



## Utilization of Elements of Digital Transformation in Project Management: A comparative study

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### Abstract

Improving effectiveness and efficiency in project management (PM) in today's world with digital transformation (DT) being omnipresent is a serious and important challenge for today's organizations.

The motivation for this study stems from the fact that organizations are increasingly project-based and require performant and effective PM, however, the possible impact of DT elements has not been investigated yet. The purpose of this paper is to provide academia and practitioners with appreciation of DT elements as useful factors that help project managers to execute their work more efficiently. As part of a larger research project (doctoral thesis), this paper suggests disassembling the phenomenon of DT in elements and analyze their role in the realm of PM. The previous research stage identified DT elements that may have the ability to impact project success. On this basis, an online questionnaire was conducted to examine different aspects of the relationship between DT elements and PM.

With more than 400 answers from project managers, clients and other stakeholders, a rich empirical data basis for various analyses emerged. First analysis shows that the choice DT elements can be efficaciously utilized either on project level, or on the level of project environment (typically organization level). This paper presents exemplary the relationship between utilization of DT elements and PM depending on project success criteria, the respondent's role in PM and the geographical region via comparative analysis.

The research makes its contribution to the body of academic knowledge by suggesting a structured basis of DT elements and revealing their role in project management practices. For practitioners, the study offers an overview and a better understanding of DT elements that may help during project execution.

**Keywords:** *digital transformation, elements of digital transformation, project management, project success*

**JEL code:** H43, O22, O33.

### Introduction

Digital transformation is on everyone's lips and increasingly gaining speed. At the same time, increasing projectification (Midler, 1995) makes organizations become increasingly project-based (Kwak, Sadatsafavi, Walewski, & Williams, 2015; Miterev, Mancini, & Turner, 2016; Packendorff & Lindgren, 2014). In project-based organizations "the majority of products made or services supplied are against bespoke designs for customers" (Turner, & Keegan, 2001, p. 256) which requires performant project management (PM). With the ongoing development of digital tools and methods, and thus increasing of organizations' digital maturity, the way of working and co-working continues to change incrementally and leaves organizations and project managers with the question how to benefit from digitalization in practice (Parviainen, Tihinen, Kääriäinen, & Teppola, 2017).

In the realm of PM there is a growing need to understand how to exploit elements of digital transformation (DT) to increase PM efficiency (Project Management Institute, 2018). PM performance, as a combination of effectiveness and efficiency (Kerzner, 2011) and a relevant contributor to project



success (Turner, 2009), is crucial for the achievement of organizational goals and their ability to survive and successfully compete. Despite this importance, the possible impact of DT on PM success has not yet been elucidated in the academic literature.

The present research is targeting at bridging this research gap. As a part of a larger research project, namely a doctoral thesis, this paper sheds light on DT elements (EDTs) in the realm of PM. To begin with, it explores the body of literature to derive and categorize DT elements that may have the ability to increase PM success. Later, the relationship of EDTs and PM is closer analyzed based on data collected through an online questionnaire.

The research questions (RQ) are the following:

**RQ1:** *What elements of digital transformation exist and could be relevant for project management?*

**RQ2:** *How utilization of elements of digital transformation impacts project management?*

**RQ3:** *What factors can moderate this impact?*

The RQ 1 was already answered in the earlier paper (Nemirovski, & Kaul, 2020).

The present paper answers the research questions 2 and 3.

The subsequent research will attempt to further discover the impact of EDTs on project success.

## Literature review

The contemporary business world is highly projectified. Project-oriented and project-based organizations are becoming increasingly popular in the recent time (Turner & Miterev, 2019).

The tendency to projectification of value creation has emerged with an expectation of increasing growth (Liang, 2011) and faster time to impact (Svejvig, Geraldi, Grex, 2019). Also, PMI (Project Management Institute) has recently affirmed that the nature of work is changing from “job for life” to “portfolio of projects” (PMI, 2019, p.3). In-depth studies in Germany, Norway and Iceland show that the national projectification levels were between 25% and 29,3% in the years 2009/2010 of these countries’ GDP and are expected between 31,5 and 41,3% in the years 2019/2020 (Schoper, Wald, Ingason, & Fridgeirsson, 2018). This strongly growing trend will presumably continue in the future.

