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INNOVATION ENVIRONMENT TOWARDS SMART SPECIALISATION AND CIRCULAR ECONOMY[3]

The present study is devoted to the opportunities provided by the circular economy for the implementation of the integrated strategy for smart specialisation. At the end of the period of validity of the current strategy, it is imperative to monitor the extent to which the identified thematic areas in the strategy have fulfilled their purpose, as well as whether a change in them is necessary.
JEL: Q53; Q55; Q58; L59

Introduction

The increasing consumption of resources and the environmental consequences that result from it require a change in the economic model. The concept of a circular economy is part of this change (Ivanova, 2019). The main thesis is that changes in the model of indexing the innovation activity of business units should be aimed not only at existing capacity and assets, but also at the competitive advantages of the circular economy. Object of the study is the circular economy and the subject is the natural environment for innovation and intelligent specialisation.

The following research tasks are set:

- Clarification of the concept of circular economy and basic principles on which it is based – Presentation of the circular economy model of the European Commission and the most applicable industries.
- Critical analysis of the methodology used to select priority sectors for support through the integrated strategy for smart specialisation and outlining its strengths and weaknesses.

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[3] The study is under the IRISI ("Indexing the Regional Innovative Levels in the Sectors of the Economy – scenario for the identified in the ISSS four priority thematic areas for smart specialization and their positioning towards the circular economy") KP-06-OPR01_4 project financed under the Bulgarian National Scientific Fund.

- Clarification of the connection between the thematic areas in integrated strategy for smart specialisation and the innovation activity of the companies.
- Analysis of the approaches for interconnection of integrated strategy for smart specialisation and the circular economy.

The first part of the present study focuses on revealing the essence of the circular economy, the typical models for its manifestation, as well as the most applicable industries. The second part analyses the existing model for indexing the innovation activity of companies in the sectors of the economy, with an emphasis on its strengths and weaknesses. The third part presents the thematic areas in the Integrated Strategy for Smart Specialization, their dynamics and connection with the innovation activity of companies. Based on the existing thematic areas, in the fourth part criteria for compliance of the areas with the specifics of the circular economy are presented and proposals for changes are made. This outlines the prospect of developing the idea (Beev, 2019).

1. Circular economy – definition, model of the European Commission, most applicable industries

In this part of the presentation, we present the definitions of the circular economy, which give an in-depth idea of its essence. The model of the European Commission for circular economy and its main characteristics are presented. Emphasis is placed on the applicable industries as part of the circular economy.

1.1. Definition and models

According to a report by the Ellen Macarthur Foundation (EMF, 2013) Europe is the world's largest net importer of production resources, seriously jeopardising its potential for future economic growth in the absence of changes in production and consumption patterns. This is also valid with the special force for our country. According to estimates of the report, the input materials form between 40 and 60% of the value of production in Europe. At the same time, there is a tendency to increase their value due to increasingly limited stocks worldwide, as well as increasing fluctuations in their prices, which threatens the competitiveness and ability to hold the market of enterprises. The current model of economic growth in developed economies based on low raw material costs is no longer relevant. At present, a huge share of raw materials is lost in the process from their extraction to the end of use of the final product. Despite the increased share of waste recycling, these efforts are still extremely insufficient. In addition, industrial activity leads to the erosion of services from different ecosystems, and at present man consumes much more than he allows ecosystems to recover. These, as well as other problems related to human impact on the environment, raise the issue of moving to a new model of the economy that is independent of limited production resources, uses waste-free technologies and at the same time is environmentally friendly. This economy must also be based on responsible consumerism in the form of a shared economy and long-term use of products. According to estimates summarised by the report, the overall effect of the transition to a

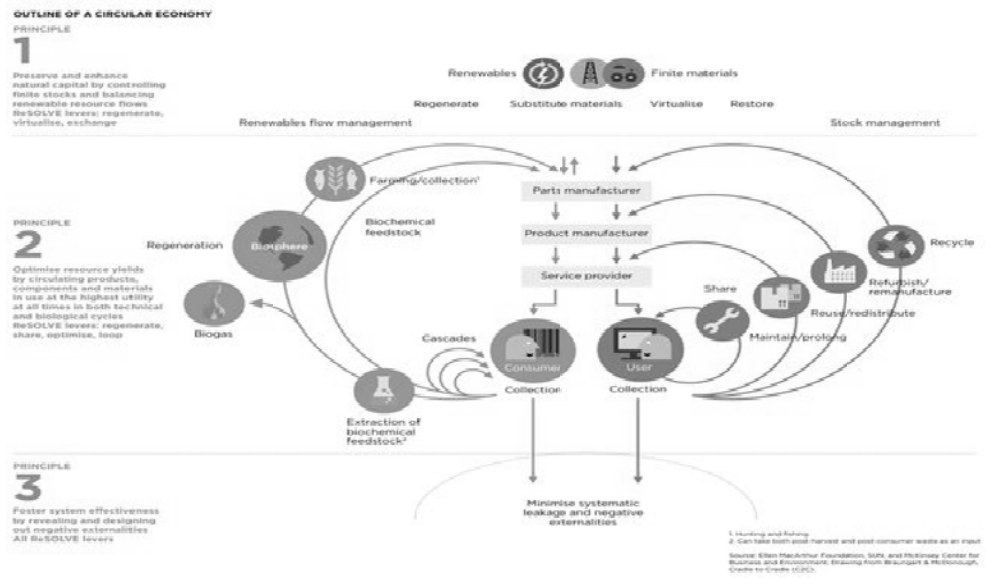
circular economy is expected to be very positive in the long run, contributing to employment and innovation growth and a significant reduction in raw material costs as well as price fluctuations.

There are many definitions related to the concept of "circular economy", but in general they can be summarised and reduced to several basic elements, including the creation of preconditions for unlimited use of resources in production, production and consumption, the most environmentally friendly and minimising waste generated at all levels.

Among the simplest definitions is that of the 2015 EU Circular Economy Action Plan. A circular housekeeper, according to him, is an economy "in which the value of goods, materials and resources is preserved for as long as possible in the economy, and waste generation is minimised". In general, the model of the circular economy can be reduced to the scheme presented on Figure 1.

Figure 1

EMF's Circular Economy Model Outline



Source: EMF, 2015.

It is characterised by the fact that all its constituent elements are interconnected in different types of cycles that allow efficient use of resources and a two-way link between production and consumption in the full utilisation of waste or its decomposition into biologically useful substances. The main goal of the circular economy is through appropriate product design methods to ensure maximum circulation of resources after use back into production or creating conditions for secondary cascade production and high-quality recycling. This system is characterised by ensuring the durability of products, the possibility of reuse and

modernisation and repair, preventing the use of hazardous chemicals in production and increasing their energy and resource efficiency and increasing the content of recycled materials in them. The circular housekeeper also seeks to reduce carbon dioxide emissions and the environmental footprint and limit single-use products. Models aimed at purchasing services instead of products, or other models in which manufacturers retain ownership of the product or responsibility for its effectiveness throughout its life cycle, are encouraged. Building a circular economy is also supported by innovative forms of consumption, such as the sharing of products or infrastructures, the consumption of services rather than products, and the widespread use of information and communication technologies.

In a report by the Ellen Macarthur Foundation (EMF, 2013), (the foundation was established in 2010 with the specific purpose of outlining and disseminating knowledge about the path to the circular economy) can always find a definition of the circular economy that emphasises its connection with environmental protection – "The circular economy is an industrial system that allows endless use and regeneration of resources invested in production. It replaces the concept of "end-of-life cycle" with regeneration using approaches such as renewable energy, elimination of toxic materials in production that reduce reusability and waste elimination through appropriate design of materials used, products, relevant materials, production systems and business models used".

