*Advances in Economics, Business and Management Research, volume 129*
**III International Scientific Congress Society of Ambient Intelligence 2020 (ISC-SAI 2020)**

# Implementation of Smart Specialisation for Regional Industrial Development

Mykola Sychevskiy[1] Liudmyla Deineko[2] Oksana Kushnirenko[2] Olena Tsyplitska[2,*]
Oleksandr Deineko[3]

[1]*Institute of Food Resources of national Academy of Agrarian Sciences of Ukraine, Kyiv, 02002, Ukraine*
[2]*State Organization "Institute for Economics and Forecasting of NAS of Ukraine", Kyiv, 01011, Ukraine*
[3]*Ukrainian-American Concordia University, Kyiv, 02000, Ukraine*
[*]*Corresponding author. Email: o.liakhovetz@gmail.com*

**ABSTRACT**
Smart specialisation is seen as a new opportunity for the European regions and the whole economies development. In Ukraine smart specialisation is only being mastered according to the results of Ukrainian industrial enterprises survey held in 2019 by authors. The purpose of the research is the identification of the role, opportunities and perspectives of smart specialisation implementation in regions for Ukrainian industrial growth with the help of the industry experts' survey. The objectives of the research were: to consider the foreign experience in smart specialisation strategies implementation and its effects of industrial development; to analyze the findings of the survey of industry's experts; to make recommendations for smart specialization strategies implementation in Ukraine. The methodology included the questioning of 50 representatives of manufacturing (light, pharamceutical and food industries) and of related government bodies on the smart specialisation perspectives for the industrial potential development and its statistical analysis. The key finding of the research is that representatives of Ukrainian industry though perceive the importance of this tool face many obstacles in its implementation: difficult financial situation, lack of public support, lack of skilled personnel and of information about existing smart technologies. Considering research results the solutions of the identified problems were proposed which included the establishing an effective dialogue between central and local authorities, national producers and academic institutions; development of new areas of activity through targeted forms of interregional cooperation; development and implementation of the industrial and financial policy tools to stimulate R&D and S3 implementation on a regional level.
***Keywords:*** *smart specialisation, industrial development, industrial policy, smart technologies, Ukraine*

## 1. INTRODUCTION

At the beginning of the 21st century both developed and developing countries faced new global challenges related to increased global competition of industrial products trade. This stipulated governments to seek and to implement new approaches of economic policy to enhance industrial sector innovative development. EU members, USA, China and many others are developing and embedding main issues of Industry 4.0 in industrial renaissance strategies with a core of industrial transformation, revitalization and development [18]. Smart specialisation implies the identification of unique characteristics and assets of each type of human activity aimed at promotion of collaboration between regional and national authorities responsible for decision-making process in innovative policy development, and appropriate stakeholders participating in this process (entrepreneurs, universities, research institutions, non-government organizations). Smart specialisation intensifying a vertical and horizontal integration stipulates the right coordination of industrial policy of central government with the regional policy and business initiatives [12].

Smart specialisation is one of the priorities of the Europe 2020 Strategy [3], where a smart growth is determined as developing an economy based on knowledge and innovation. In certain regions of Europe there are numerous research institutions introducing innovative technologies; other regions have well-developed manufacturing base and labour force that will provide innovative-oriented industrial development. Smart specialisation is intended to help for European regions to join to transnational networks of knowledge and experience and to promote development of transnational and macroregional value chains [11]. The purpose of smart specialisation implementation relates to achievement of 17 Global Goals of Sustainable Development. It is a driver of regional economic growth and stimulates to raise the performance of local communities through the creation of regional competitive advantages, enhancing local opportunities and accelerating innovative transformations provided under coordination of science, business and community [8].

 

The implementation of Smart Specialisation Strategies (S3) is also accompanied by cluster policy and clusters nurturing by integrating research institutions, industrial enterprises, associations, non-government institutions, small and medium business [5] and cooperating with government institutions, local authorities.
The purpose of the research is the identification of the role, opportunities and perspectives of smart specialisation implementation in regions for Ukrainian industrial growth with the help of the industry experts' survey.

