Digital business models in industrial enterprises

T Mihova¹ and K Chukalov²
¹Technical University-Sofia, branch Plovdiv, Faculty of Mechanical Engineering, Department of Industrial Management
expert2009@abv.bg

Abstract. The report examines the reasons for turning business models into digital ones and reveals their nature and technological trends. The authors try to point out what are the first concrete steps in the company practice for digital transformation of business models. Based on our own research, the level of digital maturity of small and medium-sized industrial enterprises in Bulgaria

1 Introduction
We are witnessing how the use of the terms "digitization", "digital models", "digital transformation" is increasing on a daily basis. In the scientific and media space, a number of publications emerge about the essence of these concepts, roundtables and various forums are being held on this issue. Surveys from leading consultancy companies show, that in the era of the Fourth Industrial Revolution, when more and more sectors are forced to change their business models, Europe is lagging behind in the field of digital transformation. The consulting company PricewaterhouseCoopers (PwC) predicts that digitization and adaptation of smart technology in business can lead to a 14% increase in global GDP by 2030 [1].

It is a challenge for us to point out in this report what are the specific actions on the way of digital transformation of business models. For this purpose, we conducted a survey in small and medium-sized industrial enterprises on the practice of digitizing existing business models, on the basis of which we drew conclusions about the digital maturity of the surveyed representatives of the small and medium business.

2 Basic views of business model and digital business model
Before clarifying the essence of the digital business model, we will look at what the business model is. The term "business model" has become particularly popular since the second half of the 20th century, as a result of the big changes in the creation and supply of products by the companies, thanks to the new technologies and the e-commerce opportunities. The idea of a business model arises from the need to understand and explain the new approaches to doing business through the Internet [2]. In the specialized literature, there are a number of definitions of the validity of the concept in question. According to some authors, the business model shows how earnings can be increased from a particular economic activity (how to make money out of it) [3]. Others mention only the components of the business model, namely: value, market segment, value chain, cost structure and potential profit, network value, competitive strategy. In his monograph, Daniel Pavlov makes a detailed overview of the different concepts of the essence of the business model and explores the links of the business model with other management tools, among which: business idea, business strategy, business plan,
business project and production program. [4]. We support his position that the most comprehensive definition of a business model is that of A. Osterwalder, who links the concepts of "business" ("purchase and sale of products and services" and "making money") and "model" ("the presentation of something through a simple description, which can be used to make an assessment") individually, to arrive at a precise definition of the business model. Thus, the business model serves as a scheme, which shows how an organization works — he transforms the company's strategic goals into a simplified model, which clearly shows the functions of the business and can be used as a plan on which the it can be structured [5]. If we summarize, the business model shows the way from idea to realization (Figure 1). The development of a business model begins after the business idea is generated and ends with the transition to the development of a business plan. In this way, we can justify the key role of the business model to show the way of the idea of economic activity towards the real environment in which it is to be realized.

![Figure 1. Business model](image)

To try to answer the question of what a "digital" business model is, it is necessary first of all to identify some of the reasons for the digital transformation. Systematically, they are mostly related to the growing customer expectations, search for speed and flexibility, the need to know the customers and the engagement of the companies with them, increasing digital maturity at all levels. Digital transformation involves a rediscovery of the business as a whole, including his strategy, leadership models, organizational processes and culture. Digitization will affect the relations with the different stakeholders [6].

All this can serve as a basis for summarizing that digital business models are those where digital services play an important role in creating value for the product / service or even underpin the business itself.

The analysis of publications on this topic enables us to highlight those with a practical focus, which give specific directions for turning the business models into digital. After extensive research inside companies across a wide range of industries, MIT research scientist Stephanie Woerner and coauthor Peter Weill have developed a powerful yet simple framework to guide organizational thinking about which digital business models could be right for your company and where profits can be made [7].

Other publications state a specific model for digital transformation and digital enterprise building, as well as recommendations for successful digital transformation [8].

It is essential to identify the technological trends in the digital transformation of the business models.

3 Technological trends
A number of articles on the dynamic development of technology are published in the media and science space [9]. For us, distinguishing with an emphasis on the practical orientation of the subject are the project materials DIGITRANS, which in a systematic way indicate the current technological trends in digital transformation [10].