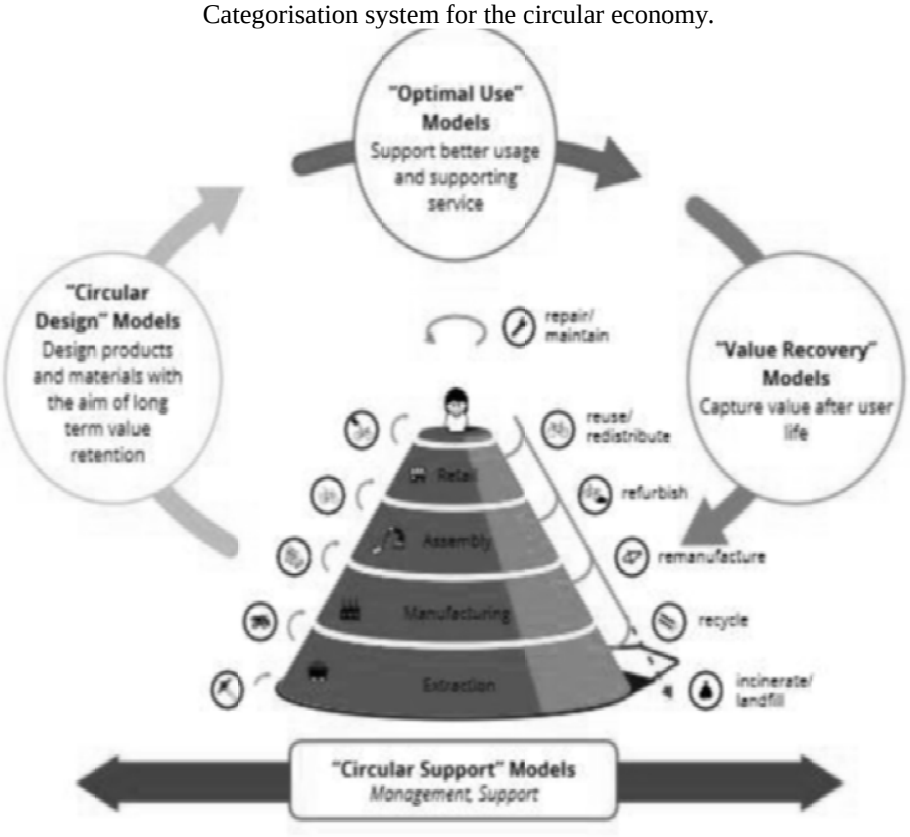
One of the most comprehensive definitions of the term "circular economy" is given by the following report of the Ellen Macarthur Foundation (EMF, 2015) – "The circular economy is a continuous cycle of positive development that preserves and improves natural capital, optimises revenue from resource use and minimises system-wide risks by managing limited stocks of resources and using renewable flows from them. Such an economy is efficient on any scale. The circular economy creates multivariate mechanisms of production that are not limited by the availability of resources. In the realisation of the concept of the circular economy, consumption is realised only in the presence of efficient biocycles related to the production and reuse of products. Resources are regenerated in the process of going through a biocycle or are restored along the technical cycle. In the biocycle, the natural processes of life regenerate materials without human intervention. In the technical cycle, using energy with human intervention, the value of materials is restored". In this regard, there are two types of resources: technical – such as minerals, metals, polymers, alloys and hydrocarbons; and biological – such as food and wood, which are non-toxic and can easily return to the biosphere and nourish it. According to the above definition of a circular economy, it is based on three main principles:

- Preservation and improvement of natural capital, while controlling the availability of limited natural resources and balancing the flow of recycled raw materials; regeneration; virtualisation; exchange.
- Optimising the use of resources through the circular use of products, components, and materials to the highest degree in both the technical and biological cycle; regeneration; optimisation; sharing; connectivity.
- Stimulating the efficiency of the system by detecting and removing bottlenecks.

According to the proposed model for categorisation of the circular economy of the European Commission (EC, 2020), the circular economy should include 4 main elements presented in the scheme below – creating models for the design of resources and products that allow their longest possible use; the existence of intermediaries to facilitate the use and maintenance of the products; the use of models to recover the value of the products used; an element that fully supports the system through the development of new strategies, tools, services and applications. These elements are described in detail in a total of 14 categories.

Figure 2

Categorisation system for the circular economy.



Source: European Commission.

1.2. The most priority sectors for the transition to a circular economy

Numerous studies are available on the question of which sectors should be prioritised for the transition to a circular economy. A study commissioned by the EC attempts to summarise much of the available information and come up with a proposal for priority raw

materials and sectors of the economy, which should be prioritised. On this basis, the possibilities for improving their application have been studied (Nenkov, Miteva, 2018).

The first step of the methodology for prioritising specific areas in relation to the transition to a circular economy involves identifying the key raw materials used in the economy where there are opportunities to significantly improve resource efficiency and/or include them in an endless production cycle, and recycling. Among the main raw materials and materials presented in various studies and summarised in the above study are:

The first step of the methodology for prioritising specific areas in relation to the transition to a circular economy involves identifying the key raw materials used in the economy where there are opportunities to significantly improve resource efficiency and/or include them in an endless production cycle, and recycling. Among the main raw materials and materials presented in various studies and summarised in the above study are: Food and waste thereof; Wood and paper; Plastics; Metals; Phosphorus.

The most frequently prioritised raw materials are metals, due to their high potential for resource efficiency in production and recycling, and raw materials for the food industry and food waste, due to huge food losses in the chain from production to consumption and the expected high potential of food wastes for composting and energy production. Chemicals are not listed as a priority raw material, but they are presented as components in the production process together with other raw materials and are important in terms of purity of production and recyclability of other raw materials. The diagram below presents the methodology for reporting priorities. The study derives on the basis of the identified raw materials critical for the development of the circular economy the following priority product groups for interventions: packaging; food and waste thereof; electronics and electrical equipment; vehicles; furniture; buildings and public infrastructure.

The criteria used are the presence of a deficit of the specific raw material, the impact on the environment when using it in production, the amount of possible savings of energy and resources, the need for changes in the way it is used. In general, areas of research could include – waste recovery; better product design to allow repair or modernisation of products, the possibility of using their components in a new product, improving their durability or efficient recycling, improving energy and resource efficiency in production and consumption; reducing or eliminating the toxicity of the resources used in the products; recovery of waste in production and consumption; production and consumption neutral to the climate and the environment, etc.

Considering the lasting strategic importance of raw materials for industry in the EU, the EC launched in 2008 the so-called Raw Materials Initiative. A key element of this initiative is the list of critical raw materials for the EU (European Commission, 2017), whose strategic stocks have been declining critically in recent decades. It was last renewed in 2017 and includes 27 raw materials, the majority of which are produced outside the EU, and most of their reserves are concentrated in one country – China. This makes the research area more environmentally friendly, replacing them with other materials and finding more efficient recycling methods of paramount importance. The sectors that are seriously threatened by shortages of these raw materials are electronics, battery production, the automotive

industry, the production of photovoltaics and wind generators, the aeronautics and defense industry, part of the chemical and pharmaceutical industries.

In 2015, the first EU Action Plan in the field of the circular economy was adopted (European Commission, 2015). The document identifies the following areas as priorities for interventions: plastics; food waste; the main raw materials from the Raw Materials Initiative; construction and demolition waste; biomass and biologically based products. At the beginning of 2020, the document was updated, focusing on the following areas: electronics; rechargeable batteries and vehicles; packaging; plastics; textiles; construction and buildings; food, water, and nutrients.

From what has been said so far, it can be concluded that the following areas could be identified as priorities for the development of the circular economy, in addition to the updated New Action Plan on the EU Circular Economy of 2020: Biomass and bio-based products; Manufactures involving the use of the main raw materials from the Raw Materials Initiative – see above: in addition to those listed so far, the production of photovoltaics and wind turbines, the aeronautics and defence industry, part of the chemical and pharmaceutical industries.

2. Model for indexing the innovation activity of companies, used in the Innovation Strategy for Smart Specialization (ISSS) of the Republic of Bulgaria 2014-2020 for analysis and identification of priority sectors for support – analysis of strengths and weaknesses

This section attempts to critically analyse the methodology used to select priority sectors for support through ISIS and to identify its strengths and weaknesses. It is made based on the information available in the strategy itself and in this regard does not claim to have a complete knowledge of the methodology, which would allow a very precise analysis. The strategy uses a top-down planning approach by initially setting national goals, which are then further specified at the regional level. In this case, regional planning takes place at the last possible stage. On the one hand, this allows for a unified national policy in the field of innovation, given the relatively small size of our economy, and to better apply the approach of grouping the individual priority industries into larger groups to cooperate and complement each other. On the other hand, given the strong regional concentration of production and innovation capacity in the country, it is possible to get different results with an approach starting with the selection of priorities by region. However, such a possible shortcoming is most likely offset by the wide range of priority sectors involved in shaping the thematic areas.

The methodology for selection of priority areas of ISSS begins with a general economic analysis of 82 sectors of the economy at Classifier of economic activities, 2008 (second level of aggregation), identifying the most important for the functioning of the economy at the time considered industries. The first step in identifying economic activities involves the selection of all medium-high and high-tech industries and science-intensive high-tech services and the inclusion in the analysis of only three leading industries of low-knowledge-intensive services. This approach has as a strength the selection of industries

with the potential to restructure the economy to more knowledge-intensive activities, which in general would contribute to increasing productivity and gross value added in the country. Also included are three of the less knowledge-intensive industries, which helps to consider the need for technological innovation in them as an important factor forming a large part of employment and gross value added in the economy.

