The Innovation in Services and Service Economy

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INTRODUCTION

The monograph reflects the specific environment in which we focus on innovation and its implementation. Attention is therefore paid to the identification of the phenomenon of the service economy as a background for the emergence and use of service innovations. Furthermore, the study discusses relevant theoretical aspects of service innovation, the specificities that limit the possibilities of evaluating and measuring innovation. The second part of the monograph is devoted to the presentation of the research results on the impact of the innovation environment of the economy on performance of services.

The topics of ‚service economy' and ‚service innovation' are linked by a new approach, particularly in business and marketing, which emphasises the dominance of services in the economy – the *‚service-dominant logic*' (SDL). It derives from an institutional theory and reinforces the fact that service innovation represents a new way of doing things. The SDL approach emerged in the early years of the 21st century as an alternative way of reflecting on services (Vargo and Lusch, 2004, Vargo and Lusch, 2008). This view contrasts with the traditional goods dominance logic (GDL), which focuses on the production of value chain outputs (Lusch, Vargo, and Wessels, 2008). While the approach applying the goods dominance principle presents the service as a category applied in the market, the SDL approach presents the service as the fundamental unit of exchange and value creation. This is the first key axiom of the SDL approach. Other axioms focus on the cooperation of actors in the creation of value and integration of resources, also on the influence of the recipient of the service on value, and on the importance of organisational arrangements and rules within the institute of cooperation. From this perspective, service is defined as a process through which actors integrate their resources for the benefit of other actors (Vargo and Lusch, 2008). The SDL approach draws attention to the position and role of the customer in service innovation processes. The customer/consumer is co-creator of the service, is the source of new ideas and determines the quality of the service. From this perspective, service is a creative process. It is influenced by customer's expectations and available corporate resources. The authors Sarmah and Rahman (2018) cite customer's innovativeness and willingness to co-create, customer's socialization and capability as essential elements in the innovation efforts of service providers. The strong position of the customer/consumer in services is reflected in current service management theory in the „*Dynamic Customer-Centric Model*", which respects the influence of social networks and big data influencing customer's loyalty as the key tools for customer relationship management in services.

It follows that the issue of innovation in services is a dynamic complex of strong sub-problems that address the position of services in the value chain of the economy, the actors of innovation processes, including the strong position of the customer, the impact of the specific characteristics of services, socio-technological changes and, last but not least, the optimal management processes focused on innovation. However, this does not, of course, complete the statement of the related and follow-up topics. In addition to the wide-ranging impact of the innovation issue itself, this is influenced by the dynamics of changes in society and in the economy, which continuously give rise to new research challenges.

1 FUNDAMENTAL ASPECTS OF INNOVATION PROCESSES IN SERVICES

1.1 Service economy

The nature of services, their differentiation from goods and questions directed to the problem of valuation of their inputs to total production are topics that have been actual since the beginning of the functionality of the modern economy.

The work of Baumol (1967) can be described as pioneering in the identification of the service economy. In his research he dealt with the relationship between service production and economic growth. He develops a two-sector (manufacturing and services) unbalanced growth model to find out why the share of employment in services increases. The results of his studies show that under the effectiveness of two conditions (productivity growth in manufacturing is higher than in services and there is a constant level of demand for both services and products), the share of employment in services increases and the rate of economic growth gradually declines until it converges to services productivity growth. Baumol identified lower productivity growth in services (Sasaki, 2015).

If labour productivity in the industrial sector grows faster than in the service sector, then wages in the industrial sector are likely to rise. If the labour market is sufficiently competitive to prevent wage levels in the two sectors from diverging, unit labour costs in the service sector will increase in comparison to those in the industrial sector. As a consequence, the price level of services increases in comparison to industrial products. The paradoxical result is that the sector with lower productivity gains grows more in terms of value added than the sector with higher productivity gains. At the same time, relatively more jobs are maintained or created (as a result of economic growth) in services rather than in manufacturing, so that the share of employment in the service sector also increases (Nordhaus, 2006).

Indeed, productivity differences between industries and the corresponding differences in wage costs per unit of output have been growing over time. Despite a significant increase in the relative price level of services, employment in the service sector has grown. Because of increased relative prices of services, the share of value

added in the service economy must also have increased (Henriques and Kander 2010, Baily and Bosworth 2014). The challenge is to determine the reasons for productivity differences across sectors. These are found in the fact about the capital intensity of industrial production, which generates demand for technology, machinery and equipment. These result in the energy intensity of product output. The impact of changes in the price ratio of energy and human capital is reflected in the productivity achieved in industrial production, not in the service sector (Witt and Gross, 2019). While the growth of the industrial economy is provided by mass production and the reduction of unit costs of production, the growth of the service economy is based on knowledge-intensive production of goods and services, well-educated workers, and innovative firms (Shek, Chung, & Leung, 2015).

An analysis of the post-industrial economy from a political economy perspective has been undertaken by Iversen and Wren (1998). They identified the service sector as the main source of employment growth in advanced democracies over the last three decades of the 20th century. The timing of the beginning of the development of the service economy differs in the authors‘ works. Barett and Davidson (2008) identify it as the middle of the 20th century, and according to them this emergence is evident not only in developed but also in developing economies. The explosive growth of information and communication technologies, and the associated increase in B2B trading, have resulted in the existence of a „new service economy“ and a „knowledge-based economy“ (Greenhalgl, Gregory, 2002).

Table 1 Overview of authors and selected titles related to the topic of service economy and service empowerment

Author	Year	Title
Service economy		
Michalová, V.	1998	*Trhové služby v modernej ekonomike*. Bratislava: Vydavateľstvo EKONÓM
OECD	2000	*The Service Economy*. Available at: http://www.oecd.org/sti/ind/2090561.pdf
Bailey, S.J.	2001	Bailey, S.J. *Cities and services: a post welfarist analysis*. Paddison, R. (ed) Handbook of urban studies. Sage Publications, London, 336–350.
Lovelock, C., Vandermerwe, S., & Lewis, B.	2001	*Services marketing: an European perspective*. London: Prentice Hall.
Rubalcaba, L.	2007	*The New Service Economy: Challenges and Policy Implications for Europe (Services, Economy and Innovation),* Edward Elgar Publishing, ISBN-101845425855, ISBN-13 : 978-1845425852
Wirtz, J. & Lovelock, C.	2010	*Services Marketing: People, Technology, Strategy*, World Scientific Publishing Co Inc, ISBN10 1944659013, ISBN13 9781944659011
Michalová, V., Benešová, D. & Šťastná, J.	2013	*Služby v modernej ekonomike*. Bratislava: Vydavateľstvo EKONÓM

Author	Year	Title
Anttiroiko, A.V. & Valkama, P. & Bailey, S.	2014	*Smart Cities in the New Service Economy: Building Platforms for Smart Services.* AI & Society. 29. 323-334. 10.1007/s00146-013-0464-0.
Gallouj, F., Weber, M., Stare, M. & Rubalcaba, L.	2015	*The futures of the service economy in Europe: a foresight analysis. Technological Forecasting and Social Change,* Elsevier.
Codagnone, C., Abadie, F., & Biagi, F.	2016	*The Future of Work in the Sharing Economy*. Science for Policy Report. doi: 10.2791/431485
Dehejia, R. & Panagariya, A.	2016	*The Link between Manufacturing Growth and Accelerated Services Growth in India.* Economic Development and Cultural Change. Vol 64(2). pp. 221-264.
Service empowerment		
Grönroos, C.	1984	*Strategic Management and Marketing in the Service*. Chartwell-Bratt . ISBN-10 : 0862380596, ISBN-13 : 978-0862380595
Vandermerwe, S.	1990	*The market power is in the services: Because the value is in the results.* European Management Journal. 8 (4), December 1990, pp. 464-473
Gadrey. J, Gallouj, F. & Weinstein, O.	1995	*New modes of innovation: how services benefit industry.* International Journal of Service Industry Management, Emerald, 6 (3), pp.4 – 16. ff10.1108/09564239510091321ff.
Wise, R., & Baumgartner, P.	1999	*Go downstream: The new profit imperative in manufacturing*. Harvard Business Review, 77(5), 133–141.
Farah, M. F.	2000	*The Third Industrial Revolution and the New Productive Paradigm: Some Considerations on Brazilian Industrial Development in the 1990s*. Rev. FAE, Curitiba, 3(2), 45-61.
Sweet, P.	2001	*Strategic value configuration logics and the "new" economy: a service economy revolution?* International Journal of Service Industry Management, 12(1), 7084.
Evangelista, R. & Savona, M.	2002	*The Impact of Innovation on Employment in Services: Evidence from Italy.* International Review of Applied Economics. 16. 309-318. 10.1080/02692170210136136.
Oliva, R., & Kallenberg, R.	2003	*Managing the transition from products to services*. International Journal of Service Industry Management, 14(2), 160–172.
Baláž, V.	2004	*Knowledge-intensive Business Services in Transition Economies*. Service Industries Journal – SERV IND J. 24. 83-100. 10.1080/0264206042000275208.
Gebauer, H., & Fleisch, E.	2007	*An investigation of the relationship between behavioral processes, motivation, investments in the service business and service revenue*. Industrial Marketing Management, 36(3), 337–348.
Joshi, S.	2008	*Growth and structure of tertiary sector in developing economies*. New Delhi : Academic Foundation.
Gummesson, E.	2008	*Extending the new dominant logic: from customer centricity to balanced centricity. J Acad Mark Sci* 36(1):15–17
Michalová, V.	2008	*Hybné sily trhu služieb v procese globalizácie, internacionalizácie a integrácie.* Bratislava: Vydavateľstvo EKONÓM

Author	Year	Title
Lightfoot, H.	2013	*The servitization of manufacturing: investigating contributions to knowledge production. I*nternational Journal of Operations & Production Management, 33, (11/12), 1408-1434.
Das, S. P. & Saha, A.	2015	*Growth of business services. A suplly – side hypothesis*. Canadian Journal of Economics. Publisher: Wiley. vol 48 (1).

Source: authors'own

The emergence of the service economy represented a new era in the world economy. This phenomenon is characterised by a change in the mode of production, a transition from the industrial regime to the information age. This process began to take place after the Second World War and transformed the world economy and society (Bailey, 2001; OECD, 2000). Currently, services is the sector with the highest growth rate in the world economy, accounting for 64% of GDP, followed by manufacturing with 32% and agriculture with 4%. Thus, the share of market and non-market services in GDP generation currently exceeds 50%, reaching 70% in some countries, and the share of services in employment is recorded in the range of 55% – 69% (Orchel and Wegner, 2019). In developed countries, the service sector is thus responsible for more than three-quarters of the economy with its output. In the US, 79% of its GDP is the result of services, in France 77% and in the UK 76% (Lovelock, Wirtz, 2010; OECD, 2000; CIA, 2017).

„The ‚service economy' is characterised by the rise of the service sector's dominance in terms of employment and value added shares. We can observe this rise in the second half of the 20th century in the US, more precisely in the period from 1970 to 2005 (Witt, Gross, 2019). Structural change in the economy is an inevitable concomitant of economic growth. Its impact can be seen in the changing employment structure and value-added shares of different sectors of the economy. The production of services is stimulated in the 1970s, when there are changes in the resource structure of economic growth and stronger efforts to exploit endogenous resources. Technological progress and the innovations it generates become an essential source of growth, which is gaining momentum due to the development and implementation of information and communication technologies, robotics and artificial intelligence. This has now given rise to the characteristics of Industry 4.0, where services are gaining strength through their significant share in the production of information and communication technologies and in the production of R&D services. The technological maturity and complexity of production systems and their short life cycle generate an intermediate demand for professional consultancy services. Also, the rising standard of living of the population in developed countries and the increase in the leisure time fund, as well as demographic changes, are underpinning the increasing production of services for the final consumer.

The author Michalová identifies the promotion of intermediate services based on their role in production processes as a key factor in highlighting their importance in the economy (Michalová, Benešová, Št›astná, 2013). The process of service promotion was also influenced by global developments that gradually removed barriers to world trade in services (Rao, Kothari, & Kurtz, 1993). The globalization of markets and the development of information and communication technology (ICT) enables businesses to conduct activities around the world. Thus, services do not require direct physical contact, they can be provided remotely through ICT and this phenomenon includes the use of outsourcing and offshoring (Messenger, Ghosheh, 2010).

Overall, we can conclude that recent and current studies identify socio-technological change as a factor stimulating the demand for services and hence the development of a service economy. Within the framework of societal changes, these are mainly demographic changes, changes in family functioning, upbringing and education, the economy and political power relations. Technological changes take the form of the use of the Internet, Industry 4.0, Internet of Things, Big Data, 3D printers, Clouds (Chukanova, 2017).

Table 2 Development stages of the service economy

Period	Accompanying development features
The 50s-60s 20th century	Development of technologies, increasing importance of science and research, changes in the structure of the economy (Japan, USA, Western Europe)
The 70s 20th century	Crisis associated with „oil shocks", restructuring of economies, intensification of economic growth – research and development, business services
The 80s 20th century	Use of personal computers, data accumulation and their storage
The 90s 20th century	Internet use, mobile communication, ICT development
The 21st century	Digitalization, automation, robotics, mobile apps, e-business, digital partnerships, collaborative economy, artificial intelligence, circular economy

Source: authors'own

As Table 2 suggests, technological development is the dominant factor in the development of the service economy. Other factors that have a positive impact on service consumption are: leisure time, lifestyle, demographic structure and living standards of the population, trade liberalisation and globalisation, and sustainable aspirations.

The current stage of the service economy reflects the needs of Industry 4.0 and 5.0. It is defined by the demand for research and development in digitalisation, artificial intelligence and socially beneficial sustainability solutions. Knowledge is a key element of economic growth. The ability to produce quality knowledge-intensive services, including business services, is a feature of a competitive economy.

1.1.1 Representation of the service economy in the European Union

Services are a major source of employment in developed economies. In the EU countries, services accounted for 74% of jobs in 2018, while industry accounted for 15.3%. The situation in Slovakia is different. The share of services in total employment in that year was 65.4%, while the share of industry in total employment was 24.4%. Exports of products to GDP in Slovakia accounted for 88.5% in 2018 (Eurostat, 2019).

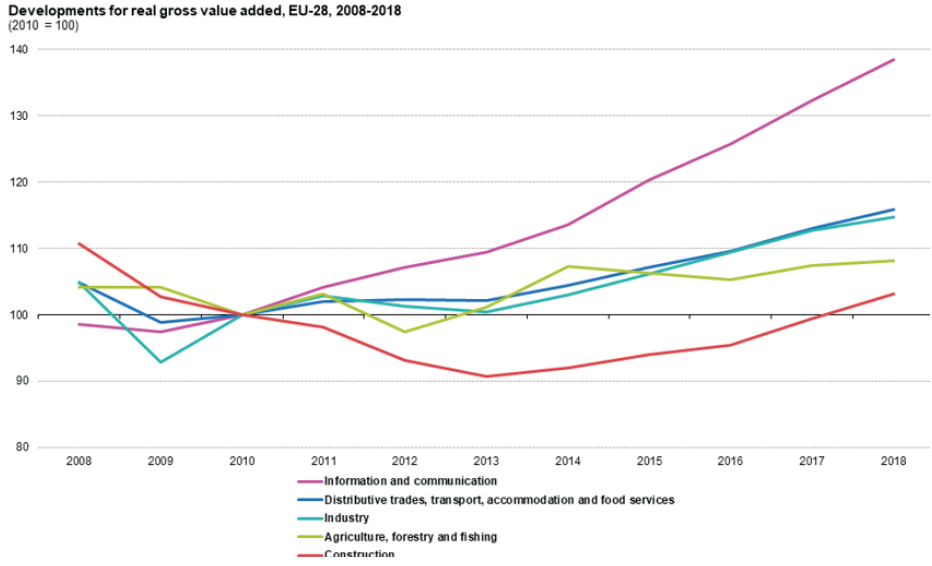
Services accounted for 73.2% of total EU28 gross value added in 2018, compared to 72.2% in 2008. Services were particularly prominent in Luxembourg, Malta and Cyprus, France, the United Kingdom, Greece, the Netherlands, Belgium, Portugal and Denmark, where they accounted for more than three quarters of total value added. By contrast, the share of services was close to three-fifths in Ireland, Slovakia and Czechia (all of which recorded relatively high shares of industry) (Eurostat, 2020).

Structural change is driven, at least to some extent, by phenomena such as changes in technology, developments in relative prices or outsourcing and globalisation, which often lead to industrial production and some services (which can be provided remotely, for example online or through call centres) moving to regions with lower labour costs, both within and outside the EU. In addition, a number of activities have been severely affected by the global financial and economic crisis and its consequences. The most significant reduction occurred in the industrial sector, where value added in the EU28 fell by 11.4% overall in volume terms from 2008 to 2009 (after having already fallen slightly in 2007-2008). From 2011 to 2013, industrial output in the EU28 fell by a further 2.3% and then grew at a relatively fast pace over the next four years (with annual growth of 2.5% to 3.1%) and at a slower pace (1.8%) in 2018. The deepest and longest decline was in the construction sector, where output fell every year from 2008 to 2013 in the EU28, with an overall decline of 18.1% (with the decline already occurring in 2008). In 2014, the construction sector grew by 1.3%, the first annual increase in seven years. By 2018, growth rates ranged from 1.6% to 4.2%. Business services and trade, transport, accommodation and food services both experienced relatively large declines in value added in the EU28 in 2009, by 7.0% and 5.8% (respectively), but subsequently showed positive annual rates of change each year until 2018 (with the exception of a slight decline of 0.1% for trade, transport and accommodation and food services in 2013). After a period of relative stability (no change) in 2009, output in agriculture, forestry and fishing in the EU28 fell by 3.9% in 2010 and again by 5.5% in 2012. After growing by 3.8% in 2013 and 6.1% in 2014, output in this sector fell by 0.9% in both 2015 and 2016 before starting to grow again: by 2.1% in 2017 and by 0.6% in 2018. In no

year during the period under review did real estate activities; public administration, defence, education, health and social work activities experience an annual decline in value added. Interestingly, although the value added of real estate activities in the EU28 increased each year during the period considered (albeit at a relatively slow pace), the overall share of real estate activities in total gross value added decreased slightly (Eurostat, 2020).