These insights underpin the suggestion that the value creation in each organization relates to and depending on success of projects conducted in this organization.

Project success is a sophisticated and multidimensional variable. Since decades, academic minds keep arguing about how it can be measured. In the last decades, the overall recognition has been reached those different types of projects require different approaches to their management (Müller, & Turner, 2007; Crawford et al., 2005). Furthermore, it seems to be a general agreement that success of different types of projects can be assessed with different success criteria. Though, it is still not clear whether different types of projects perform differently in terms of different success criteria (Müller, & Turner, 2007).

Although projects are generally expected to increase the shareholder value, many projects remain rated as unsuccessful, even though the academic field of PM has been experienced intensive research for over 50 years. With introduction and development of Project Management Methodologies (PMM) as well as establishing of project management offices (PMO), it became possible to improve the PM quality.



Nevertheless, a considerable and sustainable increase of project success rates has not yet arrived. The PMI issue “Pulse of the profession - 2019” stated that “Yet despite all the talk, project performance isn’t getting any better” (PMI, 2019, p. 2). After approximately 10% of waste rate of project investments in 2018 (PMI, 2018), it increased to 12% in 2019 (PMI, 2019).

Thereby, PMI has admitted that it is high time for the global PM community to understand possible implications of digital age and take advantage of its opportunities to improve PM practices. The first steps have already been undertaken with the development and application of agile methods. “Agility” means the ability of an organization to quickly adapt and change according to their surroundings (Rynus, 2018). Implementing and improving agile methods, organizations can raise transparency in processes, enhance value creation and achieve project excellence (PWC, 2018). Starting with agilizing their IT-departments, organizations would lay the cornerstone for the further digital transformation (Sambamurthy, Bharadwaj, & Grover, 2003; Röglinger, Römer, Schmidl, Venus, Linhart, & Utz, 2017).

But what does digital transformation (DT) actually mean?

DT is not just about the installation of robots or introduction of new technologies, but also about the emergence and development of novel (“digital”) business models and working forms. All businesses – a bakery around the corner, or a multinational corporation – must ask themselves if their business model is future-proof, and thus has henceforth chances of survival in the digital era.

With the emerging of IT as first digital technologies and their implementing in organizations in the 1960-s, the question arose whether they were worth investing and how they impact the organization. At early stages, this impact could not be understood easily and was found ambiguous. IT business value research in the 1990-s and early 2000-s showed that implementing information technology in organizations may contribute to the performance improvement (Sambamurthy et al., 2003; Melville, Kraemer, & Gurbaxani, 2004).

The question in the theoretical frameworks has been then changed from “if” to “how and why” IT investments enhance firm value (Sambamurthy et al., 2003). In the recent years, the research has become more specific and focusing on single aspects of organization’s performance which is increasingly projectified.

Bayo-Moriones, Billón, & Lera-Lopez (2013) explored whether information and communication technologies (ICT) and innovative work practices have an impact on organizational performance, both directly and indirectly as well as in short- and long-term ranges. They found a positive relationship between ICT adoption and different aspects of perceived performance. Also, advanced using of ICT improves external and internal communication and indirectly impacts performance.

Digital technologies are predestined to improve processes in an organization which should lead to more added value. Harvard Business Review states that digital technologies do not automatically lead to increasing performance but create possibilities for it (Tabrizi, Lam, Girard, & Irvin, 2019).

In a recent study on DT, the research question “What is the impact of DT on performance?” is considered one of the most relevant ones in the next future (Verhoef, Broekhuizen, Bart, Bhattacharya, Qi Dong, Fabian, & Haenlein, M., 2019).

The grade of DT achieved by a given organization can be described by means of its “*digital maturity*”. Since its introduction in early 1990s (Paulk, Curtis, Chrissis, & Weber, 1993), the concept of maturity model has been becoming popular in different areas (Becker, Niehaves, Pöppelbuß, & Simons, 2010). Commonly, maturity models are put in place to assess the as-is situation of an organization from the chosen perspective, then to define improvement actions and afterwards to monitor their implementations and results achieved (Pöppelbuß, & Röglinger, 2011).



