

INNOVATION AS ASSUMPTION OF DIGITISATION IN SLOVAKIA

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ABSTRACT

In this paper, the author will analyze two companies that belong to the category of small and medium-sized enterprises. By introducing innovative elements into their production, the author will compare the amount of profit that resulted from their implementation. Necessary condition was the implementation of digitization. The company is currently working on an innovation that will be a complete novelty on the Slovak market. It is a system that can produce electricity only from the pressure loss on gas and cold lines. In this process, the excess energy that is in the pipes is used. As Kogabayev and Kazlauskas state innovations are systematically "manufactured". The main input factor is R&D expenditure (personnel, equipment, materials, etc.). The higher these inputs are, the higher the innovation yield is likely to be. We have to speak of probability because innovation involves degree of risk or uncertainty. Ultimately, the innovation process is driven by the prospect of profits. However, innovation does not always have to be only positive. It can be a quantitative or qualitative change that also has a negative socio-economic impact. This means that a certain social change does not guarantee that an innovation will bring economic profit. In the practical part of this paper, the amount of profit that resulted from implementation of innovation will be compared.

Key words: digitization, innovations, electricity energy, profit

JEL classification: D21, L21, L53

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INTRODUCTION

The word energy first appeared in Aristotle's *Metaphysics* as "Energeia". He explained this word as an effective force that transforms the possible into the real. That is, if someone is sitting in a chair, they can get up and leave at any time, but in order to do it, they must do something necessary. This was his explanation of this word – that is, "Enérgeia" – "to make reality this possible" (Peager, n.d.) The first references to electricity date back to the 6th century BC, thanks to the famous Greek philosopher, astronomer and mathematician Thales of Miletus. Next development was very fast. In 1767, Swiss researcher Horace-Bénédict de Saussure built the first flat-plate solar collector, which was later perfected by John Herschel. In 1891, Danish meteorologist Poul la Cour built the world's first wind turbine on the Jutland Peninsula, and almost 30 years later, 120 such systems were already covering 3% of the country's electricity consumption. The first large hydroelectric power plant was commissioned at Niagara Falls in 1896. At the same time, the oil and gas were transported in China through bamboo pipelines for heating, cooking and lighting more than 2,000 years ago, when they were also first used industrially. French mathematician Augustin Mouchot, a promoter of pioneering work on the benefits of solar energy, proclaimed that fossil fuels had only a limited future. In 1879, on the occasion of the publication of his solar-powered steam engines, he warned that European industry would sooner or later run out of raw materials: "Coal will undoubtedly be exhausted. What will industry do then?" (*Energie: Eine (sehr) kurze Geschichte der Energiewende. In geo*). The aim of paper is the comparison of two companies from energy sector after implementation innovation and to calculate a sum of reached profit. Both companies invest into R&D, while only ESM-Yzamer having its own R&D department but Techem not having its own R&D department. Over the last five years, ESM-Yzamer has invested approximately 72% more money for innovations and research and development than its competitors (ESM-Yzamer, n.d.).

On the contrary, ESM-Yzamer (n.d.) is a small company and must strive to move forward with innovative technologies. It has introduced, in contrast, three major innovations and Techem has already implemented the only one that will be a complete novelty in the market, which it continues to work on and improve. We can conclude, that the large companies like Techem have succeeded after introducing a single innovation and are making significantly higher profits than ESM-Yzamer. Both companies agree that the innovations they have introduced have had a positive impact on their profits. The situation caused by the Covid-19 pandemic had a

negative impact not only on the local but also on the global economy. It has significantly affected people's behavior, the profitability of businesses and companies, as well as the development of trade and services in the country and the world. It also had a negative impact on smaller company-ESM-Yzamer. The impact has been felt by the company in reduced turnover as several development projects have been suspended or reduced in sophistication. Approximately 20-25% of customers have chosen cheaper projects that do not offer the same return. However, bigger Techem has not been so negatively affected by the Covid-19 pandemic. Despite the pandemic, the company made a high profit and its reached fee-based services were not negatively affected at all. However, the most affected area was the installation sector, as visits to residential houses for large installations were not possible in this situation at all.

We can subsequently then formulate the following hypotheses:

H1: Are larger firms more resilient to negative external economic influences than small firms?

H2: Do companies with foreign ownership have a more stable earnings development despite the negative effects of the Covid 19-pandemic situation?

LITERATURE OVERVIEW

Currently, the energy sector is more focused on new technologies and innovations that could facilitate doing business, and which are becoming more and more sustainable conditions. The enterprises are developing new strategies that not only reduce carbon footprints and costs; they are also creating long-term business benefits and a new perspective for the future. Generally, the concept of innovation does not have a well-defined universal definition. The word comes from the Latin word *inovare*, which means restoration (Hrašková, 2008). Schumpeter was considered the founder of the theory of innovative entrepreneurship. He defines innovation as both the economic impact of technological change and the use of new combinations of existing productive forces to solve current business problems (Kogabayev & Maziliauskas, 2017). Economist Twiss defined innovation as a process, which combines science, technology, management, and economics to achieve novelty and contents from the origin of an idea to its commercialization in the form of

production, exchange, and consumption (Twiss & Goodridge, 1989) According to Urabe, innovation can be understood as an idea or invention that is successfully introduced to create a new wealth. Innovation is the creation of a new idea and its implementation into a new product, process or service, leading to dynamic growth in the national economy and to increased employment. As well as the creation of net profit for the innovating enterprise. According to Twiss and Goodridge reports, from the above definitions, we can say that all authors agree that innovation is a new change that improves or replaces something that already exists in society (Verganti, 2009).

Kogabayev and Maziliauskas (2017) state, that innovations are systematically “produced”. The main input factor is R&D expenditures (personnel, equipment, materials, etc.). The higher these inputs, the higher the innovation profit from them. We speak about probability because innovation involves risk or uncertainty. Finally, the innovation process is driven by reached profits (Nutzinger, 2001). For businesses, they represent one of the most important driving forces of long-term success, since when companies wish to increase their competitiveness, they develop the differentiation strategy or try to achieve the price leadership, while in both cases it is the very innovations that are vitally important. However, innovations do not always have to be positive. They can be a quantitative or qualitative change, which also has a negative socio-economic impact. This means that a certain social change does not guarantee that an innovation will be economically efficient (Hrašková, 2008).

