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## TRENDS AND CHALLENGES OF BUSINESS MODELS IN THE ERA OF INTERNET OF THINGS: COMPARISON BETWEEN WESTERN AND EASTERN EUROPE

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### Abstract

Information technology has massively transformed the world of business over the past fifty years - first individual functional areas within companies ("first wave"), later increasingly also cross-divisional value-added processes and trade ("second wave"). With the Internet of Things (IoT), the "third digital wave" is currently rolling up.

The IoT is a driver for digitization. By analyzing machine data, the use of sensors and the intelligent real-time processing of huge amounts of data in the cloud, new business models are created. With the information gained, companies are able to improve their value chain. However, one of the most difficult issues in this context for many companies is how they can further develop their existing business model or establish successful new business models that will be based on new technologies and IoT.

To investigate resulting impacts, we draw on the existing business models and deduct specifics for the Internet of Things. Building on this, in order to reach the aims of the paper the authors will use a descriptive research method (a case study) and qualitative research method (face-to-face interviews). The data gained will be analyzed to understand what digital business model components are, listing the main benefit of companies that implement IoT and to compare the growth of a company in Western Europe with one Eastern Europe.

### Keywords

Internet of Things, Business Models, Digitization

### JEL Classification

M15, L86, O32

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### Introduction

The Internet of Things (IoT) describes the connection of physical things such as appliances, systems or vehicles with the Internet within a network (Ashton, 2009). It is estimated that by 2020 between 20 and 100 billion things will be networked worldwide (Statista, 2019). The number makes it clear what a huge potential the entire IoT industry is credited with. This will fuel the creation of new ventures with innovative business models and open up new opportunities for companies in particular to cut costs and differentiate themselves from their competitors (Bucherer & Uckelmann, 2011).

Society is becoming more flexible, individual and mobile, always connected to the internet and used to receive desired information in the shortest possible time. Consumers are more and more "digital natives", people who either grew up with the new technologies or handle

them as if they had grown up with them. They are curious about technological developments and are not afraid of digital purchases (Delgado, 2018).

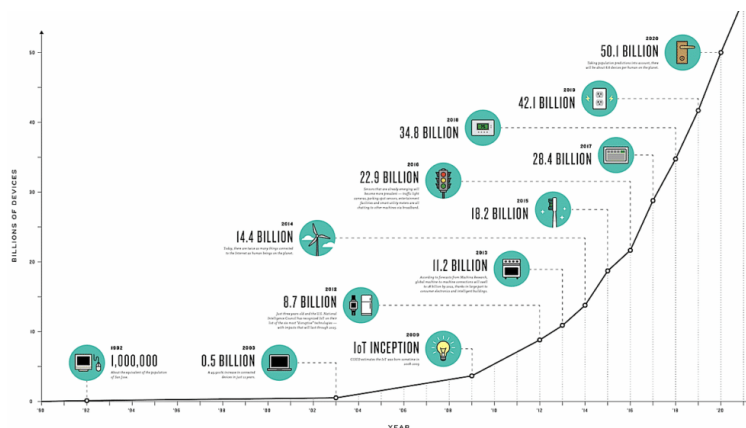
The digital transformation has already begun, and provides companies on one hand with new challenges, but on the other hand, ways to profit of untapped potential (Roland Berger Strategy Consultants, 2015). The question is what are the (technological) trends, how do they affect companies, and especially business models. One key component of this digital transformation is the Internet of Things (Gubbi et al., 2013). The purpose of this paper is to highlight the importance of Internet of Things in existing and new business models, to highlight the technological trends and their acceptance in Europe. To achieve this, in the first section of the paper key aspects of the research on business models and IoT are presented.

Further, in the second part of the paper, the results of an exploratory study will be presented, during which interviews were conducted with companies such as IBM, UiPath, Oursson, Continental Automotive, Dell, BMW AG, DriveNow or representatives of the Romanian Government. The aim of this study is to better understand aspects such as the channels companies are using to connect to their customers (both online and offline), the preferred business models of companies who deploy IoT, the main value added of IoT as well as what are the main obstacles or challenges for using IoT technologies.