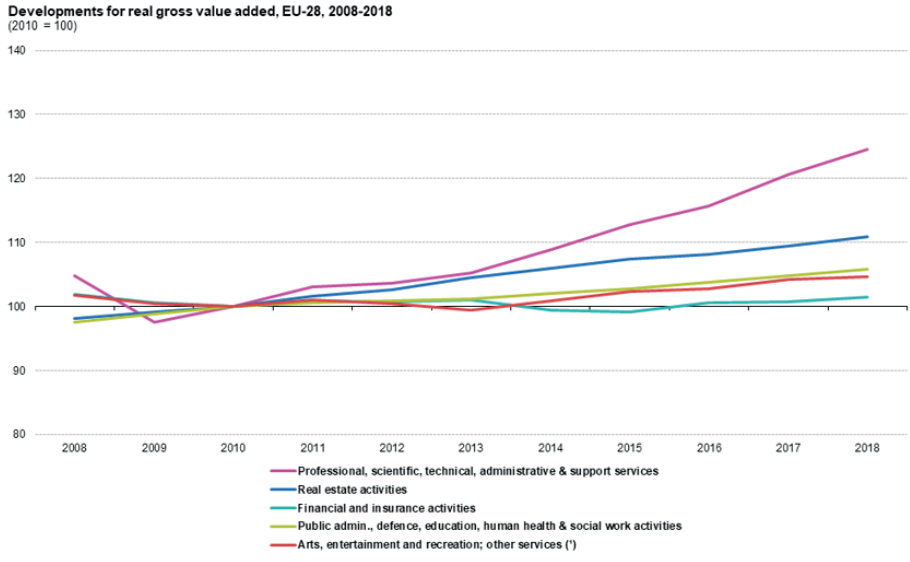
In 2018, the EU28 recorded growth in gross value added in all activities compared to 2017. The activities with the strongest growth were information and communication activities (4.7%), construction (3.6%) and business services (3.3%) (Eurostat, 2020).

Figure 1 Developments for real gross value added by selected sectors, in %, the EU28



Source: Eurostat, 2019

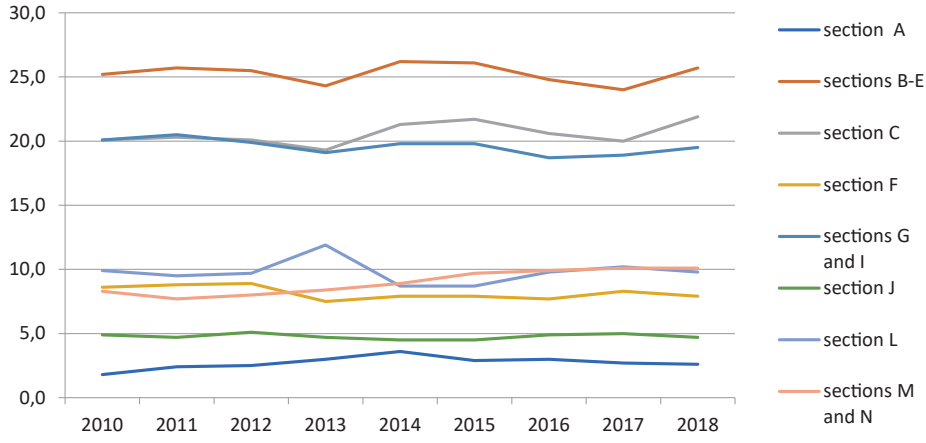
Figure 2 Developments for real gross value added by selected services sections, in %, the EU28



Source: Eurostat,2019

The economic contribution of individual activities of the Slovak economy to its total output expressed in terms of value added is presented in Figure 3. It documents the development of the share of value added generated in selected sections of economic activities in the total value added in Slovakia in 2010-2018. The graph reflects the dominance of industry in the monitored indicator, followed by wholesale and retail trade, accommodation and food services. Business services (M and N) are larger contributors to the Slovak economy than construction in the above observation. At the same time, the complete group of sections forming business services (J, L, M, N) together account for a quarter of the value added in Slovakia.

Figure 3 Developments for the share of gross value added in selected sections of economic activities in total value added in Slovakia, in %, 2010–2018

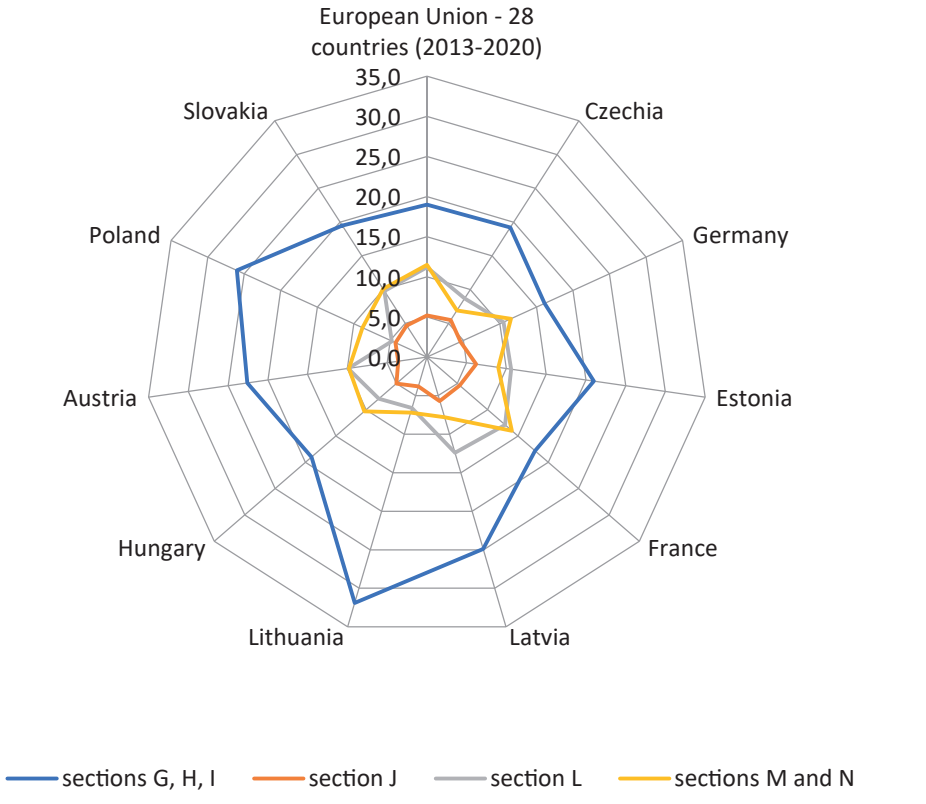


Source: authors'own based on Eurostat data[1]

The comparison of the share of services in value added in selected European economies shows that there are structural differences. While the V4 and Baltic economies dominate the group of knowledge-non intensive services (G, H, I) in terms of their contribution to value added in the economy, France and Germany document a significant position of knowledge-intensive services (M and N) in comparison to the surveyed countries. However, the attention is drawn to the section „J" as a representative of knowledge-intensive services, where the highest values of the observed indicator in 2018 are documented by Czechia, Estonia and Latvia. Slovakia reaches the EU average value (5.2%), which puts the indicator ahead of Hungary, Lithuania, Poland and Germany in terms of value.

[1] SECTION A – AGRICULTURE, FORESTRY AND FISHING, SECTION B – MINING AND QUARRYING, SECTION C – MANUFACTURING, SECTION D – ELECTRICITY,GAS, STEAM AND AIR-CONDITIONING SUPPLY, SECTION E – WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT AND REMEDIATION ACTIVITIES, SECTION F – CONSTRUCTION, SECTION G – WHOLESALE AND RETAIL TRADE; REPAIR OF MOTOR VEHICLES AND MOTORCYCLES, SECTION H – TRANSPORTATION AND STORAGE, SECTION I – ACCOMMODATION AND FOOD SERVICE ACTIVITIES, SECTION J – INFORMATION AND COMMUNICATION, SECTION K – FINANCIAL AND INSURANCE ACTIVITIES, SECTION L – REAL ESTATE ACTIVITIES, SECTION M – PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES, SECTION N – ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES

Figure 4 Gross value added in services as a share of total gross value added in selected countries, in %, 2018



Source: authors'own based on Eurostat data

1.2 Labour productivity in services

The issue of productivity measurement in services is a specific problem that has received a lot of attention within the scientific platform. This is due to the significant differences from the general practices applied in the environment of production of tangible goods. So far, there is no unified concept of measuring productivity in services, but the following specificities can be broadly agreed upon:

- The problem of identifying the unit of production (Michalová et al., 2013), which is caused by the heterogeneity of production, the degree of standardization of production, the level of personalization of services and their knowledge intensity.
- The irrelevance of output determination and productivity measurement in some components of the service sector (defence, public services, etc.) (Michalová et al., 2013).

- Temporal mismatch of production and effects from service consumption (Michalová et al., 2013).
- Direct consumer participation in value creation
- High share of human labour in services output
- Production value is perceived by the consumer through the consumption utility.

Most definitions of service productivity are based on the classical notion of productivity (Sink, 1985), but due to the non-materiality and intangibility of services, simply transferring the traditional notion of productivity from industries producing tangible goods to services is inaccurate and misleading (Corsten, 2001, Baumgartner, Bienzeisler, 2006, Lasshof, 2006, Grönroos, Ojasalo, 2004, Johnston, Jones, 2004). Non-materiality results from the intangibility of the output of service production, also the heterogeneity of services as another characteristic of services makes it difficult to develop a generally valid concept of service productivity. Services are highly diversified, broad spectrum services ranging from public services to business services, mostly knowledge intensive, to personal services. These have heterogeneous characteristics, making it difficult to identify significant factors of productivity and their specificities (Lasshof, 2006, Ojasalo, 1999, Baumgartner, Bienzeisler, 2006).

Also, the integration and involvement of customers in the value creation process is a major element in service production (Lasshof, 2006). This means that the customer is inevitably a key factor for service providers that must be integrated and included in some way in the measurement of service productivity. This is in contrast to the classical notion of productivity where the customer is usually not an integral part in value creation and business processes are also often a closed system (Grönroos and Ojasalo, 2004). This means that the quality of the product output during the value creation process, i.e. in production and also in sales, cannot and must not be influenced by the customer.

However, there is currently no single definition of service productivity or a commonly used method for measuring it. Thus, the difficulty in defining a method for measuring productivity lies in the specific nature of services as well as the difficulty in quantifying customer participation in the service production process (Vuorinen, Järvinen and Lehtinen, 1998, Grönroos and Ojasalo 2004, Jääskeläinen, 2010). The productivity measurement method is currently elaborated and used for manufacturing industry production, where productivity is defined as the ratio of the outputs of a production unit to its inputs. In contrast, service productivity measurement has not yet been precisely and uniformly defined or used. However, identifying service productivity is not unjustified because service production (as opposed to manufacturing), to a large extent, requires the participation of people, technology, internal and external stakeholders interconnected in value creation and information sharing.

The service productivity model of Grönroos and Ojasalo (2004) is one of the main existing concepts in the scientific literature (Balci et al., 2011), extending the classical concept of service productivity. It is based on a process approach and defines service productivity as a complex of different functional components. From the service provider‘s perspective, service productivity is determined by three main factors : internal, external and capacity utilization.

Internal efficiency is identified by the internal structure of the service output, involving inputs from the service provider and customers; external efficiency depends on the quality of outputs, in particular on the quality of service and quantity of outputs as assessed by customers; efficient capacity utilisation means the optimal use of the enterprise‘s capacity in relation to the quantity of outputs. Capacity utilisation is optimal when demand and supply of output are in balance. The ability of the service provider to maintain cost efficiency (internal efficiency) and to coordinate resources with customer’s expectations for quality (external efficiency) along with the capacity utilization of the enterprise (capacity efficiency) is important (Balci et al. 2011).

The traditional productivity model thus extended to include the customer; quality and customer satisfaction are incorporated into the productivity concept. However, if we consider customers’ participation in the service production process, their role does not only consist in the evaluation of quality, because in some services, customers are directly involved in the service production process and thus have as important a role as the service provider (Grönroos; Ojasalo, 2004).

Regarding the relationship between service productivity and service quality, some researchers are of the view that productivity and quality are inseparable parts of a whole (Grönroos and Ojasalo, 2004, Gummesson, 1998), while others argue that productivity is independent of quality and can be viewed separately as an expression of a qualitative benefit that is separate from a quantitative outcome (Lasshof, 2006). However, all scholars agree that the customer determines service quality (Lasshof, 2006; Grönroos and Ojasalo, 2004).

According to Lasshof (2006), productivity is crucially influenced by the customer, who judges the quality of the service (or one aspect of quality) serving as a benchmark for evaluating the production efficiency. Since the customer is a critical factor for the success of a service provider, there is therefore a need for simultaneous pressure on production efficiency and customer’s satisfaction. (Lasshof, 2006). An increase in both variables simultaneously leads to a general advantage. Lasshof (2006) also suggests that productivity considerations also imply that production efficiency and productivity expressed quantitatively can be evaluated independently of each other (Lasshof, 2006).

So these are two different perspectives on service productivity. One approach sees service productivity as part of efficiency, although it stresses the importance of customer's satisfaction. Consequently, productivity is expressed as a quantitative measure of performance and is separate from the qualitative outcome component. On the other hand, another approach views productivity as a complex integrating efficiency and performance. According to this view, productivity cannot be separated from quality. It is also assumed that there are still a large number of different factors that influence service productivity. However, few of these factors for determining productivity have been studied in detail so far.

Within the accepted standard that productivity is an expression of the rate of use of inputs to produce a quantity of outputs, as well as a recognition of the importance of human labour in the production of services, we are inclined towards the fairly commonly used expression of productivity in services in terms of labour productivity. Labour productivity is considered an acceptable option for expressing efficiency also in the tourism environment (Ivanov and Webster, 2019). The parameters used are: output, value added, revenues, and on the denominator side the number of workers, employees, hours worked, etc.

The effects of innovation on efficiency anticipate the possibility of using Total Factor Productivity (TFP) to express efficiency, but its realistic expression is limited by the complexity of the statistical record of innovation in services. TFP is a way of expressing economic efficiency that is conditional on the implementation of technological and/or organisational innovations. TFP reveals the joint effects of many factors, including new technologies, efficiency gains, economies of scale, managerial skills and changes in the production organisation. The TFP index is defined as the ratio between the output index (i.e. the change in production volumes over the period under consideration) and the input index (the corresponding change in inputs/factors used to produce them) (Comin, 2010).

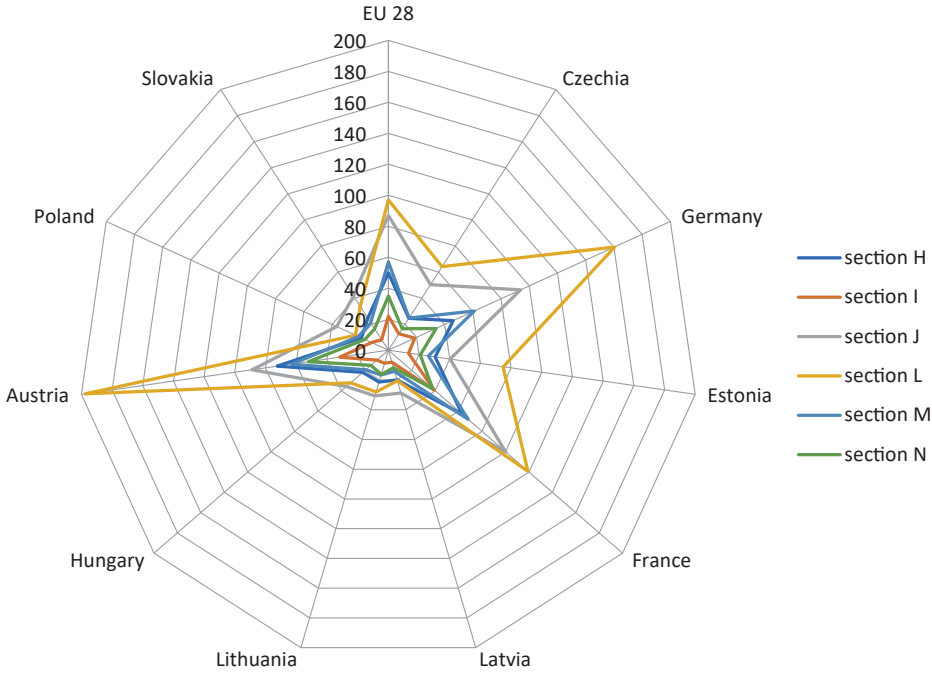
Statistical data document an average annual TFP growth of 0.8% in the EU countries and 1.9% in Slovakia between 2010 and 2018. Transnational corporations operating in Slovakia boost productivity through technology transfer, but not through business expenditure on research and development (BERD). In practice, this is confirmed by the figure of 135 robots used per 10 000 employees in Slovakia. compared to 74 robots per 10 000 employees in the OECD countries; as well as the fact that transnational corporations account for 31% of the BERD volume in Czechia, 17% in Hungary and only 10% in Slovakia (Baláž et al., 2020). The low value of BERD together with the low representation of innovative firms indicate a low effective impact of domestic R&D spending in Slovakia on productivity growth.

