

Digital Transformation Playground Operationalization – How to Select Appropriate Technologies for Business Improvement Initiatives

Martina Tomičić Furjan, Igor Pihir and Katarina Tomičić-Pupek

University of Zagreb, Faculty of Organization and Informatics,
Pavlinska 2, 42000 Varaždin, Croatia
martina.tomicic@foi.hr; igor.pihir@foi.hr; katarina.to-
micic@foi.hr

Abstract. Digital transformation (DT), as one of the contemporary paradigms, means a radical change in the way of doing business and is motivated through the need to adapt to the digital age. Organizations try to add or create new value for their customers by innovating existing or developing new business models and designing new products and/or services, implementing and using thereby new modern digital technologies. The selection of appropriate digital technologies, which are supposed to enable the desired business change, is addressing different challenges. Main reasons that make the decision hard are that not all technologies are suitable for every business change and that some technologies are emerging and bring great impact on improvement in some industries, while the same technology in another industry can be widely in use or presents already a standard. This paper is aimed to give guidance on how to select one or combination of several appropriate technologies for steering the digital transformation process towards creating the most innovative ideas for better way of doing business, by operationalizing a framework of DT related concepts called Digital Transformation Playground.

Keywords: Digital Transformation, Digital Transformation Playground, Digital technologies.

1 Introduction

Digital transformation (DT) of enterprises implies radical rethinking in technological and business ventures. “The main goal of DT is to change organizations by implementing contemporary technologies and introduce new business processes in order to create new or improve existing products and services and deliver them to the global market faster, cheaper and in new innovative ways” [1]. The concept of DT could be seen as a turning point that rapidly changes the world and affects all spheres of human life. Thereby, digital transformation is not (only) about technology, it could be presented as a new paradigm of continuous change endeavour and as a reaction to disruptions and

opportunities in the digital age, made “by creating new business models, which define the way how an organization provides value to the customers” [2].

Companies need to introduce optimal solutions and systems to in order to stay competitive, survive on the market and ensure better labour productivity as well as to comply with the new customer expectations of how to do business. In addition, they need to be fully aware of the challenges of their new business models and prepare themselves for constant changes and modifications, in order to avoid lagging behind the competition. This could be done by having in mind the key determinants of DT: 1. Strategy orientation – vision, management, leadership; 2. Customer centricity; 3. ICT and process infrastructure; 4. Talent, capability and capacity strengthening and 5. Innovation culture and organizational commitment, explained in [1], which guide organizations in improving their digital maturity and lead them in digitally transforming themselves. Studies show that focus on IT-enabled processes could help companies to overcome challenges of fast changing customer needs, struggle with international competition and ever faster technological change [3].

DT determinants can help identify what digital transformation is about, while key drivers of digital transformation describe the main moving power to start digital transformation process. According to [2], DT can be Customer, Technology and Organizational development driven, influencing directly Commercial model of business (by Customer), Value proposition (by Technology) and Operational model of business (by Organizational development).

Technology application in digital transformation ventures has a twofold role:

- 1) it forms the backbone of new opportunities for process improvement and innovation in the business model, but also
- 2) it is the cause of numerous challenges in its implementation.

In general, digital transformation and its importance for society in broader sense is often misunderstood, especially in general population, but sometimes even in professional IT circles [4]. This is shown in some technology-applications reports, which indicate that there is a need to understand potential problems related to technological aspects. Al-Ruithe et al. [5] reports on application of cloud computing and problems like: inadequate financial benefit, immature cloud computing, privacy issues / legal issues, and especially the place where the actual business or private citizen’s data are stored. Other authors experienced that blockchain technology is facing lack of skills to manage it, insufficient awareness of it and assessment of benefits in real process operation [6]. Digital transformation of trading, related to Internet commerce, is mostly concerned with the reduction of direct contact to customer or full absence of face-to-face contact with end users [7]. Also, typical problems in digital transformations are challenges related to information security and privacy, especially in field of adopting Internet of Things (IoT) technology [8]. Similar problems to the ones related to cloud computing arise with use of big data in DT such as loose definition of rights when managing business data [9]. Further research into the application of emerging technologies across industries as well as applications in society and smart cities can be found in papers [10], [11], where an overview of technologies and case studies of their application in digital transformation is made.

Altogether, there are numerous opportunities and challenges that DT brings. Since DT is an emerging, developing and promising field of research, the authors of this paper act together as a research team and work on different research projects, within a Business Process Management and Digital Transformation Laboratory [12] with the goal to explore and analyse DT-related opportunities and challenges.