**Internet of Things – Towards a Truly Connected World**

As the world gets closer together and the complexity and dynamics of the economy are constantly increasing, the work has to become "learning-intensive". It is no longer enough for a single person - a Ford or Watson - to learn on behalf of the entire organization. It will no longer be possible in the future to "figure things out" and make sure that everyone else follows the instructions of the "great strategist". The top organizations of the future will be distinguished by their knowledge of how to unlock the commitment and the learning potential at all levels of an organization" (Senge, 2008).

With the emerging knowledge industry, the growing importance of the Internet and the associated expansion of eCommerce, business models have become increasingly popular, especially in IT circles. In this dynamic environment, a business model describes the basic principles according to which an organization creates, communicates and records values (Osterwalder, 2014).



**Fig. no. 1 The Internet of Things: Explosion of Connected Possibility**

*Source: Moore’s Law and the Future of IoT, Halladay J., 2018*

The technical progress is based primarily on the exponential growth of computing power, and together with this the growing ability to gather and store data. Thus, data has started to shape not only the future, but also the very fabric of the world we currently live in. The

Internet of Things will be connecting 25 billion users by 2020, ten times the amount of people connected today (Fig. no. 1). Activities that happen in a minute over the internet in 2019: Google (3,8 million search queries), Facebook (1 million logged in user), Mobile Apps (390.000 apps download), Emails (188 million emails sent) or Messages (41,6 million messages sent) (Desjardins, 2019). This also means that more and more IoT devices are in use (Fig. no. 1). From 1975 to today, the computing power doubled every two years. Quantum computers will break through these limits and technology leaders are competing for the first commercially available quantum computer (Cusumano, 2018).

When it comes to business models and the benefits of IoT, everything can be reduced to one common point: increasing efficiency, process quality, revenue, and lowering costs / error rates (Martin, 2017). Depending on the industry and orientation, when it comes to integrating IoT into business models the outcome is: the development of new markets or innovative services for existing customers are offered. Similarly, the development of completely new business models is often sought (Pop & Pelau, 2017).

Even the term "business model" is the starting point for challenges. Although there is broad consensus in the literature, the development of new business models is of fundamental importance for successful positioning in the course of the digital transformation (Magretta, 2002). However, the definitions of which components actually make up a business model are very different. Basically, a business model is derived from the corporate strategy and business idea and comprises a number of different elements as well as an appropriate architecture, on the basis of which money is ultimately earned. Typical elements are customer segments, the cost structure, distribution channels or required resources (Altexsoft, 2018). Digital business models are the mapping of business-relevant solutions by means of software products, which are used on digital platforms, interconnected and made accessible to customers. The networking of the solutions takes place within one's own business model. The claim and potential of business model development lies precisely in identifying those solutions and customer requirements for which no technical solutions or business processes have yet been devised.

Technologies alone are not enough for companies to successfully pursue the path of digitization (Tohanian & Toma, 2018). Essentially, it is about the increased exchange of information between people, companies and products. Business models are still in transition - to highlight the changes, companies from Eastern and Western Europe will be compared, differences will be emphasized and technological impact will be analyzed.

### **Internet of Things - Impact on Business Models**

Markets are in our understanding relationships between businesses and customers (Teece, 2010). And to shape these relationships IoT opens up completely new possibilities and approaches. New distribution channels, payment models or additional revenue streams. Major companies such as Facebook, Google, Microsoft or Amazon are connected direct or indirect to smaller ones like Skype, Whatsapp, Instagram, Waze or YouTube. All have in common one thing, the internet and digital change (Miorandi et al., 2012).