## *1.1. Related Work*

### *1.1.1. Literature Review*

The peculiarities of development and implementation of smart specialisation concept are defined in many foreign and domestic studies. The methodological foundation of this complex study refers to the works of such scholars as D. Foray [6; 7; 8], F. Guzzo [10], H. Kroll [17], P. McCann [19], M. Rusu [21] etc. The researchers of the S3 concept first determined it as a base for the European Research Area, i.e. the process creating equal competition and cooperation conditions for specialized clusters. Later it penetrated many other spheres of socioeconomic activity especially on the regional level.
There are different challenges in the process of smart specialisation: theoretical background which includes new terminology and comprehension of terms among scientists; information on national and municipal institutions; new competences of entrepreneurs and society as a whole [14], which became the subjects of modern studies.
The mechanism of S3 impact on the competitiveness both of business entities and the whole economy and on the regional development is performed through increase in degree of product innovativeness [13; 16].
The studies devoted to expedient directions of smart specialisation on a regional level in Poland are presented in works of P. Soltys, D. Kamrowska-Zaluska [22], which compare priorities of smart specialisation in regions. Aleksandra Gulc [9] performed the analysis of methodological approaches to regional smart specialisation selection. Among methods used there were statistical analysis of industrial and other economic indicators, SWOT analysis, individual interviews, experts panels and public consultations.
To identify the necessary skills, competencies and smart specialisations in regions the poll of local companies has been conducted in Greenland [15]. And it has shown the great role of knowledge economy in regional development and gender differences in the perception of new knowledge. The questioning of LEP (Local Enterprise Partnership) organizations and SWOT analysis in 2012 in United Kingdom discovered new opportunities for investing in KET (Key Enabling Technologies) and the extent of entrepreneurs' awareness of how the technological evolution happened. The British government declared eight directions for smart specialisation: 1) big data and energy efficient computing; 2) robotics and autonomous systems; 3) satellites and commercial applications of space; 4) life sciences, genomics and synthetic biology; 5) regenerative medicine; 6) agri-science; 7) advanced materials and nano-technology; 8) energy technologies [2].
The economists from National Academy of Sciences of Ukraine generalize existing foundations of economic development and approaches to create conditions for active use of R&D and innovative potentials, define the strategic course of state innovative development within further integration in world economic and scientific scope, and analyze the European experience of smart specialisation [12; 23].
The role of a state in S3 development according to the modern scholars should be only subsidiary [7]. However, the observation of the early-stage experience of RIS3 implementation across many EU regions suggests that the benefits of RIS3 tend to be multi-dimensional rather than purely technological and research-related [17], also involving institutional and governance dimensions. Yet, this multidimensionality also reflects the fundamental nature of innovation [19].
The direction of smart growth is embodied in development strategies of many countries, in particular, of the European Union, and is under the close supervision of policymakers. That is why European Commission regularly monitors the smart growth process in the form of surveys.
In 2010 the European Commission developed the Communication "Regional Policy contributing to smart growth in Europe 2020" [3] by which the Smart Specialisation Strategy Platform (S3P) has been created. The business surveys, polls of policymakers about their attitude to S3, its advantages and disadvantages are conducted annually through the platform. In 2013, 2014 and 2015 first surveys were held by Fraunhofer ISI. The main intention of the survey was to understand the extent to which the new EU Cohesion Policy regulations and guidelines relating to smart growth were in reality being translated into actual changes in policy actions.
In 2017 on demand of European Commission the observation about its assistance provided for implementation of Smart Specialisation Strategies was conducted. Policy makers' perception of the RIS3 (Research and Innovation Strategies for Smart Specialisation) was explored through questioning of the S3 Platform website. And 71 valid responses from 18 countries were received by April 2018 [10]. The common result of the survey says that smart specialization is positively valued by the majority of interviewees. However, the legislation and institutional capacity of governments in S3 implementation need to be strengthened. At the same time European Commission in 2017 generalizes the results of the 2013-2017 surveys of 140 entrepreneurs and policymakers questioned about the perspectives of economic development of the European regions and S3 implementation [17]. About 55% of respondents are satisfied with RIS3 process in Europe and marked that benefits outweighed (45%) or greatly

outweighed (10%) costs. According to the research the forms of government support most appropriate for the RIS3 implementation progress are building local capacity and support to intermediaries, limited support to many beneficiaries, enabling technology creation.
The generalization of the theoretical foundations of the S3 concept and experience of its inclusion in development strategies of the European countries allows considering smart specialisation as a tool of industrial revitalization for countries with partially lost production capacities, as well as for Ukraine.