While Vejseli, Proba, Rossmann, & Reinhard (2018) recognize that some aspects of digital maturity could have an impact on some criteria of project success, this possible effect has not yet been explicitly elucidated in the academic literature. Management is often unsure not only about how improve processes but also regarding choice of the right digital technology (Denner, Püschel, & Röglinger, 2017). The currently existing approaches on measuring of how a given organization is doing on DT focus merely on digital maturity. Assessment results and recommendations usually contain general guidelines how to improve the state of maturity whilst performance improvement stays in the shadow.

Implementing the research lens of Mathur, G., Jugdev, K., & Shing Fung, T. (2013) as well as referring to Radujkovic, & Sjekavica (2017), who laid the focus on tools and techniques used in project management, this research suggests changing the perspective and to disassemble digital transformation in *elements* (in analogy to “project management elements” of Jugdev, & Mathur, 2006) which are then to be individually analyzed.

As already reported in the previous paper (Nemirovski, & Kaul, 2020), Elements of Digital Transformation for Project Management (EDT4PM for short) was identified from which two lists were composed:

- one list with 14 elements relevant by utilization directly in PM – EDT\_PM; and
- one list with 36 elements relevant by utilization in the project environment (organization) – EDT\_Org.

Both lists are enclosed in Appendices 3 and 4.

This way, the RQ1 was already entirely answered in advance. The question remains, how utilization of the identified EDTs impacts PM? This constitutes the RQ2 which is dealt with in the present paper.

Every project is unique like every human being is individual. Even if major similarities between two different projects may be found, some other characteristics will probably distinguish. Therefore, an additional question arises in the present research, namely whether project characteristics can change (moderate) the relationship between the utilized EDTs and PM (RQ3).

## Research Design

The figure 1 outlines the research model. Utilization of EDTs plays the role of independent variables (IV) which is supposed to have impact on project management as dependent variable (DV). There are different factors (Moderators) that may reinforce or reduce this impact. The research investigates first what is the relationship between IV and DV (RQ2), and then what factors can be the moderators (RQ3).

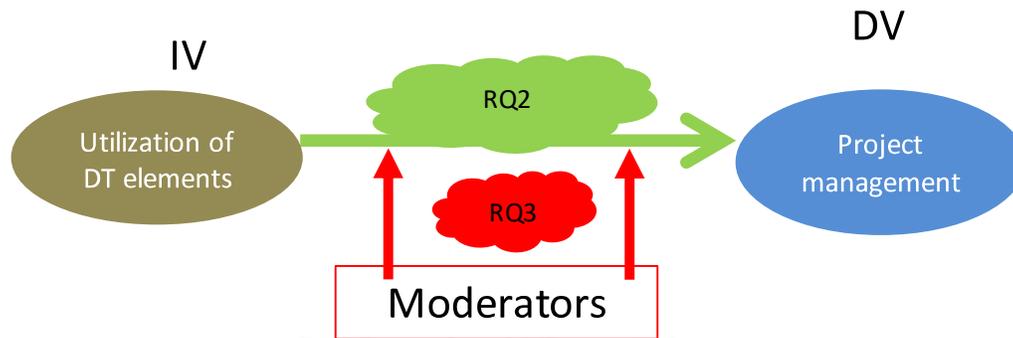


Fig.1 *Research model (Source: Author)*

A survey was conducted online between August 2020 and April 2021 and brought more than 400 answers of project managers and other participant or stakeholders of projects. The data sets were analyzed using SPSS as well as Sphinx software resulting in findings that will be discussed below.

Following kinds of analysis were provided:

- Factor analysis
- Regression analysis
- Comparative analysis
- Textual and sentiment analysis

In this paper, only preliminary results of comparative analysis are presented to concentrate on discovering moderators in the research model and describing their influence on the relationship between IV and DV.

## Results

The respondents were first asked about their general perception of the impact of DT on PM. Generally, most respondents (95 %) perceive that project management is already impacted by digital transformation while about 80% say that this impact is significant or even radical (s. figure 2).