An analysis of labour productivity per worker in real terms (chained volumes) over the ten-year period from 2008 to 2018 shows that the EU28 has seen productivity

gains in most activities, with the largest increases in agriculture, forestry and fishing (up 28.0% overall), information and communication services (17.5%) and industry (16.3%). The average annual growth of total real labour productivity per hour worked in 1996-2018 was 1.3% in the EU countries, but 3.7% in Slovakia (Eurostat, 2020).

Labour productivity per worker in real terms increased in almost all EU Member States between 2008 and 2018, with declines in Finland, Italy, Luxembourg and Greece (no data are available for Malta). Over the same period, labour productivity per hour worked increased in all EU Member States except Luxembourg and Greece (again, no data are available for Malta). Excluding Member States with a break in the time series, the largest increases (in percentage terms) in both labour productivity indicators in real terms were recorded in Bulgaria, Estonia, Latvia, Lithuania, Romania and Slovakia (Eurostat, 2020).

Figure 5 Labour productivity (gross value added per employee) in selected market services, selected EU countries, in EUR thous., 2017



Source: authors'own based on Eurostat data

Figure 5 below compares the achieved values of the labour productivity parameter, which is expressed as a share of gross value added per employee considering the presence of a relatively large group of self-employers. The highest achieved values within the selected countries are registered in the section L (Austria, Germany,

France above the EU28 average). In the KIBS environment, the highest values are registered in the section J, where Slovakia asserts itself as the 2nd best performer after Czechia among the V4 countries and former Soviet republics. However, it is evident that these countries do not reach the EU28 average in any of the assessed sections, which suggests room for the implementation of innovations enhancing the competitiveness of service enterprises and their output.

1.3 Innovations in services

The definitions refer to services as economic activities between two parties in which one party offers a service or intermediation to the other, such as access to goods, labour, professional skills, equipment, etc. However, the client does not own or purchase the assets used in the process (Lovelock, Wirtz, 2010; OECD, 2000). A more general definition classifies services as a group of economic activities whose process is usually provided and mediated by human labour through advice, various professional skills and entertainment. They are distinguished from other economic activities because of their ephemerality, non-materiality and their immediate consumption (OECD, 2000; Bailey, 2001). More recently, technological advances have enabled enterprises to offer services more accessibly and massively. Using electronic devices, integrated into specific programs developed by enterprises, services can be consumed without the client being physically present. The use of technology to deliver services has therefore changed the interaction between service providers and their clients, and more independent and personalized consumer behavior has evolved (Taylor, 1999; OECD, 2000).

The author Michalová, who can be described as a distinctive personality of the Slovak science and academic environment in the field of service economy, approaches the definition of services from several perspectives. She takes into account marketing, management, the process of service production and the product characteristics of the service. Her approach is thus comprehensive and describes services as any activity that can be offered by one party to another, is intangible in nature, and does not constitute an acquisition of property. Services are economic activities that create value and provide an effect to the consumer at a specific time and place (Michalová, 2006).

The topic of service innovations is emerging gradually in the context of the development of service theory. Its dynamisation has been observed since the beginning of the 1990s and its main representatives include the authors Gallouj, Sundbo, Sirilli, Evangelista, Tether, Van der Aa, Elfring and others. Based on their views, we can identify the following characteristics of services that influence the implementation of innovations in them: the inseparability of production and consumption,

information intensity, the importance of the human factor, the special role of organisational factors.

The topic of innovation in services is gaining importance with the recognition of the transformative power of innovations due to externalization processes in the economy. By making the demand for services intermediate in nature (especially in business services), innovative service inputs into other outputs affect the innovativeness and competitiveness of the final output. The transformative power of service innovation is understood as a process where services disrupt traditional marketing channels, business processes and models, enhancing the consumer experience in a way that affects the entire value chain. Service innovations thus shape entire sectors, industries and markets and drive structural change and industrial modernisation (Expert Panel on Service Innovation in the EU, 2011).

However, service innovation also has a transformative impact in non-intermediate consumption environments. Innovation in health, education, and public administration affects consumer utility from service consumption. It also changes the pattern of consumption and its course. In final demand service production environment, service innovations change the consumer utility. They allow personalisation of services, thereby enhancing consumer's satisfaction and loyalty, which ultimately generates positive economic value for the provider. The scope, nature and intensity of service enterprises' innovation activities vary and take diverse forms within the heterogeneity of services (Kubičková, 2009). In tourism, this diversity is further enhanced by the interdisciplinary nature of the industry.

The theory and practice of service innovations have evolved under the influence of the traditional notion of the production of intangible goods and has influenced relevant considerations in that service innovations have been seen as isolated elements. Supporting their development through education, policy and promotion is undoubtedly important, but their more effective use presupposes their interconnection with production. Then service innovations achieve large multiplier effects. Their implementation in the value processes of production and consumption of various goods will cause changes/transformation on a wide scale. This premise is based on the fact that service activities are part of any production.

Table 3 The approaches to successfully using the transformative power of service innovations

Incorrect approaches	Correct approaches
Focus only on research and technological innovation	Focus on all forms of knowledge and innovation
Promoting service innovations as such	Supporting transformation through service innovations
Support of individual specialised firms	Promoting clusters and networks of related firms
Focus on the services sector	Concentration on production and services
Imitating and improving best practice	Future practice-oriented research
Following growth/development trends without reflection	Engaging regional competences for the development of new industries
Following a horizontal approach without specific objectives	Following a systems approach
Following a narrow sectoral approach	Following the cross-sectoral approach
Carrying out pilot projects independently	Carrying out large-scale projects through a systematic approach
To find the problem in innovations or for innovations (their application, commercialization, efficient use, cost-effectiveness, etc.)	Finding an innovation that solves a problem (responding to a challenge/need)

Source: European Commision, 2012

Given the transformative effects of intermediate demand for services, KIBS are a preferred component of researchers' interest in service innovations. Rehák (2008) draws attention to their importance for regional knowledge development and innovations. He states that „*Systematic gaps in innovation creation in the region resulting from the fragmentation of the innovation system allow the emergence of specific markets for knowledge-intensive service enterprises. KIBS are a mediator of knowledge in the region and equally bring to the region the best experiences of technical or managerial practice from other regions. Therefore, especially large clients present in metropolitan regions that create demand for specialised consultancy gain a competitive advantage and in turn also promote the quality of regional KIBS. The higher the concentration of such firms in the region and the more intensively firms use such services, the faster the diffusion of new knowledge in the region can be expected. Therefore, even regions with fragmented innovation systems can have good access to new knowledge. The lack of incentives from the regional research sector can to some extent be compensated by KIBS firms.*" In terms of the structure of economic activities, KIBS are seen as a source of benefits for production. Partnerships of firms with KIBS, bring them cost savings, externalization of risk and knowledge sharing (Bustinza et al., 2019).

Table 4 Overview of service innovations definitions and the relevant authors

Author	Definition
Gallouj, Wenstein (1995)	Any change affecting one or more characteristics.
Van der Aa, Elfring (2002)	Ideas, processes or products that are new to the organisation and the relevant environment.
Toivonen, Tuominen (2009)	A new or modified service that, when implemented in practice, brings new benefits to the enterprise that developed it as well as to consumers. In order for a service to qualify as an innovation, its renewal must be a novelty not only for the enterprise that introduced it but also in the wider economic and social context. The innovation must have general application characteristics.
Ordanini, Parasuraman (2011)	An offer of a service previously unavailable to consumers or its delivery that requires modification of various competencies for the provider and/or the consumer.
Cho, Park, Kim (2012)	The introduction of a new or significantly improved service or product.
Santamaria, Nieto, Miles (2014)	New services that have entered the market or existing, significantly improved services or important changes that have altered their essential features, intangible components or expectations.
Skalén et al. (2014)	The creation of new value through the development of an existing or new process and/or resources or through the integration of processes and resources in a new way.
European Commission (1996)	Renewing and increasing the range of products and services and the relevant markets, creating new methods of production, supply and distribution, introducing changes in management, work organisation and working conditions, and in the experience of the workforce.
OECD (2005)	The introduction of a new or significantly improved product or process, a new marketing method or a new organisational method into a business practice, work organisation or external relations.
Chang, Chen (2004)	The process of applying new forms of knowledge.
Kubičková (2007)	A new or significantly improved service concept and is introduced in the environment of service enterprises as well as in manufacturing enterprises, since service performance is an important component of production processes. Innovation in a service enterprise can be defined as any change in its structure, which is made up of all the enterprise elements and the relationships between them, and also the relationships between the enterprise elements and its environment. This change results in a qualitatively new enterprise element (product, workforce, enterprise culture, organisational structure, etc.) or an original element improved in at least one of its parameters. Changes may be technical or non-technical in nature.

Source: authors'own according to Witell et al., 2016

The above perspectives on defining service innovations stimulate a reflection on whether there is a semantic difference between the terms ‚service innovations' and ‚innovations in services'. Services as activities are part of all production systems. Their total or partial change manifests itself in a change in their utility characteristics for an internal (e.g. the service of an accounting department in an enterprise) or external client (e.g. car servicing). In this case, we are talking about service innovation as part of the final product. Innovations in services concern the processes of production and distribution of a service under the direction of the provider. However, the process of production and consumption of services, including distribution, is inseparable, the service is an intangible product, and therefore the change in the service is the result of a change occurring in the process of production and/or distribution. A change in the production or distribution process will ultimately lead to a change in the product. Some theoretical approaches also look for differences between innovations in production and in services. In this case, services are seen as production, the specificities of which are also reflected in innovation activities that are different from those carried out in production. Finally, it can be stated that the authors do not concentrate on these different considerations and more or less deal with the issue of innovation in services in a complex way.

1.3.1 Knowledge-intensive business services and their importance in innovation processes

The growing impact of knowledge on the development of the economy increasingly links the production and consumption of services and innovations. Knowledge-intensive services (KIS) and, within them, knowledge-intensive business services (KIBS) are gaining priority, filling the gap between business services and market KIS. This is due to their ability to transform innovations across the economy through intermediate demand. KIBS are represented by firms and institutions that possess advanced professional knowledge in a relatively niche domain and transfer their products into customer portfolios as part of the absorption of their products into value chains. KIBS provide high quality services with high added intellectual value and their activities lead to the creation, accumulation and dissemination of knowledge in order to develop highly personalised services or even product solutions (Muller, Zenker, 2011). One of the first definitions of the term KIBS is associated with the authors Davis and Botkin in 1994. Their definition consisted in the common characteristic of knowledge intensive businesses. KIBS are represented in the economic activities by sections J – information and communication services (divisions J 62, J 63) and M – professional, scientific and technical activities (divisions M 69 – M 74) (Schnabl, Zenker, 2013).

Some studies also assign to the group of KIBS services the divisions N78 – employment activities, N80 – security and investigation activities because of their knowledge intensity of production and belonging to business services, selected subdivisions of section K and L, respectively, and reduce the set to subdivisions (Badulescu, 2020; Doroshenko et al., 2014). Thus, the authors of the studies take a more or less specific approach to defining the set of KIBS, respecting the intention of their own research.

According to Nählinder (2005), KIBS are services and business operations that are highly dependent on expertise. As a result, their employment patterns are shaped in favour of scientists, engineers and other professionals. He also distinguishes between technological KIBS defined by the J 62 and J 63 divisions and professional KIBS defined by the remaining divisions from the KIBS set.

The KIBS services sector is characterized by high firm turnover rates, rapid changes in technological advances (e.g., in the software industry), as well as high interdependence between sub-sectors (e.g., consulting and industry) (Horgos, Koch, 2008).

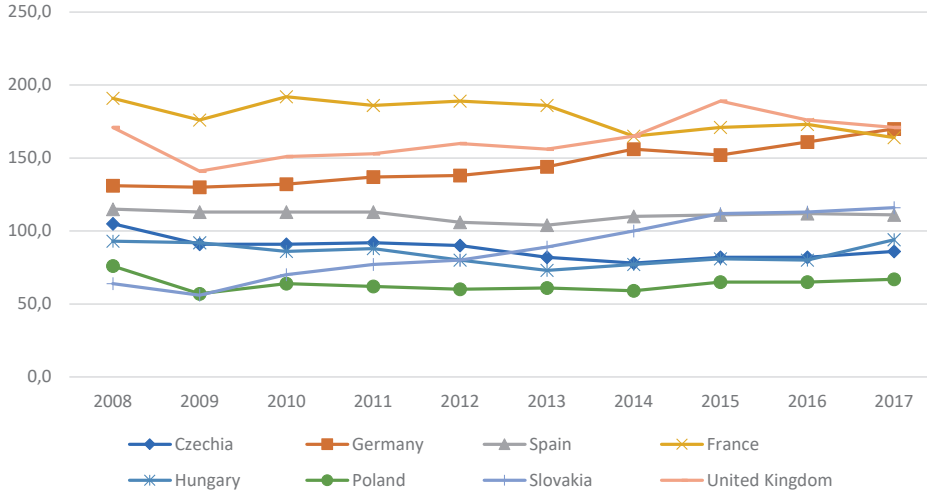
The production of KIS services has been attributed with a positive impact on the competitiveness of the economy (Haataja, Okkonen, 2004). This is due to the nature of their products accompanied by high levels of value added, sophistication and intermediate demand. However, education services, scientific activities, health and culture are also part of the group of knowledge-intensive services. Their output determines the quality of life of the population and the educational level of society. KIS, and within them KIBS, are part of national innovation systems (Kox, Rubalcaba, 2007). Their performance (employment, exports, revenues, etc.) is monitored for this very function in the framework of European statistical initiatives focused on innovations, high-growth enterprises and, partially, on gazelle enterprises.

The most important producers of KIBS within Europe are the UK, Germany, France and Spain. The first three of these countries are also the leaders in labour productivity achieved in KIBS. Within the V4 countries, the ranking of KIBS revenue achieved in 2016 is as follows: Poland, Czechia, Hungary and Slovakia. An obvious factor influencing this parameter is the strength of the economy and its priority focus.

In 2018, KIBS accounted for 13.3% of total GDP in Slovakia, while information and communication services accounted for 4.2% of GDP. In total employment, KIBS accounted for 13.4%, information and communication services 2.9% (Statistical Office of the Slovak Republic, 2020). Due to statistical availability, GDP and employment in KIBS includes the outputs of sections J, M. In Slovakia, in the period 2008-2017, the volume of GDP generated in sections J and M together was increasing, amounting to EUR 5211.5 million and in 2007 EUR 7933.0 million in

2017. It was only in 2013 when a decrease in this indicator was recorded. This volume was the lowest among the V4 countries, but the growth rate was higher in Slovakia than in Czechia and Hungary. In Slovakia, the average annual growth rate of GDP in KIBS was 4.8% in the period under review. (European Commission, 2020). The dynamics of the development of KIBS in Slovakia suggests their relatively significant impact on the economy of the country. At the same time, their impact also strengthens the ability of KIBS products to transform innovations into customers and to improve value chains in the Slovak economy. A comparison of the achieved labour productivity in KIBS (expressed as revenues per employee) and its development between 2008 and 2017 in selected countries suggests that the productivity of KIBS in Slovakia increased and was, at the end of the period under review, the highest in the V4 countries and reached the level of labour productivity achieved in Spain. Promoting performance improvement in KIBS in Slovakia is a challenge for innovations field and its management.

Figure 6 Labour productivity in KIBS, in EUR thous.



Source: authors'own based on Eurostat data

1.3.2 Typology of innovations in services

The approach to the typology of innovations in services is based on the typology of innovations in manufacturing. The traditional view of innovations emphasizes the effect of technological breakthroughs on the need for change (Schumpeter, 1934; van der Aa, Elfring, 2002). Conceptualizing service innovation only as a breakthrough in technology limits the scope and impact of the concept and hinders theoretical development. It is likely that service innovation encompasses a much

broader perspective. Ostrom et al. (2010) suggest that service innovation creates value for customers, employees, entrepreneurs, alliance partners and communities through new and/or improved service offerings, production processes and service business models.

The traditional classification of service innovation divides them into radical and incremental innovations (Gallouj and Weinstein, 1997) and product and process innovations (Vaux Halliday and Trott, 2010). Recent classification suggest that service innovation differs from traditional innovation perspectives in aspects such as the changing role of the customer (Michel, Brown and Gallan, 2008), the use of the Internet (Dotzel, Shankar and Berry, 2013) and new business models (Hsieh , Chiu, Wei, Yen and Cheng, 2013). Evidence suggests that ignoring the uniqueness of service innovation leads to an underestimation of the impact of innovations in the service sector. Gallouj and Savona (2008) further challenge existing classification and suggest the need for new classifications to better understand the nature of service innovation.