### *1.1.2. Methodological Approach*

The research methodology derived from the basic principles for identification and establishing the priorities of smart specialisation introduced by D. Foray [6]. In particular, they include granularity and entrepreneurial discovery principles that anticipate the designation of the priorities through interaction with entrepreneurs and state and local institutions as well as through exploration of opportunities of new technologies implementation from the company's level to regional level.
In Ukraine this is, evidently, the first try of the investigation of the business and authority representatives' attitude in the form of questionnaire. Following the European methodology the questionnaire is the right method to identify sentiments, trends and needs of manufacturers what becomes a ground for S3 development.
In the research we provide the results of survey of entrepreneurs and other experts in different industries in Ukraine and of SWOT analysis of the implementation of smart specialization as well. The survey was conducted in 2019 and covered entrepreneurs, government officials, academicians etc. from different regions of Ukraine. As mentioned in OECD paper "Innovation Driven Growth in Regions: The Role of Smart Specialisation" [20] the smart specialization approach calls for an 'entrepreneurial selection' of market opportunities.
The main method used in the study is public opinion survey – specially organized poll for various industries and public authorities' representatives in Ukraine. The observation took place in Kyiv in June, 2019 during Ukrainian Export Week – 2019 under the project "Smart Specialization of Industry as a Trigger of Innovative Changes".
The survey was held in the form of written questionnaires for industry and central and local government representatives. Each questionnaire contained 8 questions – 2 open-ended questions, 2 closed-ended questions and 4 semi-open questions. In comparison with other methods of observation this method is one of the best frameworks to obtain non quantitative data. It provides consistency and targeting of information that cannot be obtained in other way than by questioning.
We used a target sample following European Commission statistical approach. The sample is obtained by invitation of representatives from predominantly manufacturing sector mainly from light, food and pharmaceutical industries of Ukraine. This structure was chosen on such rationale: pharmaceutical industry is the pioneer industry in the world to implement smart technologies; the food industry of Ukraine has the biggest share in manufacturing sector and has great opportunities to provide smart development; light industry is one of the least successful in Ukraine, so smart technologies can be considered as a driver of its growth. The sample includes 50 participants. The sampling error does not exceed 15%. Considering the purpose of the analytical and experimental investigation the error value is satisfactory.
The data gathered during the questioning was processed using such techniques as grouping, reduction, comparison, and graph analysis.

### *1.2. Our Contribution*

This paper presents the results of the survey of industry's experts, in which the role, opportunities and perspectives of smart specialisation implementation in Ukrainian economy are identified. These analytical material can be implemented in programs of regional development in countries that modernize industry and seek for new effective approaches of industrial development policies.

### *1.3. Paper Structure*

The research is organized as follows. The first section represents the theoretical base for smart specialisation implementation and the foreign experience of conducting surveys to monitor the performance of the process. The description of the methodological approaches used in the research is given in the second section. The third section describes main results of the survey of industrial enterprises concerning their level of perception of S3 held in June 2019. At the end of the study we conclude the survey results and give some policy recommendations concerning the main vector and tools of smart specialisation.

## 2. BACKGROUND

### *2.1. Preconditions of the S3 concept implementation*

Considering the originality and complexity of smart specialisation concept it should be taken into account the evolution of this category related to peculiarities of its implementation in EU. The S3 Platform assists EU countries and regions to develop, implement and review their RIS3. The concept was developed in 2006 by the group of analysts and politicians to provide the scientific base for professional consulting at the national and regional level concerning creation and implementation S3.

The key task anticipated more efficient distribution of European Structural & Investment Funds (ESIF) that would stimulate the Europe 2020 goals achievement.

In the European Union S3 Platform for industrial modernisation aims to support EU regions which are required to provide the movement of industrial investment projects "down up" through interregional cooperation, cluster development and industry inclusion.

The implementation of the S3 concept in Ukraine is reinforced by the Order of Cabinet of Ministers of Ukraine "On approval of the Concept of digital economy and society development in Ukraine for 2018-2020" [1] and Digital Agenda of Ukraine developed in 2016.

Summarizing our findings we may denote that the peculiarity of S3 implemenation is the capability of industrial sector to generate a transformational effect which is necessary for sector modernization according to the Fourth Industrial Revolution, will promote the reinforcement of the investments in R&D and optimization of financial and organizational efforts.

## *2.2. Survey Findings*

To determine main obstacles and perspectives of smart specialisation implementation in Ukraine and to identify main policy tools and public and non-public support we conducted a survey of 50 representatives of industrial sector mainly from food, light and pharmaceutical industries (Figure 1).

The survey sample represents a sufficient number of respondents for description of the general picture of business adaptation to smart technologies.

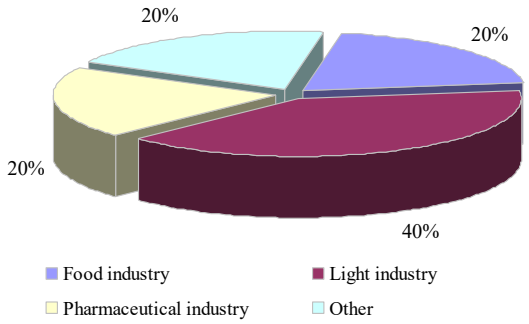


**Figure 1** Industries surveyed

The research made it possible to identify main obstacles for Ukrainian business innovative development and policy tools to increase the degree of business adaptation to new technological challenges.

The most valuable finding of the survey is the manufacturers' full perception of smart technologies impact importance 87% of business and authorities representatives recognized the compelling weight of smart specialisation for business development, 13% did not decide on the answer, and there were no "no" answers at all (Figure 2).

