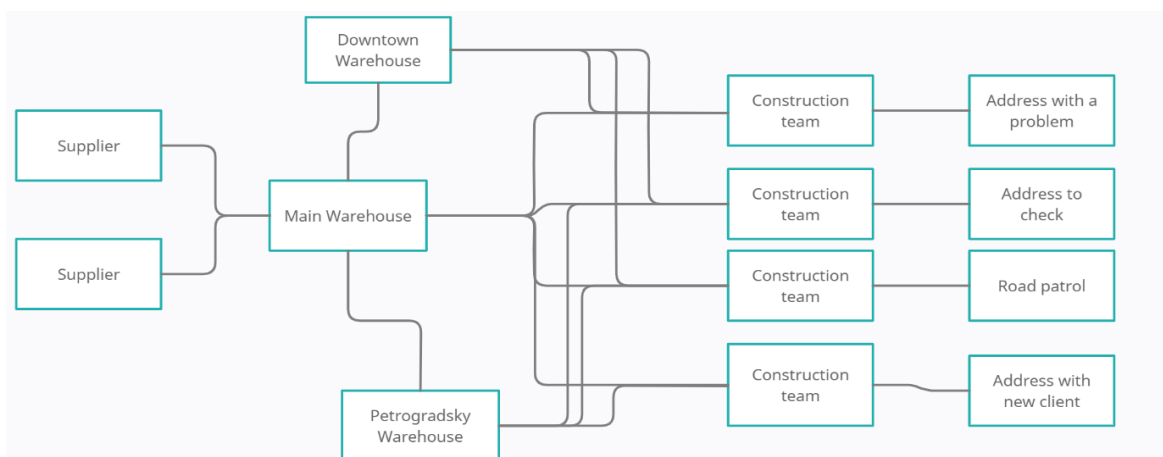


Figure 2. Scheme ‘To Be’ of a company after separating warehouses

Table 1. Comparing characteristics of warehouses for rent in two different districts

	Downtown or near it	Petrogradsky district
Rental costs	30 000P	15 000P
Service cost per kilometer	4 500P	4 500P
Number of kilometers	1	2
Equipment costs	0P	0P
Profit from installing a new cable	200 000P	130 000P
Number of customers near the warehouse	15,00	5,00
Average number of incidents	4,00	2,00
Average price for elimination of emergency incidents	35 000P	17 500P
Profit annually per year	1 574 000P	478 000P
Benefit without the introduction of a warehouse	1 214 000P	454 000P

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