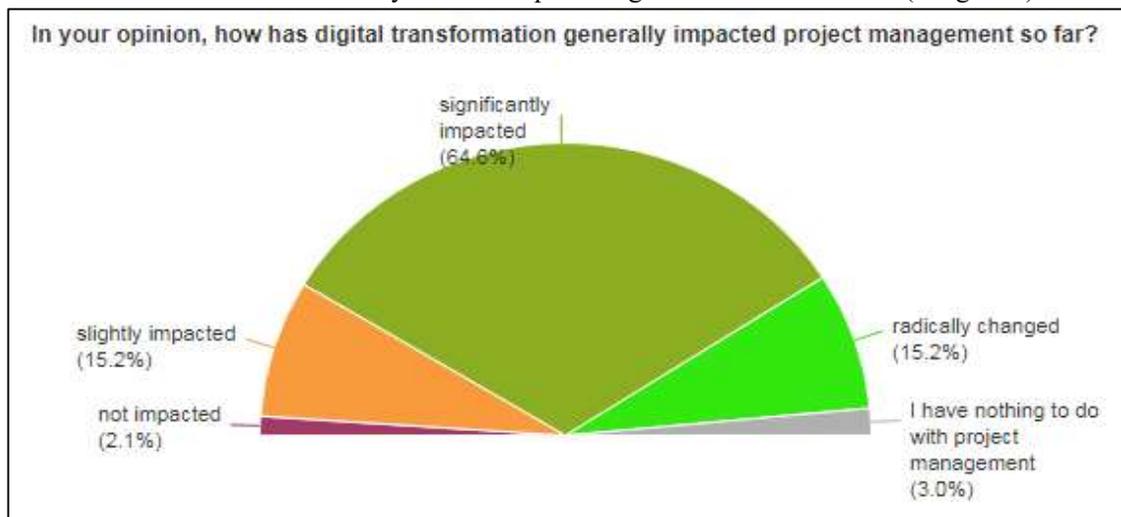


Fig.2 *Perceived impact of DT on PM (Source: Author based on survey data)*



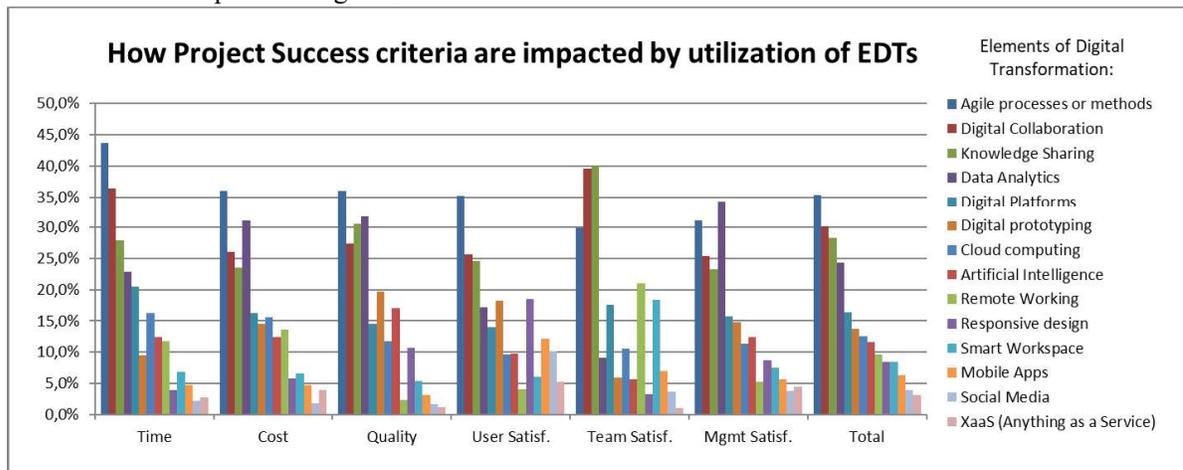
To evaluate the impact on project management more precisely, following project success criteria were chosen:

- *meeting project time schedule,*
- *meeting project cost budget,*
- *scope and quality of project outputs,*
- *client's/users' satisfaction,*
- *satisfaction of project team, and*
- *satisfaction of senior management.*

Respective survey questions were formulated as follows:

*Please choose from the following elements of digital transformation those being able - in your opinion - to improve project success in terms of **meeting project time schedule** and arrange them beginning with the highest relevance (1) towards lower relevance (2/3/4/5/...).*

During the evaluation phase, a mean of given numbers was calculated as 5.3 (answers with all possibilities chosen were excluded). Then, the EDTs were weighted by 5 for the highest place, by 4 for the second place, ... and by 1 for the 5<sup>th</sup> place. This way, a relevance scales for each criterion were constructed and depicted in figure 3.



**Fig.3 Relevance of utilized EDTs on projects success criteria (Source: Author based on survey data)**

The results disclose *Agile processes or methods* as the most important driver for the overall Project success as well as regarding the criteria *Time*, *Cost*, *Quality*, and *User Satisfaction*. Besides, *Knowledge Sharing* and *Digital Collaboration* are most important for *Team Satisfaction* while *Management Satisfaction* is mainly impacted by *Data Analytics*. *Social Media* and *Mobile Apps* managed to score 10% only regarding *User Satisfaction* whereas *Remote Working* and *Smart Workplace* are solely relevant for *Team Satisfaction*. *Responsive Design* has the strongest correlation with *User Satisfaction*. *XaaS* is not seen to play any important role for project success.

These discovering answers the RQ2.

To continue, the following questions were asked:



*In your opinion, how do the following digital transformation elements, being utilized in project management, influence project success (broadly speaking)?*

and

*In your opinion, how do the following digital transformation elements, being utilized in project environment (an organization where the project is conducted), influence project success (broadly speaking)?*

To elucidate the RQ3 “*What factors can moderate the impact of EDTs on project management?*”, the respondents were asked to make statements regarding the country of activity and their role in project management.

The figures 4 and 5 portray how the perceptions vary depending on regional differences. The countries were aggregated in regions for sake of readability.

