PREGLED OBSTOJEČIH ORODIJ ZA MERJENJE DIGITALNE ZRELOSTI

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Povzetek Evropska unija ima večletni načrt za spodbujanje gospodarstva na enotnem trgu skozi dvojni, zeleni, trajnostni in digitalni, prehod. Iz tega razloga je nastalo več akcijskih načrtov, namenjenih različnim ciljnim skupinam in področjem razvoja. Med najpomembnejšimi področji je spodbujanje razvoja malih in srednjih podjetij (MSP), ki predstavljajo večino vseh podjetij tako v EU kot tudi v Sloveniji. MSPji so se razvili iz obrtništva, ki se usmerjeno ukvarja s svojo panogo, digitalizacija in trajnostno poslovanje pa jim pri tem pogosto predstavlja dodatno breme. Kljub temu, pa se je potrebno zaveadati, da dvojno prehod predstavlja nujnost in hkrati prinaša vrsto priložnosti. Zato je EU razvila veliko število programov s katerimi pomaga in podpira MSPje. Pri tem pa je pomembno izmeriti trenutno digitalno zrelost MSP. Ko MSP izmeri svojo digitalno zrelost pred in po izvedenih korakih k digitalni transformaciji, lahko izmerimo učinek ukrepa na digitalno zrelost podjetja. V prispevku bomo predstavili različne pristope k merjenju digitalne zrelosti in pripravili primerjavo med različnimi orodji za merjenje digitalne zrelosti, ki so uporabljena na ravni EU.

Ključne besede:
digitalizacija,
trajnost,
digitalna zrelost,
orodja za merjenje,
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EDIH,
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The Overview and Comparison of Existing Digital Maturity Tools

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Abstract European union prepared a multiannual plan to encourage the economy on the internal market for double (green and digital) transition. That leads to many action plans dedicated to different target groups and development areas. Among the most important areas is encouraging the development of small and medium enterprises (SMEs), which represent most enterprises in the EU and in Slovenia. SMEs developed out of craftsmanship, which is traditionally focused on its industry and daily business operations. For many of them, digitalization and sustainability represent additional burdens. Nevertheless, we can recognize new opportunities in the double transition in EU programs. When SME measures its digital maturity before and after taking steps towards digital transformation, we can measure the effectiveness of the received support for increasing digital maturity. In the paper, we present different approaches and compare different tools for digital maturity assessment.

Keywords: digitalization, sustainability, digital maturity, measurement tools, DIH, EDIH, SME, EU

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1 Introduction

The rise of new digital technologies in last decade has built foundations for digital transformation of enterprises and societies (Pucihar, 2020). In addition, in recent years, the need towards green and sustainable transition has become urgent to minimize waste and pollution and to provide more rightful economic and social solutions and models. These needs are also reflected in various measures of policy makers. For example, also the European Commission emphasized that future competitiveness will depend on the ability to move towards sustainability, resource-efficiency, and (or we may even say with) the ability to exploit the advantages of digital technologies (European Commission, 2019). Based on opportunities of digital technologies, the concept of digitalization and digital transformation has become an important tool for green and sustainable transition.

However, beside the opportunities of digital technologies, many enterprises are facing challenges on their digital transformation journey and consequently green and sustainable transition (Pucihar, Marolt, Lenart, & Vidmar, 2021). This is evident from official reports as for example Digital Economy and Society Index (DESI) and as well as Integration of digital technologies index (part of DESI), both measured yearly by European Commission (European Commission, 2022). It is also noticed that SMEs in general lag behind larger enterprises. As SMEs represent majority of all enterprises in EU market (99%) (European Commission, 2019) the situation is alarming. SMEs represent a variety of different stakeholders, who has different values and culture, also regarding the environmental questions, because of their number, they are critical to the success of the green transition in the EU. As stated in the Annual report on European SMEs, they are currently responsible for around 60% of all greenhouse gas emissions by enterprises. SMEs distinguish from large enterprises as they tend to operate in a geographic and product niche, with limited diversification, and may have limited access to resources, including access to finance, expertise, skills, and human resources. In addition, SMEs are often owned and managed by the same person, and consequently depend on the ambitions, beliefs, and values of the owner-manager. Finally, SMEs have limited influence on the wider business environment (e.g., through lobbying or advocacy activities) and supply chains[1].

[1] SME AR 2021_22_Background_Document_Sustainability.pdf

To support digital and green transformation with proper actions and measures, enterprises and policy makers have to have an overview of current situation. There are various tools available to measure digital maturity of enterprises. These tools enable monitoring of organizational and technological development of a particular entity. Beside already mentioned DESI index, there are also other tools available, as for example multi-attribute decision models. One of them has been developed for particular needs of Digital innovation hub Slovenia (Kljajić Borštnar & Pucihar, 2021).