The prerequisite for creating such connections or business models is the secure exchange of data and to embrace digital change by taking advantage of mobility, data analytics and cloud computing. The results are improved business processes, access to real-time information and changes the way data is managed and used. Following above patterns, we identified five main technology trends:

*Digital and physical boundaries disappear:* in the so-called Internet of Things, machines communicate with each other, sensors and radio chips connect the physical and the virtual world. Businesses use real-time data to respond faster and smarter to market changes. The Internet of Things is changing the way people live and work (Koreshoff et al., 2013).

*Boundaries between customer and workforce dissolve:* so far, marketing departments have explored the desires and preferences of consumers. In the future, customers will work directly on products by contributing their ideas via networks. The boundaries between the workforce and consumers are dissolving. In the US, for example, MasterCard benefits from the data inventors of the computer science and mathematician network Kaggle (Goetz, 2013). In Germany, companies such as Tchibo have created platforms such as Tchibo Ideas, through which customers develop their own product ideas. Crowdsourcing as a new form of collaboration shows big companies where new trends emerge (Capece, 2009).

*Businesses integrate their data across departments:* despite sophisticated data management tools, data remains unused in many organizations. Only one in five companies integrates their data across all departments. Data optimization and integration is a prerequisite for a new look at information usage. The use of data should be based on the model that helps the entire enterprise to grow. The data is used, shared and reused, just like other products. Google shows how this approach can be expanded. Since the company opened its programming interfaces, more than 800,000 Web sites are working with data from Google Maps.

*Hardware gains new meaning through hyperscaling:* the need for large and fast data centers is increasing. Digitalization is enabling large companies to take advantage of their hardware: those who intelligently manage energy consumption, processors, and the architecture of their infrastructure can leverage economies of scale and reduce costs. Due to the digitization of their business models, hardware is increasingly relevant as a basis for future growth.

*Apps make software a core competency:* originally intended for the private user, apps are increasingly contributing to the agility of a company. Companies with or without own IT departments have introduced Apps as a main tool. Apps are developed in such a way that they support the company's goals. One of the pioneers is Japan Post Co. The company uses apps through the Salesforce.com platform. Japan Post has developed 15 apps that provide users with insight into corporate financial services and products. According to own data Japan post achieved more flexibility and decreasing costs.

All this technology trends have one thing in common: connecting activities, processes and data via the internet. However, the implementation of IoT is an enormous challenge for many. One of the most difficult questions in this context is: how can the existing business model be further developed and how can successful new business models be established? (Gassmann, Frankenberger, et al., 2018). By evaluating machine data, the use of sensors and the intelligent real-time processing of huge amounts of data in the cloud, new business models are created. With the information gained, companies are able to improve their value chain by optimizing existing processes and costs, improving customer contact and experience and developing new business areas through new service offers.

The IoT is a key component of new business models (Tohanian & Toma, 2018). It is very important that companies make an inventory, whether their existing business model is still future-proof against the background of the IoT and what potential can be tapped through targeted adjustments. The challenges are enormous, but the opportunities are as well (Cvijikj & Michahelles, 2011). Opportunities which are build up by people, devices, places, networks and offered services – all together represent the way of working of IoT: anything any device, any service any business, any path any network, any place anywhere, anytime and anybody – opportunities are linked together.

### **Research methodology**

The authors employed a descriptive research method, namely the case study and qualitative research method, face-to-face interviews.

The case study presents a complex analysis of a contemporary phenomenon. Yin (1994) as cited in Tellis (1997) noted three categories: descriptive, exploratory and explanatory. Yin's

approach is closely aligned with a realist-positivist orientation, as he conceptualizes this research method as a form of social science (Harrison, et al., 2017). The case study was employed to understand and learn more about the process and actions of a company when IoT occurs.

To achieve the objectives of the paper, the authors, also, conducted 14 semi-structured interviews with key employees of companies from the automotive and IT industry. Companies like: UiPath, Oursson, Continental Automotive Romania, Dell, BMW AG, SC Database for Commerce and Industry Romania SRL, DriveNow, IBM or SAP SE. The interviews were conducted over a timeframe of 6 months, from September 2018 to April 2019. Results are used to understand what digital business model components are, listing the main benefit of companies that implement IoT and to compare the growth of a company in Western Europe with one Eastern Europe.