Despite the possible negative consequences, innovation is very important in society. For companies, they are one of the most important driving forces of long-term success, because if companies want to increase their competitiveness, they have to develop the differentiation strategy, or they can try to achieve price leadership, and in both cases innovation and digitization. Innovations concern both products and processes. They can be classified as incremental or radical according to the nature of the change they bring to the enterprise. The typology of innovation is shown in Figure 1.

In current literature we can read, that the literature on innovation has focused either on radical innovations driven by technology or incremental innovations driven by the market. But Verganti (2009) presents “a third strategy, a radical change of perspective that introduces a bold new way of competing, stated as in Design-Driven

Innovation". These types of design-driven innovation do not come from the market, because they create a new market. They don't push new technologies; they push new meanings. It's about having a vision and taking it to the customers. Using fascinating examples from leading European and American companies, Verganti shows that for truly ground-breaking products and services, we need to look not only at customers and users, but also at those he calls "performers"- the experts who deeply understand and shape the markets in which they work. Design-led innovation offers a new perspective on innovative thinking and practice.

Figure 1 Typology of innovation

	Continual innovation	Radical innovation, Change structure, culture
Product: physical product or service, answer on demand of customers	Improvement of product, its quality	New product=new strategy=new structure=new culture
Process: the chain of connected processes= is realized by researchers	Improvement of process (new product)	New process = new strategy=new structure=new culture

Source: authors' analysis according to Verganti (2009)

From the figure we can note that incremental innovations improve an old product or process within an existing structure and strategy, while radical innovations create new business opportunities, new strategies and structures, but can also be the result of many innovations that reinforce each other in a common direction (Twiss & Goodridge, 1989).

As Schwab (2009) states, successful investment into research and development and their cooperation with universities and other research centers is important for appropriate implementation innovations to their product, processes and whole production chain till to selling.

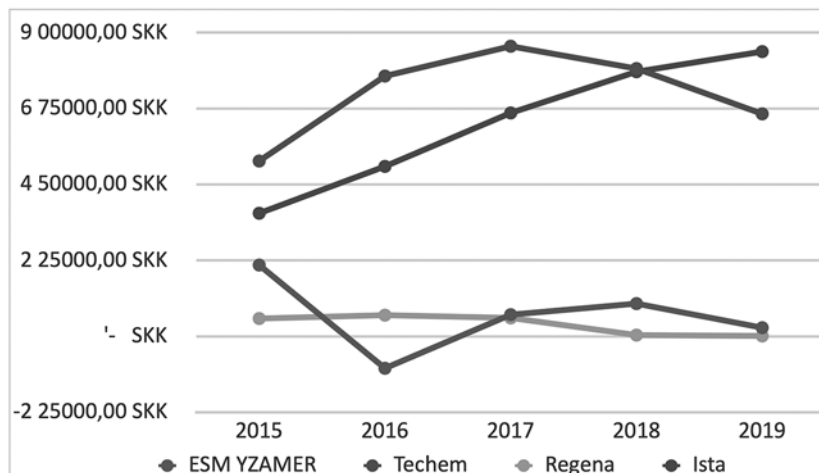
METHODOLOGY

In this paper, we used several paired scientific methods from both foreign and domestic authors. Subsequently, we divided them into individual parts of paper. Starting with method of collecting information, especially from scientific books or scientific researched “gates”. From the scientific methods we mainly used mentioned paired methods such as induction and deduction, analysis and synthesis, the method of observing theoretical, but mainly numerical data in the analyzed period. Subsequently we sorted them to simple conclusions. For a better presentation of the obtained results, we used graphical and mathematical methods, which are mainly used for a clearer presentation of our results in tables and charts. The aim of the article was to calculate the mathematic value of profit achieved by introducing innovations, which was a prerequisite of changes in the implementation of elements and process of digitalization namely small and medium companies in line with EU policy.

RESULTS AND DISCUSSION

The competition is important not only for consumers but also for companies as a whole. We can say that it is the driving force of companies, thanks to which they are constantly evolving and increasing their activity on the market. This is an incentive to create innovations that are much more acceptable to the consumer from a financial or consumer point of view. To compare profitability, we have chosen two competitors in the energy sector in addition to the firms under study. As Kantor (2007) states, an important feature of competition is its profitability. He states that in a competitive market, the main goal of firms is to achieve the highest profit, while consumers want to achieve the highest utility.

Chart 1 Profits of analyzed companies



Source: authors' analysis according to Ministerstvo financí Slovenskej republiky (n.d.).

It is implicating from the above chart that the profit of individual companies in analyzed period under review shows essential different economic results. It was caused, (as we formulate in H1) due to their different sizes and the length of time in which they have been on the market. From the chart we can observe that Ista's profits are gradually growing linearly, and its profit is steadily increasing. Despite rising costs, the firm's revenues are also increasing, especially revenues from the sale of services, which are making the firm profitable.