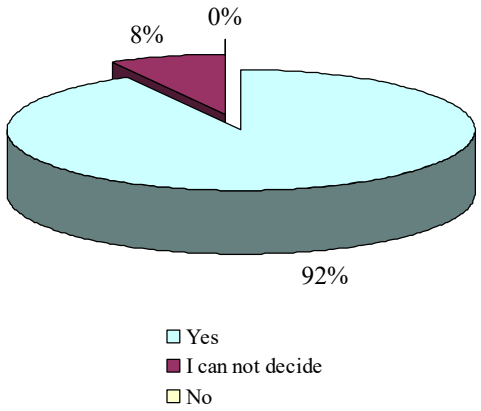


**Figure 2** The assessment of the importance of smart specialization for business development

Next stage of analysis is the determination of the most sensitive segments of enterprises' production and sales chain with the highest impact of smart technologies. The survey results showed that 67% of respondents denoted R&D stage, second place (56%) belonged to production and the third place (44%) – to ecologization of production. Logistics, human resource management and trade 40%, 40% i 30% respondents respectively considered as a priority for smart specialisation and digitalization as they aimed to reduce transaction costs. The after-sales service was defined as the less sensitive to smart technologies implementation (Figure 3).

All the survey participants (> 50%) recognized the industrial engineering and process automation and robotics as the most prospective technologies.

The supervisory control and data acquisition systems (SCADA) are able to optimize business processes and production control that is why 32% of pollees considered them as an inherent element of production management systems.

Management and protection of data require the introduction of cloud technologies, artificial intelligence and blockchain (< 20% of respondents).

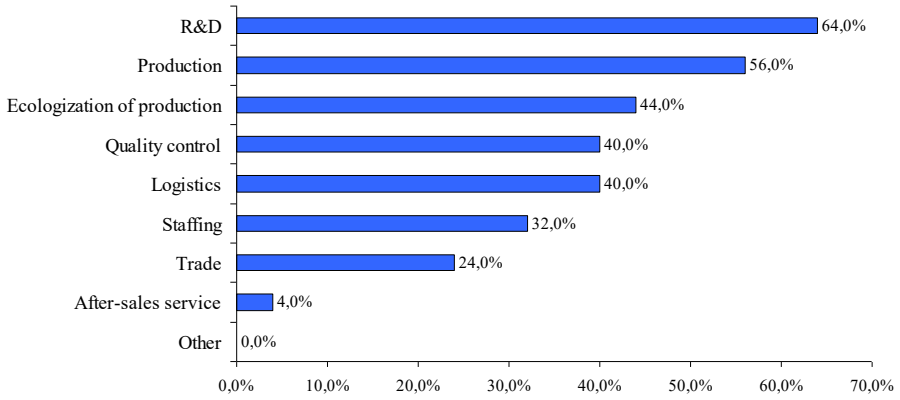


**Figure 3** Segments of production and sales chain which are greatly influenced by smart technologies

The role of other smart technologies is not comprehended yet by the industry experts what is explained by insufficient level of existing technologies (Figure 4).

To obtain significant competitive advantages smart specialisation implemenation in manufacturing is a key-point.

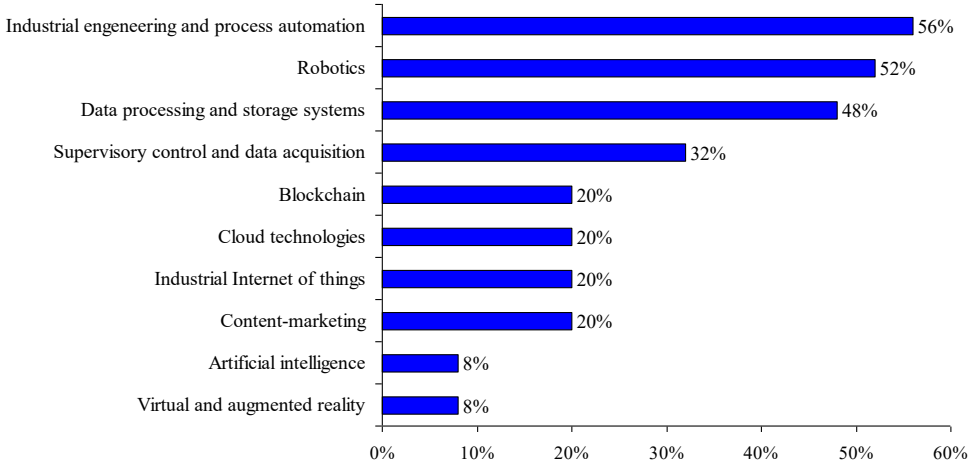


**Figure 4** The most prospective smart technologies

Industry surveys in identification of prioritis of smart technologies introduction showed some reasonable divergence:

*respondents of the group "Food industry"* defined that the most perspective smart technologies for the industry as effective tools of sales promotion and management improvement include industrial robots for production automatization, big data, blockchain, and content marketing;

*respondents of the group "Pharmaceutical industry"* found out that the prospective technologies for thei industry are industrial robots, blockchain for data security and SCADA systems;

*respondents of the group "Light industry"* identified Industrial Internet of Things (IIoT), 3D printing and industrial robots for production automatization as most appropriate technologies for their industry.