Westerman et al. [13] states that “New digital technologies can fuel innovation and improve company’s performance, but only if applied in the right places“. The latest research topics of the authors are the “right places” and the “right ways” while innovating the business by implementing a DT initiative. They can be identified with help of a new framework, developed in previous work and called Digital Transformation Playground (DTP) [1].

There are several other approaches to the way of identifying, selecting and/or implementing the right business and technological improvement initiatives defined in existing literature. The Digital transformation roadmap [14] navigates organizations to digitally transform through a set of activities, grouped into 5 phases, whereby each of these phases has a defined goal and questions that are supposed to be answered through the results of the performed activities. Digital transformation compass [13] is a tool that should guide companies through DT, and it was created from existing practices that have been established by the ‘digital masters’ i.e. companies that are using digital processes to improve their business. Business engineering navigator [15] describes the changes in organisations through definition of the As-Is state, analysis of processes and creation of the To-be state on strategic, organizational and IT level, needed for a proper business transformation. The ability of the organization to start a DT initiative can also be evaluated by using a digital maturity model, developed in [16], which helps the organization to assess their digital maturity in 9 different dimensions/maturity criteria and steer DT activities toward improvement of the identified “weak” or low level valued dimensions. Digital transformation framework [17] supports the company in formulating an appropriate digital transformation strategy, which help the organization to focus on the transformation of products, processes, and organizational aspects of a business with an emphasis on the customers, their expectations and needs. A small and medium enterprises specific methodology was developed within an international project named Digital Transformation in the Danube Region, with the aim to support SMEs in the development of digital business models by offering targeted blended learning trainings [18].

This paper combines Vortex-behaviour within the Digital Transformation Playground in order to provide guidance on how to provoke digital transformation and select thereby the “right” technology for the “right” business improvement initiative. In that context the DTP Vortex should direct the digital transformation process and bring out the most promising ideas for the better way of doing business. After this introduction, the DTP Vortex is presented and a process model of DTP Vortex appliance is given, followed by identified instruments to “play” and the conclusion with further research indications.

2 Digital transformation playground Vortex

DT changes the way how businesses perform their processes. New approaches, frameworks, methodologies, strategies and case study researches, related to DT, are aiming to help businesses to digitally transform, create new value for customers, improving thereby their business results. This improvement, in the digital age, always refers to the use of one or several suitable technologies for supporting processes engaged in the digital transformation, whereby all these technologies are oriented towards making the organization “future-ready” [19], [20].

As already mentioned in the introduction part, the authors of this paper developed a Digital Transformation Playground (DTP) representing a framework of concepts related to digital transformation [1]. The framework is divided into three parts, namely *Business related concepts*, *Other ICT /digitalization concepts* and *Mainstream concepts*, and it is supposed to help organizations to select an appropriate technology or their combination, taking into account business transformation and improvement of their business processes. *Mainstream concepts* represent already traditional technologies in most industries, while *Other ICT and digitalization concepts* enable industries, or organizations within, to become leaders in their domain. The position of each technology or concept within the DTP is industry and business related, highly depending on their susceptibility to digital disruption [21], so *Other ICT and digitalization concepts* may have an emerging status in some industries, and mainstream in others.

Typical advocating case for analysing the status of technologies can be found in following examples: augmented reality has become a standard i.e. Mainstream technology for various innovations in the automotive and tourism-related industries, but at the same time this technology is still quite emerging in Retail [22]. Beside few similar industry reports about how technologies can add or create value in Industries, scientific studies on technology appliance across industries also scarcely report about this in an explicitly manner, which reinforces the attitude of “try, try, try and try some more until you can play for real”.

In Figure 1 the initial version of the DTP is complemented with a spiral, representing a Vortex-behaviour in running one or several cycles in using the DTP for selection of the appropriate technology.

It is important to notice that the concepts listed in each three parts of the DTP are not comprehensive, but their purpose is to show examples of their placement in relation to other elements in the DTP.