Techem (n.d.) was the leader in achieving the profit, but the change came in 2018 when the firm's profits begun to decline gradually. In the year 2020, Techem made a profit of €680,882. This means that in comparing to the previous 2019 year, its profits increased by approximately about 3%. From the above stated chart for ESM Yzamer (n.d.), we can observe the significant decline of profit since 2016, which caused reaching a loss of up to € 94,617. It was due to the high increasing of approximately 19% in the cost of economic activity, these were namely service costs. A possible negative reason for the increase in this part of the costs could be outsourcing. However, since 2016, the company's profits have linearly increase, and for 2020 it reported a profit of €1,175. It is possible that the company would

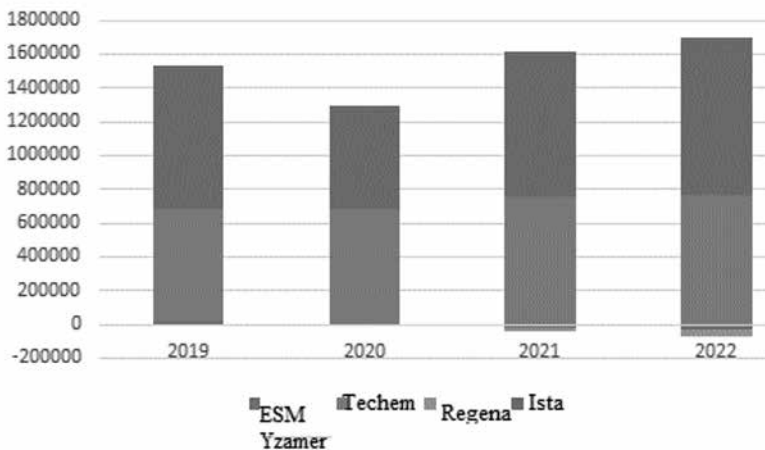
have done better results if there was not the situation regarding the Covid-19 pandemic. ESM Yzamer (n.d.) created only one important innovative strategy, however, and that is new software development, which is used namely for cloud-based heat pump software. Despite numerous Techem's strategies that the company implemented as innovative, we think that essential was mainly the systematic training provided for their employees could be described as significantly innovative. We think that the other strategies that the company has mentioned could be considered as classic production strategies that fit into a classic innovation strategy. Techem is a larger company than ESM-Yzamer; and its maternity company supports it with financial sources and consequently has the name of this company really well-known and therefore has the largest market share. ESM Yzamer has a competitive advantage due to the fact that it provides the complete turnkey heat source technology at its own cost from the beginning of the implementation to the final approval. Competitive companies provide only similar services, but they are provided for a fee. The product portfolio is also a competitive advantage. Techem produced its own products, under its own brand name, that are for example water meters and heat meters. On the other hand, ESM Yzamer does not have its own brand of products and offers a range of products from companies it works with, for example heat pumps and microturbines.

Table 1 Prediction of future profits for the period 2020-2022

	2015	2016	2017	2018	2019 Base year	2020	2021	2022
ESM-YZAMER	211.212	-9.4617	64.186	96.982	25.539	1.175	-14.945,933	-33.715,1048
Techem	519.409	771.130	859.384	793.266	659.144	680.882	754.398,067	765.977,7524
Regena	52.791	62.716	54.579	3.685	1.170	-6.786	-25.315,867	-40.556,3524
Ista	364.658	503.435	661.860	783.900	843.536	609.221	864.284,133	931.860,0762

Source: authors' analysis according to Ministerstvo financií Slovenskej republiky (n.d.).

Chart 2 Prediction of future profits



Source: own processing according to table 1

Both companies invest in science and research. Company ESM-Yzamer (n.d.) has its own R&D department, due financial support of maternity foreign company, and Techem doesn't have its own R&D department. During the last 5 years, ESM Yzamer has invested 72% more money in research than its competitors. ESM Yzamer is a small company and has to strive to move forward.

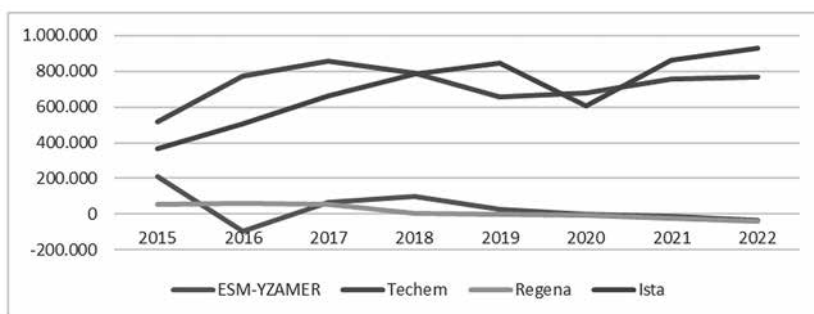
Based on data from past developments from 2015 to 2019, we have predicted, expected development the expected future net earnings of ESM Yzamer. Still in 2020, it achieved a profit of €1,175, a difference to base year 2019 is €24,364, in percentage terms this is 4.60%. But already in 2021 the company reached a loss in absolute terms -40 484,93 euros, what is in percentage terms 132,01% as stated in table 2. In the projected year 2022, ESC Yzamer has a loss of 58,52% compared to the base year it is in percentage terms it is a 132.01% decrease to base year 2019. The second company analyzed is Techem (n.d.), whose projected net profits were not affected at all by the Covid-19 situation and achieved positive net profits throughout the period under review. The highest percentage difference compared to the base year 2019 was in 2020/2019, with positive a percentage change of 103.30%.

Table 2 Compare differences of analysed companies

	2019 base year	2020	2021	2022	2020/2019 (%)	2021/2019 (%)	2022/2019 (%)
ESM-YZAM-ER	25.539	1.175	-14945,93	-33715,10	4,60	58,52	132,01
Techem	659.144	680.882	754398,07	765977,75	103,30	2,27	5,11
Regena	1.170	-6.786	-25315,87	-40556,35	-580	1277,43	2881,63
Ista	843.536	609.221	864284,13	931860,08	72,22	1,77	4,00

Source: authors' analysis according to Ministerstvo financií Slovenskej republiky (n.d.).