**Results - Business models in transition: Western vs. Eastern Europe**

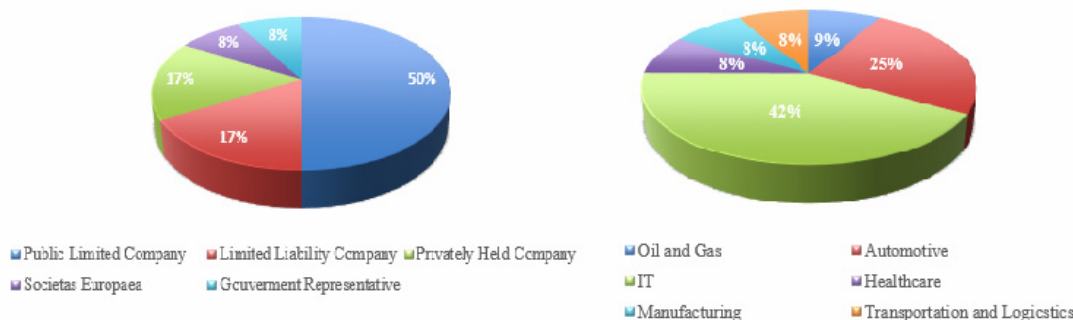
In the past 20 years, there always have been differences between Western and Eastern Europe. When comparing the per capita income of European countries, there are striking differences. In Bulgaria, for example, the annual per capita income in 2018 was € 7.100, in Spain € 25.000, and in Luxembourg € 92.800. In the East per capita income is no more than € 20,000 in any country, but in the West is growing more and more every year. Table no. 1 shows the differences below:

**Table no. 1 GDP per capita in EU countries 2018 (in €)**

	Bulgaria	Estonia	Spain	EU	Germany	Luxembourg
GDP per capita in EUR	7.100	17.500	25.000	32.700	39.500	92.800

Source: Author’s own creation, data from International Monetary Fund World Economic Outlook

This also affects the business sector, developing it to modern standards and investing in digital solutions. Having this as a starting point, we want to highlight the differences how digital business models evolve with the help of IoT in these regions. To reach this goal 58% of the selected companies are located Eastern Europe, 30% are in Western Europe and 12% with activities all over the world. Different industries where taken into consideration (Fig. no. 2):



**Fig. no. 2 Legal classification and industry of the interviewed companies**

Source: Author’s own creation

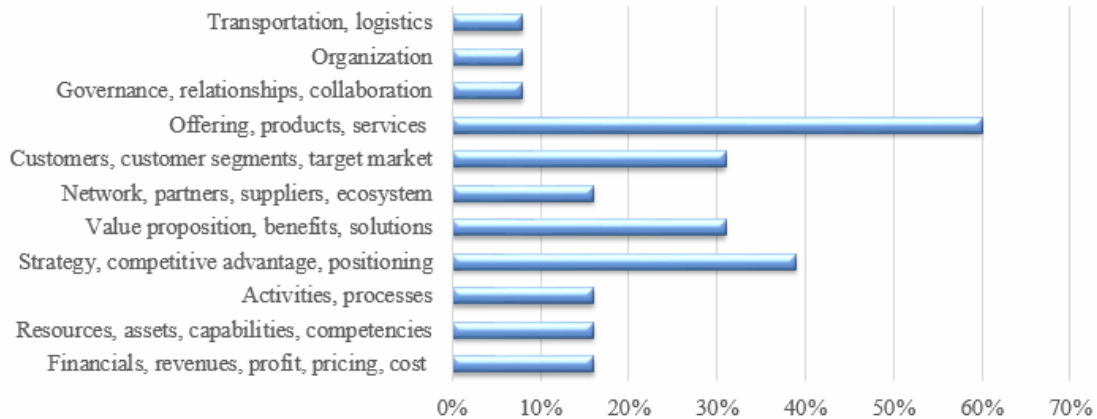
Digital transformation has long been in full swing. Nevertheless, many established companies find it difficult to come to terms with this fact, to adapt to change and to develop their own company accordingly. The speed has changed, and digital business model should be constantly reviewed and adapted to the circumstances. Below different particularities, that are influencing companies in Western Europe:

- Customer relationships are maintained digitally;
- Customer requirements are in digital format and added in a planning tool or database; the system analyses the information automatically and provides the needed solutions.
- Customer work is recorded by a computer and made available at any time via the Internet;
- The information is analyzed contextually by a software and results are made available to the own employee;
- Company-internal product-, service- or business ideas are recorded and stored digitally and automatically evaluated by the system;
- Company-external product-, service- or business ideas are recorded and stored digitally and automatically evaluated by the system.

Below different particularities, that are influencing companies in Eastern Europe:

- Customer relationships are maintained exclusively analogously and documented with a Microsoft Office solution;
- Customer requirements are recorded analogously and documented in a Microsoft Office solution;
- Customer work is recorded retrospectively;
- Company-internal product-, service- or business ideas are recorded, stored and documented with a Microsoft Office solution; evaluated and analyzed manually;
- Company-external product-, service- or business ideas are recorded and stored both analog and digital; evaluated and analyzed manually.

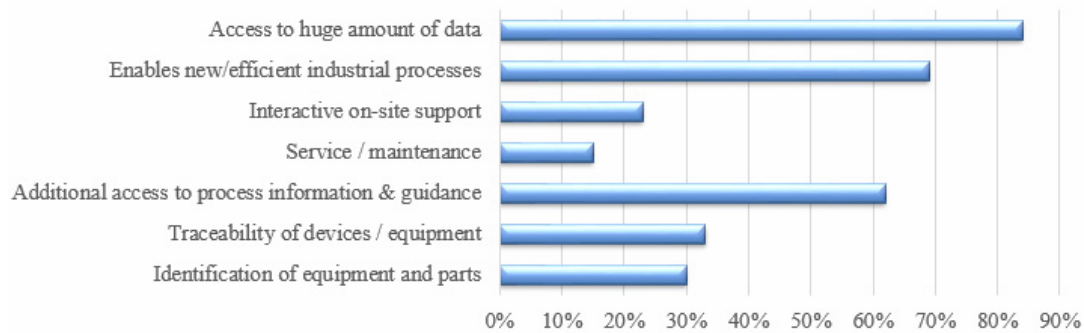
Start-ups challenge established companies with disruptive business models, while innovation cycles shorten significantly. The opportunities often conflict with the rigid and obsolete structures of traditional companies. A cultural change is overdue, which requires new forms of work. Employee satisfaction becomes increasingly important in times of skill shortages. Fig. no. 3 shows the aggregated answers from the 14 interviewed and analyzed companies: 11 have more than one main activity.



**Fig. no. 3 More than one more business model per company**

*Source: Author's own creation*

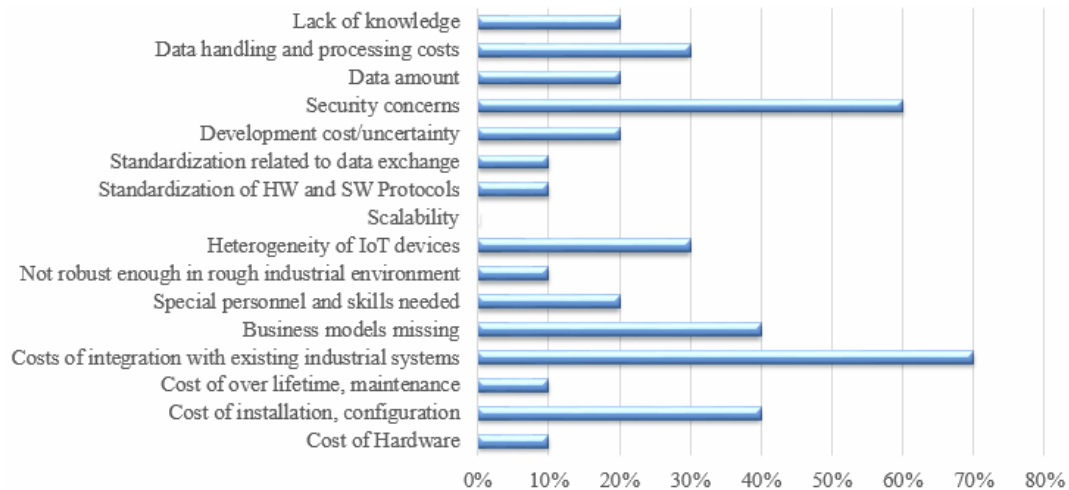
IoT is a turning point in the digital transformation. Fig. no. 4 shows the main values added to company systems using IoT devices.