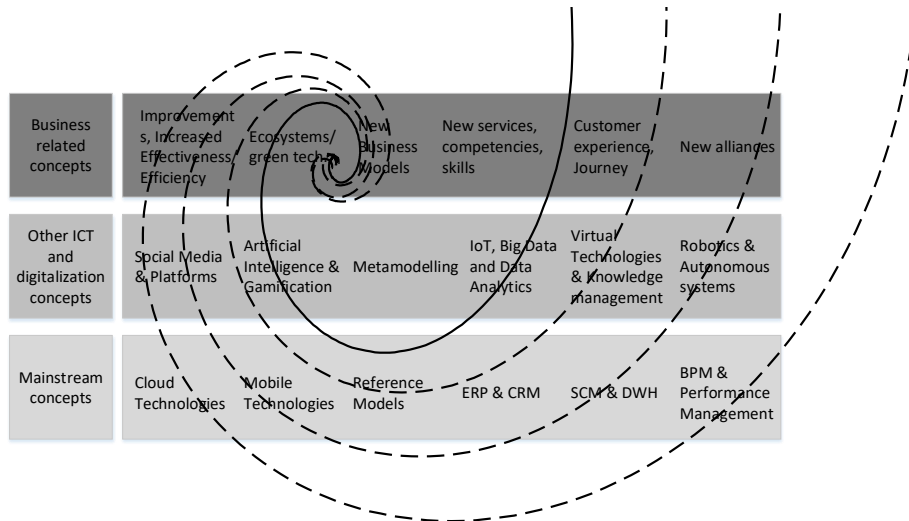


Fig. 1. Digital transformation playground Vortex, modified from [1]

Business related concepts imply any idea of business improvement, arising from the organizational need to work better. Some existing trends in business improvement, listed in the DTP are: development of new business models, accomplishment of new alliances, forming of new ecosystems, creation of added value through new products or services, improvement of customer journey and experience, and similar. Business related concepts are the starting point for selecting the right technology, and the assessment of the business related concept that is aimed for business improvement in the first planning cycle means the determination of the organizational processes, resources, skills and capabilities in the As Is and To Be state.

Once the initial business improvement initiative is chosen, *Other ICT and digitalization concepts*, representing emerging technologies within the industry of the business that is going to be improved, have to be analysed, in order to determine which of them have the potential to be chosen for implementing it.

All emerging technologies usually imply some existing underlying *Mainstream concepts*, already in use within the industry, again for accomplishing the assessed business related concept. These mainstream concepts are the prerequisite for the corresponding emerging digitalization concept, so the selection of the emerging technology (or technologies) depends on the ability of the business (that is going to be improved) to use or acquire the mainstream technology needed. It is the upgrading and combining of the mainstream technologies with emerging concepts that is going to lead to the implementation of the desired business related improvement.

The described analysis and/or selection of concepts is representing one spiral on the DTP. It is complex and acquires a lot of organizational efforts and use of resources prior to the actual digital transformation. But it can get even more complex. Namely, every “move” on the DTP can lead in multiple directions. The assessed business related concept can sometimes be accomplished through several emerging technologies. Also, each emerging ICT and digitalization concept can have several underlying mainstream

concepts. Each mainstream concept can also be underlying for different other emerging concepts, and they can again lead to new ideas for improvement and new business related concepts. This means that the initial spiral has a potential to get wider or multiply several times, involving thereby other “technology” related concepts into the accomplishment of selected business related concept(s). This can be identified as a vortex-behaviour, defined in [vortex] as chaotic, pulling all the objects on the line towards the centre, whereby the “objects can collide, break apart and recombine, as they converge toward the centre”. Since the attitude of “try, try, try and try some more until you can play for real” becomes an imperative, that is the reason the DTP Vortex is not a closed one-line loop, but it can have several alternative loops, showing the complexity of the “Play”.

3 Process model of “playing” on the DTP

A process model for “playing” on the DTP, shown in Figure 2, is developed as a BPMN process model using BizAgi Modeler [23].

The process starts with the decision to start playing by *Planning the future development through business related concepts for DT*. This activity is dealing with the analysis of existing organizational processes, resources, skills and capabilities, as well as determining the future vision and strategic development direction through definition of strategic goals related to the selected new business improvement concept.

Since DT always implies the use of digital technologies, available options for “moves” on the DTP are next to be seen through *Exploring industry-effective emerging technologies applicable for achieving the planned business related concept*. For this analysis, available literature and industry related researches can be consulted, like Gartner’s Hype cycle analysis about the maturity of digital technologies [24] and other existing evaluations of Industry 4.0. technologies like in [25], [26] and [27].

After selecting an emerging technology that has the potential to help implementing the business related concept, next “move” determines what it takes to win the game by *Analysing the mainstream technologies for achieving the planned business related concept*. As stated in [28] “there are clear indications that the configuration and functionality covered by classical ERP and CRM systems will change and the same change is expected for enterprise architecture methodologies for their design and development”, so it is necessary to analyse the existing organizational legacy systems.