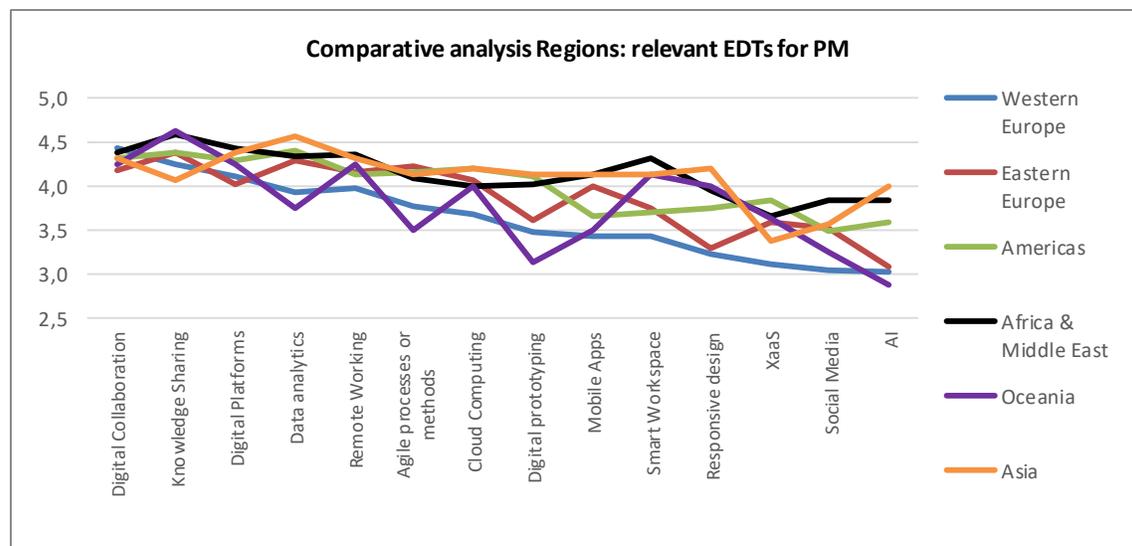
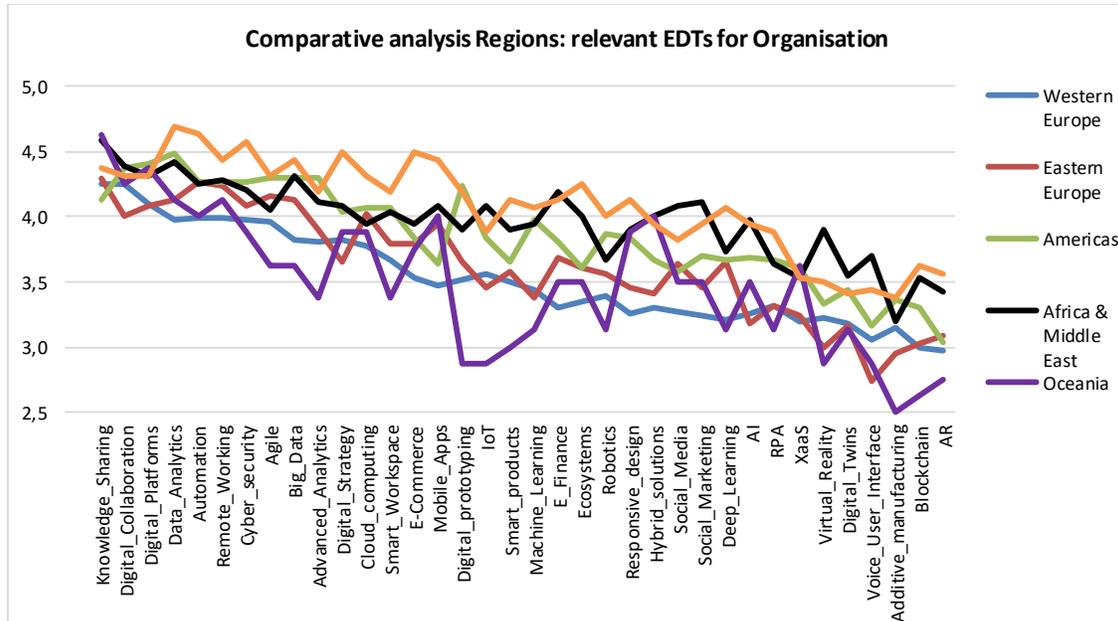


Fig.4 *Comparative analysis Regions: relevant EDTs for PM (Source: Author based on survey data)*

While the Western Europeans marked the relevance of the most EDTs for PM as relatively moderate, the respondents from Asia and MEA (Middle East & Africa) were more generous.



*Fig.5 Comparative analysis Regions: relevant EDTs for Organization (Source: Author based on survey data)*

*Social Media* and *AI* are seen least important as being utilized in PM. *Smart workspace* is not very successful for PM but much more popular for Organization. *Digital Collaboration*, *Knowledge Sharing*, *Digital Platforms* and *Data Analytics* are unquestionable leaders on both graphs. *Agile Methods* and *Remote Working* remain some behind them.

Considering the importance of EDTs for organizations as project environment, Oceania gave the worst marks, especially for *Digital prototyping*, *IoT*, *Additive manufacturing*, *Blockchain* and *AR*. It can be well observed that the lines crisscross each other and don't join together to a spot. In the "point of mutual consensus", the score range only melts once to 0.2 (*Digital Collaboration*) staying higher in other cases and growing up to 1.1 (*AI = Artificial Intelligence*) in case of the PM graph, On the organization graph, the score range oscillates between 0.3 (*Digital Platforms*) and 1.4 (*Digital Prototyping*).

Like the geographical analysis, a comparative analysis regarding the respondent's role in PM was conducted. The figures 6 and 7 illustrate this type of variances.