**Fig. no. 4 Main value added to company systems using IoT devices**

Source: Author's own creation

As well as adding value to existing or new business models, IoT faces also obstacles or challenges when it comes to use it or implement it. Fig. no. 5 is showing such obstacles. The main ones are the integration with existing systems, lack of knowledge, data handling or security concerns.



**Fig. no. 5 Main obstacles or challenges for using IoT technologies**

Source: Author's own creation

### Conclusions

To sum up IoT is a journey of self-discovery that can add incredible value over time. IoT can help develop and scale solutions that go toe-to-toe with existing and new business models – to help customers and users all over the globe, to improve their business or process.

In times of turbo progress, it is no longer only patents, product and process innovations that ensure the success of companies. Today, innovations of its own business model or models are necessary for this. IoT is the focus. Lifelong training, collaboration, mobile work, different types of remuneration, home office, modern office concepts, agility, diversity and creativity are on the other hand the other parts for focus.

### References

Ashton, K., 2009. *That "Internet of Things" thing*, RFID Journal, [online] Available at: <<http://www.rfidjournal.com/articles/view?4986>> [Accessed 6 March 2019].

- Bucherer, E. and Uckelmann, D., 2011. Business models for the Internet of Things. In: D. Uckelmann, M. Harrison and F. Michahelles eds., 2011. *Architecting the Internet of Things*. Berlin: Springer. pp. 253–277.
- Capece, D., 2009. *Top 5 Crowdsourcing Entrepreneurs*. [online] Available at: <<https://www.fastcompany.com/1433478/top-5-crowdsourcing-entrepreneurs>> Accessed 11 March 2019].
- Cusumano, M.A., 2018. *The Business of Quantum Computing*. [online] Available at: <<https://cacm.acm.org/magazines/2018/10/231363-the-business-of-quantum-computing/abstract>> [Accessed 12 April 2019].
- Cvijikj, I. P. and Michahelles, F., 2011. The toolkit approach for end-user participation in the Internet of Things. In: D. Uckelmann, M. Harrison and F. Michahelles eds., 2011. *Architecting the Internet of Things*. Berlin: Springer. pp. 65–96.
- Delgado, M., 2018. *How Future Technology Impacts Employees*. [online] Available at: <<https://clutch.co/hr/resources/how-future-technology-impacts-employees>> [Accessed 10 February 2019].
- Desjardins, J., 2019. *What Happens in an Internet Minute in 2019?* [online] Available at: <<https://www.visualcapitalist.com/what-happens-in-an-internet-minute-in-2019/>> [Accessed 22 March 2019].
- Gassmann, O., Frankenberger, K. and Csik, M., 2018. *The Business Model Navigator: 55 Models That Will Revolutionise Your Business*. Munich: Carl Hanser Verlag.
- Gubbi, J., Buyya, R., Marusic, S. and Palaniswami, M., 2013. Internet of Things (IoT): A vision, architectural elements, and future directions. *Future Generation Computer Systems*, 29(7), pp. 1645-1660.
- Halladay, J., 2018. *Moore's Law and the Future of IoT - A future we can all take advantage of*. [online] Available at: <<https://medium.com/mybit-dapp/moores-law-and-the-future-of-iot-d9ed7d725f0a>> [Accessed 1 April 2019].
- Harrison, H., Birks, M., Franklin, R. and Mills, J., 2017. Case Study Research: Foundations and Methodological Orientations. *FQS - Forum: Qualitative social research* [online] Available at: <<http://www.qualitative-research.net/index.php/fqs/article/view/2655/4079#g341>> [Accessed 17 March 2019].
- International Monetary Fund World Economic Outlook, 2018. *List of European Union countries by GDP per capita*. [online] Available at: <<http://statisticstimes.com/economy/european-union-countries-by-gdp-per-capita.php>> [Accessed 12 February 2019].
- Magretta, J., 2002. *Why Business Models Matter*. [online] Available at: <<https://hbr.org/2002/05/why-business-models-matter>> [Accessed 23 February 2019].
- Martin, L.R., 2017. *The High Price of Efficiency*. [online] Available at: <<https://hbr.org/2019/01/rethinking-efficiency>> [Accessed 15 January 2019].
- Miorandi, D., Sicari, S., De Pellegrini, F. and Chlamtac, I., 2012. Internet of Things: Vision, applications and research challenges. *Ad Hoc Networks*, 10(7), pp. 1497-1516.
- Osterwalder, A., Pigneur, Y., Bernarda, G. and Smith, A., 2014. *Value Proposition Design*. New Jersey: Wiley.