If the mainstream technologies needed are available within the organization, then it is time to use them and *Select promising own mainstream technologies for achieving the planned business related concept*. If the mainstream technologies needed are not available within the organization, then it is time to get what is needed and *Acquire minimum mainstream technologies requirements*.

These mainstream technologies are going to be upgraded and/or combined with industry-effective emerging ICT / digitalization concepts, once they are *Evaluated for achieving the planned business related concept* - once or through *Performing* multiple iterations of *Evaluating technologies*.

When one or the combination of technologies that is contributing to the achievement of the planned business related concept(s) has been found, the game is finished and won by *Predicting the impact on business related concept for DT*. If the evaluation of technologies resulted with a new improvement idea, a new game can be started.

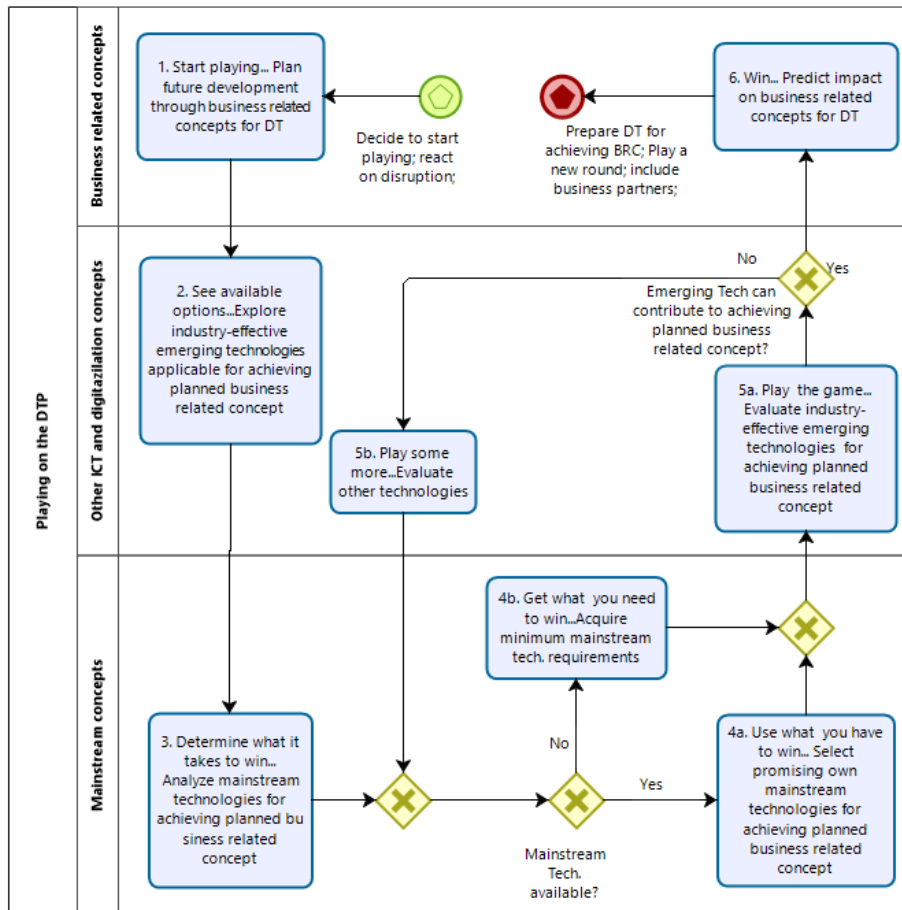


Fig. 2. Playing on the DTP

In order to “play” on our playground framework, a set of instruments that can help in performing the activities from the process model is suggested in Figure 3. Basic keywords are listed in grey rectangles, while most common or known methods and techniques are given in light blue rectangles, whereby some activities can use same instruments (4a. & 4b., or 5a. & 5b.).



Fig. 3. Instruments for playing on the DTP

Some of the listed instruments for playing on the DTP are well known in the field of business and ICT development and are used already for decades (like Maturity models, ICT and Data infrastructure or Feasibility analysis), while others (such as Digital compass, Digital twins or Industry 4.0.) are created or identified recently and are related specifically for the Digital transformation age. The instruments should always be revised when applying them in a real business case.

