Outcome Specification:

Agile Digital Transformation Maturity Model

Within the Erasmus+ Knowledge Alliance ProDiT – Projects for the Digital Transformation

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1. Summary

Digital transformation maturity models (DTMM) provide a structured approach for organizations to evaluate their current digital capabilities, identify areas for improvement, and establish a roadmap for digital transformation. Agility of small organizations is a key enabler of digital transformation. The ability to quickly adapt, innovate, and maintain a strong customer focus positions small organizations well to leverage digital technologies and achieve significant performance improvements. As the digital transformation progress, agility might be also enhanced. Current DTMM insufficiently explicitly addresses and leverages these synergies. Consequently, organizations may miss out on the benefits of a cohesive and integrated approach.

This work aims to propose a DTMM that integrates key agility components influencing digital transformation in small organizations. This alignment can contribute to successfully implementing digital transformation initiatives, increase agility in the organization, and ultimately contribute to continuous improvement. This document contains the goal, the intended purpose and use case scenario, the existing state of the art, the problem statement, and the research plan to develop the DTMM.

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2. Introduction to the new model

The process of digital transformation is not straightforward as there are different possible courses of action and a manager needs to understand the current state of their organization and then evaluate all these possible action paths to make comparisons and informed decisions to be able to reform a transformation roadmap and define a digital transformation strategy.

To identify the stages within the digital transformation, the concept of the “maturity model” comes into the picture which provides some guidance in this respect. Digital transformation maturity models are frameworks that organizations can use to monitor their digital transformation process by continuously assessing levels of digital maturity. These models provide a structured approach to assessing an organization's digital capabilities across various dimensions, such as strategy, leadership, technology, and culture.

Recent studies have revealed and reformed many digital transformation maturity models (DTMM) (Haryanti et al., 2023) and some have highlighted how agility positively influences digital transformation (Wendler, 2014; Rivelino & Nur, 2023). Regardless of these developments, there exists a significant gap: although some maturity models have incorporated several aspects of agility (Brosseau et al., 2019; Rika & Aamer, 2023; Wendler, 2014; Greineder et al., 2020; Stojanov et al., 2015; Rivelino & Nur, 2023; Cimini et al., 2024; Hernaus et al., 2020; Gunsberg et al., 2018) no existing maturity model has been designed exclusively for agile organizations which fully integrates all the critical agility components in the context of agile digital transformation.

Considering these limitations, this study proposes a maturity model for digital transformation considering that takes into account all of the essential agility factors to meet the needs of an agile small organization. The research seeks to further investigate the synergies between agile methodologies and digital transformation in small organizations, providing valuable insights and guidance in adopting and optimizing agile practices in their digital transformation journey. The rest of this specification tackles the research design and a current body of knowledge supporting the proposal.

3. Description of the planned research

3.1 Overall Goal

The **overall goal** of this research project is to provide a model for the assessment of digital transformation maturity that considers agility components to identify areas of improvements in the transformation journey of small agile organizations.

3.2 Purpose and Requirement Analysis

The agile DTMM this research aims to develop is intended to be adapted to suit the specific needs of maturity assessment for different organizations that have fully adopted agile methods or are using the hybrid approach to guide their digital transformation projects. In particular, the model could be applied to enable organizations in the following forms:

1. Diagnose: The agile DTMM can be used to integrally assessing the ‘as-is’ state of digital maturity and agility components influencing digital transformation maturity areas like strategy, technology, people, or culture.
2. Improvement: The agile DTMM can contribute to identifying specific courses of improvement actions to move towards the ‘to-be’ state in synergetic and holistic ways that consider both the agile and digital transformation processes.
3. Project Monitoring: The metrics defined within the agile DTMM will target the success of digital transformation projects. By using them, managers can identify potential issues early on and take corrective action to ensure that the project not only stays on track but also aligned with the transformation strategy.
4. Communication and Stakeholder Engagement: The agile DTMM can assist in improving communication and keep all the stakeholders of digital transformation projects on the same track. By continuously receiving valuable feedback through discussions with internal and external stakeholders on an integral view of agile and digital transformation maturity levels, organizations could ensure that digital transformation projects are focused on delivering value to their customers and the organization itself.

3.3 Current State-of-the-Art

Digital transformations are strategic initiatives, characterized by complexities that go beyond the realm of traditional project management tools (Jiang, 2023). In their study to investigate the relationship between project management and digital transformation in organizations, (Gonçalves et al., 2023) found that agile project management is the most used project management framework in digital transformation projects. The agile approach to project management has its origins in software development. However, agile practices have garnered widespread adoption across numerous industries, particularly in fast-paced and fiercely competitive markets, as well as organizations oriented toward technology and innovation (Ng et al., 2023).