The industries are selected on the basis of two types of factors – internal – through the indicators share in gross value added, level of investments in fixed assets, contribution to employment and external, related to the competitive advantages on the international markets. It is noteworthy that the external factor receives insignificant points in most cases and in most cases, is not able to influence the final assessment. On the other hand, usually mainly exporting companies are predominantly carriers of innovation activity since they face greater competition in international markets. It would be good to add an element describing the level of foreign direct investment, as in many cases they are realised by more efficient and innovative enterprises. It is noteworthy that both at this and the next stage of evaluation, no attention is paid to the state of the labour market in the country, the available human resources by sector, the lack of staff in some industries and whether in the industries we are prioritised, in fact, companies will be able to find the right specialists to ensure their development. The problem of the lack of balance between labour supply and demand for the selected prioritised sectors is very little addressed in the analysis. Overall, at this stage of the evaluation, the use of a human resource indicator would also be positive. In addition to the above, in general, when developing and implementing strategies of this type, it is good to assess what employment growth is expected after supporting projects in the selected priority sectors. In many cases, the implementation of high-tech projects has a positive impact on gross value added and efficiency, but this is often at the expense of a relatively small and even negative increase in employment. This, in turn, could exacerbate social inequality.

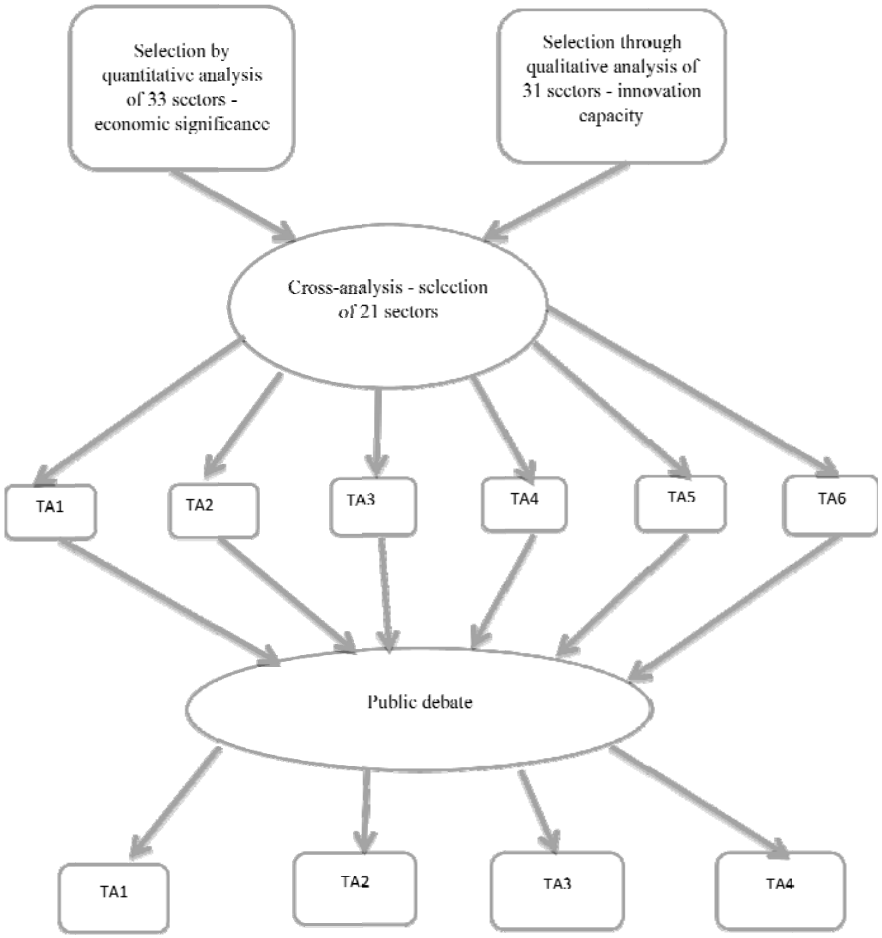
The second element of the ISIS methodology includes a qualitative assessment of the potential for innovation in individual sectors through an assessment of state support for offices and technology transfer centres, projects funded by the National Innovation Fund (1-6 sessions), support for projects under the Operational Program Competitiveness (2007-2013), number of companies holding patents, number of companies holding trademarks. It is not clear why the assessment is called qualitative, as the listed indicators most likely have specific quantitative values in practice. The development of the methodology in this area is most likely based on the presumption that the activity in applying for European and national funding of companies correctly reflects the potential for innovation development in the country. However, this also implies that we agree with the assumption that the current policy to stimulate innovation, as well as its design, have managed to attract participants from economic sectors with the highest potential for development. It is possible that a large share of the implemented innovations is self-financed or in the form of loans. We can also assume that there are sectors where branch organisations are not active enough in informing their members about opportunities to participate in government projects and in supporting them to apply for such a line, but at the same time, there is a serious need to finance innovation activity.

The weak point of the methodology could be its focus on the implementation of projects in the country, while there are no criteria for participation in international programs, for example at EU level, which in practice are a real guarantee of quality and development potential in a particular area for the development of innovation and research. Data could also be used to show the country's potential in various fields of scientific knowledge based on leading publications. It is also noteworthy that the methodology does not use an analysis of the investments made by enterprises in research and development in individual sectors, and such data are available and could give a good picture of the readiness of enterprises to finance innovations and trends in individual sectors industries. Information on innovations financed through different credit schemes would also be interesting, as they may be more motivated. In addition, the third step of the analysis does not take into account the human factor, such as statistics on the distribution of research and development staff in the private sector, possibly the potential of staff available in the public sector. It is positive that such a qualitative analysis is made at the level of areas further in the methodology after the identification of the leading priority areas of the strategy, to specify the priorities for each planning region.

Although the availability of research infrastructure is described in detail and commented on in the analysis, they are again not included as a selection criterion in the quantitative analysis. On the positive side, they have been considered in defining thematic areas. Based on the combination of the results of the quantitative and qualitative analysis, an additional selection of potential priority areas for innovation development is made. It is noteworthy that the contribution to the total number of points obtained from the qualitative analysis (innovation activity-oriented) is generally significantly smaller than that received by the sectors based on the quantitative analysis. This implies a greater weight in the methodology of the importance of the industries predominant in the structure of the economy than of those aimed at the development of innovation. This would be an advantage if our goal is to develop innovations in traditional industries for our economy, but it may manifest itself as a disadvantage if we want structural changes in the economy. In addition, as far as it is possible to extract information from the strategy, it is noteworthy that the methodology uses static indicators, which does not allow to highlight the trends that are important in a highly dynamic global economy. The use of dynamic indicators would make it possible to highlight fast-growing industries that are beginning to stand out with their comparative competitive advantages. At the next stage of selection of the priority areas, thematic areas of the industry have been identified, which highlight links between the 21 areas selected so far. This approach is a major strength of the strategy, as it examines the cross-sectoral links in the economy and what unites the individual actors in economic life. Possibly, this would help to monitor how the implementation of a project could affect the whole ecosystem covering the specific area, as well as to identify missing or insufficient intermediaries in the area to be stimulated.

Figure 3

Model for indexing the innovation activity in ISSS



After highlighting the thematic areas for development, based on a broad public debate by highlighting the specific strengths and challenges in the selected thematic areas, they are further specified and regrouped, as well as very detailed specific sectors for support. Identifying priority areas for support based on this approach is a particularly strong point of the strategy. It is clear from her reading that the developers of the document have managed to attract different types of participants in each of the thematic areas and with their help to get an objective picture of their condition. This step seems very well planned and implemented, given the detailed analysis and information presented in the strategy. As a general remark, it is noteworthy that the strategy does not pay special attention to the state's experience in supporting innovation activity until the development of the document, the challenges encountered, positive experience and possible mistakes. This could be corrected

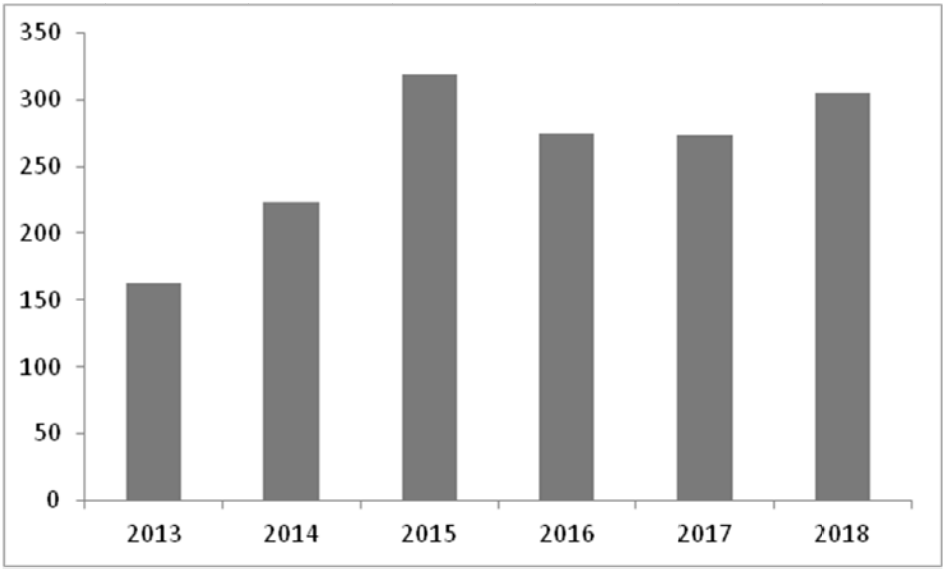
in the development of the next strategic document. In addition, a significant part of the information in the analysis also does not fall into some form in the methodology used. No less important than selecting the appropriate priorities is to provide an opportunity to easily track the results of the implementation of intentions. In this case, organising the information in such a way that it can be grouped across the selected thematic areas and allow an analysis of the functioning of the whole system would be extremely useful in order to be able to track the effectiveness of the methods chosen for its implementation. Taking into account the result of the implementation of the methodology for deriving priority sectors in ISIS, it can be said that in general, this is a successful methodology, despite the presence of some bottlenecks in its individual steps of implementation. Considering previous attempts to prioritise the sectors in need of support for innovation activity in the country, the result of the current strategy manages to provide a good basis for future policy in the field.