The authors Tether and Hipp offer such a breakdown of innovations existing in different service industries with different representation:
1. service (product) innovation that results in a new or significantly improved service,
2. process innovation, which results in a new or substantially improved method of producing the service,
3. organisational innovation, which means a significant organisational change.

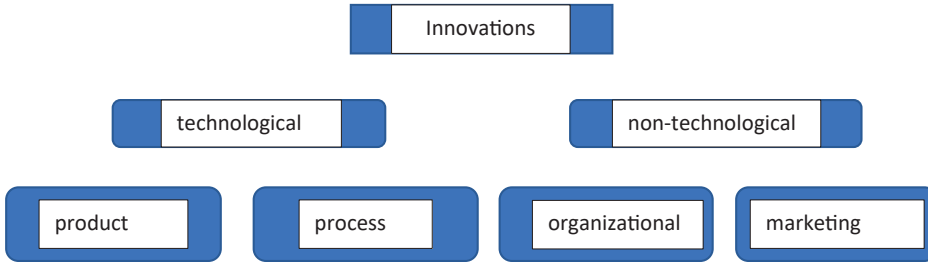
A common feature of authors trying to offer a typology of service innovations to highlight their impact is the recognition of four basic criteria for identifying the type of service innovation: level of change, type of change, degree of novelty, mode of production. Further, the authors differ in the typological differentiation of service innovations depending on which service activities they consider. This is due to the heterogeneous nature of service activities. Different services have different degrees of standardization of production, different levels of knowledge intensity of production, personalization of services, different determination of demand, etc. This also causes differences in preferences for the use of different types of innovations. In tourism, for example, we distinguish incremental innovations, distinctive innovations, and breakthrough innovations (Chan, 1998). Disruptive innovations in the tourism sector cause changes in the value chains of tourism products in the current stage of the service economy, where we identify new service providers (sharing economy entities, reservation systems accessible to the final client, mobile applications for travelers, etc.) that weaken the traditional ones (hotels, transportation companies, travel agencies, tour guides, etc.).

The European statistics apply a unified innovation monitoring system for both manufacturing and service sectors, which distinguishes between technological and

non-technological innovations (OECD, 2005). Technological innovations are represented by product and process innovations, non-technological innovations are represented by organisational and marketing innovations. The unified application of the type distinction of innovations in services and in production makes it possible to identify differences in the application of innovations in enterprises. The inseparability of the production and consumption of services makes it relatively easy to imitate technological innovations, which reduces the realisation of returns from the introduction of technological innovations. In manufacturing, this is protected by a system of patents and IPR protection, which is very complicated in services. Non-technological innovations in services are therefore more widely adopted than in manufacturing.

Accepting the division of innovations into technological and non-technological is important for the implementation of primary research in the specific conditions of the functioning of services, especially for the possible comparison of innovation activities and performances across economic sectors, as well as for compatibility with secondary sources, especially statistical ones.

Scheme 1 Classification of innovations



Source: authors'own

The implementation of service innovations supports the continuous growth of the service sector, their main objective is to create new value as well as to create new business models (Kuo, Chi and Yeh, 2013). Moreover, technological innovation and within it, rapid advances in ICT (information and communication technology) enabled the introduction of large-scale innovations in the service sector (Kuo, Chi and Yeh, 2013). Their strategic role was examined and technological innovations were found to significantly facilitate processes in the service sector (health, financial, engineering, consulting, tourism services and others). This makes ICTs highly relevant to the service sector (Chae and Olson, 2011). They are an indispensable part of services and key to keeping up with customer's expectations (Agarwal and Singhi, 2010). Today's society is built on digital services and ICT, which play a central role in the daily life and economy of a country. They are a natural and important part of socio-economic relationships in which people and technological devices are interconnected (Brandt, 2007).

This is therefore a positive effect of ICT investment in the services sector. A number of studies have addressed the issue of how ICT affects or ensures economic growth and employment. It is therefore important to examine the impact of ICT on economic performance (Benešová et al., 2019) In general, however, the widespread use of ICT across the economy increases efficiency and boosts productivity growth (OECD, 2003).

It is challenging for service businesses to secure a sustainable and stable position given the current highly competitive environment and turbulent market changes. Already Porter (1990) described the importance of innovation and ICT as a factor in the competitiveness of services, but he also sees the indispensability of quality management and a skilled workforce. The introduction of new progressive ICT tools into service business processes shaping service offerings and increasing their competitiveness is therefore a current challenge. This includes, for example, the widespread use of the Internet to develop the marketing of service enterprises, as well as the widespread use of complex information systems and the interconnectivity of individual information flows. In order to increase the competitiveness of services, according to the OECD (2012), it is also necessary to select an appropriate workforce with the necessary digital skills, to increase the digital skills of permanent staff and to increase the skills of consumers.

ICT has thus now been positioned to bring strategic advantage and achieve sustainable competitive advantage. Also, the investment and innovations, enabling advances in ICT itself, are making a significant contribution to productivity gains and are having a major impact on competitiveness in services (European Commission, 2012). Hackley (2005) argues that in order to gain competitive advantage in services, the digitalization of business processes, the implementation of appropriate information systems that give service businesses the opportunity to expand in the market is necessary. He also highlights the important role of online marketing tools as a possible competitive advantage. In ICT investment, the service sector is ahead of other sectors, which as Lush, Vargo (2004) point out, supports the growth of service value added. Furthermore, in KIS, production is predominantly based on information and knowledge, if services are to remain competitive, they must implement and use ICT (Berr, 2008). Ghani, Goswami, and Kharas (2012) confirm that there is a growing number of service sector enterprises whose portfolio can be communicated to customers through the digital marketplace without the constraints of country borders, thus removing any barriers and giving even smaller enterprises the opportunity to use more sophisticated ICT.

1.3.3 Measuring innovations in services and their effects

Current theory and practice approach the measurement of innovations in different ways and to different extents. It depends on the level of monitoring of innovation activities. At the enterprise level, innovation monitoring is more or less linked to traditional ROI assessment practices. Among the management methods used, the Balanced Scorecard (customer perspective, financial perspective, internal business process perspective, learning and growth perspective) and the *ABC method* (Activity Based Costing Method) are only sparingly used (Cokins, 2016). However, specific evaluation in the area of, for example, investments in employee training is a methodologically complicated procedure that enterprises largely do not follow. Mature corporate cultures understand this kind of investment as a necessary element of their progression. The evaluation of innovation and its measurement must therefore be approached individually. While the measurement of technological innovation at enterprise level can be described as relatively straightforward, the measurement of non-technological innovation is a complex and, moreover, imprecise process.

Table 5 The examples of innovation metrics at enterprise level

Performance metrics of innovation adoption in the enterprise	Metrics of the effectiveness of innovation adoption in the enterprise
Return on investments in innovations	Profitability of the innovated product by life cycle phases
Ratio of revenues of the innovated product to total revenues	Percentage decrease in costs of innovated processes
Percentage revenue growth due to successful innovation	Revenues (profit) volume from innovated products
Innovated product lifetime	Revenue per worker from the innovated product
Number of patents per year per employee	

Source: Chromjaková, F., Rajnoha, R., 2009

Efforts to measure the innovation environment of an economy as a key fragment of the knowledge economy, but also of competitiveness, resulted in several systems operating at global and European level. Eurostat offers an innovation tracking „*community innovation survey*“ (CIS) and results from a total of 10 surveys are currently available. The most recent year assessed in terms of the business environment is 2016. Several of the monitored parameters are tracked at the level of the breakdown of economic activities into sections. Therefore, it is possible to track innovation performance partly also in the service sector. However, over the years, the methodology as well as the classification of economic activities changed, and there were also changes within the Eurozone. These facts cause incompleteness of comparable parameters and limited time series, therefore correlation analyses are very

limited. In addition, monitoring focuses on fact-finding in the area of implementation of product and process innovations, with a limited focus on organisational and marketing innovations, which is a significant limitation in a service production environment.

Within the European Union, the European Innovation Scoreboard (EIS) is in place, which monitors the level of the innovation environment and its performance across the EU countries through indices. The Scoreboard has been compiled regularly since 2001, and every two years it includes a comparison of regions within the EU (Regional Innovation Scoreboard). In the past, there has been an initiative to monitor the innovation performance of the service sector across the EU countries (Service Sector Innovation Index). However, this was discontinued in 2006. The impetus for the implementation of this specific monitoring was the acceptance of the specific characteristics of service innovations, which is oriented towards non-technological innovations. The comparisons of country results under the two systems were in many cases different, including different results for Slovakia, and so a revision of the assessment took place, which now focuses on assessing the inputs and outputs of innovation activities of enterprises in general, including both manufacturing and services.

The EIS provides a comparative assessment of research and innovation performances in the EU countries, other European countries and regional neighbours. It assesses the relative strengths and weaknesses of national innovation systems and helps countries identify areas they need to address. It assesses indicators that characterise the inputs to the innovation system (innovation capacities and potential) as well as the outputs of a functioning innovation system (innovation activities and impacts). The EIS ranks countries according to their performance in four groups: leaders, strong innovators, moderate innovators and emerging innovators.

In the overall EIS ranking for 2019, 14 countries belong to the group of moderate innovators, together with Slovakia, which achieved a performance in the range of 50%-90% of the European average: Croatia, Cyprus, Czechia, Greece, Hungary, Italy, Latvia, Lithuania, Malta, Poland, Portugal, Slovenia, Spain.

As part of the EIS evaluation system, the export of KIBS is also monitored in the performance area, thus the system confirms the importance of the position of services in countries‘ innovation systems and their significant synergistic effect on the economy and its competitiveness. This parameter is expressed as a relative share to the EU average of the monitored parameter in 2010. In 2019, Slovakia reached the level of 41.89%, the best performance was recorded by Ireland (151.81%), Luxembourg (151.81%) and the UK (131.07%). Slovakia‘s performance is the weakest among the V4 countries (41.89%) in the monitored parameter, with Bulgaria, Slovenia, Spain, Lithuania and Croatia recording weaker performances compared to

Slovakia. The results suggest a relatively weak innovation performance of Slovakia in the field of production of competitive KIBS that are able to position themselves on the international market. The reasons for this can be identified in the insufficient innovation background of the Slovak economy, in the socio-political prioritisation of industry in the structure of the economy, in the low support for science and research, and in the foreign capital participation in key economic sectors, which is very strong and favours the satisfaction of intermediate demand for KIBS by foreign firms. Although Slovakia performs well in the EIS assessment in the area of revenues of product innovations, the CIS assessment of innovative enterprises confirms only 25.4% share of product/process innovator enterprises in Slovakia to the EU average and 48.9% share of marketing/organisational innovator enterprises. The share of innovating enterprises in Slovakia is 27.4% of the value achieved in the EU countries in 2017.

The issue of measuring innovations in services can be found in the works of several authors. The lack of appropriate indicators and methodologies to express and quantify innovations in services has been shown to be a limiting factor in the study of the impact of innovation activities on service performances (Cainelli et al. 2004; Ferreira et al.,2005). There is no general methodological framework to measure innovations in services, studies are approached individually and the structure of parameters is constructed according to the specificities of the particular study and the service fields being investigated. The logic of this practice is based on the heterogeneity of the service environment, which reflects different levels of standardisation of production, knowledge intensity of production, personalisation and the nature of demand. In addition, complications in the measurement of innovations in services are caused by the time lag of the effects from the innovations that are the object of evaluation and measurement. This is due to the trust-based nature of service consumption. Because of the intangibility of the product, the consumer makes a decision to buy a service based on trust, or on experience, whether personal or mediated. This process takes time, which delays the effects of service innovations. At the same time, the consumer‘s participation in production makes it difficult to identify precisely the provider/producer‘s input to the innovation and the consumer‘s contribution. In practice, enterprises struggle to define the benefits of innovations because they are selling a product, not value to the customer. However, it is the utility value to the customer that defines the value of the service as a product, not the cost at which it is produced.

Overall, we can state that approaches to measuring innovations distinguish inputs to innovations. These are in fact the capacity conditions for the realisation of an innovation, which together constitute the innovation potential. And on the other hand, they refer to the outputs of innovations as manifestations of effects. On the side of inputs, the authors and relevant studies mainly mention the following indicators: research and development expenditures, education and training of employees,

qualification structure of employees, skills of employees, know-how of the enterprise, innovativeness of employees, business model and others (Vacek, 2017, Müller, Srholec, 2006, Klička, 2007) . It is obvious that several indicators can be expressed in quantifiable parameters, which is the basic condition of measurement, on the other hand, some of the indicators have rather qualitative expression.

On the output side of innovation activities, performance indicators are used: implemented innovations, patents and intellectual property protection, revenues from the sales of innovative products, performance economic indicators of a general nature.

A more complex approach to the evaluation of the innovation performance of an enterprise is a system that evaluates the inputs, the course and the results of innovation processes. This is an enterprise innovation index. Within the environment of Slovak business entities, the Innovation Index was constructed and tested, composed of 30 evaluation criteria within 5 areas: strategy, market, product, process, people (Janovčík, 2010). The author considers the evaluation of innovation performance to be a self-assessment of the achieved innovation performance based on the comparison of the current state of the enterprise to the ideal state in the above five priority areas. Several traditional approaches to measuring enterprise performance have fundamental flaws in that they provide only a retrospective view of the competitive position of an enterprise that existed at a certain point in the past. Such analyses do not provide enough information to reveal the true dynamics of an enterprise‘s innovation performance. Janovčík (2010) states that „*classic financial indicators may not always be indicative, we cannot use them to see how the enterprise is moving towards achieving its strategic goals. Therefore, it is important to complement the evaluation of innovation performance with a system based on self-assessment*.“

The measurement of innovation in services faces a lack of monitoring within national and supranational statistical systems, which focus on innovation performance in general, and at the same time, at the enterprise level, measurement is being complicated by the existence of specific characteristics of services.

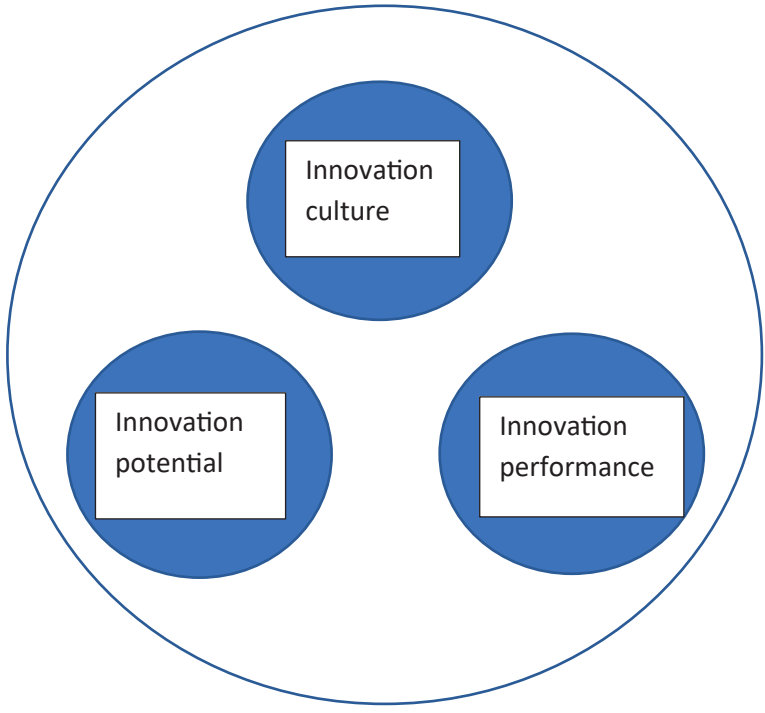
2 THE IMPACT OF THE INNOVATION ENVIRONMENT OF THE ECONOMY ON PERFORMANCE IN SERVICES

The intention to examine the innovation environment of an economy as a determinant of service performance is based on the idea that the quality of the innovation environment causes innovation effects throughout the whole value chain of the economy. Due to the existence of intermediate demand for services (business services, KIBS), the requirement for the provision of sophisticated services is logical because they affect the innovativeness of the purchasing entities and their output. The production of services thus achieves a higher efficiency of production through a higher volume of value added and/or cost reduction. This process also works in reverse, where service enterprises are customers of products that are influenced by innovative activity and increase the competitiveness of the final product – a service, for example in a tourism environment.

We perceive the innovation environment of an economy as the synchronous existence of innovation culture, innovation potential and innovation performance in the economy. Innovation culture is a phenomenon that is identified through the quality of the educational system, the socio-political prioritization of scientific activities, and the social valuation of research and education results. Innovative potential consists of resources whose effective use leads to innovation performance.

In the characteristics of the global, sharing and collaborative economy, the above elements of the innovation environment of the economy take a predominantly collaborative form. This means that the innovation environment of the economy is influenced by cooperation and partnership between actors both across the internal economy and internationally. The innovation environment and its level can be quantified through a number of parameters that are part of the EIS, including government expenditure on R&D (GERD) and business expenditure on R&D (BERD). The CIS allows tracking selected service sections and their innovation performance through the volume of revenues of innovative products. This allows documenting the impact of R&D expenditure on the commercialisation of service innovations.

Scheme 2 The elements of the innovation environment in the economy



Source: authors'own

Observations of the relationship between innovation and performance in services are influenced by the specificities of services, which are heterogeneous and produced with different knowledge intensities and with different degrees of standardization of production. Labour productivity is considered to be a generally applicable parameter for measuring performance in services, primarily because of the human intensity of this output as well as the relatively difficult valuation of the costs of service production.