3.1 Internet of Things (IoT)
The Internet of Things describes the vision of the physical and digital worlds becoming one as a result of smart objects being connected through the Internet. Depending on the perspective, the focus can be put on the connected things themselves, the protocols or the opportunities and semantic challenges. The idea goes back to the early 90s with the vision of Ubiquitous Computing and has been developed further over the years with the term of Pervasive Computing as the precursor to the Internet of Things. Simply put, IoT is the concept of connecting any device to the Internet (or a local network). It includes smart devices like phones or tablets as well as original dumb devices like lights, door locks or HVAC that are made smart by enhancing them with intelligence and network connectivity. The IoT trend is driven by decreasing costs of technologies and the sky-rocketing penetration of smart devices (Figure 2).

![Figure 2. Internet of Things (IoT)](image)

### 3.2 Blockchain

The blockchain technology describes an algorithm and distributed data structures for secure data transfers without a central administration (e.g. electronic cash transfers). It was originally designed for the crypto-currency Bitcoin and the blockchain concept was mainly driven by the rejection movement against money and bank-controlled payments regulated by governments. The original vision of the Bitcoin developers was to enable people to spend money without friction, intermediaries, regulations or the necessity to know or trust third parties (Figure 3).

![Figure 3. Block chain](image)

### 3.3 Big Data

When searching the Internet for a definition of Big Data, one will inevitably stumble across the V-Model describing Big Data with its three dimensions: volume, velocity and variety. These dimensions make it difficult to handle with present technologies. Big Data is mostly unstructured data that exceeds the processing capacity of conventional database systems. It is too big, moves too fast or does not fit the structures of existing database architectures (Figure 4).
3.4 Machine Learning

The objective followed with Machine Learning is to enable machines to imitate and adapt human-like behavior. This is done by teaching machines to learn from experience. Machine Learning algorithms contain methods to learn from data without relying on predetermined equations and thus memorizing it. The aim is to find natural patterns and get insights from data and ideally make predictions for data-driven decision making. Examples for the use of Machine Learning are personal assistants like Siri, medical diagnosis or personalized shopping suggestions and ads (Figure 5).

In summary, these are the current technological trends in synthesized form in the digital transformation of the business models.

4 Methodology and results of the study

4.1 Methodology of the study

In previous publications, we mainly studied the attitudes and readiness of industrial enterprises to digitally transform existing business models. Now, our goal is to analyze the concrete steps in the practice of digital business models.

The survey was conducted in 50 small and 50 medium-sized industrial enterprises in Bulgaria in the period October 2018 - January 2019. Businesses are selected according to criteria from a previous survey – informed and attentive to the first steps of digitization of business models. The methods used in the survey are polls and interviews with business managers. The used model is "Digital Maturity Business Model", Developed by Researchers of Digital Management and Marketing at the University of Salford, UK, which determines the level of digital maturity of an enterprise [11]. Polls include issues related to specific activities undertaken with regard to digital business models and expected results. Participants in the survey are managers of three levels of government: operationally, secondary and higher, covering 328 people. The distribution is as follows – 194 are representatives of the middle business and 134 are managers of small businesses. Enterprises are from the sectors "Manufacture of computer and communication equipment, electronic and optical products", "Manufacture of electrical equipment", " Manufacture of machinery and equipment", "Food Manufacturing", "Manufacture of beverages" and "Manufacture of paper, paperboard and products of paper and paperboard".
4.2 Results of the study
The analyses of the results of the study, in accordance with the Digital Maturity Business Model used, are as follows:
1. 6% of the participants from the small and 4% of the representatives of the medium enterprises, are still at Level 0, where there is no digital presence – enterprises do not have a website and presence in digital networks.
2. 72% of small respondents and 76% of medium-sized enterprises are at Level 1, which means they have a presence in the digital world – businesses provide digital information to partners and customers.
3. 20% of small and medium-sized enterprises surveyed are at Level 2, for which it is characteristic that companies have an electronic commitment. They have two-way communication, E-business processes, E-supply management, human resources and e-commerce.

4.3 Conclusions from the study
From the brief analysis of the survey results, it is logical to conclude that still a small part of small and medium enterprises have digitized the existing business models. The main reasons that survey participants point to the low level of digital maturity are related to limited financial resources for the use of cutting-edge technologies, limited capacity to manage them and lack of well-prepared teams.
The expected results of the digital transformation of small and medium business representatives are related to facilitating communication with clients and partners, attract more customers, creating businesses with greater engagement with their clients and partners, improving productivity and generating higher revenue.