Chart 3 Future profits of analysed companies

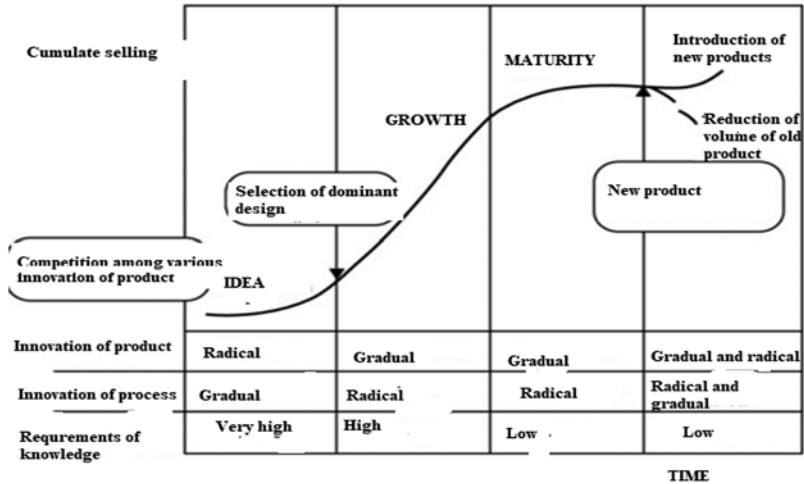


Source: own processing according web. sites of analysed companies

Relationships in the innovation chain

At the same time, it is essential to synchronize innovation with the product life cycle. The importance of different types of innovation varies depending on the maturity of the industry. In the next figure we can see the product life cycle, which can be used to measure the maturity of a company.

Figure 2 Product lifecycle

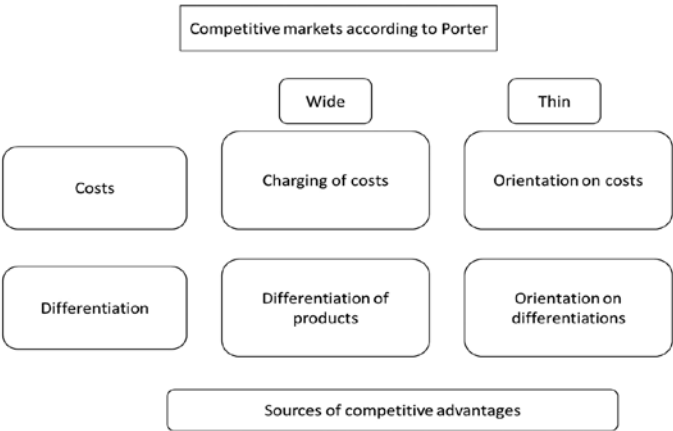


Source: authors' analysis according to Smeds (1994)

The product lifecycle starts with the introduction of radical innovations. It continues until the selection of a dominant product design. Once selected, the product begins to grow through major process innovations that affect price, quality, and segmentation, and through incremental innovations try to improve and enhance the original product. In the maturity phase, only incremental innovations can be used, due the product is related with another processes. In the last phase, the product starts to decline as the market has quite reached saturation and some external shocks in the market or in the technology may trigger a new wave of product innovation and the initial phase of a new substitute product starts (Smeds, 1994). At this point, it is important to note that innovation is linked to the competitiveness and new strategy of the enterprise. In order to differentiate itself from its competitors, a company needs to have a strategic plan and for this, and innovations are necessary. In less developed countries, enterprises must design and develop high-quality products and processes to remain competitive, which requires an appropriate space for innovative activity, financially supported by both the private and public sectors. In particular, sufficient additional investment in research and

development as well as scientific research institutions and research cooperation between universities and industry is essential (Schwab, 2009). To have a way for achieving a suitable competitive advantage over other competitors and their products and other companies in the market is a key strategic challenge for the most entrepreneurs (Riley, n.d.). At the innovation-driven phase of production, the ability to provide an innovative products or services is at the global technology border using the highest advanced methods a dominant source of competitive advantage (Porter et al., 2006). Competitiveness can be defined as “the set of institutions, factors and policies that determine a country’s level of productivity.” This means that the more competitive an economy is, the more it tends to generate higher levels of income for its inhabitants. But firms do not compete only in established markets. They seek to introduce previously unused goods or services and so they create entirely new markets. A firm’s ability to create such global markets is related to its innovative competitiveness (Rouvinen, 2002). To find a way to achieve a sustainable competitive advantage over other competing products and companies in the market is a key strategic challenge for most entrepreneurs (Riley, n.d.). At the innovation-driven stage, the ability to produce innovative products and services at the global technological frontier using the most advanced methods becomes a dominant source of competitive advantage (Porter et al., 2006). A competitive advantage is an exceptional capability, for example, cutting-edge research and development, innovative flexibility, unique production facilities and others, which differentiates a company from its competitors. Where there is no scope and reason for differences to arise, competitive advantage does not arise and can therefore only arise under favorable conditions that cause differences between firms. (Riley, n.d.; Slávik, 2002). In order to gain a competitive advantage, Porter said they could adopt the four general business strategies he suggested.

Figure 3 General Porter's strategies



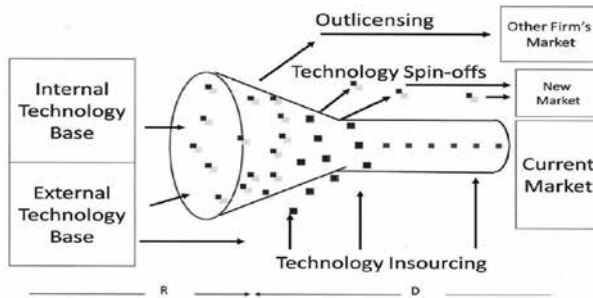
Source: Authors' analysis

From figure 3, we can see that the cost leadership and differentiation strategies gain competitive advantage in a wide range of market segments, while the cost focus differentiation strategies are adopted in a narrow market. The cost leadership strategy aims at becoming the cheapest producer in the industry. This strategy is mostly associated with large enterprises and requires close cooperation between all functional areas of the business, whereas, the cost focus.

As part of driving differentiation, the business focuses on differentiation across the industry. In this strategy, the firm charges a higher price for the product due to higher production costs and offers the consumer a product with extra added value. The firm may achieve differentiation through higher product quality, branding, industry-wide distribution through all major channels or promotion such as advertising, sponsors, etc. By contrast, in differentiation focus, as in the cost focus strategy, the firm focuses on differentiation in only one or a smaller. The definition of open innovation was first defined in 2003 by Chesbrough (2011) as “the use of targeted inflows and outflows of knowledge to accelerate internal innovation processes as well as to expand into innovation markets”. The disadvantages of such innovation is the possibility of loss of direct control over the innovation process

due to possible risks of the protection of intellectual property rights. But in the law framework concerning of innovations is continuously developing new possibilities of research protections capabilities as well production capacities and the possibilities to sell the additional research value of internal as well as external patents for providing their required protection.