In the service production environment, the issue of the impact of innovation on enterprises' performance has been documented by many researches and authors. However, the results of the observations vary, which is attributed to the chosen research methodology as well as the geopolitical location of the observations. At the same time, contradictory interpretations appear in studies from both knowledge-intensive services environment and those non-intensive one as well. The authors attribute the failure to demonstrate the impact of innovation on the performance of service enterprises primarily to the problem of lagged effects from the introduction of innovations in services, or in the accurate identification of the effects of innovations (Bulkley, Alstyne, 2004).

The positive relationship between innovations and economic performances in tourism services were documented by several authors in their studies (e.g. Han et al., 1998; Li, Atuahene-Gima, 2001; Hult et al., 2004; Gunday et al.,2008; Rubera, Kirca, 2012; Nepierala, Szutowski, 2019). Lin (2013) argues in his work that service innovation affects enterprise's performance in both direct and indirect ways, with service quality playing a positive mediating role and direct impacts being more pronounced than indirect ones. The positive impact of innovations on above-average revenues of service enterprises was noted by Nepierala, Szutowski (2019). A non-significant or negative relationship between innovations and performances in tourism is found in the works of several authors (e.g. Birley, Westhead , 1990; Jaworski, Kohli , 1993; Heunks, 1998; McGee et al, 1995; Guisado-González et al,2013).

In addition to the performance indicators monitored in tourism services, an important tourism indicator is the Travel and Tourism Competitiveness Index (TTCI). It is a World Economic Forum method designed for the purpose of tracking the competitiveness of countries in tourism. It was launched in 2007 and is linked to a country-wide observation, which is expressed by the Global Competitiveness Index. Overall, it ranks countries according to the data collected in five dimensions: business environment, safety, health and hygiene, human resources and labour market, and ICT readiness. The dimensions are elaborated into 14 pillars containing more detailed indicators: business environment, safety and security, health and hygiene, human resources and labour market, international openness, political and social priority of tourism, price competitiveness, environmental sustainability, air transport infrastructure, ground and port infrastructure, tourist service infrastructure, natural resources, cultural resources and business travel.

The countries with the highest tourism competitiveness among the 140 countries assessed worldwide are Spain, France, Germany and Japan, achieving the highest values (5.4) and ranked in the top positions of the 2019 TTCI rankings. Among the V4 countries, Czechia achieved the best rankings and scores and Slovakia the worst, yet they occupied positions in the top half of the ranked countries (Table 6).

Tourism enterprises represent low knowledge-intensive production and the degree of standardisation of their production varies widely. It is defined by the nature of the product and its degree of adaptation to the consumer. The empirical results support the fact that the tourism industry exhibits differentiated innovation behaviour in the service sector. There are two determinants of the impact of innovations on economic performance in tourism: the type of innovations and the type of enterprise. Also, localisation and its associated *networking can be identified as a determinant force for the contemporary tourism industry.*

As the research (Camisóna, Monfort-Mir, 2012) shows, tourism enterprises are less technologically innovative than those operating in manufacturing and other services,

and mainly perform incremental innovations based on previously available knowledge within the organisation, allowing imitators and adaptors to prevail over true innovators. The innovation behaviour of tourism enterprises is more focused on non-technological innovations. The results also support internal heterogeneity in innovations of tourism industry.

Table 6 Ranking of selected countries by TTCI index in 2019

Rank	Country	Value (1–7)
1.	Spain	5,4
2.	France	5,4
3.	Germany	5,4
4.	Japan	5,4
5.	United States	5,3
6.	United Kingdom	5,2
7.	Australia	5,1
8.	Italy	5,1
9.	Canada	5,1
10.	Switzerland	5
38.	Czechia	4,3
42.	Poland	4,2
48.	Hungary	4,2
60.	Slovakia	4

Source: The World Economic Forum, 2019

Compared to manufacturing, innovations in services are driven by practical experiences rather than research activities. Employees, consumers, suppliers and other partners are more involved in the development of new service qualities. The relevant environment of the service enterprise is thus an important factor for innovation activities. All activities in the area of concentration and knowledge exchange within the various forms of networking are therefore justified. This is particularly true in service environments, especially those produced with a high degree of consumer participation in production (prosumer). Services in tourism industry are clearly identified in this way.

In the innovation processes of tourism enterprises and entities there are recognizable specifics that can be called „innovation paradoxes“. Their existence is contradictory and partly influences the natural motivation of entities to introduce innovations and/or the achieved innovation effects.

- Innovation paradox 1 – time lag effects from product innovations. The paradox is based on the intangible nature of the tourism service product. A tourism product is a service whose consumption is based on experience or trust. Consumption of the innovated product is thus in practice motivated by price and other bonuses from providers, which stimulate demand and thus create room for a new experience. In the next phase of the product's lifecycle, revenues from the new product are boosted by the application of a real price and/or increased demand.
- Innovation paradox 2 – is based on the fact that the production and consumption of services are realised in time coincidence. Returns from the introduction of product and process innovation are severely limited by their relatively easy imitation. An easily identifiable new product quality or a new service production process is therefore often imitated and tourism industries are dominated by imitation. Moreover, they are not accompanied by research and development costs and, in line with the low knowledge intensity of tourism service production, imitation is therefore a very logical reality. On the other hand, non-technological innovations are thus gaining ground for tourism service enterprises and creating scope for achieving innovative financial and non-financial effects. The reason for the promotion of marketing and organisational innovations in tourism is that their implementation is disconnected from direct contact with the client, which means that their imitation is limited, thus increasing the scope for achieving returns on innovation.
- Innovation paradox 3 – Barras' inverted production cycle (BARRAS, 1986. Its effectiveness can be described as follows:
  - Stage 1 the firm acquires information technology or other technology to increase the efficiency of an existing process,
  - Stage 2 the new process induces a subsequent increase in the quality of the service provided
  - Stage 3 it is evident that the new technology has provided the basis for an entirely new service.
- Innovation paradox 4 – pursuit of incremental, not radical innovations due to low knowledge intensity of tourism service production.
- Innovation paradox 5 – the consumer is the key incentive to implement product and process innovations, even ensuring innovation transfer due to his position as a „prosumer", thus causing pressure to implement innovations.
- Innovation paradox 6 – the implementation of innovations in tourism services and its success depend on the quality of the innovation environment of the destination. Localisation factor of tourism service production – the environment supports or hinders innovation.

Tourism enterprises are clearly users of innovations, not producers of it, and prefer incremental innovation. However, it is indisputable that the use of modern technologies is a necessity in tourism, especially in the field of ICT. There is also interest in the use of robots, artificial intelligence and service automation. These elements offer

multiple effects in the tourism environment in the areas of operational management, human resource management, marketing management and financial management (Ivanov and Webster, 2019).

The intensity of competition in the relevant market determines innovativeness in tourism. It causes pressure for innovative activity and the use of all possible sources of innovations. Tourism is a cross-cutting industry, the product value chain is influenced by the quality of inputs from different disciplines. The supply network in tourism includes not only basic services but also other complementary services and services related to tourism (Ţigu, Călăreţu, 2013). The final tourism product is location-specific and linked to a particular environment, the quality of which is also conditioned by many inputs. Thus, the production of tourism services creates a complex mechanism. Its proper functioning is conditioned by the ability of individual elements to respond to changes and flexibly introduce innovations of different types.

The technological demands of market partners and the availability of technologically advanced solutions can support the penetration of innovations in tourism and positively influence its performance. This reasoning is supported by the results of research on the intensity of the relationship between tourism and knowledge-intensive business services (KIBS) in Poland. KIBS create an offer of external specialization and expertise, bringing strong support in the generation of new practices and solutions (Borodako, 2015). Technological pressure of an environment as a determinant of innovation in tourism is also mentioned by Hjalager (2010). The wide-ranging impacts of massive technology are causing pressure on tourism enterprises, destinations and innovation development is continuously ongoing. As long as the technology applied in the relevant tourism environment causes pressure on the use of innovations in the tourism enterprises themselves, the demand causes an incentive pull for the enterprises.

Consumer customisation and personalisation are key elements in today‘s innovative tourism. Client’s sophistication, availability of information, generational change of consumer segments are factors that push for both the development and use of progressive technologies. The self-service technologies (SSTs) are the norm for today‘s tourism industry (Kelly, Lawlor & Mulvey, 2017). The conceptual framework of SSTs adaptation cites technological need, technological readiness, personal contact preference, customer’s demographics, trust, risk and situational influences as factors for SSTs adaptation (Kelly, Lawlor & Mulvey, 2019). The presence of these factors and their positive incentive effects are closely related to the maturity of the innovation culture in the society and the innovation potential and performance of the economy. Innovative progress in tourism is determined by the innovation environment of the economy. We hypothesize that the quality of the innovation environment of the economy positively influences the penetration of innovations into tourism and thus the performance that tourism achieves.

Several authors (Brynjolfsson and Hitt, 1996; Stolarick, 1999; Gilchrist et al. 2001; Greenan et al. 2001; Gretton et al. 2004) demonstrated the positive impact of ICT investments on the productivity of service enterprises. On the contrary, other authors (Roach, 1987; Solow 1987 In Triplett, 2000; Banker, Kauffman, 1988; Barus et al, 1995; Strassman, 1997) present the view that there is no or almost no dependence between ICT investment and productivity.

Over the past decades, the implementation of ICT in service processes has required significant investment, but in many cases this was not used effectively. Salah (2003) showed through his research that 75% of ICT investments in services have failed to meet business objectives as insufficient attention has been paid to ICT adoption. The failures and missed opportunities led to the loss of strategic advantages of enterprises, which resulted in a reduction in the level of future ICT investments (Goulding – Alshawi, 2004; Peppard – Ward, 2004; Zuhairi – Alshawi, 2004). However, this condition was not only due to unskilled workforce in general, but was mainly due to the ignorance of management who were unable to identify the functionality and quantify the benefits of ICT to the enterprise. This is important given that ICT workers have no knowledge of the operations and economics of the enterprise or its strategic objectives (Basu – Jarnagin, 2008).

It is therefore imperative to examine and improve managers‘ approach to understanding the benefits of adopting ICT, i.e. to get managers to recognize the value of ICT and then to find out how this understanding and approach of managers affect the actual state of ICT implementation, which is directly related to ICT investment (Vargo – Maglio – Akaka, 2008; Ekuobase, 2013). Impact of ICT on business performance and productivity, according to Brynjolfsson, Hitt (2000), can also be seen in a broader context, which implies that the positive economic consequences of ICT use can be achieved through a combination of investment in ICT together with a combination of additional investment in labour skills, business process restructuring and human capital.

The factors bringing efficient effects in the production of service enterprises mediated by the use of ICT have been addressed by a number of authors. For example, the author Raisinghani (2004) generally identified four critical factors for effective use of ICT, which are the ability of the enterprise to quantify the benefits of information technology; to collect, organize and evaluate information; to understand the importance of people working with information technology and recognize its usefulness; and to invest in upskilling and training of information technology skilled workers for future benefit.

The heterogeneity of the service sector and the specific nature of services require other factors to be taken into account in the deployment of ICT. As stated by Burgess (2002), each enterprise needs to take into account the supply and direction of

its production and hence the sectoral approach when implementing ICT. Therefore, an enterprise must also consider its portfolio when selecting the appropriate ICT, otherwise the implementation of information technology may be ineffective. Martiško (2003) emphasizes that the information system is improved simultaneously with the enterprise. For its healthy development, it is important to take into account not only the industry factor, but also the attractiveness factor of the region within which the enterprise operates and the scale of business factor. Thus, by introducing appropriate information technology, an enterprise can, according to Earl (2003), achieve the successful fulfilment of its set goals.

Based on analyses in the eBusiness watch study initiated by the European Commission, Koellinger confirmed the hypothesis that the positive impact of ICT on productivity is most visible in companies with more advanced ICT and with technologies implemented in all or more of the enterprise‘s processes that are compatible with each other. Aldhmour, Shannak (2009) appeal to the importance of using more advanced information technology in order to improve the quality of services offered and the cost-effectiveness of service production. The authors investigated the relationship between information technology and competitive advantage, concluding that the relationship is positive, but competitive advantage must be measured by the profitability of the enterprise, its market share and customer satisfaction itself.

In order for enterprises to adopt new technologies, it is necessary to innovate organizational procedures as well as the technological infrastructure of the company in order to comprehensively optimize processes. (Dedrick – Kraemer, 1998). Information technology has the position of a kind of catalyst for several changes in the enterprise, it is also necessary to increase the demands on knowledge as well as on the appropriate education of workers in the field of ICT skills. Optimization of business processes is, as Holland, Light (1999) state, crucial not only in the implementation of basic information technology, but especially of more advanced ones. In order to successfully use more advanced information systems, existing business processes must be subjected to a thorough analysis, which identifies the compatibility of ICT with the business process and defines the changes that need to be implemented within the business processes (Scheer – Habermann, 2000). Smith, Chaffey (2002) also consider it necessary to adapt business processes to the use of ICT, which is also supported by Pride, Ferrel (2006).

Thus, in addition to changes in business processes and investment in ICT, the ICT skills of a skilled workforce are also important in ICT implementation. This view is also shared by other authors, e.g. Delina, Vajda (2009), Greenwood (1998), Powell (1997), Brynjolfsson, Hitt (2003), who put skilled workforce at the forefront, but also stress the importance of changes in business processes and corporate culture. Indeed, they believe that the effective use of ICT is conditional on other related changes. A similar view is presented by Drake-Brockman, McCredie (2011), who

consider a skilled workforce as a key factor for effective ICT use. They add that workforce training is costly for the enterprise, which may be reflected in increased costs for the enterprise. Trainor et al. (2010) also stress that human resources play the most important role in ICT adoption as they directly affect the performance of the enterprise itself.

In the context of information technology implementation, several authors have also considered it important to examine the satisfaction of the workers themselves. The introduction of ICT in service enterprises is inevitably linked to the demands placed on workers and their technical skills. Colombier et al. (2007) have shown that workers consider the introduction of ICT into service enterprises to be positive, valuing in particular the time saved and faster and better quality communication, not only internally but also externally.

ICT is an area that is constantly changing, evolving and requiring significant investment. However, the use of ICT, which is improving at a rapid pace, makes it possible to improve business performance and the quality of business processes and services offered. The dominance of SMEs in the service sector and their underinvestment appears to be the biggest barrier to the introduction of more advanced ICT. The creation of electronic partnerships, relationships and networks can reduce or spread the cost of ICT provision for small businesses. In addition, these bring more opportunities to win new markets, new contracts, which a service enterprise could not win on its own.

The focus of business activities on the core of their business, the desire of service enterprises to outsource the provision of business support processes as well as the desire to purchase only ICT services has resulted in the increasing use of ICT outsourcing. Sparrow (2003) points to the high interest of enterprises in ICT outsourcing as they have come to understand that innovating ICT in-house was disadvantageous to them due to the constant upgrading and developments in information technology. This is because enterprises were not able to innovate technology as quickly as specialist professionals and especially not with the same quality.

Many authors (Lesjak – Lynn, 2000; Gilley – Rasheed, 2000; Claver – Gonzáles et al., 2002; Kamayabi – Devi, 2011 and others) have conducted studies investigating the impact of outsourcing on business processes in relation to the use of outsourcing. Lesjak, Lynn (2000) showed through their research that information technology is most used in enterprises that see innovation as a source of competitiveness. Gilley, Rasheed (2000), in their study, investigated the impact of ICT outsourcing on business performance. Their research showed that there is no direct dependence of the two variables, this relationship is greatly influenced by the chosen strategy of the enterprise. On the other hand, other authors Devi, Kamayabi (2011) showed a positive impact of outsourcing on enterprise performance in SMEs. Thus, ICT

outsourcing gives enterprises the opportunity to completely leave the management of ICT to professionals. Enterprises thus eliminate the problems associated with unprofessional handling of technology and are thus able to focus fully on the core activities of the business.

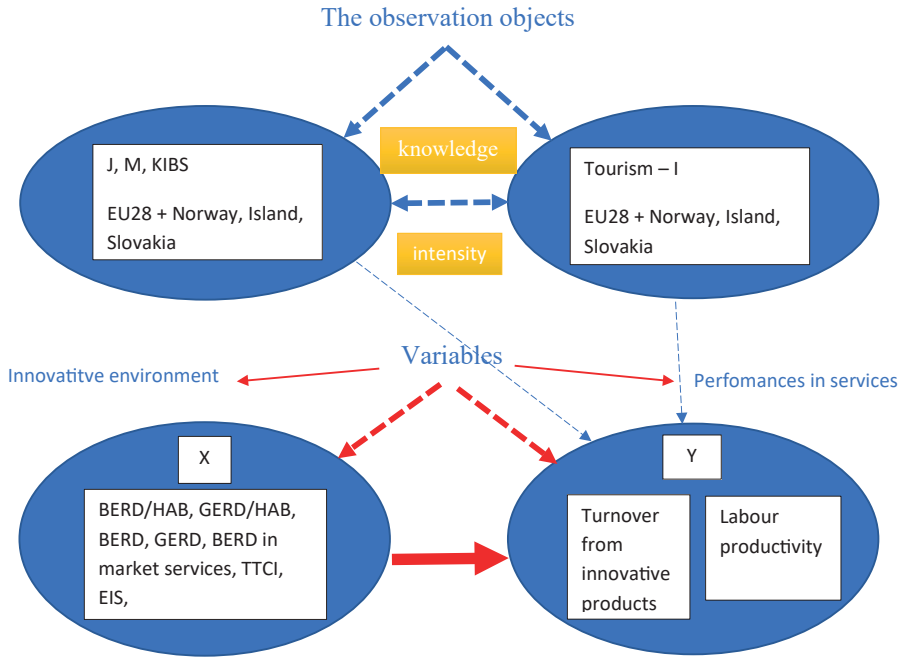
Based on the researchers‘ opinions, it can be concluded that the appropriate implementation of ICT makes enterprises competitive, as it connects the enterprise with the market, provides knowledge about the competition and the market, optimizes business processes, supports faster response of the enterprise to market changes, etc. However, it is important when implementing ICT to take into account the factors that will give the enterprise effects that differentiate the enterprise from its competitors. In addition, the specific nature of services and the heterogeneity of the service sector must also be taken into account. Based on the knowledge base of the subject matter, the factors for the effective use of ICT in services can be identified as follows: quantifying the benefits of information technology; respecting the sectoral approach; introducing more advanced information technologies or systems; changing business processes in line with the introduction of ICT; the ICT skills of a skilled workforce; creating electronic partnerships, relationships and networks; and the use of ICT outsourcing (Benešová, Hušek, 2019) .