3. Thematic areas in the Innovation Strategy for intelligent specialisation and innovation activity of companies

For the period 2013-2017, there are serious changes in the innovation activity of Bulgarian enterprises. The role of industry is growing significantly, with its share in total investment increasing from 14.1% in 2013 to 35.5% at the end of 2017. This is happening against the background of sustained overall growth in research and development expenditure (R&D) of enterprises, which compared to the end of 2013 amounted to 67.6%.

Figure 4

Research and development expenditure in millions of Euro

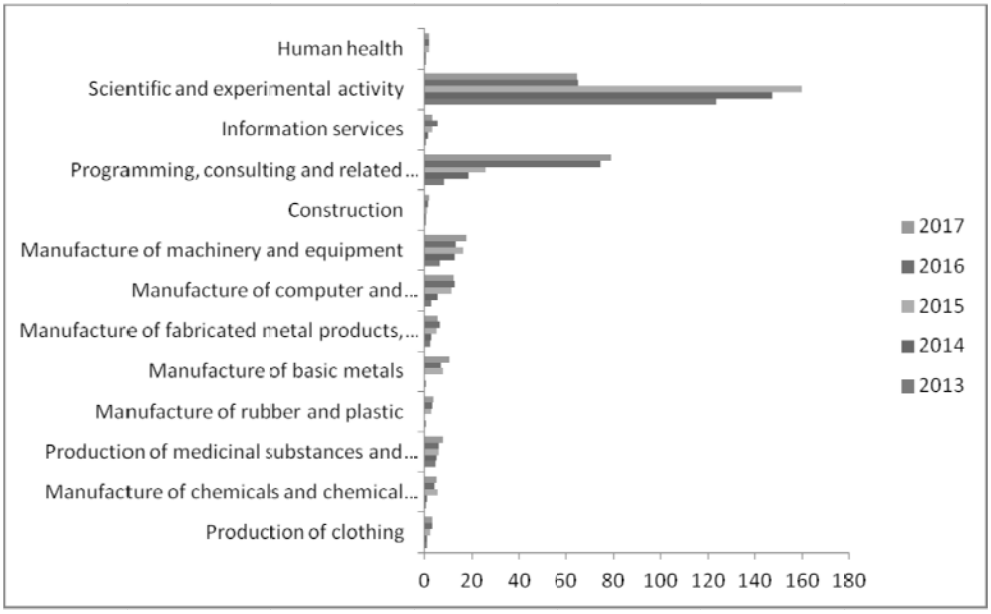


Source: Eurostat.

It is interesting to note that although at different rates during the period there is a significant increase in innovation activity in fast-growing sectors such as information and communication technologies and in traditional sectors of the Bulgarian economy such as machinery and electronics, chemical industry and the production of rubber and plastics. Many industries considered to be low-knowledge-intensive, such as the textile industry, the manufacture of metals and metal products, the paper and furniture industry and construction, also have different attitudes towards the need for R&D investment. Unfortunately, there are also such industries as the food industry, which occupy an important place in the Bulgarian economy, but still lag significantly behind in investment in R&D.

Figure 5

Research and development expenditure individual sectors of the economy in millions of Euro

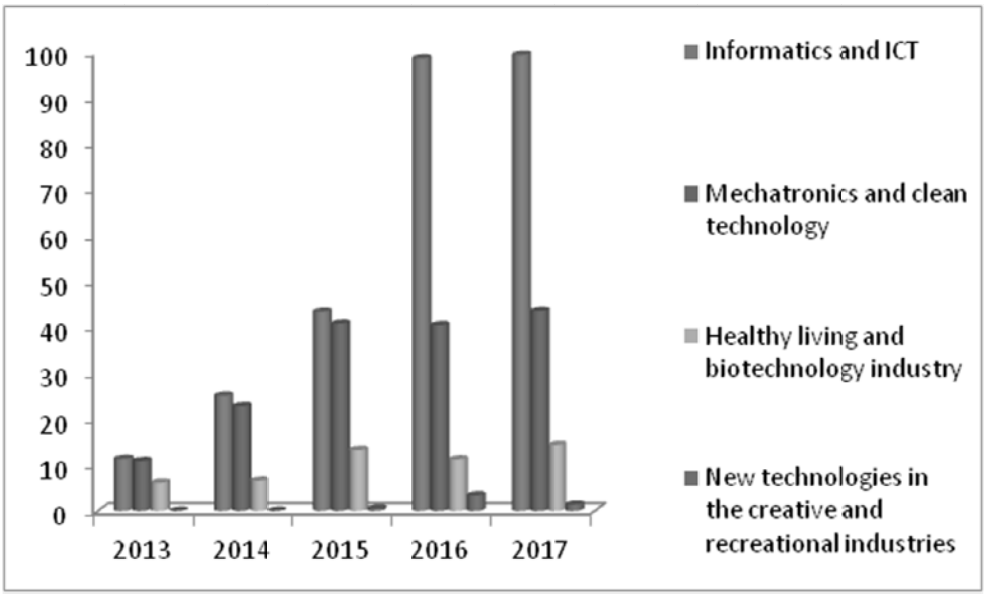


Source: Eurostat.

As can be seen from the chart below, the fastest-growing thematic area (TO) is that of the Informatics and Information and Communication Technologies sector (IT and ICT TO). It is followed by Mechatronics and Clean Technologies, which has also been gaining momentum in recent years in terms of investment in research. Positive developments have also been observed in various sectors of the other two thematic areas, especially given the low baseline in 2013, but at a slower pace.

Figure 6

R&D Expenditure by Enterprise by thematic Area in millions of Euro



Source: Eurostat.

3.1. Thematic area "Informatics and information and communication technologies"

The ICT[4] sector has undergone extremely dynamic changes in recent years. According to an analysis of the report "Innovation.bg 2019" (Applied Research and Communications Foundation, 2019) in recent years the sector is gradually reorienting from mainly software outsourcing and production as a subcontractor to products and integrated services with high added value. There is a tendency to establish R&D centres of international companies, very often based on the acquisition of Bulgarian companies that have worked with them in the form of subcontractors or suppliers. Expansion of the activity of Bulgarian companies begins, which in most cases are mainly export-oriented and specialise in specific market niches. New companies have emerged in areas such as data analysis, financial services, and the Internet of Things. It is characteristic of the ICT sector that it is still highly concentrated

[4] In the current analysis for the thematic area "Informatics and ICT" will be considered all sub-areas selected according to the methodology described in "ISIS", namely code 26, 61, 62, 63, without code 72 of NACE.BG 2008. of the characteristics of this activity, which in its predominant part – 97.2% includes experimental research in the field of natural and engineering sciences. For this reason and because it represents a large part of the R&D of Bulgarian enterprises, it will be considered separately from the other thematic areas. It should also be borne in mind that the sectors selected in the strategy do not fully coincide with the EU definition of ICT and therefore some deviations in data related to other ICT analyzes are possible.

in Sofia, but some other cities – major university centres in the country – are beginning to gain momentum in this area.

According to a report by BASCOM (Bascom Barometer, 2019) the main and most dynamic representative of the ICT sector – the software industry, is extremely export-oriented, and it also generates high revenue growth. The Bulgarian software industry is extremely attractive to foreign investors, as more than 50 representative offices of global software companies already operate in the country. Revenues from the export of intellectual product in 2018 reach BGN 2.5 billion. Unfortunately, the opportunities for growth in the local market and thus bringing the Bulgarian business to a qualitatively different level, remain untapped due to lack of interest from many local businesses.

During the period under review, the structure of the sector changed significantly, with the two leading sectors, Telecommunications and Programming, Consulting and Related Activities (Programming), changing their positions sharply in terms of their contribution to gross value added (GVA). While at the end of 2013 the two sectors share the main contribution of the ICT sector in GVA[5] at the end of 2018 2/3 of GVA in maintenance is produced by the "Programming" sector. However, the most knowledge-intensive sector is "Manufacture of computer and communication equipment, electronic and optical products". Although at the end of 2017 it was responsible for only 5.9% of GVA (7% in 2018), the sector has invested as much as 8.3% of it as expenditures for research and development. The most knowledge-intensive and dynamic in this respect are the sub-sectors "Manufacture of electronic components and boards" and "Manufacture of communication equipment". The production of computers and peripherals is relatively underrepresented. In second place is the Programming Sector, which at the end of 2017 invested 5.3% of its GVA. While in the production of computer and communication equipment, electronic and optical products such high levels of R&D are typical for the beginning of the period under review, the "Programming" sector has undergone a revolutionary change in this respect – from 0.9% R&D expenditure in GVA by the end of 2013. year, to 5.9% in 2017.