The paper emerges from the need for constant improvement of the digital maturity tool of DIH Slovenia, developed in 2021 for the needs of Slovenian SMEs. The tool is used to assess current digital maturity of an enterprise, which would like to participate in vouchering program for digital transformation. This program is carried out through DIH Slovenia. In addition, the tool also suggests the enterprise future steps for digital transformation evolvement and enables validation of national and international support and measures. The main motivation for this paper is to research the dimensions in which we can improve the digital maturity tool: whether there are any improvements on the measurements, which needs to be considered and secondly, to prepare the model for including also the green and sustainable indicators.

In the paper, we focus on the SMEs, which represent most of the European economy. Also the lowest digital index remains among the SMEs, where there are the largest number of enterprises with very low digital index (45%) (Pucihar, Mohar Bastar, & Lenart, 2022). In the paper, we define the digital maturity and the need to measure it. In the empirical part, we analyse and compare different digital maturity assessment tools. We conclude with discussion and future research and design steps.

2 Theoretical Background of Digital Maturity

Digital maturity is in the focus of research since the topic is closely related to digitalization and digital transformation, and it represents the main measurement tool to measure the development. For the guidance, we decided for the approach of the overview and analysis of what has been researched so far. With the focus on SMEs, we decided to consider specially the closely related literature. There are

different definitions in the existing literature and on websites from experts and consultants, preparing the digital maturity assessment tools.

As defined by Dieffenbacher (2022) Digital Maturity refers to an organization's ability to quickly respond to the developments and shifting trends of technology. The focus is on creating value through these new capabilities and consumer interests fast enough to have a competitive advantage over rivals. Digital Maturity requires investment in the tools and human resources that can best leverage new technology.[2]

Aslanova and Kulichkina (2020) researched different definitions of digital maturity from different authors and synthesised the definition: "The synthesized definition of digital maturity is an adequate reaction of a company on changes in the digital sphere, implementation of digital achievements into business processes as well as the development of staff's digital competences."

By Alsufyani and Gill (2021) maturity refers to the desired state or an abstract vision of reality that allows organizations to attain desirable outcomes. A maturity model may serve as a method to capture the concept of maturity in a setting through specified dimensions associated with their measures to estimate the degree of maturity.

Digital maturity is not the simple implementation of new technology to support company strategies, staff members, culture, technology, or structure to satisfy the needs of end users, employees, or stakeholders. It also cannot be achieved via fast actions or by accident. Rather digital maturity is attained through the uninterrupted process of adaption to a transforming digital landscape (Nasiri, Saunila, Ukko 2021; Kane et al, 2017).

The term "maturity" can be defined as "the state of being complete, perfect or ready" (Lasardi, Vatrapu, Andersen, 2015).

With the rising uptake of digital technologies and transformation, digital maturity models became indispensable tools for measuring success of the digital transformation. Assessing the maturity of digitalization reflects the degree of digital

[2] https://digitalleadership.com/blog/digital-maturity/#Digital_Maturity_Measuring_Tools

transformation in a company. (Alsufyani, Gill, 2021) Digital maturity can also be connected to business process capability, since standardized process capability/maturity models and standards, provide a structural process assessment framework for improvement of software development and related management processes. Market dynamics is constantly changing and so must the organizations if they want to survive and compete on the market (Gokalp, Martinez, 2021).

In larger enterprises, digital maturity is a part of the organizational maturity. Main difference from previous transformations is that digital transformation is not linear and at the beginning of the process, it is impossible to predict where exactly the path will go. Given the complexity of digital transformation, enterprises must implement a varied set of strategies, resources and operational routines and practices to obtain successful outcomes. One of those is also digital maturity, which is long and uninterrupted process, covering technology, culture, company strategies, staff, and end user's needs (Nasiri, Sunila, Ukko, 2022).

Digital maturity assessment is one of the most important indicators to measure the success of digital transformation of individual company.

Synthesis of definitions above can be that digital maturity assessment helps organizations understand their current level of digital capabilities and identify areas for improvement. By assessing their technology infrastructure, processes and personnel, SMEs can identify where they need to invest resources to become more efficient, effective, and competitive. It helps organizations to understand the level of their digital readiness and identify the areas that need improvement to achieve their business goals.

One of the most important potential advantages presents the database of responds from SMEs - if data is available for analysis and the analysis is accessible to policy makers, there is a potential for preparing effective measures with the knowledge about the target areas for SMEs development.

The measurement must be done before and after SME receives public intervention and therefore the effect of the intervention can be measured. In this case individual intervention can be adjusted to the real needs of the SMEs. SMEs lack resources (budget, knowledge, time), so they need support, the type of the support can be

determined by the Digital maturity measurement (Borštnar Pucihar, 2021, European Commission, 2022).