4 Conclusion

Business improvement initiatives in the digital age implicate the integration of digital technologies with the goal of carrying out and enforcing the desired change. The selection of technologies, that are appropriate for the planned business improvement initiative and which enable the digital transformation, is usually not an easy task. It can be seen as opportunity or as a challenge, due to the fact that the technologies of the 4th industrial revolution are highly industry dependent and require different prerequisites in order to be implemented.

A variety of approaches, methodologies and frameworks related to digital transformation has arisen as a research field due to research community's efforts to find a way how to assist businesses to digitally transform their work and/or the results of it.

In this paper, a guidance that is aimed to help organizations in selection of appropriate technologies is given, represented and explained through the Digital Transformation Playground Vortex and the Process model of "playing" on the DTP. Its initial operationalization is concretized through Instruments for playing.

Although the presented work is in its early stage of research, it represents the first step in achieving one of the main goals of the authors' ongoing work, which is to create a methodology that is going to help organizations to handle their DT initiatives and that will be supported by an appropriate software tool. The tool will enable generation and work with domain-specific models, used for DT related decision making and implementation. It is going to be developed in an open and upgradable environment, within the Open Models Laboratory (OMiLAB) [31], in accordance to the OMiLAB lifecycle [32]. The identified Instruments to play (which will be updated with new ones throughout the research process), are the foundation for the tool's building blocks, whereby existing tools within the OMiLAB will be analysed and, if applicable, integrated into it.

Further operationalization of the DTP, as the next step within this process of methodology creation, is planned through analysis of its practical utility. In order to demonstrate the "Game" and give proof of concept for the described procedures, case studies analyses are in progress, as well as additional research and experimentation for supporting the framework's use.

Acknowledgement

This research has been conducted as part of the wider research in the project Development of innovative platform for digital transformation of enterprises (RDI) which is funded by European Union through the European Regional Development Fund (ERDF).

References

1. Pihir, I., Tomičić-Pupek, K., Tomičić Furjan, M.: Digital Transformation Playground - Literature Review and Framework of Concepts. *Journal of Information and Organizational Science* 43(1), 33-48 (2019).
2. Hrustek, L., Tomičić Furjan, M., Pihir, I.: Influence of Digital Transformation Drivers on Business Model creation. In: *Proceedings of the 42nd International Convention MIPRO*, pp. 1509-1513. MIPRO, Opatija (2019).
3. Lederer, M., Knapp, J., Schott, P.: The Digital Future Has Many Names, How business process management drives the digital transformation. In: *Proceedings of the 6th International Conference on Industrial Technology and Management*, pp. 22-26. IEEE, Cambridge (2017),
4. Khitskov, E., Veretekhina, S., Medvedeva, A., Mnatsakanyan, O., Shmakova, E., Kotenev, A.: Digital Transformation of Society: Problems Entering in the Digital Economy. *Eurasian Journal of Analytical Chemistry* 12(5b), 855-873 (2017).
5. Al-Ruithe, M., Benkhelifa, E., Hameed, K.: Key Issues for Embracing the Cloud Computing to Adopt a DT: A study of Saudi Public Sector. *Procedia Computer Science* 130, 1037-1043 (2018)
6. Hossain, S.A.: Blockchain Computing: Prospects and Challenges for Digital Transformation. In: *Proceedings of 6th International Conference on Reliability, Infocom Technologies and Optimization (ICRITO)*, pp. 61-65. Amity University, Uttar Pradesh (2017).
7. Ianenko, M., Ianenko, M., Huhlaev, D., Martynenko, O.: Digital transformation of trade: problems and prospects of marketing activities. In: *Proceedings of IOP Conference Series: Materials Science and Engineering* 497(1), pp. 1-5, IOP Publishing (2018).
8. Mendhurwar, S., Mishra, R.: Integration of social and IoT technologies: architectural framework for digital transformation and cyber security challenges. *Enterprise Information Systems*, 1-20. (2019).
9. Pereira, J.L., Belo, O., Ravesteijn, P.: Special Issue on Big Data and Digital Transformation. *Journal of Grid Computing* 16(4), 531-533 (2018).
10. Kutnjak, A., Pihir, I., Tomičić Furjan, M.: Digital Transformation Case Studies Across Industries - Literature Review. In: *Proceedings of the 42nd International Convention MIPRO*, pp. 1293-1298. MIPRO, Opatija (2019).
11. Tomičić-Pupek, K., Pihir, I., Tomičić Furjan, M.: Smart City Initiatives in the Context of Digital Transformation - Scope, Services and Technologies. *Management-Journal of Contemporary Management Issues* 24(1), 39-54 (2019).
12. Business Process Management and Digital Transformation Laboratory Homepage, <https://www.foi.unizg.hr/en/about-us/departments/bpm-dt-lab>, last accessed 2019/08/20.
13. Westerman, G., Bonnet, D., McAfee, A.: *Leading Digital – turning technology into business transformation*. Harvard business review press, USA (2014).
14. Schalmo, D., Rusnjak, A.: Roadmap zur Digitalen Transformation von Geschäftsmodellen, In: D. Schalmo et al. (eds) *Digitale Transformation von Geschäftsmodellen*. pp. 1-31. Springer (2017).
15. Winter, R.: *Business Engineering Navigator: Gestaltung und Analyse von Geschäftslösungen "Business-to-IT"*. Berlin: Springer-Verlag Berlin Heidelberg, (2011).
16. Berghaus, S., Back, A.: Gestaltungsbereiche der Digitalen Transformation von Unternehmen: Entwicklung eines Reifegradmodells. *Die Unternehmung*, 70 (2). 98-123. (2016).
17. Matt, C., Hess, T., Benlian, A.: Digital Transformation Strategies, *Business and Information Systems Engineering*, 57(5), 339–343. (2015).
18. Digitrans.me, <https://digitrans.me/psm/home?lang=en>, last accessed 2019/08/20.