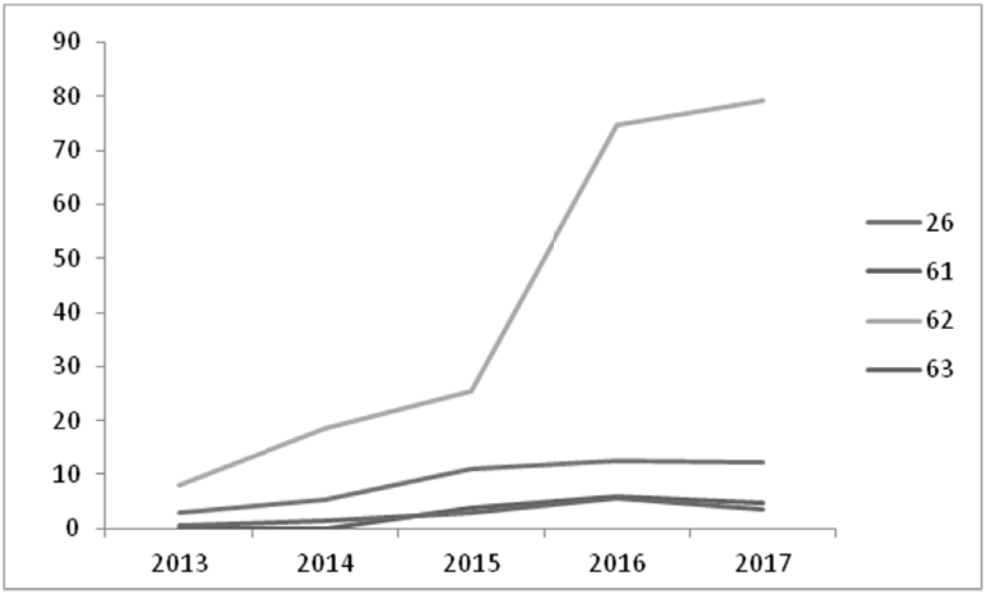
The dynamics in terms of the researchers appointed over the years is also extremely interesting. In the thematic area "Informatics and ICT" there is a widespread increase in the number of hired researchers. The Programming sector is, of course, the largest contributor to the increase, with a strong position in this regard at the beginning of the period under review. It is also expected to increase, albeit at a slower pace, in the production of computer and communication equipment, electronic and optical products, as this sector also has a good position in this regard in 2013. The situation is most dynamic in the other two sectors, which start from a much lower base of hired scientists in 2013 and reach much higher growth than the faster-developing sectors. With only 4 scientists employed in 2013 in the Telecommunications sector in 2017, they reached 238. This is most likely a promise of serious potential for R&D development in this area. Another interesting trend that is observed is the sharp increase in the number of hired scientists in the Information Services sector, which represents a relatively small share of the thematic area. With 50 employees

[5] The shares in the analysis are calculated based on current GVA prices for the respective year according to Eurostat data.

hired in 2013, their number reached 457 – an increase of 5 times, comparable to that of the field of "Programming".

Figure 7

TA "Informatics and ICT" – R&D of Enterprises in millions of Euro



Source: Eurostat.

3.2. Thematic area "Industry for healthy living and biotechnology"

Thematic area "Industry for healthy living and biotechnology" has a serious potential for development, given the advantages of our country as a centre for development in the field of medicine and natural sciences. In recent years, there has been an attempt to consolidate the efforts of individual actors in this area. In 2018, a biotechnology and health cluster were established, and its goals include stimulating innovation, cooperation, exchange of experience between companies operating in the sector, support for their internationalisation and better communication with the public sector. Among the strengths of the sector continue to be the presence of leading specialists, as well as appropriate infrastructure. Unlike the ICT sector in the field of biotechnology, risk financing is generally absent, as the sector is not known to investors and, in general, investments in it are associated with higher risk. Another distinctive feature is the significantly higher degree of regulation, which also hinders its development. The specialists still point to the still missing strategic vision for its development by the state as a problem in the sector. According to the National Action Plan for the Development of Organic Production, the applied research in this field in Bulgaria is small, and those that are being developed are not well popularised. At the same time, none of the universities and research institutes in the country works in the field of organic production and processing. An additional problem for the existing scientific units is

the difficult maintenance of the biological certification. This situation is partly due to the lack of demand for such services, as the market is dominated by smaller producers with small financial resources, and larger ones directly turn to foreign experience for advice. The establishment of a national integrated consultation system in this area could improve the situation. The sector also suffers from general problems such as a lack of a link between business science and education. No official information is collected on important indicators regarding the dynamics of development in the sector, such as sales turnover, as well as on the realised exports, which greatly complicates the analysis of its development. Unfortunately, in the period 2013-2017, there is a very negative trend in business costs in the field of biotechnology. Although they are the second largest group of investments after those of technical sciences, in the last two years the expenditures for science in this field have fallen sharply from 110.4 million euros in 2013 to 78.4 million euros in 2018. This is due to medical sciences, which are a major part of them.

Table 1

R&D of Enterprises by Fields of Science in Millions of Euro

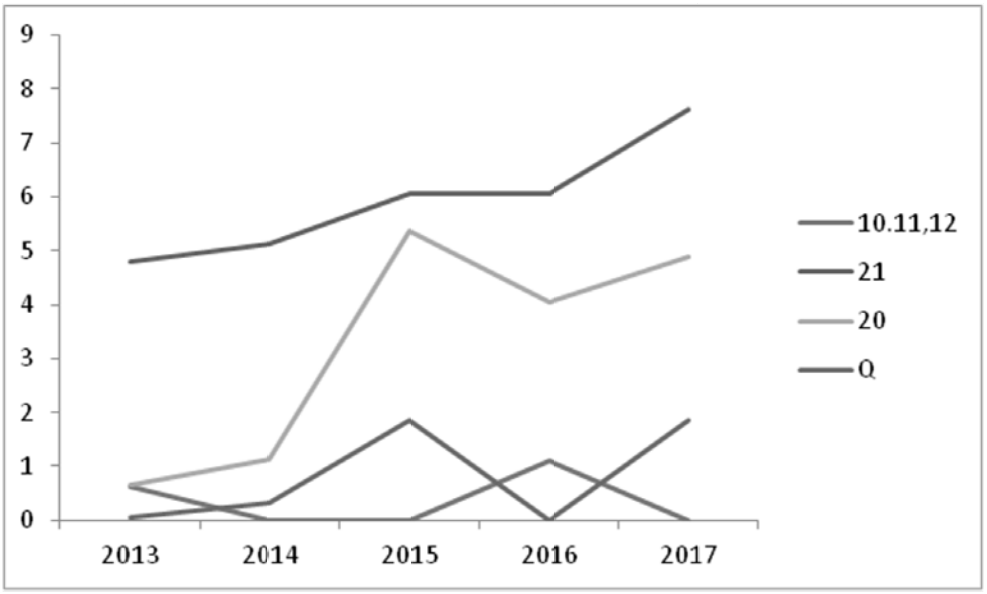
	2013	2014	2015	2016	2017	2018
Total	162.9	223.4	319.0	275.0	273.1	304.8
Natural sciences		7.0	9.6	7.2	7.9	8.6
Medical sciences	110.4	114.4	131.1	67.7	61.6	67.6
Agricultural sciences			2.1	2.0	1.8	2.2
General Biotechnologies	110.4	121.4	142.8	77.0	71.3	78.4

Source: NSI.

In the present analysis in connection with biotechnologies, the innovation activity in the following industries will be considered – food industry, pharmaceutical industry, chemical industry, and human health. A significant part of the costs incurred in this line are contained in the "Scientific and Experimental Activity" activity, but as the exact share of the thematic area under consideration in it is not known, it is analysed separately. In the considered group the largest share in GVA is occupied by the healthcare sector, as it remains relatively stable over time for the considered period (about 50% of the total GVA). Next is the sector of the food industry, as its share decreased over the years from nearly 40% to nearly 30% in the period 2013-2018. It is followed by the chemical industry, with a steady upward trend in the share in the group – with a 7.7% share in 2013 it reached 10.3% in 2018. The smallest contribution has the smallest industry – the pharmaceutical industry, which retains a share of about 6-7% for the entire period. For the period, the share of the whole group in GVA decreased – from 8.2% in 2013 it reached 7.8% in 2018. The most intensive in R&D is the smallest branch of the thematic area – the pharmaceutical industry, which is traditionally typical with its higher innovation activity. Over the years, we have also seen another positive trend – a clear direction to increase R&D investment in production (from 2.4% of GVA in 2013 to 3.2% in 2017). The next position in terms of R&D expenditures is occupied by the chemical industry, with a gradual and lasting increase in R&D expenditures in production, which reached from 0.3% in 2013 to 1.1% in 2017. In 2017, 4.6% of R&D expenditures in the country were incurred in the thematic area. The human health sector, although the largest in terms of value produced in the thematic area,

still devotes a negligible part of its revenue to research and development. However, it should be noted that there is a serious upward trend in R&D expenditure, which more than doubled over the period under review to EUR 14.4 million at the end of 2017. Thus, its share in total innovation expenditure in the country increased from 0 to 0.7% for the period. As of 2016, the food industry, which is also a sector with a significant share in the thematic area, invests only symbolic funds for R&D – only 1.1 million euros. However, it should be noted that it has almost doubled its spending in this area since 2013.