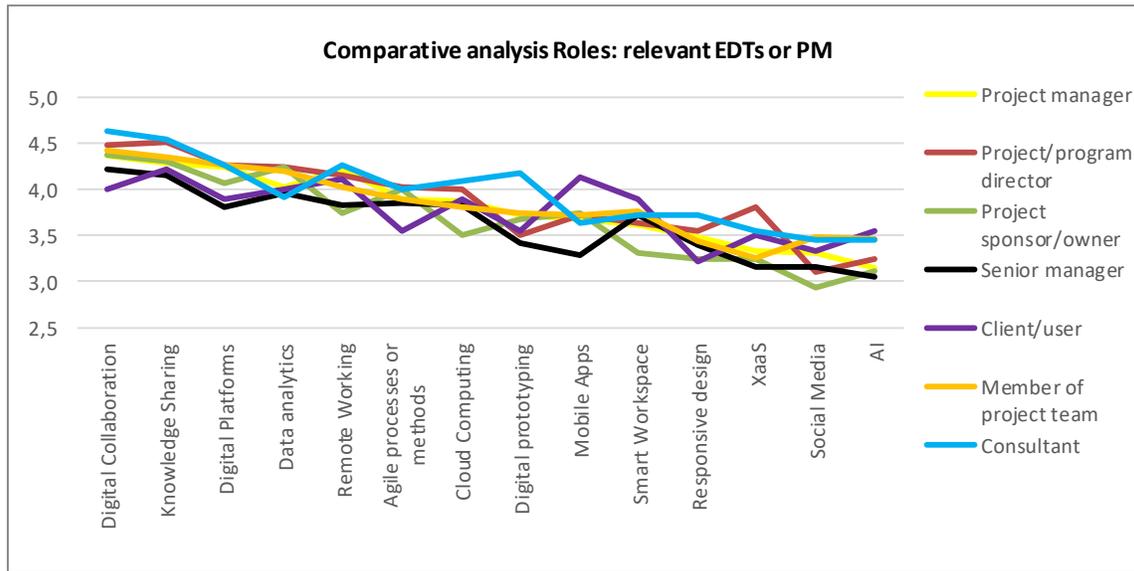


Fig.6 Comparative analysis Roles: relevant EDTs for PM (Source: Author based on survey data)

Senior managers show the highest skepticism while consultants are more generous for the most EDTs.

Also, here, the lines do not run parallelly but rather differentiate from each other in the pattern. In the “point of mutual consensus”, the score range melts to 0.2 (*Data Analytics*), but in other cases grow up to 0.7 (*Mobile Apps*) in case of the PM graph, respectively to 0.9 (*Responsive design*) in case of the organization graph.