- Koreshoff, T.L., Robertson, T. and Leong, T.W., 2013. Internet of things: a review of literature and products. In: H. Shen, R. Smith, J. Paay, P. Calder and T. Wyeld, eds. 2013. *Proceedings of the 25th Australian Computer-Human Interaction (OzCHI '13)*. New York, NY, USA: ACM. pp 335-344.
- Pop, N.A. and Pelau, C., 2017. Correlations within the EFQM Business Excellence Model by Applying a Factor Analysis. *Amfiteatru Economic*, 19(44), pp. 28-40
- Roland Berger Strategy Consultants, 2015. *The digital transformation of industry*. [online] Available at: <[https://www.rolandberger.com/publications/publication\\_pdf/roland\\_berger\\_digital\\_transformation\\_of\\_industry\\_20150315.pdf](https://www.rolandberger.com/publications/publication_pdf/roland_berger_digital_transformation_of_industry_20150315.pdf)> [Accessed 10 April 2019].
- Senge, P. M., Kleiner, A., Smith, B., Roberts, C., Ross, R., 2008. *Das Fieldbook zur Fünften Disziplin (Systemisches Management)*, Schäffer Poeschel, 5th edition 2008.
- Statista, 2019. *Internet of Things (IoT) connected devices installed base worldwide from 2015 to 2025 (in billions)*. [online] Available at: <<https://www.statista.com/statistics/471264/iot-number-of-connected-devices-worldwide/>> [Accessed 9 January 2019].
- Teece, D., 2010. Business models, business strategy and innovation. *Long Range Planning*, 43, pp. 172-194.
- Tellis, W.M., 1997. Application of a Case Study Methodology. *The Qualitative Report* [e-journal] 3(3), pp.1-19. Available at: <<https://nsuworks.nova.edu/tqr/vol3/iss3/1>> [Accessed 7 March 2019].
- Tohanean, D. and Toma, S.G., 2018. Innovation, a key element of business models in the fourth industrial revolution. *Network Intelligence Studies*, VI(12), pp. 121-130.
- Tohanean, D., Toma, S.G. and Dumitru, I., 2018. Organizational Performance and Digitalization in Industry 4.0. *Journal of Emerging Trends in Marketing and Management*, I(1), pp. 282 - 288.
- Yin, R.K., 1994. *Case Study Research - Design and Methods*. 2nd edition. S.l: Sage Publications.