Figure 7
TA "Industry for healthy Living and Biotechnology" – R&D of Enterprises in Millions of Euro



Source: Eurostat.

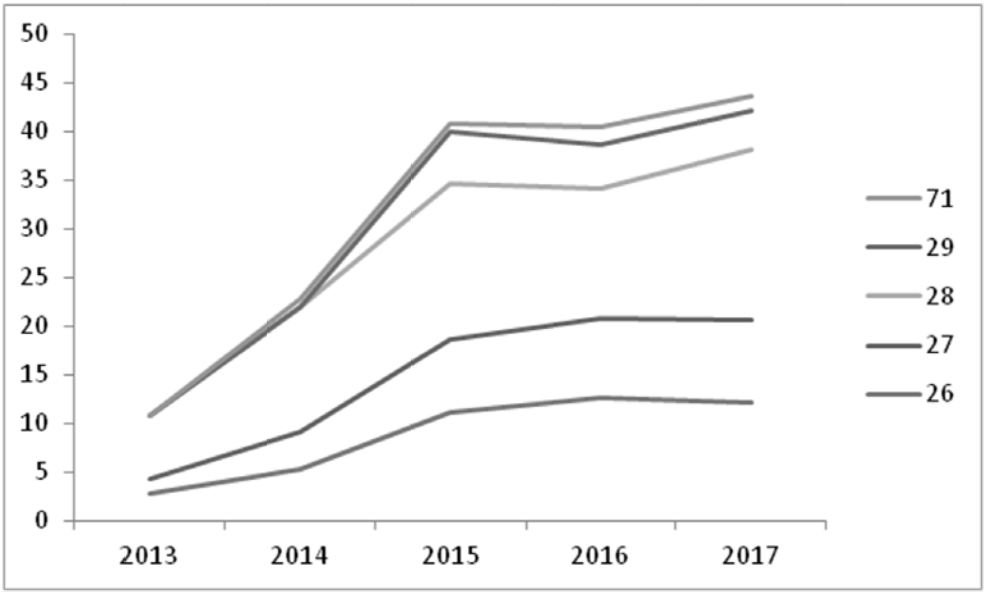
The dynamics of the hired scientists from the business shows interesting tendencies in this sector as well. The Human Healthcare sector stands out most clearly here, which, despite investing a relatively small part of its GVA in R&D, has significantly increased the number of hired scientists – from 13 in 2013 to 349 in 2017. We observe similar dynamics in the chemical industry, where there is also a significant increase – from 80 in 2013 to 483 in 2017, which corresponds to the trend of increasing its share in GVA. Although the pharmaceutical industry was the leader in 2013, it significantly lost ground at the end of the period, although it maintained a constant number of scientists employed.

3.3. Thematic area "Mechatronics and clean technologies"

Mechatronics and Clean Technologies retains its leading and stable position in the economy of our country for the period under review, as from 3.1% share in GVA at the end of 2013, it increased to 3.7% in 2018. The country produces both lower-tech products and those that contribute with a larger share in the country's GDP, gradually increasing the share of higher-tech industries. During the period 2013-2018, the positions of the electronics, machine-building and automotive sectors in the total GVA remained relatively stable over the years with some fluctuations. The most dynamic sector is "Manufacture of computer and communication equipment, electronic and optical products", which almost tripled its share for the period. A negative trend that is observed is the permanent decrease in the share of GVA in the provision of services in the field of "Architectural and engineering activities, technical testing and analysis" from 24.6% in 2013 to 18.1% in 2018. Thematic area "Mechatronics and clean technologies" is among the most knowledge-intensive industries in our economy, and in 2017 it accounted for 16% of all business expenditures on R&D. The machine-building sector is at the forefront of investments in innovations with 6.4% of the total R&D expenditures in the country. The largest percentage of the value-added produced is invested in the R&D sector "Manufacture of computer and communication equipment, electronic and optical products" (8.5% in 2017), followed by the mechanical engineering sector – 3.4%, and the production of electrical equipment – 2.1%. R&D expenditures in the production of electrical equipment increased almost four times compared to 2013, and those in the mechanical engineering sector – twice.

Figure 8

TA "Mechatronics and clean Technologies" – R&D of Enterprises in Millions of Euro



Source: Eurostat.

In the thematic area "Mechatronics and clean technologies" we observe the preservation of the positions of the sector in the total share of employed scientists in production. The group of sectors manages to increase the share of scientists working on R&D projects at a similar pace as production grows. Thus, its share in this area increased from 15.4% in 2013 to 16.4% in 2017. The main contribution to the number of employed scientists is the mechanical engineering sector with 6.7% of the total employed in enterprises, followed by the sectors "Computer and computer manufacturing" communication equipment, electronic and optical products "and the manufacture of electrical equipment.

3.4. Thematic area "New technologies in the creative and recreational industries"[6]

The share of the thematic area "New technologies in the creative and recreational industries" in BDS increased in the period 2013-2018 from 0.7% in 2013 to 1% in 2018. As well as in the thematic area "Informatics and ICT" and here we observe strong geographical concentration in the capital, which is one of the problems in the creative industries. During the period under review, book publishing increased significantly, as with about 6,000 books published in 2018, they already number 8.6 thousand. There is also a serious increase in cinemas, which from 40 in 2013 became 69. However, this is not significantly reflected in an increase in the number of visits. The number of television operators is also growing, as in 2013 it was 103 compared to 116 in 2018. Over the years, the number of functioning theatres has remained constant. The number of performances increased by nearly 5% and the attendance of spectators by about 10%. The number of films produced fell sharply in 2018 to 77 from 106 in 2013.

Table 2

Activities of creative industries (number)

	2013	2014	2015	2016	2017	2018
Book publishing	5939	6443	8221	7416	8640	8650
Cinema	40	49	55	59	68	69
Cinema screenings	248486	282202	305989	321842	356385	348959
Produced films	106	114	116	106	106	77
Television operators	103	112	116	121	117	116
Theatrical performances	14463	14694	14168	15162	15333	15155
Theatrical visits	2178249	2302217	2168625	2295323	2221693	2388823

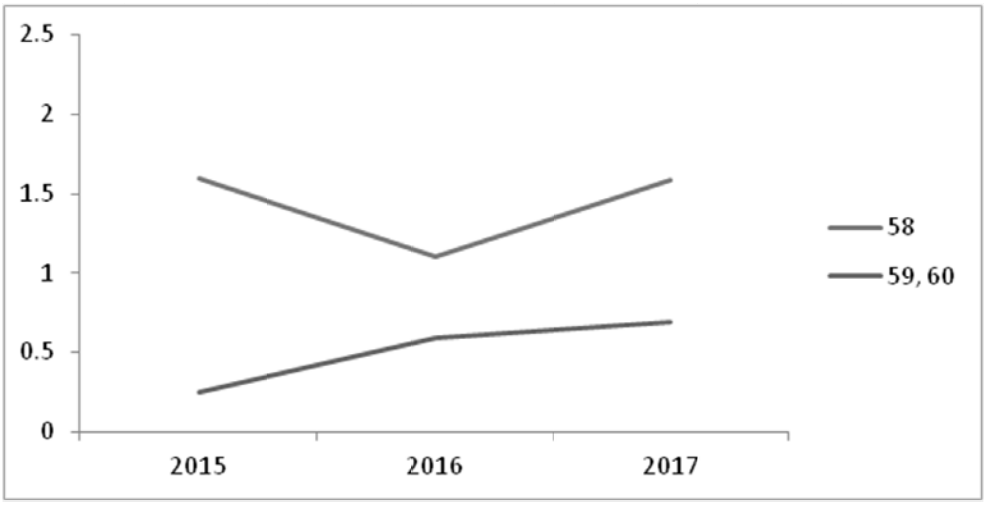
Source: NSI.