Smart specialisation as an area of wide implementation of digital technologies may become the tool transforming the physical work into smart work with predominant use of creative and intellectual activity and thus will result in increase of products quality, reduction of environmental pressure, in other words in the long run it will provide both socioeconomic and ecological effects. This was justified by the results of the survey that showed the full understanding of the significance of smart specialisation processes (Figure 5).

The expectations of manufacturers are fairly predictable. At first they are oriented on improvement of production, sales, socioeconomic and ecological performance of business, and then – on facilitation of analysis, calculations and other standard procedures in business activity what will contribute to diversification and starting new types of activity. The important result of smart specialisation implementation concerns the increase in volumes of production and exports, improvement of communication with clients and suppliers and reduction of

production period. Here we observe some discrepancy with previous answers where client-oriented smart technologies were in the last places while the manufacturers' expectations about increase in efficiency in this segment are notable.

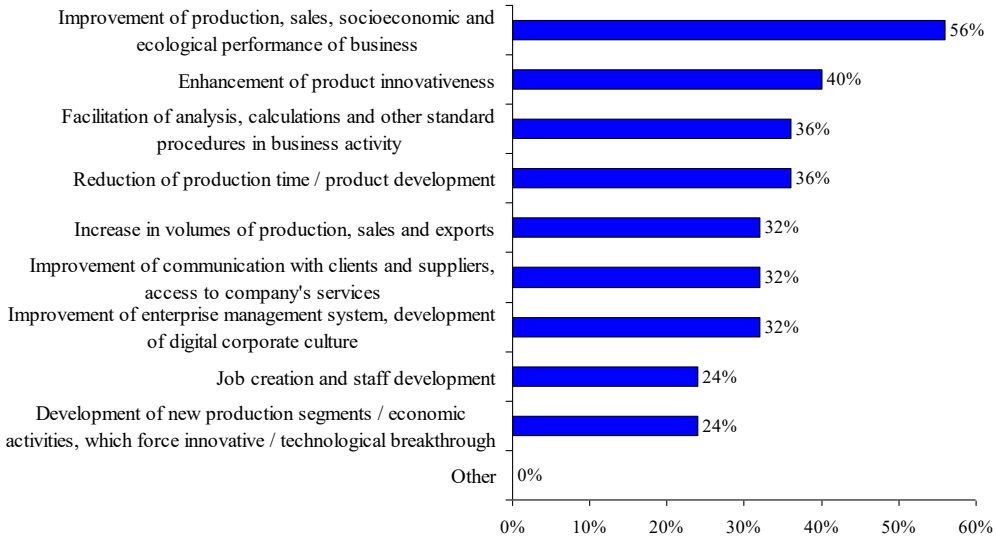


**Figure 5** Expectations of Ukrainian industrial business from smart technologies implementation

Less than half of respondents also marked enhancement of product innovativeness, staff development and job creation, improvement of enterprise management system and development of new production directions as possible consequences of S3 implementation. In turn European poll results [10] showed that general improvements in the course of RIS3 were obtained in stakeholder engagement, concentration of funding, prioritization procress and emergence of innovative potential. And the main impact came out in structure and functioning of the innovation ecosystem. The differences are explained by different policy and survey priorities in the EU.

For the further development of smart specialisation it is important to identify the bottlenecks obstructing Ukrainian industrial business development (Figure 6).

The interviewees concluded that the most sensitive factors hindering smart specialisation implementation in industrial sector included difficult financial situation (60%) and the lack of public support (52%). About half of survey participants (48%) denoted the lack of skilled personnel and work experience in smart solutions in business.

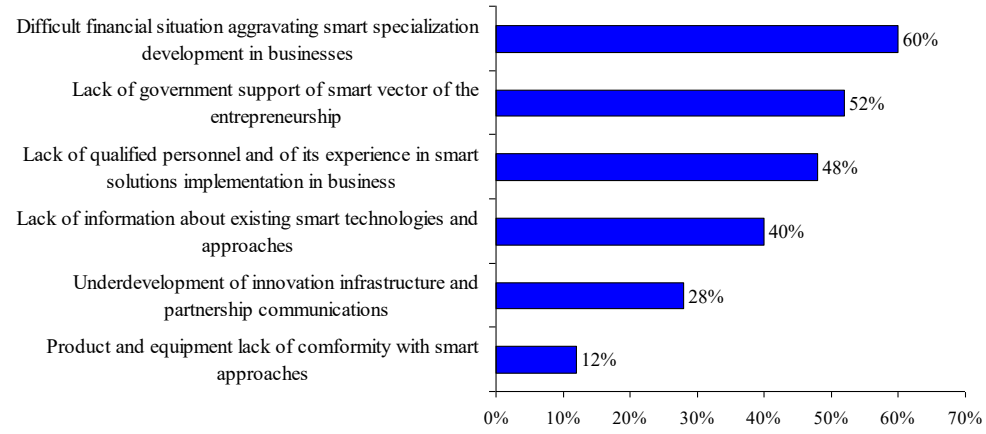


**Figure 6** Issues inhibiting smart specialization in Ukraine

Moreover, the obstacles for smart specialisation is stipulated by lack of information about existing smart technologies and opportunities (40%), underdeveloped innovative and partnership communications infrastructure (28%), discrepancy the products and equipment quality to standards associated with smart specialisation (12%).