The agile project management approach is distinguished by the absence of a complete definition regarding the final project details, which are gradually revealed over a succession of brief, well-defined timeframes (Larson & C.F. Gray, 2010). Several authors point that agile project management is renowned for its flexibility, adaptability, and iterative nature. It strongly emphasizes collaboration, customer feedback, and the capacity to adapt to change rather than strictly adhering to a predetermined plan. Throughout a literature review on the agile approach of project management in different sectors, (Dong et al., 2024) discuss how its conceptualization has evolved. Their study concludes that agile project management is “a flexible approach that includes discovering the aim and delivering the project. It embodies the organizational capability to adapt to changes as they arise”.

Digital transformation projects are also influenced by the characteristics of the so-called VUCA environment, namely volatile, uncertain, complex, and ambiguous. For instance, (Jiang, 2023) states that the goals of a digital transformation project are often ambiguous and influenced by environmental, technological, and organizational uncertainties. The agile approach has been pointed to as capable of dealing with the characteristics of the VUCA environment (van Solingen, 2019); and particularly effective in dealing with volatility (degree of change) (de Moura et al., 2023). Agility has been also found to be a driver of digital transformation Schlömer, 2022). In a recent study on the relationship between agile maturity and digital transformation success, the authors state that both agility and digital transformation are still emerging and can potentially coexist (Ibrahimi & Benchekroun, 2023).

Several authors has agreed on the importance of considering the specificities of the context in the adoption of agile project management and its need for continuous alignment (Bianchi et al., 2020)(Soares et al., 2022). In line with these authors, in this work is assumed that the implementation of agile project management does not occur in a vacuum, but it influences and requires adjustment to how the entire organization is being managed.

In the context of digital transformation, maturity models play a crucial role in helping organizations gauge their progress and readiness to embrace digital technologies fully. The models offer a structured approach to assessing the different stages of digital maturity and provide organizations with a clear understanding of their capabilities, resources, and operations as they progress through the stages.

A rapid literature review was conducted in order to gain understanding on available digital transformation maturity models starting from related literature reviews published in Scopus database. Although the rapid literature review is not an exhaustive research over a topic, this approach allows delivery of scientific evidence in a timely manner to support decision-making (Cartaxo et al., 2020). The research process involved for all the phases includes the following steps: (1) scanning paper titles and abstracts, (2) reviewing the full text of the selected articles and (3) selecting the most cited maturity models for further analysis. The string used was "digital transformation maturity model" OR "digital maturity model" and "literature review". The

inclusion criteria was set to articles and conference papers, published in the period 2020-2023, written in English. A total of 20 documents were retrieved after running the query on the database, one of them was not available and thus, excluded. After scanned the titles and abstracts and read the full available papers, 32 maturity models were identified for further analysis from the literature review conducted by the authors.

Table 1 summarizes the scope of 32 identified DTMMs that are proposed from both, the academy and consultancies' perspectives. The list includes those models that were found to be the most cited and current. Out of the 32 models outlined in Table 1, only the model proposed by (Schuh et al., 2020) was found to explicitly address agility capabilities. However, this model was specifically designed for the manufacturing sector.

Table 1 Overview of digital transformation maturity models.

Reference	Scope
(Valdez-De-Leon, 2016)	The model targets the telecommunications industry.
(Berghaus & Back, 2016)	This is a generic model, intended to be applied to any sector or industry.
(Ganzarain & Errasti, 2016)	Intended to be applied in any industry that seeks to identify new opportunities for diversification within Industry 4.0.
(Shahduzzaman et al., 2017)	PWC Maturity Model - a general model that can be applied to any organization.
(Rossmann & Reutlingen, 2018)	Intended to be applied in any organization that is undergoing digital transformation, regardless of the sector or industry.
(Akdil et al., 2018)	The model assesses readiness for Industry 4.0 implementation.
(Horvat et al., 2018)	The authors suggest that the model can be used to assess the readiness for Industry 4.0 at the level of single companies, industries, the manufacturing sector, and countries as a whole.
(Deloitte, 2018)	The Deloitte Digital Maturity Index Survey is specifically designed to analyze the degree of digitalization in the manufacturing industry.
Industry 4.0 Readiness Online Self-Check for Businesses, n.d.)	IMPULS, Industry 4.0 Readiness Online Self-Check for Businesses, is designed to help companies assess their readiness for Industry 4.0.
(Sjödin et al., 2018)	The model is focused on leveraging digitalization in manufacturing to enable smart factory implementation and process innovation.