The first investments in R&D in the thematic area were registered in 2015. According to the information provided by Eurostat, more than EUR 5.8 million was invested in research and development in the thematic area for the period 2015-2017. The most represented is the publishing activity with 4.3 million euros of investments for the period. The thematic area

[6] Areas with codes 58, 59 and 60 according to the Classifier from 2008 are considered. The economic activities with codes 26, 62, 72 and 63 are not considered here, as they predominantly belong to the thematic area "Informatics and ICT" and their inclusion in the analysis of this group would distort it strongly in their favor

engages on average about 1% of researchers in the country, and its share decreased to 0.7% in 2017. Publishing is in first place in the group, as the number of scientists working in these sectors of the economy fluctuates around 100 for the period 2015-2017.

Figure 9
TA "New Technologies in the creative and recreational Industries" – R&D of Enterprises in Millions of Euro



Source: Eurostat.

3.5. Scientific and experimental activity

This activity is collective for each of the thematic areas, as its predominant part (97.2%) falls in biotechnology, natural, medical, agricultural, and technical sciences. Unfortunately, its dynamics show a very negative trend. For the period 2013-2017, the purely scientific activity of the business, most likely oriented towards larger and strategic projects, was halved. Over the years, this economic activity has seriously lost its position, as its share in the total R&D expenditures of businesses decreased from 75.9% in 2013 to 23.7% in 2017. All this is mainly at the expense of greater investment in information and communication technologies, which are gaining more and more popularity, as well as getting better funding opportunities. During the period under review, there has been a positive development in terms of innovation in all thematic areas. The most dynamic development is in the field of Informatics and ICT, followed by the field of Mechatronics and Clean Technologies. The lack of state policy in the individual areas remains a serious problem for the development of the individual sectors. This is especially true for the Healthy Living and Biotechnology Industry and New Technologies in the Creative and Recreational Industries. In general, it is noteworthy that up-to-date analyses are not available for most of the thematic areas, which raises the need for more systematic work in this direction in order to monitor the results of the implementation of the innovation strategy.

4. Need for change in the thematic areas of the Innovation Strategy for Smart Specialization

As described in the first part, the circular economy is a concept that considers in the first place the relationship of human economic activity to the environment. This includes the use of less natural resources, providing opportunities for their natural regeneration and preventing pollution of nature. With the New Action Plan on the EU Circular Economy (EC, 2020), the gradual transition to a similar way of functioning of the economy is increasingly becoming a luxury and a prerequisite for competitiveness in the medium and long term. The document contains several legislative and other initiatives aimed at the gradual introduction of the principles of the circular economy in the European Union. There are various methods for embedding these principles in ISSS.

4.1. Horizontal presentation of the principles of the circular economy in the Innovation Strategy

The first approach could include their derivation as horizontal principles of the strategy, valid for all thematic areas and mandatory for compliance as criteria in the approval of projects under various programs to subsidise innovation by the state or through European funds. This would ensure that the thematic areas are in line with the principles of the circular economy. As mentioned in part one of the analysis, among the most important of them are:

- Better product design to allow repair or modernisation of products, the ability to use their components in a new product, improve their durability or efficient recycling.
- Improving energy and resource efficiency in production and consumption.
- Optimising the use of resources through the circular use of products, components, and materials to the highest degree through the technical and biological cycle.
- Reducing or eliminating the toxicity of the resources used in the products.
- Recovery of waste in production and consumption.
- Climate and environment neutral production and consumption.
- Preservation and improvement of natural capital, simultaneously controlling the availability of limited natural resources and balancing the flows of recycled raw materials, regeneration, virtualisation, exchange.

In a comprehensive and comprehensive innovation strategy aimed at the development of a circular economy, these principles should be embedded in any activity implemented through the strategy.

4.2. The establishment of a separate thematic area dedicated to the technologies for transition to a circular economy

On the other hand, if only the horizontal introduction of the principles of the circular economy is used, the prioritisation of important areas identified in both this year's updated EU strategy and those identified as important in other documents in this area would remain outside the scope of the strategy (see section 1 of the analysis). Many studies on the subject mention that the raw materials used by enterprises have a huge potential (in many cases up to 30-40% of the costs of enterprises) to reduce costs and improve their competitiveness, as well as their resilience in modern conditions of sharp fluctuations in resource prices on international markets. In addition, given that our economy is highly dependent on imports, the widespread introduction of innovative technologies in enterprises to reduce their resource intensity would be crucial for the economic development of our country. Another important problem of the economy is the generation of a significant amount of industrial waste, which in other conditions could be reduced or recycled in a more efficient way. In this context, it is necessary to stimulate innovative solutions that lead to technologies that generate less waste, as well as those that help to recycle end-of-life products more efficiently. In this regard, an additional priority related to resource efficiency in all (or strategically selected industries) and to optimising the use of resources through the circular use of products, components and materials to the highest degree in both the technical and biological cycle, would be significantly valuable.

4.3. Expanding, reformulating, and supplementing the existing thematic areas regarding activities related to the circular economy

In addition, in the individual thematic areas, innovative activities could be formulated, aimed at the specific development of a circle in the individual industries, and to direct the enterprises directly to such activities.

4.3.1. Thematic area "Informatics and ICT"

The thematic area "Informatics and ICT" is a key opportunity for transition to a circular economy. ICTs have a huge potential to optimise many production processes of enterprises, including those that are associated with reducing the resource intensity of production. This thematic area, in good cooperation with other areas, could significantly improve the results of the implementation of specific innovation projects, as it can be a complementary element to other technologies. However, it is necessary to stimulate the interest of Bulgarian entrepreneurs, as well as their knowledge of the possible benefits of including ICT solutions in the implementation of innovative projects.

Point 1 "Manufactures, especially Fabless and new approaches to design and/or assembly" could focus on eco-design of products, which would allow to extend their life, repair or upgrade their modernisation in order to use the same components, developing methods to extend their life, improve their durability or efficient recycling. Point 2 "ICT approaches in mechanical engineering, medicine and creative industries (in relation to the other three

thematic areas), incl. digitisation of cultural and historical heritage, entertainment and educational games, embedded software" could be extended to other priority sectors of the circular economy described in section 1 of the analysis – electronics; rechargeable batteries and vehicles. Point 3 of the activities of the current strategy – "3D digitisation, visualisation and prototyping": The development of modern methods for digitisation, visualisation and prototyping in different sectors of the economy would significantly help reduce the resource intensity of different industries. It has the potential to support and accelerate the introduction of new technologies by facilitating research. It is possible that these methods have, for example, significant potential in the creation of, for example, buildings that are neutral to their impact on the environment, using methods such as Building Information Modeling. In its new action plan on the circular economy, the European Commission identifies the construction sector as an important priority sector for the development of the circular economy. It is estimated that globally more than a third of resource consumption falls on the construction sector (EMF, 2019).

4.3.2. Thematic area "Mechatronics and clean technologies"

In general, most of the activities provided for in this ISIS in the section "Mechatronics and clean technologies" fall into the category of clean technologies and can be classified as contributing to the development of a circular economy. Among them are the opportunities for implementation of clean technologies in energy and transport, reengineering and extension of the life cycle of industrial machines, appliances and systems, creation of modern information complexes for autonomous energy systems, incorporation of RES in robotic systems with artificial intelligence, promotion of activities related to the construction of smart cities. Implicitly, many of the activities envisaged as priorities may also contribute to the protection and restoration of the environment. Such activities could be, for example, the stimulation of robotics and process automation, incl. 3-D modeling of robotic automated systems. However, almost half of the envisaged opportunities to stimulate innovation in this thematic area are not explicitly aimed at improving the impact of production on the environment. Such are, for example, "Manufacture of basic elements, parts, assemblies and equipment, incorporated as part of a mechatronic unit or independently constituting such a unit", "Mechanical engineering and instrument making, incl. parts, components and systems with a focus on transport and energy", "Automated and software-assisted management systems with production application". To these activities could be added better product design to allow products to be repaired or upgraded, to develop methods to extend their life, to use their components in a new product, to improve their durability or to recycle efficiently.

4.3.3. Thematic area "Industry for healthy living and biotechnology"

In the thematic area "Industry for Healthy Living and Biotechnology" a very small part includes the area of "green/bio-based" economy. The green economy, according to the definition chosen in the strategy, is defined as an economy that aims at sustainable development by reducing environmental risks. This concept is very broad and in practice

could include a large part of the necessary activities for the development of a circular economy. On the other hand, thus so broadly defined, it has no strategic focus on anything specific. The latest activity in the thematic area – "green/bio-based" economy has a serious potential to be expanded and specified in the spirit of the circular economy. As described in the first part of the analysis, in the circular economy there are two cycles of materials – technical and biocycle. In the biocycle, the natural processes of life regenerate materials without human intervention. In the technical cycle, using energy with human intervention, the value of materials is restored. In this sense, the stimulation of innovations in biotechnology to regenerate materials and the environment in a natural way is a key moment in the development of a circular, waste-free economy and could be added as a strategic focus in updating the Innovation Strategy. The development of an industry towards bio-based products (i.e. those that are wholly or partly derived from materials of biological origin) is also crucial, as bio-based resources and materials do not in themselves contain hazards for humans and the environment chemicals. Their decomposition also preserves the natural renewable processes in nature.