2.1 Research methodology – verification of relationship 1

In view of the above, the following relationships became the subject of our own investigation of the impact of the innovation environment of the economy on performance in services:

1. the relationship between R&D expenditure and turnover of innovative products in services
2. the relationship between R&D expenditure and labour productivity in services
3. the relationship between the innovation performance of the economy and the competitiveness of tourism
4. the relationship between the innovation performance of the economy and labour productivity in tourism

Scheme 3 Schematic presentation of the research methodology



Source: authors'own

Research question 1: Is investment in R&D a factor influencing the commercialisation of innovations in services?

H01: there is no relationship between R&D expenditures and turnover of innovative ICT services products

H1: there is a relationship between R&D expenditures and turnover of innovative ICT service products

The verification of this relationship is carried out through the total government and business R&D expenditures per inhabitant in the selected countries and the volume of turnover achieved from ICT products (Section J) that are new to the market. We used the Spearman's rank correlation coefficient method within the selected parameters and 28 European countries. The reason for defining this set and variables were the limits in statistical observation, while we were looking for data complexity. The concentration on data complexity also limited the narrowing of the investigated issue to the services included in section J – Information and communication as well as the fact that the above section is a key fraction of the KIBS services. As the most

recent CIS statistical tracking data is from 2016, this year was the reference year of the study.

We use Spearman's rank correlation coefficient in the correlation analysis. Using it, we compare the linear dependence between two variables X and Y in the form of ranks. The pattern of the equation for calculating the Spearman's correlation coefficient:

$$r_s = 1 - \frac{6 \sum d_i^2}{n\,(n^2 - 1)}$$

where: n – the number of observations

d_i – the difference between two ranks of each observation

$\sum d_i^2$ – the sum of squared differences

Since the sample size is less than 30, we used the corresponding critical value statistics table when comparing.

Table 7 Input data for the calculation of the Spearman's coefficient, 2016

Country	GERD per inhabitant, EUR	Ranking GERD per inhabitant	BERD per inhabitant., EUR	BERD ranking per inhabitant	Turnover from new products on the market, section J, in EUR thousand	Ranking by turnover from new products in section J	GERD – turnover relationship	BERD – turnover relationship
Belgium	959,5	7	658,2	7	1 331 816	13	-6	-6
Bulgaria	52,5	27	38,4	26	301 136	19	8	7
Czechia	280,8	15	171,7	14	1 038 609	14	1	0
Germany	1 121,7	5	764,5	3	9 004 855	4	1	-1
Estonia	205,4	17	105,8	17	202 388	22	-5	-5
Ireland	671,8	10	485,1	9	3 277 666	7	3	2
Greece	162,7	18	68,7	21	2 020 617	9	9	12
Spain	285,5	14	153,4	15	5 312 376	5	9	10
France	745,1	9	485,0	10	14 531 759	3	6	7
Croatia	96	25	44,3	23	279 279	20	5	3
Italy	382	13	232,2	13	27 478 211	1	12	12
Cyprus	116,5	22	43,1	24	162 577	23	-1	1
Latvia	56,1	26	13,7	28	85 234	27	-1	1
Lithuania	113,4	23	39,7	25	134 575	26	-3	-1
Luxembourg	1 235,8	4	685,5	6	159 843	24	-20	-18
Hungary	139,5	19	103,4	18	392 924	17	2	1
Malta	130,3	20	80,7	19	12 753	28	-8	-9

Country	GERD per inhabitant, EUR	Ranking GERD per inhabitant	BERD per inhabitant., EUR	BERD ranking per inhabitant	Turnover from new products on the market, section J, in EUR thousand	Ranking by turnover from new products in section J	GERD – turnover relationship	BERD – turnover relationship
Netherlands	833	8	485,6	8	4 826 355	6	2	2
Austria	1 279,9	3	898,6	2	1 819 165	11	8	-9
Poland	108,3	24	71,1	20	1 003 920	16	8	4
Portugal	231	16	111,8	16	1 006 997	15	1	1
Romania	41,4	28	22,9	27	210 741	21	7	6
Slovenia	393,4	12	297,8	12	147 521	25	-13	-13
Slovakia	118,1	21	59,5	22	384 706	18	3	4
Finland	1 080	6	711	4	2 000 564	10	-4	-6
Sweden	1 537	1	1 069,5	1	2 976 833	8	-7	-7
United Kingdom	618,3	11	414,8	11	17 886 175	2	9	9
Norway	1 308,5	2	697	5	1 646 746	12	-10 Σd_i^2 1588 r_s 0,565	-7 Σd_i^2 1508 r_s 0,587

Source: authors'own

2.2 Results: evaluation of the research question 1

Since r_s (0.565) > r_0 (0.522) in the case of the analysis of the relationship between GERD and turnover, and similarly, r_s (0.587) > r_0 (0.567) in the case of the analysis of the relationship between BERD and turnover, we reject hypothesis 0 and accept hypothesis 1 and at the α = 0,005 level of significance, (GERD and turnover) and α = 0.002 (BERD and turnover), we argue that there is a moderate positive correlation between country rankings constructed on the basis of documented R&D expenditures and turnover from innovated ICT products. Based on the results of the implementation of the above correlation method, we conclude that *R&D expenditure is a factor influencing the commercialization of service innovations.*

To complete the study, we note that Slovakia belongs to the group of countries that record the lowest per inhabitant business expenditure on R&D both in total and in the market services sections (4 times less than Czechia, 3 times less than Hungary, 2.5 times less than Poland), in section J (4 times less than Czechia, 2 times less than Poland) and in section M (6 times less than Czechia, 6 times less than Hungary and 3 times less than Poland) (Eurostat, 2020). The situation is very similar in the

category of government R&D expenditure. Despite this fact, according to the CIS statistical tracking (table below), Slovak enterprises are quite successful in commercialising innovations in services in the market compared to countries with higher recorded R&D expenditures.

Table 8 Turnover of enterprises from sales of new and innovative services out of total turnover, selected countries, selected sections, services new to the enterprise (IPF), services new to the market (IPT), in %, 2016

Section	G	G	H	H	J	J	K	K	M	M
Country	IPF	IPT	IPF	IPT	IPF	IPT	IPF	IPT	IPF	IPT
Czechia	11,8	11,0	22,0	1,4	14,6	14,6	28,8	7,1	13,1	19,3
Germany	:	:	14,8	4,0	13,4	4,9	8,7	2,0	:	:
Spain	41,2	10,2	12,3	6,0	14,9	12,6	26,5	6,3	19,2	17,2
France	7,8	7,9	7,1	4,7	15,3	13,8	4,5	2,4	12,2	12,0
Hungary	8,5	13,4	5,9	2,1	7,3	10,4	6,5	5,2	7,3	22,5
Austria	:	:	10,5	3,6	13,3	14,6	7,7	5,2	:	:
Poland	6,7	8,9	9,2	7,3	20,8	7,6	6,2	4,5	3,7	16,8
Slovakia	27,9	23,2	7,5	3,1	15,1	15,6	9,6	15,4	16,3	23,6
Finland	:	:	4,5	2,3	5,0	17,3	7,5	1,7	:	:
Sweden	:	:	:	:	8,4	8,1	:	:	7,0	6,8
Norway	6,9	4,9	4,7	6,9	8,5	8,2	4,5	3,0	11,8	10,4

Source: authors'own based on the Eurostat data

2.3 Research methodology – verification of relationship 2

Research question 2: Are investments in R&D a factor affecting labour productivity in services?

The identified research problem is based on the premise that innovations are a source of competitiveness. Competitive production is the origin of positive economic performance, value added and efficiency. Therefore, the observation object was the relationship between innovation activity expressed by R&D expenditures and labour productivity in services in Slovakia. At the same time, the observation is extended to the relationship between R&D investments (BERD per inhabitant, GERD per inhabitant) and labour productivity in services (value added per employee) in the EU28 + Norway, Iceland in the sections I, J and M. The observation within the conditions of Slovakia also focuses on possible differences in the relevant relationships depending on the knowledge intensity of services. As a representative of low

knowledge-intensive services, data on tourism services represented by NACE Rev.2 section „I“ are used. Knowledge-intensive services production is represented by the sections „J“ (J 62, J 63) and „M“ (M 69 – M 74), i.e. KIBS (knowledge-intensive business services). Government and business R&D expenditure represents the financial backing for solutions that provide value-added enhancement to the value chains of production in the economy. Thus, the impact of innovations supported by R&D spending should also be reflected directly or multiplicatively in service outputs. In answering RQ 2, the subject of the investigation was to confirm this reasoning by verifying the following hypotheses:

$H0_2$: there is no relationship between R&D expenditure and labour productivity in accommodation and food services (Section I)

H2: there is a relationship between R&D expenditure and labour productivity in accommodation and food services (Section I)

$H0_3$: there is no relationship between R&D expenditure and labour productivity in knowledge-intensive business services (KIBS)

H3: there is a relationship between R&D expenditure and labour productivity in knowledge-intensive business services (KIBS)

The hypotheses were verified through correlation and regression analysis using Statgraphics statistical software and Microsoft Excel spreadsheet. The relationship of variables was determined using Pearson‘s correlation coefficient (r) and coefficient of determination (r^2), the values of the performance indicator of labour productivity (expressed as the volume of added value per employee in EUR thousand, respectively, the volume of sales per employee in EUR thousand) are in the position of the dependent variable (y), the values of GERD (government expenditure on R&D in EUR million), BERD (business expenditure on R&D in EUR million) and BERD invested in market service enterprises in EUR million (BERD in MS) in Slovakia act as independent variables (x). When examining the relationship between R&D investments and labour productivity in services in the EU28 + Norway and Iceland in the sections I, J, M, BERD per inhabitant and GERD per inhabitant act as independent variables ‚x‘, and value added per employee as dependent variable ‚y‘. In the case of examining the relationship between R&D investment and labour productivity in services in Slovakia (tourism services and KIBS), the values of GERD (government expenditure on R&D in EUR million) BERD (business expenditure on R&D in EUR million) and BERD invested in market service enterprises in EUR million (BERD in MS) in Slovakia are the independent variables ‚x‘, as independent variables ‚y‘, there are the values of labour productivity expressed as a share of turnover per employee in section „I“ and in KIBS. For the input data, an annual lag between the dependent and independent variables was tolerated. The variable

‚x' represents the time series 2005-2017, the variable ‚y' represents the time series 2006–2018 (in the case of Slovakia's analysis study). In the case of the EU28+ Norway and Iceland's analysis study in the sections I, J and M, the variable ‚x' represents data from 2016, the variable ‚y' represents data from 2017.

According to Grančay et al. (2013), the relevant correlation coefficient (r) ranges from –1 to +1. The closer the coefficient is to 1, the stronger the correlation between the variables,. A positive value of the coefficient determines the same direction of the compared variables (i.e. if variable X increases, Y also increases). Negative values of the coefficient indicate that the direction of the variables is changing in the opposite direction (X is increasing, Y is decreasing or vice versa).

For the correlation analysis, we use the methodology of Cohen (1988), who reports the following relationships between the correlation coefficient R and the measure of correlation: – a correlation coefficient R < 0.1 indicates a negligible degree of correlation, – a correlation coefficient R in the interval 0.11–0.3 indicates a low degree of correlation, – a correlation coefficient R in the interval 0.31–0.5 indicates a medium degree of correlation, – a correlation coefficient R in the interval 0,51–0,7 indicates a high degree of correlation, – a correlation coefficient R in the interval 0,71–0,9 indicates a very high degree of correlation, – a correlation coefficient R in the interval 0,91–1 indicates an almost perfect degree of correlation.

For the regression method, we were interested here in the equation of the regression line, the notation of which is as follows:

$$\mathbf{y' = b_0 + b_1 X}$$

where:
y' = theoretical values of dependent variable,
$\mathbf{b_0}$ = constant,
$\mathbf{b_1}$ = regression coefficient,
X = values of independent variable.

At the same time, the quality of the regression analysis is conditioned on the coefficient of determination (r2), the t-statistic, the locus constant (p-value constant) and the number of observations (N).

2.4 Results: evaluation of the research question 2

Table 9 Evaluation of correlation and regression analysis of the relationship between R&D expenditures and labour productivity in services of the section „J", EU28+ Norway and Iceland, 2016, 2017

Variable x	R	R2	P-value	Result evaluation
BERD per inhabitant, 2016	0,512	0,262	0,004	Direct linear relationship; high degree of correlation; statistically significant correlation 0.004<0.05 (α=0.05) White test: Pr=0.2894>0.05; failing to reject H_0 that random errors are homoscedastic Durbin-Watson test 2.295, Pr>0.05, failing to reject H_0, random errors are independent Estimated regression equation: y = 51,660 + 0,078*x
GERD per inhabitant, 2016	0,518	0,268	0,003	Direct linear relationship; high degree of correlation; statistically significant correlation 0,003<0,05 (α=0,05) White test: Pr = 0.529>0.05; failing to reject H_0 that random errors are homoscedastic Durbin-Watson test 2,317, Pr > 0,05; failing to reject H_0, random errors are independent Estimated regression equation: y = 50,0 + 0,053*x

Source: authors'own

Further, the analysis of the correlation between R&D expenditures (GERD per inhabitant, BERD per inhabitant) and labour productivity in the market services sections (the sections I, M) showed a direct linear dependence in all observations, but the models used were not statistically significant; therefore, we confirm the impact of government and business expenditures on economic performance in market services only in the case of the representative of the knowledge-intensive production of services – information and communication services. The innovation background of the EU28+Norway and Iceland economies positively affects economic performance in services as measured by labour productivity. Thus, we confirm the validity of H3 in the information and communication services production environment.

Table 10 Evaluation of correlation and regression analysis of the relationship between R&D expenditures and labour productivity in services, Slovakia

Variable y – labour productivity in the section „I"				
Variable x	**R**	**R^2**	**P-value**	**Result evaluation**
BERD in Slovakia	0,796	0,633	0,003	Direct linear relationship; very high degree of correlation; statistically significant correlation at α=0,05 White test: LM=1,54 (P=0,4633); failing to reject H_0 that random errors are homoscedastic Durbin-Watson statistic = 2,54082 (P=0,7291); failing to reject H_0, random errors are independent Estimated regression equation: y = 24,2967 + 0,0212512*x
BERD in MS in Slovakia	0,723	0,523	0,012	Direct linear relationship; very high degree of correlation; statistically significant correlation at α=0,05 White test: LM=0,04 (P=0,9794); failing to reject H_0 that random errors are homoscedastic Durbin-Watson statistic = 2,13602 (P=0,4747); failing to reject H_0, random errors are independent Estimated regression equation: y = 24,2968 + 0,0619944*x
GERD in Slovakia	0,819	0,670	0,002	Direct linear relationship; very high degree of correlation; statistically significant correlation at α=0,05 White test: LM=1,20 (P=0,5479); failing to reject H_0 that random errors are homoscedastic Durbin-Watson statistic = 2,58025 (P=0,7728); failing to reject H_0, random errors are independent Estimated regression equation: y = 23,8288 + 0,00969748*x
Variable y – labour productivity in KIBS				
Variable x	**R**	**R^2**	**P-value**	**Result evaluation**
BERD in Slovakia	0,923	0,852	0,0000	Direct linear relationship; almost perfect degree of correlation; statistically significant correlation at α=0,05 White test: $P_r = 0.4512 > 0.05$; failing to reject H_0 that random errors are homoscedastic Durbin-Watson statistic = 1,50845 (P=0,1018); failing to reject H_0, random errors are independent Estimated regression equation: y = 34,863 + 0,173*x
BERD in MS in Slovakia	0,709	0,503	0,007	Direct linear relationship; very high degree of correlation; statistically significant correlation at α=0,05 White test: $P_r = 0.1043 > 0.05$; failing to reject H_0 that random errors are homoscedastic Durbin-Watson statistic = 0,849704 (P=0,0039); accepting H_1, random errors are not independent; direct positive autocorrelation; non-valid model
GERD v SR	0,903	0,816	0,0000	Direct linear relationship; very high degree of correlation; statistically significant correlation at α=0,05 White test: $P_r = 0.2507 > 0.05$; failing to reject H_0 that random errors are homoscedastic Durbin-Watson statistic = 1,58968 (P=0,1338); failing to reject H_0, random errors are independent Estimated regression equation: y = 34,886 + 0,073*x

Source: authors'own

Table 10 presents the results of the correlation and regression analysis carried out in terms of testing the relationship between R&D expenditure and labour productivity in services in Slovakia. As in the conditions of knowledge-low intensity as well as in the conditions of knowledge-intensive productions, a direct linear dependence between the selected variables is demonstrated. Total government expenditure and business R&D expenditure positively affect labour productivity in both tourism services and KIBS. A stronger degree of correlation is observed in KIBS services, which corresponds to the knowledge intensity of the relevant services and their participation in R&D activities. At the same time, the used models document a high variability of the data – in KIBS terms, more than 81% of labour productivity variability is explained by government R&D expenditure, 19% is caused by factors other than total government R&D expenditure and random phenomena; almost 85% of labour productivity variability is explained by business R&D expenditure, 15% is caused by factors other than business R&D expenditure and random phenomena.