Figure 4 Open innovation

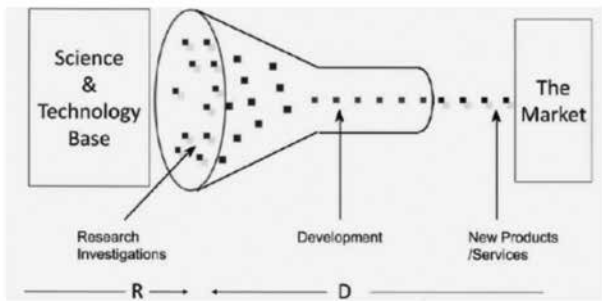


Source: Chesbrough (2011, 69)

From point of view of the degree of openness of the innovation process, the following four types of open innovation can be distinguished (Cohen & Levinthal, 1990):

- pure outsourcing, the management the scientific research by external entities such as universities and contract research organisations;
- licences and patents, technology transfers, venture capital financing;
- collaborations and variants such as joint ventures companies, joint development;
- open resources: sharing of technologies, skills, capabilities for improving production.

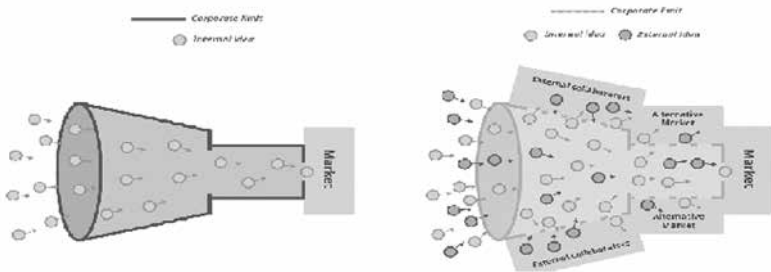
Figure 5 Processed innovation



Source: Cohen & Levinthal (1990,128)

Over the course of the Industrial Revolution, different kinds and types of innovations have gradually been identified. The original closed innovations, which were characterized by innovations only within the enterprise, in its scientific research department, were aimed only at improving product characteristics. Later on, research and development were moved to the cooperation between the company and universities, specialized research institutes, and there were already significant process changes.

Figure 6 Closed and open innovation

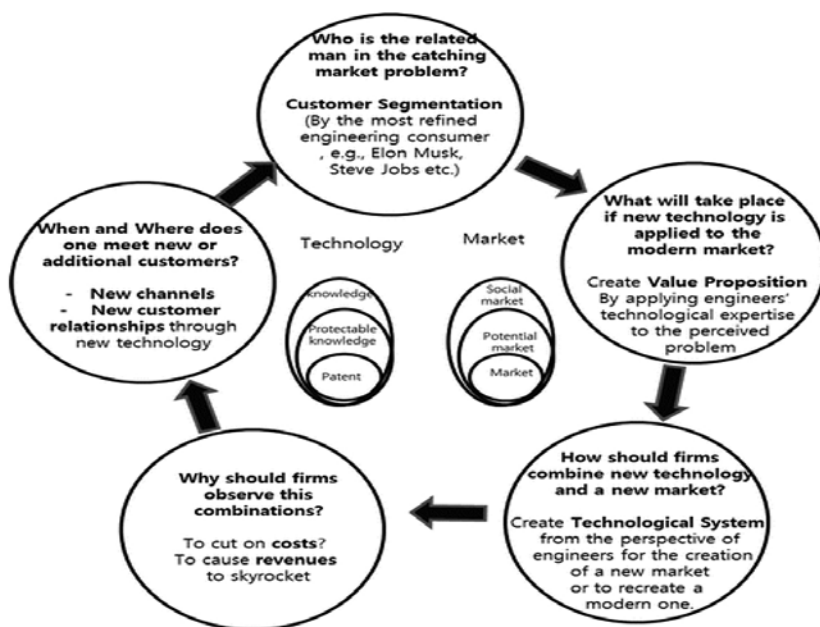


Source: Isomäki (2018)

Merged companies may gain new market power; their new formal structures may increase labor productivity, reduce unnecessary investment, and corporate costs. They may be seen as an external corporate governance mechanism to “punish” inefficient managers, which results in a transfer of assets from inefficient to efficient management.

Synergies between the related companies can be manifested in different ways. These companies can gain market power as well as increase labor productivity, reduce unnecessary investments and corporate costs. They could be seen as an external mechanism of corporate management with aims to punish inefficient managers, resulting in the transfer of assets from inefficient to efficient management.

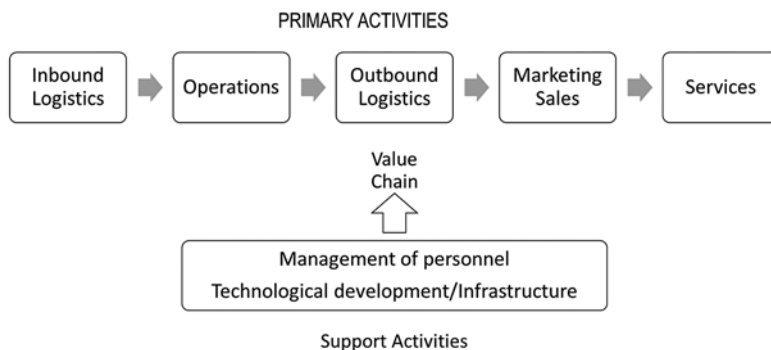
Figure 7 Synergy effect in the innovation process



Source: Pant (2015)

Innovative business strategies involve new ways of competing that could bring great results. However, there are also certain structured practices that are used in the search for new ways of competing. One of such method is the value chain, whose author is Porter. The value chain is based on the idea of viewing a manufacturing or service organization as a system that is made up of other subsystems (Slávik, 2002). Each of these has inputs, transformation processes and outputs that involve the acquisition and consumption of resources—money, materials, buildings, energies, labor, etc. Through the execution of value chain activities, costs are determined and affect profit. The activities in transforming inputs into outputs can be classified as primary and supporting. (Porter's Value Chain)

Figure 8 Porter's value chain



Source: Authors' analysis according to the University of Cambridge (n.d.).