On the other hand, the digital maturity anonymized, and aggregated data can be analysed and in case of database on national level, the policy makers can measure the SME development level through digital maturity.

3 Methodology

The research aim of this paper was to prepare the comparison of existing digital maturity tools, for which the theoretical overview was prepared to deepen understanding of the digital maturity measurements and map the existing research. Both Scopus and Web of Science were searched to get insights of the most recent research conducted in the years from 2020 and 2022.

Queries were executed in January 2023 in Scopus and Web of Science with keyword: "digital maturity" or "digital maturity assessment tools".

For the relevant discussion, we checked the existing research on the field of digital maturity theory with the following criteria:

- Articles describing digital maturity models,
- Articles discussing digital maturity assessment,
- Articles researching literature on the digital maturity,
- European programs, definitions and guidance regarding the digital transformation programs and digital maturity.

4 Results

In 2021 DIH Slovenia with partners University of Maribor, Faculty for organizational sciences and Arctur, software engineering enterprise, developed the digital maturity self-assessment tool. The tool is used for SMEs aiming the assessment of measures of DIH Slovenia, which are offered to SMEs through its activities.

In 2021, the description of the digital assessment tool methodology from DIH Slovenia is provided by the article Multi-Attribute Assessment of Digital Maturity of SMEs (Borštnar, Pucihar, 2021). The paper describes the background theory from both literature review and the outcomes from the expert group, and the model description, containing hierarchical tree of attributes, domain values definition, utility functions and the model validation on the real -life cases. In the digital maturity cases analysis, the assessed value, derived by the model is explained in the manner, which helps the SME with digital transformation. With describing strong and weak points the model shows the possibilities for development to gain higher digital maturity. The aim of development of comprehensive multi-attribute model to assess different levels of digital maturity of an SME on Slovenian national market.

Since the development of the model is ongoing, same authors prepared the update for the model in 2022 and described it in the document Update of Existing Model for Self-assessment of Digital Maturity and Preparation of Wholesome Analysis of the State of Digital Maturity of Slovenian SMEs. (Borštnar, Pucihar, 2022) where the latest developments are described. Main developments tackled the check of existing criteria and supplementing some of them with criteria that affect the assessment of the level of digital maturity after 2 years of the development of the initial model. The update also includes development of measurement scales for newly defined criteria and development and adjustment of the rules for the markings of all combined criteria in model, including the rules for development of the final digital maturity level. The validation of the model has been done on 15 SMEs.

During the investigation for the paper, 8 digital maturity assessment tools were identified, which are described following in the paper. For the baseline model we chose the model from DIH Slovenia, because we would like to improve it in two main dimensions: whether there are any improvements on the measurements, which needs to be considered and secondly, to prepare the model for including also the green and sustainable indicators.

At first, we compared it to the official tool made by European Commission for the obligatory usage of all included SMEs into EDIH programs to measure, how much the SMEs and other included entities have digitally developed though the services offered from EDIH. Another tool was as well meant to help Baltic EDIHs, therefore we expected many similarities. Fourth tool that we investigated was the

digital maturity assessment tool for the non-profits, which is also offered free of charge for the non-profit organizations, but it was convenient for test, because it was freely available.

Further, we have inspected the British health system digital maturity tool, which model is the most precise, but their target group are the health system entities in the British health system. Next, we compared also the three tools, made by consulting companies Deloitte, Mendix and Domont Consulting. Consulting companies usually use these tools as a first step of their consulting services. In addition, enterprises also get the service of interpreting the results and consulting on further steps. Therefore, these tools are not freely available. For the need of analyses of these consulting tools, we used the presentations available on their websites.

The comparison of the digital maturity assessment tools based on their purpose is presented in the Table 1. Comparison among the areas of investigation – assessing dimensions of digital transformation is presented in the Table 2.

Table 1: Comparison of the digital maturity assessment tools based on their purpose