In terms of tourism services, i.e. non knowledge-intensive production, we observed a very high degree of direct linear correlation in all three observed models. These explain less labour productivity variability than the KIBS, i.e. other factors and random phenomena have a greater impact on the ‚y' variable compared to the KIBS.

The estimated regression equations and regression coefficients suggest a stronger impact of R&D expenditure in a knowledge-intensive service production environment.

Based on the results presented in Table 9, the validity of H2 as well as H3 can be confirmed. R&D expenditures positively affect labour productivity in the relevant services. Closer relationships are evident in the case of knowledge-intensive services, which corresponds to their characteristics and the fact that the divisions of the sections J and M are objects of intermediate demand and thus interact directly with technologically advanced producers from the manufacturing environment. Participation in industrial product value chains influences the effectiveness of the R&D expenditure factor on the economic performance of the service divisions in question. At the same time, it should be added that a number of KIBS service divisions are, by the very nature of their activities, concentrated on R&D activities, including the software development, communication applications, etc. The KIBS service entities are thus part of supplier-customer relationships, the object of which is to supply R&D projects.

2.5 Research methodology – verification of relationship 3

Research question 3: Is the innovation environment of the economy a factor influencing the competitiveness of tourism?

We answer the question posed by means of the hypotheses set out:

$H0_4$: there is no relationship between the innovation performance of the economy and the competitiveness of tourism

H4: there is a relationship between the innovation performance of the economy and the competitiveness of tourism

We perceive the innovation environment of an economy as the synchronous existence of innovation culture, innovation potential and innovation performance in the economy. All these elements are part of the European Innovation Scoreboard (EIS) indicators. We hypothesize that the innovation environment (quantitatively measured by innovation performance in the EIS) of an economy has a positive impact on the economic performance of tourism and its competitiveness. The verification of this relationship is carried out through two evaluation systems: the European Innovation Scoreboard (EIS) and the Travel and Tourism Competitiveness Index (TTCI). We have used the method of correlation and regression analysis within these evaluation systems for the 28 EU countries. The temporal asynchronicity of the evaluation systems used (EIS and TTCI) determines the relevance of the expression of the relationship between the innovation performance of the economy and the competitiveness of tourism. The year of comparison is 2017 for both evaluation systems.

The hypotheses were tested using correlation and regression analysis and using the statistical program Gretl and Microsoft Excel spreadsheet. The relationship between the variables was investigated using Pearson's correlation coefficient (r) and coefficient of determination (r^2), a dependence plot was used, with the TTCI scores in the position of the dependent variable (y) and the EIS scores of the European countries acting as independent variables (x).

According to Grančay et al. (2013), the correlation coefficient (r) ranges from –1 to +1. The closer the coefficient is to 1, the stronger the relationship between the variables. A positive value of the coefficient determines the same direction of the variables being compared (i.e. if variable X increases, Y also increases). Negative values of the coefficient indicate that the direction of the variables is changing in the opposite direction (X is increasing, Y is decreasing or vice versa). The strength of the relationship is further interpreted by the magnitude of the coefficient as follows:

(± 1) – Perfect positive or negative dependence
(± 0,7 ; ± 1) – High degree of dependence
(± 0,4 ; ± 0,7) – Moderate interdependence
(0 ; ± 0,4) – Low degree of dependence

If the coefficient equals 0, it means the independence of the variables.

For the regression method, we were interested here in the equation of the regression line, the notation of which is as follows:

$$y' = b_0 + b_1 X$$

y' = theoretical values of dependent variable,
$\mathbf{b_0}$ = constant,
$\mathbf{b_1}$ = regression coefficient,
X = values of independent variable.

At the same time, the quality of the regression analysis is conditioned on the coefficient of determination (r2), the t-statistic, the locus constant (p-value constant) and the number of observations (N).

Table 11 Database for calculating the relationship between the innovation performance of the economies and the competitiveness of the EU28 countries in tourism in 2017

Country	EIS score	TTCI score
Belgium	119	4,54
Bulgaria	47	4,14
Czechia	82	4,22
Germany	121	5,28
Denmark	134	4,43
Estonia	78	4,23
Ireland	114	4,53
Greece	67	4,51
Spain	77	5,43
France	107	5,32
Croatia	54	4,42
Italy	74	4,99
Cyprus	73	4,02
Latvia	78	3,97
Lithuania	47	3,91

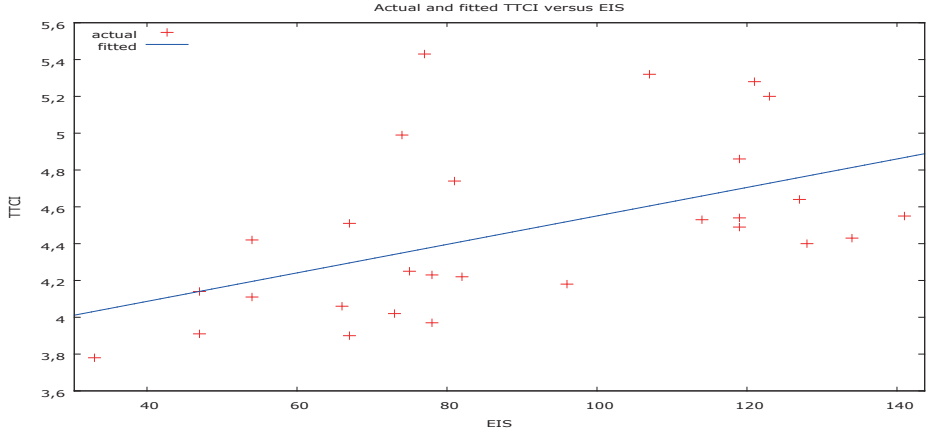
Country	EIS score	TTCI score
Luxembourg	119	4,49
Hungary	66	4,06
Malta	75	4,25
Netherlands	127	4,64
Austria	119	4,86
Poland	54	4,11
Portugal	81	4,74
Romania	33	3,78
Slovenia	96	4,18
Slovakia	67	3,90
Finland	128	4,40
Sweden	141	4,55
Great Britain	123	5,20

Note: The EU28 countries excluding Denmark due to unavailability of labour productivity data in 2017

Source: authors'own based on EIS data, 2018 a TTCI data, 2017

2.6 Results: evaluation of the research question 3

Figure 7 Relationship between the innovation performance of the economy and the competitiveness of tourism in the EU28 in 2017



Source: authors'own based on the EIS data, 2018 a TTCI data, 2017

The model found a moderate degree of dependence between the innovation performance of the economy and the competitiveness of tourism in the EU28 countries in

2017. The correlation coefficient has a value (r) of 0.52, however, the slope of the regression line shows a direct linear dependence, which means that if the innovation performance of the economy increases, the tourism competitiveness of the EU28 countries also increases. The value of the coefficient of determination (R-squared) is 0.27, thus the regression model explains 27% of the variability of the data, the rest of the data are other factors and random phenomena not included in the model. The p-value of 0.0001 indicates the statistical significance of the model.

Based on the results of the implementation of the above correlation and regression analysis (Figure 7), we conclude that *the innovation environment of the economy is a factor influencing the competitiveness of tourism*. We confirm H4 with this model and reject $H0_4$ at the same time. The input data highlights an example of a country that does not fit this conclusion. Spain is ranked as the most competitive country in tourism among the countries considered, despite the fact that the innovation performance of its economy places it among the countries labelled as moderate innovators. The quality of natural and cultural resources, transport infrastructure, services for tourists, political priority and business environment are the factors that eliminate the relatively weak stimulating effect of the innovation environment in the economy. However, from the perspective of sustainability, the innovation environment of the economy is a key stimulus to the competitiveness of the sector.

2.7 Research methodology – verification of relationship 4

Research question 4: Is the innovation performance of the EU economies a determinant of the economic performance of tourism?

We answer the question posed by means of the hypotheses set out:

$H0_5$ there is no relationship between the innovation performance of the economy and labour productivity in tourism

H5: there is a relationship between the innovation performance of the economy and labour productivity in tourism

Labour productivity is one of the important economic performance indicators in tourism services. In the following section, we have used the statistical-mathematical method of correlation and regression analysis to verify the relationship between the innovation performance of the economy and labour productivity in the tourism industry by using the statistical program Gretl and Microsoft Excel spreadsheet calculator. The relationship of the variables was investigated using Pearson‘s correlation

coefficient (r) and coefficient of determination (r2), the dependent variables (y) were the values of the labour productivity performance indicator and the independent variables (x) were the scores of the EIS of each European country.

Table 12 Database for the calculation of the relationship between the innovation performance of the economy and labour productivity in tourism in 2017

Country	EIS score	Labour productivity in the section I (in Eur)	Labour productivity in the division I 55 (in Eur)	Labour productivity in the division I 56 (in Eur)
Belgium	119	43 700	61 300	40 600
Bulgaria	47	7 200	11 900	5 000
Czechia	82	18 400	26 700	15 700
Germany	121	20 900	29 100	18 100
Denmark	134	-	-	-
Estonia	78	13 600	19 600	11 400
Ireland	114	27 600	32 700	25 000
Greece	67	8 800	26 400	1 700
Spain	77	26 600	44 900	20 900
France	107	42 800	54 200	39 900
Croatia	54	19 800	34 400	11 200
Italy	74	31 600	52 300	26 200
Cyprus	73	27 200	33 400	21 800
Latvia	78	8 600	13 700	7 400
Lithuania	47	9 200	18 300	7 300
Luxembourg	119	37 200	52 400	34 100
Hungary	66	11 300	21 200	8 500
Malta	75	25 800	35 600	17 500
Netherlands	127	28 100	43 400	24 400
Austria	119	37 700	49 200	30 700
Poland	54	15 800	24 700	12 300
Portugal	81	20 800	34 100	16 300
Romania	33	8 800	12 800	7 300
Slovenia	96	25 500	35 000	21 300
Slovakia	67	10 000	15 000	8 500
Finland	128	36 600	47 200	34 700
Sweden	141	41 600	49 500	38 800
Great Britain	123	24 900	37 300	22 000

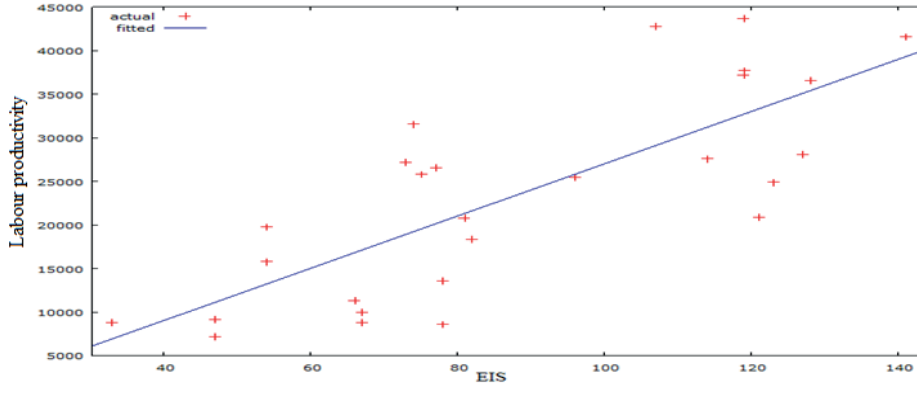
Note: EU28 countries excluding Denmark due to unavailability of labour productivity data in 2017

Source: authors'own based on EIS data, 2018 and Eurostat

2.8 Results: evaluation of the research question 4

The Figures 8, 9 and 10 show the results of the correlation and regression analysis performed. The Figure 8 shows the relationship between the innovation performance of the EU countries and labour productivity in economic activities of the section I, the Figure 9 shows the relationship between the innovation performance of the EU countries and labour productivity in economic activities of the division I 55 and the Figure 10 shows the relationship between the innovation performance of the EU countries and labour productivity in economic activities of the division I 56.

Figure 8 Relationship between innovation performance and labour productivity in the EU tourism in 2017

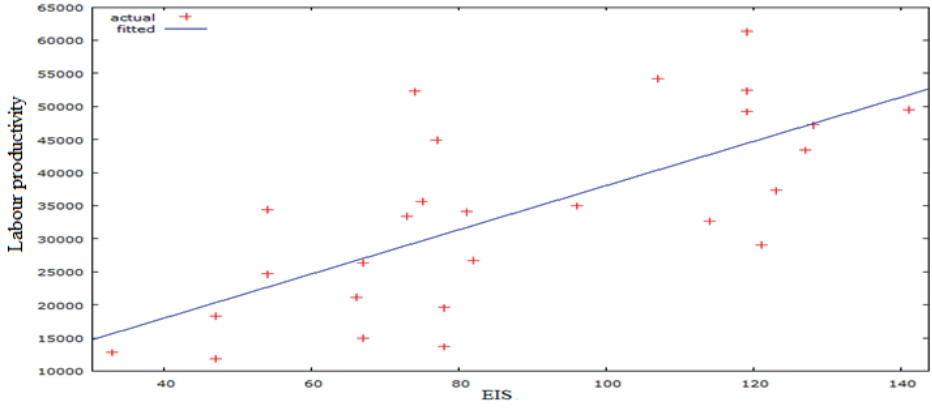


Note: the EU28 countries excluding Denmark due to unavailability of labour productivity data in 2017

Source: authors'own based on the EIS data, 2018 and Eurostat

The results show a high positive correlation between innovation performance and labour productivity in the tourism sector of the EU countries in 2017. The correlation coefficient (r) reaches a value of 0.78, identifying a strong linear direct dependence between the variables studied. The coefficient of determination (R-squared) has a value of 0.60, 60% of the variability of the data is explained by this regression model, the remaining 40% of the variability in the data are other factors and random phenomena not included in the model. The model is statistically significant (p-value is 0.0001), both the correlation coefficient and the regression line indicate a direct linear relationship between the two variables.

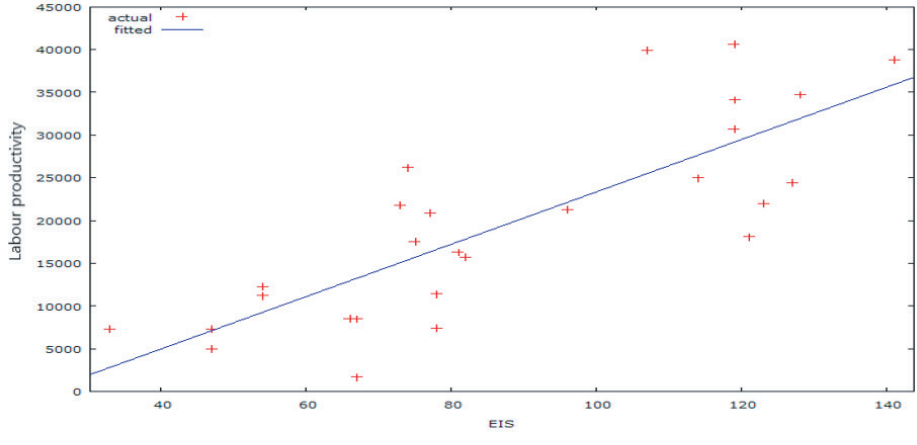
Figure 9 Relationship between innovation performance and labour productivity in accommodation services in the EU countries in 2017



Note: The EU28 countries excluding Denmark due to unavailability of labour productivity data in 2017 Source: authors'own based on the EIS, 2018 and Eurostat

The relationship between innovation performance and labour productivity in the accommodation services of the EU countries shows a high positive dependence. This is confirmed by the correlation coefficient value of 0.70, which indicates a strong direct linear dependence between the variables under study. The regression model explains 49% of the variability in the data, the remaining 51% of the variability in the data are other factors and random phenomena not included in the model. The model is statistically significant due to the p-value which is 0.0001.

Figure 10 Relationship between innovation performance and labour productivity in the EU countries' food services in 2017



Note: The EU28 countries excluding Denmark due to unavailability of labour productivity data in 2017 Source: authors'own based on the EIS, 2018 and Eurostat

Innovation performance and labour productivity in food services in the EU countries surveyed show a high direct linear relationship. This is presented by the slope of the regression line as well as the value of the correlation coefficient, which is 0.80. The model is statistically significant as the p-value is 0.0001. The value of the coefficient of determination is 0.65, so this regression model explains up to 65% of the variability in the data, the remaining 35% of the variability in the data are other factors and random phenomena not included in the model.