Support activities include procurement (purchasing of inputs), human resource management (recruitment, training, development, etc.); enterprise infrastructure serves for the needs of the enterprise and consists of various functions or departments, such as accounting, finance, planning, general management, and technology development (improving and implementing technologies used in transforming inputs into outputs). However, nowadays we can encounter with hyper competition. This means that new competitive advantages are constantly being created that can disturb the advantages of leading positions of enterprises and leave them an imbalance and in chaos. In hyper-competitive markets, firms react quickly to the

innovations of their competitors. Therefore, in hyper competition, firms must create many competitive advantages rather than just one (D'Aveni, 1998).

As early as in 2005, the International Energy Agency (hereinafter IEA) identified a number of key technological challenges, in particular improving the performance of electricity energy storage, smart management of electricity grids to integrate distributed generation and generation intermittency, improving the performance of solar photovoltaic and bioenergy technologies, and improving the energy efficiency of buildings, transport and industry (Rhodes et al., 2014). Solving climate change and mitigating its damage at the time required, requires significant innovations in speed and scale. As with any innovation, the energy sector innovation reduces private incentives to invest, but the social benefits of clean energy associated with reduced pollution cannot be achieved without government intervention. (Popp et al., 2020)

The state can support innovation by (Nutzinger, 2001):

- introducing new solutions to problems and thus, above all, speeding their diffusion;
- increasing the cost of existing solutions to the problem (e.g. fossil fuel taxes) or prohibits the use them;
- entering to the market as a pioneer in demand, which will set a higher purchase price (sometimes with lower quality) and thus create the conditions for the benefits of mass production and the learning effect.

Practical application of innovation in Slovakia

Let us introduce company ESM-Yzamer (n.d.), energy services and monitoring, s. r. o., a small professional company, which is based at the outskirts of Trnava, which deals with services in the energy sector, and which has been operating on the European market for more than 20 years. The company was founded in 1998 by Emil Izakovic and currently employs 28 people. Its slogan is: "we save your heat". It provides adequate services in the energy sector using state-of-the-art technologies and, as a small company, it focuses primarily on the needs of its customers. The range of services and products offered by the company is characteristic of

professionalism in the fields of energy, management of renewable energy, technology management, and consumption monitoring. The company also focuses on reducing energy consumption, which is very important, through heating and cooling systems that emphasize the use of renewable energy sources. Its partners, with whom it cooperates are:

- Elesta – manufacturer of control systems and complex solutions for technology control, heating, cooling and building automation;
- Thermaflex – manufacturer and implementer of Flexalen plastic pre-insulated pipes for heating, hot, domestic and mineral water;
- AISIN Toyota group – manufacturer of gas and heat pumps
- mix systems – manufacturer of Metrix proportional distributors, water meters, impulse counters and heat meters with smart card read.

There is competition in all areas of service provision, including the energy sector. ESM Yzamer's biggest competitors are:

- Techem spol. s r. o.,
- Regena ES s. r. o. Strážske,
- Ista Slovakia, s. r. o.

Based on market performance, regular research and years of experience, ESM Yzamer points to its two biggest competitive advantages: namely service comprehensiveness and software development. By service comprehensiveness we mean both the design and as well as the design solution. The solution starts with an analysis of the customer's needs subsequently design and implementation. The individual steps of the solution are discussed with the customer, which leads to the subsequent in-house installation. Complexity can bring this system or technology to life using internal capabilities that are focused on the complexity of these systems.

Highlights include monitoring services, operations, service calls, and 24-hour supervision. The company considers its biggest advantage the guarantee to start the solution in case of any malfunction. Software development includes the development of monitoring software that provides control over the installed equipment at all customer sites. This system is called machine to machine (hereinafter M2M)

communication and ensures prompt repair in the event of a failure, in the case of an alarm triggered in the form of a call-out or repair of the technology remotely. ESM Yzamer is sought after in the Slovak market due to the current trend of monitoring energy consumption to save energy costs and reduce CO2 emissions.

ESM Yzamer considers software development as an innovative strategy for gaining a competitive advantage. This advantage lies in the fact that many energy companies do not practice software development, so that they do not have sufficient capacity or know-how. The problems start with the issue of financing them, because paying developers is very costly. As an example, providing a heat pump to a customer brings with it services such as cloud software or an application that is used to control and also provides knowledge to the company in case of unexpected events. At the same time, the company provides analyses in the form of monthly or semi-annual output of efficiency analysis, efficiency improvement, or possibly software change of the equipment, etc.

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This system is called machine-to-machine communication (hereinafter “M2M”) and ensures quick repair in the event of a fault, in the event of an alarm being triggered in the form of a call-out or remote repair of the technology.

Innovation on the Slovak energy market

In recent years, ESM-Yzamer has implemented three major innovations. The first is the aforementioned complete smart metering system, which is aimed at collecting data on consumption of water, gas, electricity, heat and cold. It is installed in apartment buildings and office buildings, too. The complexity of this service puts this company at the forefront, as they have won many contracts thanks to it. Another innovation is the three-generation system that produces electricity and heat using gas microturbines. The product offered has been integrated into the market by Capstone. It is a system where a gas microturbine is installed to a building to produce heat and electricity. This system saves up to two thirds of (2/3) of the actual

costs for the production of these energies. The advantage is that it is an economical and environmentally friendly solution, because it works with primary energy uses gas to produce energies, which, under normal conditions, need to be imported as the secondary ones. In the case of production of electricity, the losses are considerably high, which can be reduced or completely minimized by innovation.