In EU poll [10] experts identified such obstacles as: 1) internal bureaucratic obstacles (70% of respondents replied yes or somewhat); 2) lack of funds for recruitment and training (66%); 3) insufficient coordination among government departments (66%); 4) unavailability of skills at the local level (59%); 5) lack of interest or engagement by stakeholders (56%); 6) insufficient political commitment (51%). It is to be expected that Ukraine will

encountered the same or even bigger problems when the process of active S3 implementation is launched.

The poll also made it possible to inegrate the entrepreneurs' vision of necessary steps to qualitative changes in the production structure with scientific approaches (Figure 7).

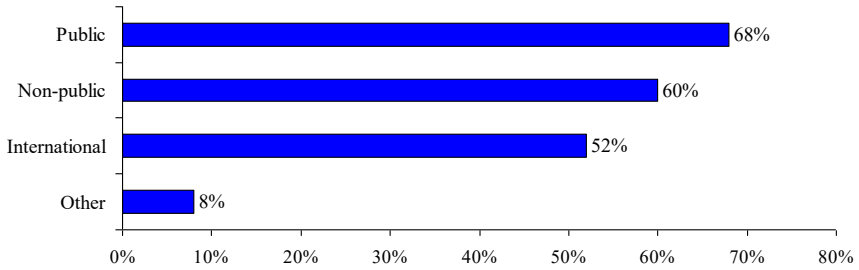


**Figure 7** Types of necessary support for smart specialization of industrial enterprises of Ukraine

Respondents were asked to identify the forms of assistance and instruments in each category of support (public, non-public, international and other) to be implemented for smart specialisation development via rating on a scale 1 = inconsiderable to 10 = important (Figure 8).

The majority of experts (68%) advocates for implementation of public support tools to stimulate smart specialisation. Financial support as a necessary element of S3 implementation was mentioned in 13,3% of responses. The rest noted technical assisstance programs, compulsory research in academic institutions and accelaration of implementation of European standards of production and labeling of products. However 62% of experts from the lagging countries of the European Union in the survey (Kroll, 2018) also believe that public investment can make a difference.

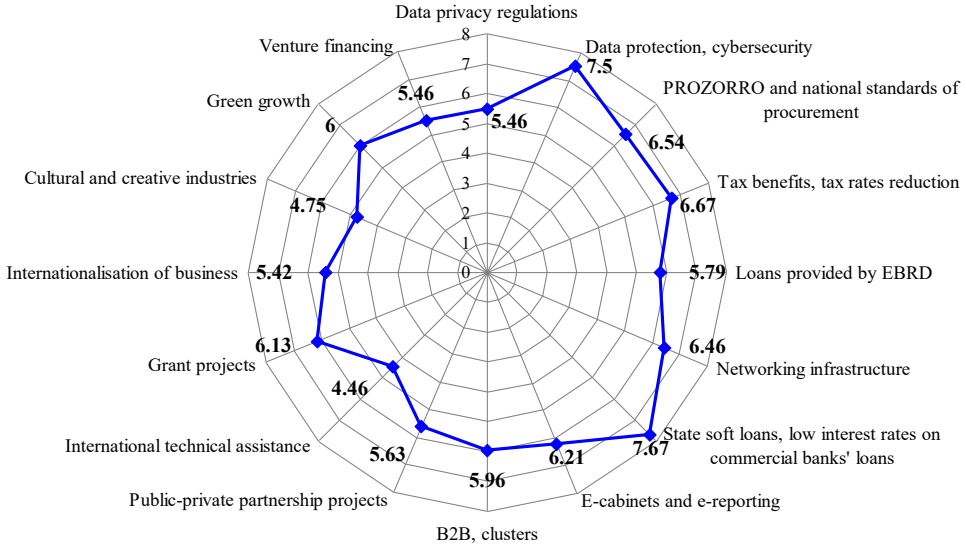


**Figure 8** Policy tools enhancing smart specialization of industrial enterprises of Ukraine

In the countries with higher level of economic development less than 23% of respondents have the same opinion. So we can consider this is a common trend of smart specialisation strategies implementation in the countries with low GDP per capita. As the survey in the EU showed the most satisfied with RIS3 process countries refer to Northern region (Denmark, Finland, Sweden) which have the highest income.