4.4 Recommendations
We will offer a practice-based methodology for a digital business model from the DIGITRANS project, which consists of the phases of Preparation, Innovation, Transformation [10].
During the Innovation phase, new ideas are being developed to create a digital business model. The innovation phase includes two sub-phases: Analysis - where the current situation, the situation of customers and competitors are analysed; and Design – where new digital ideas are created based on the results of the analysis. With the completion of the Innovation phase, we go through the whole cycle of developing a new digital business model – generate an idea, creating and testing the first prototype of the idea and identifying in the channel of business models what added value creates the new idea for a digital business model. Also, in this phase, different methods and tools are used to develop innovative ideas for digital business models in day-to-day work.
In the transformation phase, the idea of a digital business model, developed during the innovation phase is realized and implemented. This requires a comprehensive approach, which is aimed at further steps to develop a digital business model and reflects the overall strategy as well as the processes and change in employee attitudes, to cope with the challenges of digital transformation. In particular, this includes the following steps:
1. Digital roadmap
2. Involve the team
3. New styles of work
4. Continuous improvement
In the media, as well as in specialized literature, there are a number of recommendations for transforming existing business models into digital ones. This should be done after preparation, including in-depth knowledge of digital transformation and analysis of the specific features of each company.

5. Conclusion
In the report, we are attempting to showcase the essence of the digital business models, current technological trends and above all to see what the level of digital transformation of industrial
enterprises is. Undoubtedly, the majority of businesses are convinced of their benefits for their development and in recent years they have been trying to respond to challenges by introducing new models and methods of organizational work, cultural and technological level. At this stage, businesses still have a relatively low level of digital maturity, due to the insufficiently well-recognized need for digital business models and the inadequate preparation for digital transformation. New technologies, like the Internet of Things, calculation of large volumes of data (Big Data), artificial intelligence (AI) and machine self-learning will fundamentally alter the production paradigm and the business as a whole. The understanding and widespread use of new technologies not only will change how customers perceive what "value" is but will also affect the way people work in the organization.

Acknowledgements
The author/s would like to thank the Research and Development Sector at the Technical University of Sofia for the financial support.

References
[1] Europe lags behind digital transformation, https://www.capital.bg
[2] Lambert S, A 2008 Conceptual Framework for Business Model Research, published on the official website of Maribor University, http://ecom.fov.unimib.si/proceedings.nsf/0/1e893ee544d680fec12574810042ac2d/$FILE/22Lambert.pdf, c.c. 1-13
[3] Lang J., and the Cambridge Entrepreneurship Center 2002 The High-Tech Entrepreneur’s Handbook Pearson Education Limited, UK, p.12
[4] Pavlov D 2011 The Business Model - an element of a system of management tools, Publishing „A Group”, ISBN 978-954-8039-10-9
[5] Osterwalder A 2004 The Business Model Ontology – a Proposition in a Design Science Approach, dissertation work, published on the official website of the University of Lausanne, f. 11-23, available at: http://www.hec.unil.ch/aosterwa/PhD/Osterwalder_PhD_BM_Ontology.pdf
[6] Shatarova D, Zlatanova-Pazheva E 2017 Human resources in the digital age – trends and challenges, Scientific Session "Days of Science 2017" of the USB - Plovdiv
[7.] Weill P, Woerner S 2018 What’s your digital business model ? Harvard business review press, Boston, Massachusetts 02163, ISBN: 978-1-63369-270-1
[8] Alexieva V, Vyleva K 2018 Digital transformation of Bulgarian enterprises in the conditions of industry 4.0 Scientific papers at VUSI, international scientific conference "Security and Economy in the Uncertain World - Dilemmas and Challenges"
[9] Gigova T 2015 Dynamics of technological development Journal of the Technical University – Sofia Plovdiv branch, “Fundamental Sciences and Applications” Vol. 21, 311-314, ISSN 1310-8271
[10] Project DIGITRANS, https://digitrans.me/
[11] Digital Business Maturity Model: The future of #DigitalBusiness, https://blogs.salford.ac.uk/