The latest innovation is the integration of a gas heat pump. This technology has mainly helped office and buildings with higher heat and cold demand. The advantage of this equipment is that it produces both heat and cold; therefore, there is no need to purchase an air conditioner and a boiler, as you only need to have one device that provides both commodities. It saves both space and costs. The operation is more efficient and the costs are lower because one third (1/3) of the energy is produced by a chemical process that is enclosed in the heat pump in question. During operation, low potential heat from the surrounding environment is used by means of expansion. The company is currently working on an innovation that will be a complete novelty on the Slovak market. It is a system that can produce electricity only from the pressure losses on gas and cold lines. This process uses the excess energy, which is in the pipes. The company would like to use this surplus energy to supplement electricity generation for larger units. All the above-mentioned innovations implemented by the company have had a positive impact on the growth of profits. The more the innovation is invested, the more profitable the innovation becomes. Yzamer is aware of its strengths in software quality.

Characteristics of the company Techem, s r. o.

Techem, s r.o. (Official Website of Techem, n.d.) is a leading certified company dealing with energy services, which are created as individually designed and tailor-made services of packages. It is a subsidiary of the German company Techem GmbH, and in Slovakia it has regional representation in Bratislava (headquarters), Nové Zámky, Banská Bystrica, and Košice. The company was established in Slovakia in 1993 and currently employs 42 people. It provides services in the field of supply, installation and servicing of heat and water consumption with measuring equipment, as well as their metering and budgeting. Its mission is to help to owners, managers and apartment users from high costs. Currently Techem has more than 930 thousand meters installed in Slovakia and is a recognized partner of housing management, administrators, homeowners and apartment users. The company also tries to protect the environment. Through the authorized organiza-

tion NATUR-PACK a. s. the company is involved in the system of collection and recovery of packaging and packaging waste, electrical equipment, and portable batteries.

Analysis of competitors

The company has several competitive advantages as it has been operating on the Slovak market for almost 30 years. But it does not mean that the company has not competitors. The company's biggest competitors are also ESM Yzamer, Ista and Regena. The biggest advantage of Techem, s r.o. can be considered its origin. It is a subsidiary, and it leads to use own financial resources to enter the market and a well-chosen strategy that helped to differentiate itself from the competitors. It owns the largest market share in Slovakia, which is another competitive advantage because the company's reputation also influences the sales of products or services. The quality and reliability of the products and services offered by the company guarantees customer satisfaction and customer loyalty.

As its big innovative advantage, the Techem considers systematic quality control and maintaining it at the highest possible level. It tries to meet delivery deadlines through the high professionalism of the team. It offers its employees various opportunities for systematic training, which can help to improve communication with the customer, decision-making and problem-solving skills, as well as the ability to solve the stressful situations. Employees will fulfill and develop their skills in their own interest, and the employer will increase productivity and quality of its work. Another innovative strategy of the company is pro-customer behavior towards its clients. The company strives to meet the needs of the customer and in doing so, it uses innovative products and services.

Despite a slower implementation of innovation in this firm, there have been some changes associated with innovation. A significant innovation is the GSM system, which is data collection, including steps towards communication through 5G networks, as assumption of digitalization. It is a project, which connects the equipment and people and is used in modern equipment for control mainly remotely using the internet (IoT-Internet of Things). This innovation has minimized the billing errors created by paper-based instrument readings and has made faster some processes. Its greatest advantage was that end-users were sufficiently informed about their consumption and users had more control of their consumption.

These innovations are also associated with savings from primary energy resources. The company is currently working on improving this innovation. The electric power systems use a central architecture during construction that brings a new set of challenges to the industry. Internet of Energy (IoE) addresses several of these challenges and offers greater efficiency and optimal design for building energy systems. The IoE implements intelligent distributed control through energy transactions between its users. This new energy generation paradigm develops a smart grid and improves coordination and optimization in this energy system.

Science and research are mainly carried out at the headquarters in Germany, but Techem as a subsidiary pays its share to the parent company in the form of “inter-company charges”. The research and development (hereinafter R&D) item are only up to a maximum of 5% of the holding company's total costs. That means for the Slovak company invested €110,000 annually in the parent company's innovation, which amounts to €550,000 over five years. Automation is the basis of our innovation is costly and we have been forced to reduce prices due to the competitive environment.

The competitive environment – Comparison of the surveyed companies

To compare the competition among the mentioned firms, we have selected firm-specific products provided by them. As the first one we will analyze the firm ESM Yzamer. The specific technology it offers is Heat2Go. This is a generation of smart metering system that allows anyone to track, monitor and evaluate the consumption of heat, water, electricity and gas, regardless whether the subject is a homeowner, a property manager or an industrial unit owner. Heat2Go performs readings based on a smart card, which eliminates the mistakes which used to arise with conventional meters. It provides maximum privacy as there is no need to visit the apartment to take the reading its application of digitalization in practice. It also provides an advantage for the customer as they do not have to be at the meter reading location on the day of the reading and are not restricted by the time interval. In the application, an overview of the consumption for each single room is available in tables or graphs. Checks can be made for different time periods (ESM Yzamer, n.d.).

The Techem company systematically monitors energy and water consumption, applies Smart metering and saves around 10% of heating energy. The system makes sure that the amount of heat actually needed for the building is produced, considering the needs of the apartment occupants and will not disturb them their thermal comfort. It optimizes the supply of heating, thus avoiding unnecessary heat production and delivery. The customers use an online adaptor cockpit, which is available for daily updates on the operation of the heating system and the efficiency of the system (Official Website of Techem, n.d.).

In the table below, we analyzed three competing companies providing a service of metering of household's consumption monitoring, whereby the consumer can control his consumption himself. EMS Yzamer is in a leading position due to several advanced services it provides to its customers. The competitive advantage of this company clearly visible in this table.