The most efficient public support tools due to the survey results included:

1) public soft loans and low interest rates on commercial banks' loans (7.67 points);
2) enhanced data protection and cybersecurity (7.5 points);
3) tax incentives, tax rates reduction (6.67 points).

Among non-public instruments there were:

1) «green growth» of business (6 points);
2) cluster formation and B2B cooperation (5.96 points);
3) public-private partnership projects (5.63 points).

International support tools in the form of grant project financing and international financial institutions loans (like EBRD loans) oriented on S3 stimulation were recognized as an important direction of smart specialisation maintenance (5.79 points).

In the course of the poll business representatives have put forward their own policy tools for smart specialsation support: 1) facilitating of regulatory influence in the land lease; 2) public programs of industrial development; 3) the introduction of state body on industrial policy issues.

## 2. CONCLUSION

Smart specialisation for Ukraine is one of the prospective instruments of innovative development. It facilitates the financing issues solutions for new elaborations in terms of a lack of public investments in R&D and sufficient lobbying of domestic producers' interests, transformation of innovative achievements in region into commercially successful technologies, creating new areas of business activity with the help of targeted forms of interregional cooperation.

The results of the light, food, pharmaceutical and other industries survey concerning smart specialisation in manufacturing and its role in industrial revitalization enable us to state that the process is followed by many contradictions:

1. Insufficient awareness of business about the essence and areas to implement smart specialisation in manufacturing.
2. Lack of the unified approach to mechanism of smart specialisation implementation by government bodies of various level and business associations, which have different ideas about the final result of the concept implementation. Significant number of respondents answered that smart specialisation development depends on cooperation and public-private partnership projects.
3. Reliance of industrial enterprises on a state without full recognition of their active role. Two thirds of respondents (68%) denoted that the public support is one of the main issues of industrial potential development.

At the same time the experts identified the most important segments for successful implementation of smart specialisation at the current stage, to wit, R&D (64% of interviewees) and production (56% of interviewees). Among the most demanded technologies in the mentioned areas there are industrial engineering and process automation (56%), and data processing and storage systems (48%). On the opinion of the majority of respondents (56%), increasing production efficiency and sales profitability, improvements in socioeconomic and ecological performance of industrial development belong to the most anticipated benefits from smart specialisation. Significantly less interviewees consider that smart specialisation implementation will stimulate product innovativeness (40%) or will increase the volumes of production, sales and exports (32%).

Among the problems which hinder S3 implementation in industrial sector the respondents marked as follows: difficult financial situation that makes it impossible to reinvest in smart technologies, lack of public support of smart vector in entrepreneurial development, lack of skilled personnel and information about existing smart technologies and smart approaches.

The smart specialisation implementation in the Ukrainian economy can be enhanced by:

1. Establishing an effective dialogue between central and local authorities, national producers and academic institutions; development of new areas of activity through targeted forms of interregional cooperation – conferences, forums, advisory bodies, consulting divisions of regional authorities etc.
2. Business awareness campaigning about smart specialisation for industrial enterprises held by regional authorities via web-portal creating. It will help to receive full information about smart specialisation process, its opportunities and perspectives for certain industries.
3. Stimulation R&D in the smart specialisation area that which be directed on domestic industrial enterprises' problems solution relying on international, and in particular, European experience.
4. The development of financial and administrative tools of S3 implementation support on a regional level of industrial sector.

The benefits derived from smart specialisation in an industrial sector will have a multiplier effect on the whole economy.

## ACKNOWLEDGMENT

The paper represents the results of the project "Smart Specialization of Industry as a Trigger of Innovative Changes" implemented in June 2019 under the organizational support of Kyiv Regional State Administration (Ukraine).

## REFERENCES

[1] Cabinet of Ministers of Ukraine. On approval of the Concept of digital economy and society development in Ukraine for 2018-2020 [Pro shvalennia Kontseptsiyi rozvytku tsyfrovoyi. The Order of the Cabinet of Ministers of Ukraine, No. 67-r, 17.01.2018. URL: https://zakon.rada.gov.ua/laws/show/67-2018-%D1%80 (referred on 30/01/2020)

[2] Department for Business, Innovation and Skills. Smart specialization in England. Submission to the European Commission. London. 2015. 63 p.

[3] European Commission. Europe 2020. A European strategy for smart, sustainable and inclusive growth: Communication from the Commission. Brussels. 2010 // URL: https://ec.europa.eu/eu2020/pdf/COMPLET%20EN%20BARROSO%20%20%20007%20-%20Europe%202020%20-%20EN%20version.pdf (referred on 05/01/2020).