Preventing the use of hazardous chemicals in production is a fundamental principle of the circular economy and, in this connection, expanding innovation in this area would contribute significantly to developments in this direction. Another major area in the thematic area under consideration could be the development of innovative technologies to reduce waste in the production of biomass-based and bio-based products. Biomass and bio-based products have been a key priority of the 2015 EU Circular Economy Action Plan (EC, 2015). In the New Action Plan on the EU Circular Economy of 2020 (EC, 2020), this area is specified to "food, water and nutrients", but the wider area remains relevant today. According to a study, nearly 35% of the turnover of food industry enterprises are raw materials, most of which are waste products that are not recovered. In this sense, the development of innovative technologies and their use has a serious potential to improve the competitiveness of enterprises in the industry, and most likely could lead to a useful symbiosis between different industries.

4.3.4. Thematic area "New technologies in the creative and recreational industries"

Since the concept of a circular economy is oriented mainly to the impact of the economy on the environment, and this thematic area falls rather than the social development of man, it has less to do with the circular economy. In this sense, the concept of a circular economy has a narrower definition than the concept of a "sustainable economy", which includes the social aspect of development. To some extent, this may include the development of methods for using fewer resources in the creative and recreational industries. Digitisation of cultural heritage is a similar method in this direction, as well as the development of various methods for online sharing of cultural resources. Point 3 "Alternative (rural, eco-, cultural and festival) and extreme tourism and sport (to stimulate off-season, non-mass and permanent niche tourism)" also has the potential to contribute to the development of a circular economy, as this type of tourism is usually is associated with a more gentle attitude towards the environment. In summary, the best approach would be to use a combination of the three approaches, which would ensure horizontal, vertical, and in-depth integration of the principles of the circular economy in an updated version of the Innovation Strategy.

Conclusion

This study examines the possibilities for interconnection between the integrated strategy for smart specialisation and the new formulations related to the circular economy. Consistently, the presentation proves the main thesis that the indexation of the innovative activity of business units should not only consider the existing capacities, but also cover the competitive advantages of the circular economy.

The analysis of the definitions and main characteristics of the circular economy, as well as of EU documents, allows to highlight the main areas of intervention, to which can be added biomass and bio-based products, as well as photovoltaics and wind generators, aeronautics and defence industry, parts of the chemical and pharmaceutical industries.

Planning in ISSS is done from top to bottom by setting national goals, which are specified at the regional level. This allows the formulation and implementation of a single national innovation policy, but some typically regional advantages may be missed. In general, the methodology for listing priority sectors in ISIS can be defined as successful, but there are some bottlenecks. Among them we can highlight: underestimation of foreign direct investment as a factor for selecting industries; insufficient attention to the imbalance between labour supply and demand for priority sectors; concentrating the methodology on specific projects in the country, without taking into account the participation in international programs; the lack of analysis of the investments made by enterprises in research and development; the use of only static indicators, which does not allow the distinction of fast-growing industries. There is a positive development in terms of innovation in the main thematic areas.

The most dynamic development is in the field of Informatics and ICT, followed by the field of Mechatronics and Clean Technologies. A weakness is the lack of up to date analyses for most of the thematic areas, which raises the need for more systematic work in this direction to monitor the results of the implementation of the innovation strategy. It is necessary to combine the different approaches for combining the thematic areas in ISSS with the specifics of the circular economy. This allows integration in the horizontal, vertical direction, as well as in depth, which will allow the principles of the circular economy to effectively underlie an updated version of the strategy.

The problems facing economic development due to the COVID-19 crisis are also related to changes in the behavioural pattern of consumption, which will be reflected in a decrease in demand and will slow down the recovery. Production needs to respond by offering new products that are more durable, truly long-lasting, and environmentally friendly. This gives a real chance to realise the advantages of the circular economy and to become a leading model of development, which will again attract lasting consumer interest, but also provide a basis for real reduction of supply and supply chains, improving the sustainability of the European economy shock economy. Bulgaria must not lag these processes and it is necessary to timely adapt its strategic documents to this new reality. The transition will also be qualitative in nature, and for this reason, innovation and smart specialisation are the natural environment for building a new circular economy.

References

Angelova, M. (2019). Performance of Social Entrepreneurs and Social Entrepreneurship in Bulgaria. – Economic Studies, N 6.

Applied Research and Communications Foundation. (2019). "Innovations.bg": Innovations and Economic Growth". The Representation of the European Commission in Bulgaria

Baltov, M. (2008). Challenges in front of the Financing of the Innovation Active SMEs – Regional Prospects. – Economic Research Journal, Vol. 3, pp. 109-131 (in Bulgarian).

Baltov, M. (2016). Women-Run Companies' Growth and Finance, Chapter in Women and Sustainability in Business (eds. Caliyurt, Kiymet). Gower, Farnham.

Baltov, M. (2019). Methods for Indexing the Innovation Activities. – In: Proceedings of the Jubilee Conference "Economic Development and Policies: Realities and Prospects", Institute of Economic Research at BAS, Sofia.

Baltov, M. (2020). Circular Economy Features to the Blue Growth Domains. – In: Proceedings of the "Economic Science, Education and the Real Economy: Development and interactions in the digital age", University of Economics – Varna (in Bulgarian).

Baltova, S., Baltov, M. (2017). Value Creation and Value Co-Creation in Professional Business Services: A Challenge in Digital Environment. – Bulgarian Journal of Business Research, 3, p. 31-44.

Baltova, S. (2015). Policies to Support the Innovative Development of Knowledge-Intensive Services. – In: Proceeding of the International Scientific Conference "Post-crisis management in the business", UCTM Sofia, ed. Academic Publications, pp. 651-657.

BASSCOM. (2019). BASCOM Barometer 2019: Annual Report on the State of the Software Sector in Bulgaria. Bulgarian Association of Software Companies, December 2019.

Beev, I. (2019). The Economic Constitution: From Idea to Doctrine. – Nauchni trudove, University of National and World Economy, Sofia, Bulgaria, N 3, p. 33-43, November.

Belas, J., Dvorsky, J., et al. (2019). Important Factors of Smes Entrepreneurial Orientation. – Economic Studies, N 3.

Britchenko, I., et al. (2019). Potential of Sustainable Regional Development in View of Smart Specialisation. – Economic Studies, N 6.

Ellen Macarthur Foundation. (2013). Towards the Circular Economy. Economic and business rationale for an accelerated transition. Vol. I.

Ellen Macarthur Foundation. (2015). Growth Within: A Circular Economy Vision for a Competitive Europe. McKinsey Center for Business and Environment, Report, June 1, 2015.

Ellen Macarthur Foundation. (2019). Buildings All. March 2019.

European Commission. (2015). Closing the loop – An EU action plan for the Circular Economy. Communication from the Commission, COM/2015/0614.

European Commission. (2017). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the 2017 list of Critical Raw Materials for the EU", COM/2017/0490.

European Commission. (2020). Categorisation System for the Circular Economy. Directorate-General for Research and Innovation, Publications Office of the European Union, March 2020.

European Commission. (2020). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. A new Circular Economy Action Plan For a cleaner and more competitive Europe", COM/2020/98.

Ivanova, V. (2018). The model of the circle economy – new opportunities for firm development. – Ikonomiceski i Socialni Alternativi, N 4, p. 141-152.

Joint Research Centre. (2017). Critical raw materials and the circular economy – Background report. Publications Office of the European Union.

Keremidchiev, S. (2013). Genesis and Initial Development of the Market of Consulting Services in Bulgaria. – Economic Thought, N 1, p. 26-61.

Mishyna, S., Mishyn, O., Parkhomenko, N. (2019). Innovative Methods and Tools for Personnel International Marketing Development. – Economic Studies, N 1.

Mochurova, M., Dimitrov, M., et al. (2019). Innovation Activity of the Business Sectors in the Border Regions of the Republic of Bulgaria and the Republic of Macedonia. – Economic Studies, N 1.

McKinsey Global Institute. (2011). Resource Revolution: Meeting the world's energy, materials, food, and water needs. Report, November.

Nenkov, D., Miteva, D. (2018). Comparative Analysis of the Methods for Determining the Price of Personal Funds. – Ikonomiceski i Socialni Alternativi, University of National and World Economy, Sofia, Bulgaria, N 3, p. 5-18, October.

Policy Studies Institute at the University of Westminster. (2014). Scoping study to identify potential circular economy actions, priority sectors, material flows & value chains. Publications Office of the European Union.

Zhecheva, V., Baltov, M., et al. (2019). Enhancing Innovation Capacity of SMEs in Balkan-Mediterranean Area through Regional Based Centers of Excellence as Technology Drivers. – In: Proceedings of "International Conference of Education, Research and Innovation", Seville.

Zhelyazkova, V. (2018). The Road to Circular Economy: What Can Europe Learn from the Experience of Germany and Japan?. – Economic Studies, N 6.