Table 3 Comparison of Smart systems of individual companies

	ESM Yzamer	Ista Slovakia	Techem
System	Heat2Go	Smart system Ista	Techem Smart system
Access to consumption	Application, web sites	Web sites ista24	Web sites – Adapterm cockpit
Metering of water	Yes	Yes	Yes
Metering of heating	Yes	Yes	Yes
Metering of electricy	Yes	No	No
Metering of gas	Yes	No	No
Customers	Apartments, non-residential premises, private and state institutions, heat suppliers	Apartments and non-residential premises	Apartment and non-residential premises
Monitoring	Total building, separate rooms	Total building	Total building, separate rooms

Table 3 continued

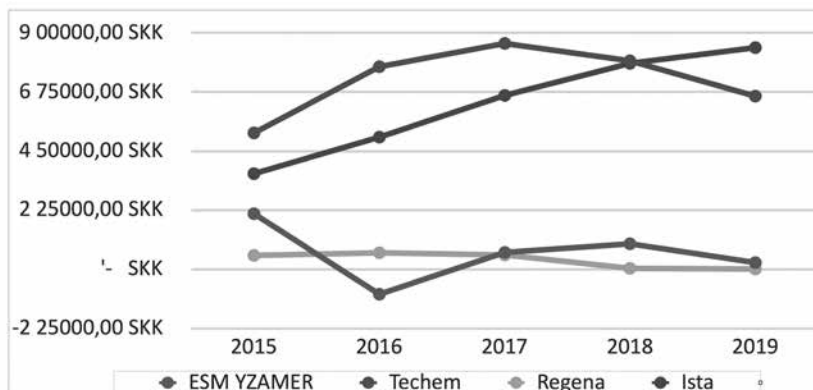
E-mail notifications	Yes	No	No
Evidence of over – consumption	Yes	No	Yes, according to average consumption
Regulation of heating	No	No	Yes, according to Adapterm system

Source: authors' analysis according to Ministerstvo financií Slovenskej republiky (n.d.).

ESM Yzamer and Techem have significant competitive advantages, but only ESM Yzamer focuses on monitoring the consumption of heat, water, gas and electricity not only in households but also for private companies, heat suppliers and government institutions. Examples include primary and kindergartens, hospitals, municipal authorities, and so on. But competing companies only focus on metering heat and water consumption in households. Techem also provides the regulation of the required heat, and it is with the Adapterm system.

The competition is important not only for consumers but also for companies as a whole. We can say that it is the driving force of companies, thanks to which they are constantly evolving and increasing their presence on the market. This is an incentive to create innovations that are much more acceptable to the consumer from a financial or consumer point of view. To compare profitability, we have chosen two competitors in the energy sector in addition to the firms under study. As Kantor (2007) states, an important feature of competition is its profitability. He states that in a competitive market, the main goal of firms is to achieve the highest profit, while consumers want to achieve the highest utility.

Chart 4 Profits of analyzed companies



Source: authors' analysis according to Ministerstvo financií Slovenskej republiky (n.d.).

It is clear from the chart that the profit development of individual firms over the period under review shows different economic results. This is due to their different sizes and the length of time they have been on the market. From the chart we can observe that Ista's profits are growing linearly, and its profits are steadily increasing. The firm's revenues are also increasing despite rising costs, especially revenues from the sale of services, which are making the firm thrive. Techem was the leading firm in profitability, but the change came in 2018 when the firm's profits started to decline gradually. For the year 2020, Techem made a profit of €680,882. This means that compared to the previous – 2019 year, its profits increased by around 3%.

From the above chart for ESM Yzamer, we can observe the significant decline of profit since 2016, reaching a loss of up to € 94,617. This was due to the high increase of approximately 19% in the cost of economic activity, these were mainly service costs. A possible reason for the increase in this part of the costs could be outsourcing. However, since 2016, the company's profits have gradually increased, and for 2020 it reported a profit of €1,175. It is more probable that the company would have done better results if it were not for the situation regarding the Covid pandemic 19. ESM Yzamer created only one innovative strategy, however, and that is software development, which its cloud-based heat pump software also offers.

Despite numerous Techem's strategies that the company considers innovative, we think that only the systematic training provided for employees could be described as innovative. We think that the other strategies that the company has mentioned could be considered as classic strategies that fit into a classic strategy structure.

ESM Yzamer has a competitive advantage in that it provides the complete turnkey heat source technology at its own cost from the beginning of the implementation to the final approval. Similar services are provided by competing companies for a fee. The product portfolio is also a competitive advantage. Techem offers its own products, under its own brand name, such as water meters and heat meters. ESM Yzamer does not have its own brand of products and offers a range of products from companies it works with, for example heat pumps and microturbines.

CONCLUSION

The aim of paper was to calculate a sum of net profit reached by implementation innovation to production process of two companies. By comparing of both companies, we can state, that they spend in R&D, with ESM Yzamer having its own R&D department in contrary small form-Techem not having its own R&D department. During the last five years, ESM Yzamer has invested 72% more money than its competitors. ESM Yzamer is a small company and has to try to move forward with innovative technologies. On the other side Techem has implement till three essential innovations that it has already implemented and next one will be a complete novelty in the relevant market. Its competitor Techem has only implemented one innovation, which it continues to work on and improve.

In terms of answering the H1, it can be noted that large companies such as Techem have succeeded after launching a single innovation and are making significantly higher profits than ESM-Yzamer. Both companies agree that the innovations they have implemented have had a positive impact on their profits. The situation caused by the Covid-19 pandemic has had a negative impact not only on the local but also on the global economy. It has significantly affected the behavior of people, the profitability of businesses, companies, as well as the development of trade and services in the country and the world. In terms of answering H2, for smaller company ESM- IZAMER also had a negative consequence. The impacts are felt by the company in reduced turnover, as a number of development projects have

been suspended or their sophisticated character has been reduced. Approximately 20-25% of customers have chosen cheaper projects as was offered by Izamer that do not “produce “the expected profits. However, Techem was not so negatively affected by the Covid-19 pandemic. Despite the pandemic, the company made high profits and its charging services were not affected at all. However, the most affected area was the installation area, due the visits to apartment buildings for major installations were not possible in this situation.

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