[4] European Commission. Smart specialisation platform. Brussels. 2018 // URL: https://s3platform.jrc.ec.europa.eu/s3-platform (referred on 26/01/2020)

[5] European Union. The role of clusters in smart specialization strategy. 2013 // URL:

https://ec.europa.eu/research/evaluations/pdf/archive/other_reports_studies_and_documents/clusters_smart_spec2013.pdf (referred on 27.01.2020) DOI: 10.2777/43211

[6] D. Foray, The economic fundamentals of smart specialization. Ekonomiaz 83(2), Springer, Berlin, Heidelberg, 2013, pp. 55–82.

[7] D. Foray, Smart Specialisation – The Concept, Knowledge Economists Policy Brief 9 (2009) 1–5. DOI: https://doi.org/10.1109/2.161279

[8] D. Foray, Guide to Research and Innovation Strategies for Smart Specialisation (RIS3). The European Commission. 2012, 122 p.

[9] A. Gulc, Analysis of Methodological Approach to Identify Smart Specialization on the Example of Polish Regions, in Proc. of the 2nd International Social and Behavioral Sciences, 213, 2015, pp. 817-823. DOI: 10.1016/j.sbspro.2015.11.483

[10] F. Guzzo, C. Gianelle, E. Marinelli, Smart Specialisation at work: the policy makers' view on strategy design and implementation, JRC Technical Reports JRC114141. S3 Working Paper Series, No 15/2018. Joint Research Centre, European Commission, Seville. 33 p.

[11] F. B. Hegyi, R. Rakhmatullin, Implementing smart specialisation - thematic platform on industrial modernisation. EUR 28769 EN. 2017 /. URL: https://www.researchgate.net/publication/331935502_Implementing_smart_specialisation-thematic_platform_on_industrial_modernisation DOI:10.2760/312534 //

[12] V.M. Heyets, Institutional conditionality of innovative processes in Ukraine's industrial development, in Economy of Ukraine. 12 (2014) 843–871.

[13] O. Ilyash, O. Dzhadan, O. Ostasz, The influence of the industry's innovation activities indices on the industrial products' revenue of Ukraine in Economics and Sociology, 11(4), 317-331. DOI: 10.14254/2071-789X.2018/11-4/21, 2010, pp. 23–37.

[14] E. Jermolajeva, B. Rivža, L. Aleksejeva, V. Šipilova, I. Ostrovska, Smart Growth as a Tool for Regional Convergence: Evidence from Latgale Region of Latvia. Economics and Sociology, 2017, 10(4), 203-224. doi:10.14254/2071-789X.2017/10- 4/

[15] L. Jungsberg, A. Copus, R. Weber, K. Nilsson, Demographic change and labour market challenges in regions with large-scale resource-based industries in the Northern Periphery and Arctic. Regina Report 2018:1. Nordregio, Stockholm, Sweden, 2018, 42 p. ISBN 978-91-87295-57-7

[16] G.Kharlamova, O.Vertelieva, The International Competitiveness of Countries: Economic-Mathematical Approach. In Economics & Sociology, 2013, Vol. 6, No 2, 39-52. doi: 10.14254/2071-789X.2013/6-2/4

[17] H. Kroll, Smart Specialisation Strategies. 2017 Survey Results. Luxembourg: Publications Office of the European Union. (2018), 28 p. DOI: 10.2776/851403

[18] C. Kuo, J. Shyu, K. Ding, Industrial revitalization via INDUSTRY 4.0. A comparative policy analysis among China, Germany and the USA, Global Transitions. Connecting. Forward-Thinking, (2019), 1: 3-14. DOI: 10.1016/J.GLT..2018.12.001

[19] M. McCann, R. Ortega-Argilés, The early experience of smart specialization implementation in EU cohesion policy. European Planning Studies, (2016), 24:8, 1407-1427, DOI: 10.1080/09654313.2016.1166177

[20] Innovation Driven Growth in Regions: The Role of Smart Specialisation. OECD. 2013. URL: https://era.gv.at/object/document/1151/attach/OECD_Project_Report_Smart_specialisationFINALAdvance.pdf (referred on 06/01/2020)

[21] M. Rusu, Smart Specialization a Possible Solution to the New Global Challenges. Procedia Economics and Finance, 6. (2013), pp. 128–136. doi: 10.1016/S2212-5671(13)00124-X //

[22] J. Soltys, D. Kamrowska-Zaluska, Comparison of smart specialization in coastal regions in Poland. 56th Congress of the European Regional Science Association: "Cities & Regions: Smart, Sustainable, Inclusive?", 23-26 August, Vienna, Austria, European Regional Science Association (ERSA), Louvain-la-Neuve, 2016. URL: http://hdl.handle.net/10419/174628 (referred on 01/02/2020)

[23] O.S. Yatsiuk, Smart-specialisation of regional development as an important direction of improvement its competitiveness and innovative activity in Naukovyy Visnyk IFNTUNG. Seriya: Ekonomika ta upravlinnia v naftoviy i gazoviy promyslovosti, (2018), No. 2 (18), 54-60