Owner/ producer	Purpose of the tool	Methodological approach	Target audience	Output and border conditions
DIH Slovenia	Effect of the state aid intervention	Tool – DEX methodology	SMEs	Automatically generated report with tips to enhance the digital transformation processes. Free of charge, in Slovenian language.
EC – EDIH DMA	Effect of the state aid intervention; impact of EDIH services	Questionnaire (various types of measurements – choose which statement describes the best, yes/no..)	SMEs and public administration	Automatically generated report on the current state. Free of charge, in English.
DMA Innocape	Ranking the enterprises in the region to see where it stands	Questionnaire (choose the intensity of agreement)	SME Baltic region	Automatically generated report – website; directing to the nearest hub or partners. Free of charge, publicly available, in English language;
Digital Maturity assessment by Digital leadership Ltd, UK	Help non-profits work better through digital	Questionnaire (choose which statement describes the best)	Non-profits	Tips on improving your maturity are sent on request; Free of charge, publicly available, in English language;
Digital maturity self-assessment by NSH 75 England	For health institutions in England to measure their digital maturity	Model: Readiness, capabilities, infrastructure (179 criteria)	Health institutions	Available for health institutions in England
Deloitte	Enables business leaders to assess where they are, create goals and plans, support to decide on investments	Model, 179 digital criteria	Industry	Consultancy service, results as a part of the payable wider service for helping the enterprises in the process of digital transformation.
Domont Consulting	One of the steps in the Digital transformation toolkit, to define current state and target state	Model	Industry	Consultancy service, results as a part of the payable wider service for helping the enterprises in the process of digital transformation.
Mendix	For companies to help them measure digital transformation success in their business.	Questionnaire (1-10)	Industry	Consultancy service, results are sent via email, payable.

Table 2:Comparison of digital assessment tools based on assessing dimensions of digital transformation

Owner/ producer	Technologies (AI, IoT, Cloud..)	IT (equipment, ERP, CRM..)	Digital business model and strategy	HR	Culture	Management and organization	Green digitalization	Other elements
DIH Slovenia	✓	✓	✓	✓	✓	✓		
EC – EDIH DMA	✓	✓	✓	✓	✓	✓	✓	
DMA Innocape	✓		✓	✓		✓		Innovation;
Digital Maturity assessment by Digital leadership Ltd, UK	✓	✓		✓	✓	✓		Innovation;
Digital maturity self-assessment by NSH 75 England	✓	✓	✓	✓	✓	✓		
Deloitte	✓	✓	✓	✓	✓	✓		
Domont Consulting	✓		✓	✓	✓	✓		Cybersecurity, marketing, brand management
Mendix	✓		✓	✓		✓		

5 Discussion and Conclusions

In the paper, we compared 8 digital maturity assessment tools. The main purpose of this research was to compare existing digital assessment tool, used in DIH Slovenia with other available assessment tools and investigate, if there are any other dimensions or elements that should be added or possibly excluded in existing model. As we compared only limited number of existing digital maturity assessment tools, the research results are limited. However, the results serve as a first information for future development of DIH Slovenia assessment tool.

From the observation of eight different digital maturity assessment tools, we can conclude that the purpose of measurement is that enterprise can see where they stand currently compared to its competition in different dimensions (Dieffenbacher, 2022). However, most of the tools also assumes the target state, where enterprise or institution see itself in the short term. Only one of the tools, DMA prototype from European Commission, is also interested in the green digitalization, which is also the aim of the upgrade of the tool from DIH Slovenia.

Comparison of the tools (depends on complexity, length and methodology of the tool or questionnaire) has shown that all the observed tools investigate the following dimensions: Business and digital strategy, Culture and people or organization and Technology. Depending, whether the tool is designed as a decision model or a questionnaire, we can investigate the structure of questions and all the details, which are included into individual questionnaire.

It can also be noticed that those tools, which were designed and are provided with public funding, can be used free of charge. After evaluation, the automatically generated reports are provided. On the other side, the tools from larger consulting enterprises are usually a part of digital transformation consulting service and therefore not freely available. In this case, the shorter version of results are provided by email, together with an offer for consulting services. In this case, it is also much harder to get the access to the questionnaire or the tool. For the investigation of two cases, only presentations were publicly available.

Results of our research have shown that one of the dimensions that should be revisited and updated is digital technology. As digital technologies are under constant development, this dimension of existing tool should be carefully analysed and updated according to evolvement of digital technology. Furthermore, it would be important to enable comparison of the results from digital assessment tool with results from DESI index, more precisely with digital intensity index. Therefore, next steps should be focused to align the criteria in existing models with digital intensity index.

Secondly, the needs for the usage of the digital maturity assessment tool in DIH Slovenia are developing constantly as well. Even in the early stage the call for digitalization of the large enterprises through Recovery and Resilience Facility

(RRF), predicted the digital maturity assessment of the large enterprises through existing tool. As existing tool is focused to SMEs and therefore the adjustments were needed. In similar cases, we need to consider different needs and requests from the policy makers, to adjust the tool accordingly.

We are also considering two directions for future use – the EDIH in-depth measurement for the users of EDIH services, and the national interest for the measurements of the digital transformation and additional information for European DESI index. At the same time, the tool gives us the decision support for the existing measures, since the assessment prior the intervention and the other after it, gives the policy makers clear picture on the effectiveness of the state aid intervention.

When considering the future developments of the tool and forthcoming trends, at one point we should include green and sustainable indicators and the connection between green, sustainable, and digital transformation, to integrate both the data collection and the perception of enterprises regarding double transition.

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