19. Ross, J.: Digital Is About Speed — But It Takes a Long Time. MIT Sloan Management Review (Online), <https://sloanreview.mit.edu/article/digital-is-about-speed-but-it-takes-a-long-time>, last accessed 2019/08/23.
20. Weill, P., Woerner, S.L.: Is Your Company Ready for a Digital Future? MIT Sloan Management Review 59(2), 21-25 (2018).
21. Loucks, J., Macaulay, J., Noronha, A., & Wade, M.: Digital Vortex – How today's market leaders can beat disruptive competitors at their own game. International Institute for Management Development, Switzerland (2016).
22. Bird, D.: How Emerging Technologies Are Impacting Industries, <https://medium.com/swlh/how-emerging-technologies-are-impacting-industries-b85afc14b5d>, last accessed 2019/08/23.
23. BizAgi. Bizagi Modeler version 3.1., <https://www.bizagi.com/en/products/bpm-suite/modeler>, last accessed 2019/08/01.
24. Gartner Inc.: Hype cycle research methodology. <https://www.gartner.com/smarterwithgartner/5-trends-appear-on-the-gartner-hype-cycle-for-emerging-technologies-2019/>, last accessed 2019/08/30.
25. Schwab, K.: The fourth industrial revolution. Portfolio penguin, UK (2017).
26. Roedder, N., Dauer, D., Laubis, K., Karaenke, P., Weinhardt, C.: The digital transformation and smart data analytics: An overview of enabling developments and application areas. In: IEEE International Conference on Big Data, pp. 2795-2802. (2016).
27. Betcho, N. K.: Digital Transformation and its impact on Human Resource Management: A Case Analysis of two unrelated businesses in the Mauritian public service. In: IEEE International Conference on Emerging Technologies and Innovative Business Practices for the Transformation of Societies (EmergiTech), pp.147-152. (2016).
28. Krizanić, S., Šestanji-Perić, T., Tomičić-Pupek, K.: The changing role of ERP and CRM in digital transformation. In: Tosovic – Stevanovic, A., Trifunovic, D., Maloletko, A. (eds.) 41st International Scientific Conference on Economic and Social Development, pp. 248-256. Belgrade (2019).
29. Osterwalder, A., Pigneur, Y., Bernarda, G., Smith, A.: Value proposition design. Hoboken, John Wiley & Sons, USA (2014).
30. Miron E.T., Muck C., Karagiannis D., Götzinger D. Transforming Storyboards into Diagrammatic Models. In: Chapman P., Stapleton G., Moktefi A., Perez-Kriz S., Bellucci F. (eds) Diagrammatic Representation and Inference Diagrams. Lecture Notes in Computer Science, vol 10871. Springer (2018).
31. Bork, D., Buchmann, R.A., Karagiannis, D., Lee, M., & Miron, E.: An Open Platform for Modeling Method Conceptualization: The OMiLAB Digital Ecosystem. Communications of the Association for Information Systems 44, 673 – 697. (2019). <https://doi.org/10.17705/1CAIS.04432>
32. Karagiannis, D.: Agile modeling method engineering. In: Proceedings of the 19th Panhellenic Conference on Informatics, pp 5-10. (2015).