Thus, it can be concluded that if the innovative performance of the EU economies increases, the labour productivity in tourism also increases. Thus, the innovation performance of an economy positively affects the performance of accommodation and food services in the section I as well as in the separate monitored divisions I 55 accommodation services and I 56 food services. The innovations generated and used in the country's economy are also used by tourism, accommodation and food service enterprises in their processes, irrespective of the source of their origin. They thus create a more favourable business environment, the ability of tourism enterprises to sustain themselves in the market, to be more efficient and competitive. Based on the analyses conducted, we accept H5 and reject $H0_5$. *The innovation performance of EU economies can be identified as a determinant of the economic performance of tourism.*

Table 13 Further results of the investigation of the impact of the innovation environment of the economy on innovativeness and performance of services, correlation and regression analysis used

Relationship examined	Parameters of variables x, y used	Result, publication outcome	Conclusion
The relationship between R&D expenditure and performance in services (own research, not yet published)	BERD/inhabitant, GERD/inhabitant; 29 European countries, year 2017 (x); labour productivity in the sections I, J and M (y)	High to very high degree of correlation (Cohen); model is statistically significant only for BERD in „J", GERD in „J"; explains 25% of data; direct linear dependence	*Government and business expenditures positively affect performance in information and communication services.*
Correlation between the competitiveness of tourism and the general competitiveness of economies	Global Competitiveness Index (GCI) (x); Travel and Tourism Competitiveness Index (TTCI) (y), 2017, 136 countries	Correlation analysis confirms a direct relationship (The Travel & Tourism Competitiveness Report 2019, available at http://www3.weforum.org/docs/WEF_TTCR_2019.pdf)	*The more competitive a country's economy is, the more competitive tourism activities are.*

Relationship examined	Parameters of variables x, y used	Result, publication outcome	Conclusion
The impact of socio-technological change on the demand for services	Index of Economic Freedom, Networked readiness Index (x); share of services in total value added in the economy (y); 117 countries; 2015	Dissertation: Čukanová, M.: Consequences of socio-technological change on the demand for services, 2016	*Dopyt po službách je vo veľkej miere ovplyvnený spoločensko-technologickými zmenami*
Dependence of performance in KIBS on external drivers of open innovation	Human resources, cooperation, intellectual property, GERD, BERD, EIS (x1-x6); turnover in KIBS (y); 8 countries: CZ, DE, ES, FR, HU, PL, UK, SK; 2004-2018	Dissertation: Prváková, M.: Open innovation in a knowledge-intensive service production environment, 2020	*The functionality of the open innovation expressed by the selected external factors has an impact on the performance of the KIBS*
The relationship between ICT use and productivity in KIBS	Utilisation rate of ERP, SCM, CRM enterprise systems (x) in the sections J and M, labour productivity in the sections J and M(y)	Kubičková, V., Benešová, D., Krošláková, M., Michálková, A. (2016). Dynamic service enterprises – gazelles. Wolters Kluwer.	*The impact of ICT on productivity in knowledge-intensive services can be assessed as unfavourable for the section J and significantly favourable for the section M*
The relationship between ICT use and productivity in tourism services	Utilization rate of ERP, SCM, CRM enterprise systems (x) in the division I 55, labour productivity in the division I 55 (y)	Strong linear dependence Kubičková, V., Benešová, D., Krošláková, M., Michálková, A. (2016). Dynamické podniky služieb – gazely. Wolters Kluwer.	*The productivity progress of lower knowledge-intensive enterprises represented by accommodation facilities (I 55) is conditioned by the progress in the use of ICT.*
Relationship between the economic performance of the supporting industries and the economic performance of the business services in Slovakia	Value added in the automotive/electronics industries (x), value added in the sections J, L, M, N (y)	Strong direct linear dependence Kubičková, V., Benešová, D., Krošláková, M., Michálková, A. (2016). Dynamické podniky služieb – gazely. Wolters Kluwer.	*The economic strength of key industrial sectors in Slovakia has an impact on the performance of the business services.*

Source: authors'own

SUMMARY

The observations made and studies carried out at the Department of Services and Tourism in the area of innovations in services confirm that the innovation background of an economy has an impact on the economic performance of services and their competitive ability. This statement is explained by several results of the investigation of the relationships between selected parameters reflecting the innovation environment of the economy and parameters reflecting the economic performance in services and their competitive ability in the environment of Slovakia and within the European countries. Recent own findings confirm that the knowledge intensity of production is a determining factor in the effectiveness of the innovative environment of the economy on services and their performance in Slovakia. A more pronounced effectiveness of the innovation environment on the performance of services, or a more consistent representation of services in the creation of the innovation environment is conditioned by economic incentives for innovative small and medium-sized enterprises, improving the quality of qualification training of scientific personnel capacities, and last but not least by initiating instruments to strengthen BERD in the Slovak economy.

However, we were also confronted with contradictory findings in our observations: e.g. a stronger positive impact of ICT use on non knowledge-intensive services, a negative impact of R&D spending on value added achieved in services. A more rigorous explanation requires follow-up at the enterprise level in the form of a primary survey.

2.9 The existence of dynamic service enterprises

The following text presents the main findings of primary research conducted in the conditions of the Slovak economy in the field of innovation in services, which focused on the emergence and existence of young dynamic service enterprises – gazelles, as representatives of enterprises that are able to use the innovative environment in the economy and implement innovative activities in favour of the production of competitive products. Gazelles are young (max. 5 years of existence), fast-growing enterprises (average annual increase in employment or turnover of at least 20 % over three consecutive years). According to Morgan (2010), they are mostly founded as start-ups. The ability to base their economic growth on innovations is one of the important characteristics attributed to gazelles by authors (Henrekson, Johanson, 2010, Stone, Badawy, 2011, Barnard et al., 1998). According to the research by Frederick (2004), these enterprises also play an important role in

regional restructuring and development. Their role in regional action lies not only in their sheer economic power as expressed in direct production, but also in generating demand for intermediate inputs of different productions and subsequently shaping the labour and capital markets.

The studies by Henrekson and Johansson (2008; 2010) present that young, fast-growing enterprises achieve a stronger dominance in the tertiary sector – the service sector, which is also confirmed by the findings of the Portuguese Instituto Nacional de Estatistica (2014). These enterprises are the main generators of economic growth in each country. According to Mitusch and Schimke (2011), the business entities in question are important for the economic competitiveness and development of all economies.

The implemented VEGA project Perspective of the Existence of Dynamic Service Enterprises in Slovakia in the Context of the Application of Principles of the Initiative Innovation Union can be described as the first study focusing on the relevant issue in Slovakia (Kubičková, 2016). Its outputs explain the dynamising elements of service enterprises and identify the differences with which they operate with respect to the knowledge intensity of production of selected groups of service enterprises. They monitor and assess the behaviour of young dynamic service enterprises with an emphasis on the use of innovation as the main dynamising element of their growth. In Slovak conditions, fast-growing enterprises make up approximately 13% of the total population of enterprises, gazelles only 1%. In the period under review, the population of gazelles in services in Slovakia comprised a total of 342 enterprises. The largest representation was recorded in the section H (116 enterprises), the section I (80 enterprises in total), 74 enterprises were identified in the section M, 40 gazelles operated in the section J, the section G was represented in the structure of enterprises – gazelles in services by 17 enterprises, the section „N“ by 10 enterprises and the section „R“ by 3 enterprises. From the above data, data on the following groups of enterprises were extracted for the purpose of fulfilling the chosen research objective:

- tourism representatives (NACE I55, I56, N79, R93),
- representatives of business services (NACE J 62, J 63, M 70, M 72, M73).

Defining the characteristics of young dynamic service enterprises and their differences with respect to the knowledge intensity of service production and their innovative activity are original insights for the theory of service innovations and service economics.

Table 14 Characteristics of dynamic service enterprises – gazelles in Slovakia

Characteristics of young dynamic service enterprises – gazelles	
Tourism – production of services with low knowledge intensity	**Business services** – knowledge-intensive production of services – KIBS
General characteristics	
small or medium-sized enterprise	small or medium-sized enterprise
domestic enterprise	domestic enterprise, or foreign invested enterprise
does not operate as a family business	does not operate as a family business
has a network of suppliers of predominantly domestic or regional origin	has a network of suppliers of predominantly domestic origin
has a client network of predominantly domestic and regional origin	has a client network of predominantly domestic origin
dominant employee representation in the 31-40 and 21-30 age categories, respectively	dominant employee representation in the 31–40 age category
does not have a staff structure shaped in favour of university-educated employees	has a staff structure shaped in favour of university--educated employees
employs mainly men	employs mainly men
provides an average salary for its employees	provides average to above-average salary for its employees
has directly linked management and ownership	has directly linked management and ownership
are located mainly in cities	are not located mainly in cities
Specific characteristics in the field of innovation	
focus on marketing innovation	focus on product and organizational innovation
implementation of new products for the company	implementation of completely new products for the domestic market
transaction and marketing processes directed towards the final consumer (online sales) implemented as a priority within process innovations	CRM systems for analytical purposes as a basis for decision-making processes implemented as a matter of priority in the context of process innovations
employee-focused organisational innovations	employee-focused organisational innovations
further orientation of organizational innovations: change of organizational structure; code of ethics; cluster and network membership	further orientation of organizational innovations: outsourcing of activities; redesigning of jobs; IT skills of employees
marketing innovations focused on the use of social networks	marketing innovations focused on the use of social networks
use the received public resources as a priority for marketing activities	prioritise the use of received public resources for the development and implementation of innovations
investment in innovations averaging 7.1% of turnover per year	investment in innovations averaging 13,0% of turnover per year
low level of cooperation in innovations with other entities (24%)	higher level of cooperation in innovations with other entities (65%)
no cooperation with universities in the field of innovation	existing cooperation with universities in the field of innovation (13.5% of enterprises)
below-average implementation of own research activities (16.7% of enterprises)*	above average implementation of own research activities (41% of enterprises)*

Source: authors'own research (Kubičková a kol., 2016)

*24% of SMEs in Slovakia carry out research activities on their own (in-house)

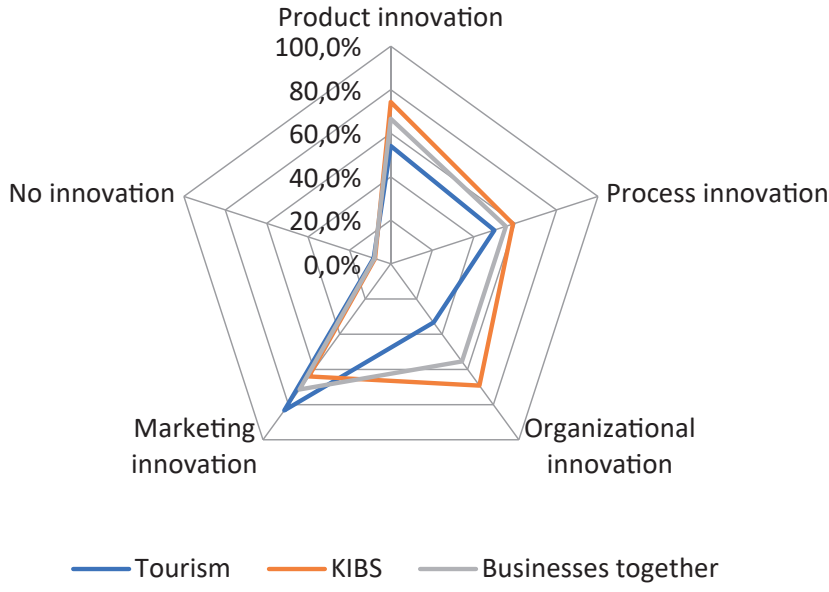
Slovak service gazelles are more innovative than SMEs in general. It can be concluded that innovation is the source of their economic success. At the same time, the results document a higher innovativeness of gazelles of knowledge-intensive business services (KIBS) compared to the innovativeness of gazelles with low knowledge intensity (tourism). Thus, knowledge intensity of production is a determinant of the innovativeness of gazelles. The geographic origin of enterprise capital can be identified as an important determinant of the use of a enterprise‘s own R&D capabilities, with foreign enterprises being the most active agents of conducting their own R&D. A negative finding is that gazelles do not make use of cooperation in R&D activities as well as enterprises in general. Thus, there is a significant and untapped potential of gazelles, which, under conditions of acceleration of research activities in various forms of cooperation, would generate further opportunities for the dynamisation of economic growth of enterprises and local economic structures.

The weak involvement and consequently the level of knowledge about the effects of innovations in the managements of gazelle enterprises can be considered problematic when enterprises cannot assess the impact of innovations on their growth.

The specificities of service production depending on its knowledge intensity are fully reflected in the structural use of innovations in gazelles. Higher universality of production in tourism conditions a significant scope of implementation of marketing innovations. The individual and specialised nature of KIBS production conditions a strong concentration on organisational innovations. The situation is very similar in the area of product and process innovations, with most tourism gazelles and KIBS innovating in these areas. However, they offer radical innovations on the international market only to a minimal extent. KIBS gazelles demonstrated the ability to offer radical innovations for the domestic market. However, the priority type of product innovations for both tourism and KIBS gazelles are product innovations partially or completely new to the enterprise. The assumption about the priority use of non-technological innovations in gazelles was not confirmed in the context of the valid statements about the application of innovations in services. Technological innovations are sources of growth exploited by gazelles, in foreign enterprises to the full extent (100% of enterprises). Gazelles are aware of the effects of innovations on their economic growth.

The KIBS gazelles make greater use of more sophisticated ICT (CRM for analytical purposes to underpin decision-making) and to support cooperation and teamwork. In contrast, tourism gazelles (knowledge-intensive services) use ICT primarily in transactional and end-consumer-facing marketing processes. Also the extent of ICT use appears to be in favour of KIBS gazelles. Thus, the knowledge intensity of production determines the use of ICT in the introduction of process innovations.

Figure 11 Applying innovations in service enterprises – gazelles in Slovakia



Source: authors'own research, (Kubičková et al., 2016)

Business services gazelles invest more in ICT as well as innovations annually than tourism gazelles. Meanwhile, compared to tourism gazelles, business services gazelles have shown better ICT equipment, while business services gazelles show higher innovativeness, the effects of which occur with greater intensity. Knowledge intensity thus affects both the amount of investments in innovations and the corresponding effects.

The socio-economic significance of the existence of gazelles in services is not primarily based on their actual economic contribution generated by the economic power of these entities. The important facts in terms of their social and economic impact are the facts that are linked to their creation and that document unique business intent, new connections, innovative solutions and the ability to take risks. They create a demand in the local economy for products that satisfy their requirements resulting from the novelty of their own products and production. They thus create a business environment towards innovations, place new demands on the workforce and change the expectations of clients. They thus put pressure on the whole value chain in the local economy towards the acceptance of innovations. In addition to the creation of new jobs, ‚educating society to innovate' is thus the main social meaning of the existence of gazelles, which should ultimately be reflected in the educational structures of the local community.

CONCLUSION

The ‚service economy' is characterised by the rise of the service sector's dominance in terms of employment and value added shares. While the growth of the industrial economy is ensured by mass production and the reduction of unit costs, the growth of the service economy is based on knowledge-intensive production of goods and services, well-educated workers and innovative enterprises.

Technological development is a dominant factor in the development of the service economy. Consequently, it acts on other factors that have a positive impact on service consumption are: leisure, lifestyle, demographic structure and living standards of the population, trade liberalisation and globalisation as well as sustainable ambitions. The current stage of the service economy reflects the needs of Industry 4.0 and 5.0. It is defined by the demand for research and development in digitalisation, artificial intelligence and socially beneficial sustainability solutions. Knowledge is a key element of economic growth. The ability to produce quality knowledge-intensive services, including business services, is a feature of a competitive economy.

Statistical data declare the economic development of the EU countries in the characteristics of the service economy. The structure of Slovakia's economy is shaped in favour of manufacturing sectors, where foreign direct investment is concentrated and exports are generated. Multinational corporations provide technology transfer and related organisational innovations, but R&D expenditures are relatively low. Despite the strong industrial presence, Slovakia has features of a service economy.

Services are part of all value chains of the economy within the nature of their intermediate consumption. Knowledge-intensive business services (KIBS) are becoming a key element, with intermediate inputs becoming the instrument of transformative power of innovations in services. Service innovations thus shape entire sectors, industries and markets and cause structural change and industrial modernisation. However, service innovations also have a transformative impact in non-intermediate consumption environments. Innovation in health, education, public administration affects consumer utility. It also changes the pattern and course of consumption in commercial services for the final consumer.

The monograph pursues a research aim: to investigate the innovation environment of the economy as a factor of performance in services. It is based on the idea that the quality of the innovation environment causes innovation effects along the whole value chain of the economy and that services perform better due to their own

innovations. Within the characteristics of the service economy, the effects of the elements of the innovation environment in the service environment are evident. The results confirmed that the innovation background of the economy has an impact on the economic performance in services and their competitive ability, knowledge intensity of production is a determining factor in the effectiveness of the innovative environment of the economy on services and their performance in Slovakia.

A more significant effectiveness of the innovation environment on performance in services, or a more consistent representation of services in the creation of the innovation environment is conditioned by economic incentives for innovative small and medium-sized enterprises, by improving the quality of qualification training of scientific personnel capacities, and last but not least by initiating instruments to strengthen entrepreneurial expenditures on research and development in the economy of Slovakia.

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