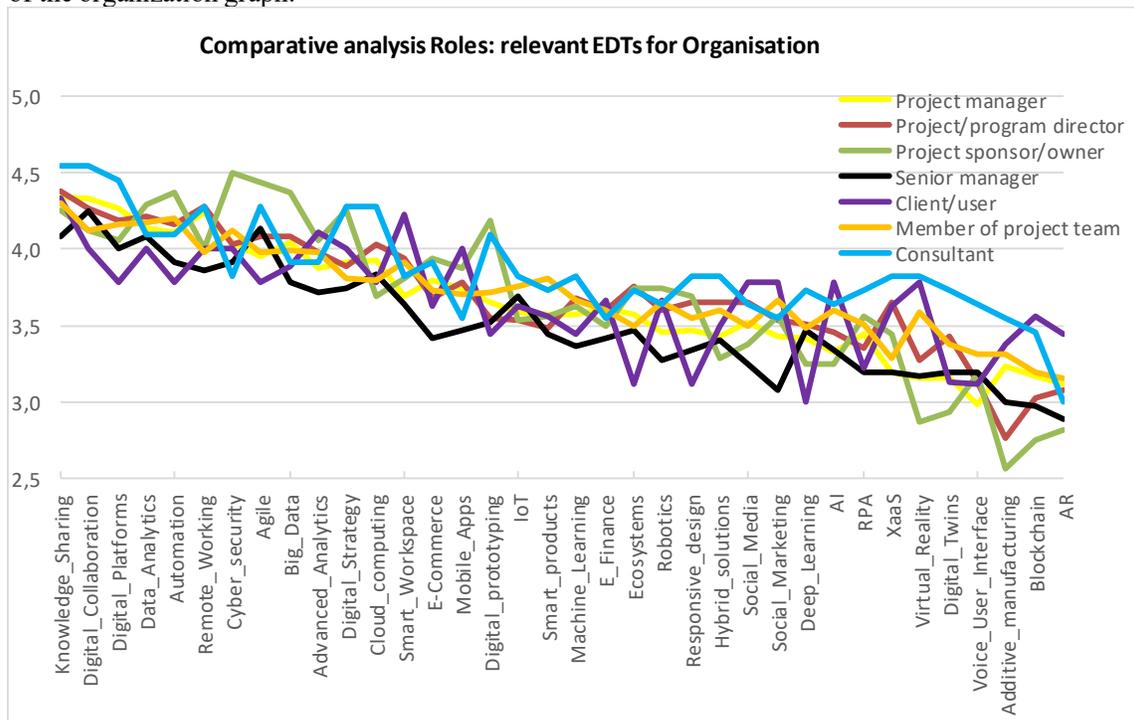


Fig.7 Comparative analysis Roles: relevant EDTs for Organization (Source: Author based on survey data)



Thus, for each Respondent's Role as well as region, a unique line course is given. This fact proves that these two factors work as moderator in the relationship between Utilization of EDTs and PM.

This way, the RQ 3 “*What factors can moderate the impact of utilization of EDTs on PM*” is answered.

## Conclusions

The present paper is the second part of a broader research on DT elements and their possible impact on PM and project success. Based on findings from the first part, this paper sheds light on how a survey was conducted and reveals some of its preliminary findings.

These shows that DTEs can impact PM either directly being utilized in PM process, or indirectly, through utilization in project environment (organization).

It was illustrated that different project success criteria are differently impacted by different EDTs utilized in PM.

To describe variety of this impact, several comparative analyses were presented. Against this background, two factors were identified as moderators, namely the region of respondent's activity and his/her role in project management.

Alongside that, several other analyses were provided on the survey data. The results will be presented in the subsequent papers and in the doctoral thesis.

The implication for academia consists of description of DT elements and their relevance for both PM process and PM environment.

For practitioners, this study's results offer new and deeper insights into existing DT elements. The relevance and importance of EDTs utilized in PM and organizations is not equal under different conditions. Being aware of this, project manager, clients, consultants, and other PM stakeholders will be better equipped to find the optimal way for organizing project management.

This study has its limitations. The literature studied was comprehensive but limited and may not always represent the most recent state of the art. The composed list of DT elements may not consider the whole variety of existing elements. The author's opinion may be biased, and definitions may not be always appropriate. The respondents were asked for their opinion and experience so that the data collected can be biased.

Along with the announced subsequent part of this research, further investigations in the presented topic may be highly promising. Future studies could contribute to consequent developing of the EDT4PM-Glossary to enhance it and kept it up to date. Also, researchers are encouraged to use the excavated data sets for other analytical studies.

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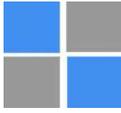
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## Appendix 1.

### *List of Elements of Digital Transformation that may be utilized in Project Management (Source: Author)*

Agile Processes or Methods	Knowledge Sharing
Artificial Intelligence (AI)	Mobile Apps
Cloud Computing	Remote Working
Deep Learning	Responsive Design
Digital Collaboration	Smart Workspace
Digital Platforms	Social Media
Digital Prototyping	XaaS (Anything as a Service)

## Appendix 2.

### *List of Elements of Digital Transformation that may be utilized in Organizations. (Source: Author)*

Additive Manufacturing (3D printing)	Ecosystems
Advanced Analytics	E-Finance
Agile Processes or Methods	Hybrid solutions
Artificial Intelligence (AI)	Internet of Things (IoT)
Augmented Reality	Knowledge Sharing
Automation	Machine Learning
Big Data	Mobile Apps
Block chain	Remote Working
Cloud Computing	Responsive Design
Cyber Security	Robotic Process Automation (RPA)
Data Analytics	Robotics
Deep Learning	Smart Products
Digital Collaboration	Smart Workspace
Digital Platforms	Social Marketing
Digital Prototyping	Social Media
Digital Strategy	Virtual Reality
Digital Twins	Voice User Interface
E-Commerce	XaaS (Anything as a Service)