(Romero et al., n.d.)	The model is intended for small and medium-sized enterprises (SMEs) undergoing digital transformation towards Smart Manufacturing and Industry 4.0.
(Schuh et al., 2020)	The Acatech Industrie 4.0 Maturity Index provides manufacturing companies with a basis for transforming themselves into learning agile organizations.
(Salume et al., 2021)	The model was specifically developed and tested in the retail sector companies in Brazil.
(Klötzer & Pflaum, n.d.)	The model targets companies within the manufacturing industry's supply chain.
(Barry et al., 2022)	The model covers 16 sub-dimensions for generic organizations, and additional sub-dimensions for specific sectors such as banking, industrial, SME, public, health, e-government, and education.
(Hongxiong & Xiaowen, 2022)	The proposal targets the evaluation of the digital maturity of the automotive supply chain.
(Turkyilmaz et al., 2023)	This model is within the scope of manufacturing industries/firms and is intended to be used in companies of different sizes.
(Aras & Büyüközkan, 2023)	The generic model is intended to be applied to companies of different sizes and sectors.
(Haryanti et al., 2023)	The model is generic and does not specify any restrictions on the company's size.
(P. Senna et al., 2023)	The proposal targets the manufacturing sector.
(Hellweg et al., 2023)	The target domain is the supply chains of companies handling physical products (including retail).
(Benotmane et al., 2023)	Intended to apply to any organization that is undergoing an IoT transformation.
(Kammerlohr et al., 2023)	The model for digital lab transformation targets the education and research sector.
(Perera et al., 2023)	This model was specifically designed for the design and construction industry in the Australian context.
(Kılıç et al., 2023)	This methodology is specifically designed for use in manufacturing companies.
(Benazzouz & Auhmani, 2023)	The model was designed for hospitals in the Moroccan pharmaceutical supply chain.
(Sukrat & Leeraphong, 2023)	The model targets micro and small businesses in developing countries.

(Ka et al., 2023)	The model is specifically tailored to the context of hospitality micro and small enterprises (MSEs).
(Nebati et al., 2023)	The model is designed for the defense industry.
(Demir et al., 2023)	The model assesses the readiness and maturity of Industry 4.0 tools and sustainability indicators.
(Mohammadi et al., 2023)	The model was specifically designed for electronic sports businesses in developing countries.
(Guerrero et al., 2023)	The model is intended to offer guidance for personal service firms to achieve the transition from analog to digital.

While maturity models offer valuable insights and guidance, they have been also criticized. In a review of eleven years of research on DTMM, (Thordsen & Bick, 2023) analyse these critical voices and conclude that there is a need for developing context-specific DTMMs, e.g, industry, branch, organization type/size. Overall, although the available models can be instrumental in guiding organizations toward a more comprehensive vision of digital transformation, more efforts are required to integrate context-specific components that characterize agile digital transformation projects. In coherence with the conclusions of this stream critical analysis of the landscape of maturity models, this research will focus on the specific context of small organizations, seen here as micro and small enterprises with 0-49 employees. Small organizations play a significant role in job creation and economic development. An study in the European Union, in 2020, found they accounted for 99% of all enterprises in the non-financial business environment; contributed 35.4% to the total gross value added and employed 48.6% of the workforce. Recent statistics highlight their growing significance across the continent since then[1].

Small organizations often have the potential to be more agile compared to larger ones, as they can benefit from a less complex structure and hence are faster to adjust to a changing environment (Wendler & Stahlke, 2014). However, achieving agility also depends on factors like organization's culture, leadership, mindset, and willingness to embrace agile methodologies. Although agile organizations are intended to be more flexible and responsive, they are not necessarily simple. The complexity lies in creating and maintaining an environment where teams can operate autonomously yet remain aligned with the overall strategy. As the conceptualization of agile organizations in (Greineder et al., 2020) points out, agile organizations increase their speed and flexibility "(a) in fast changing environments (b) by a strategic orientation in sensing and responding, by (c) a functional alignment of knowledge and fluidity of resources (d) and by an operational team & working environment for optimal customer centric product delivery." This requires a strong culture of trust, continuous learning, and effective communication, among other aspects.

[1] https://www.statista.com/topics/8231/smes-in-europe/

3.4 Problem Statement

While agility can enable organizations to implement digital transformation more effectively (Ibrahimi & Benchekroun, 2023), as organizations progress in their digital transformation journey and achieve higher levels of digital maturity, they can also become more agile, capable of adapting to changes, and better positioned to innovate and grow (Yusuf et al., 2023). These dynamics should be better captured in digital transformation maturity models to help small agile organizations create roadmaps to navigating the complexity of both perspectives in holistic and synergetic ways. Thus, the problem this research project addresses is: How can we comprehensively and effectively diagnose digital transformation maturity in small agile organizations?

3.5 Research Plan

A) Research Questions and Hypotheses

The following **research questions** are addressed:

RQ1: What are the characteristics of a model to diagnose digital transformation maturity in small agile organizations?

RQ2: What are the key agility components that influence digital transformation maturity?

RQ3: Does the assessment model addressing agility components accurately capture the key dimensions and attributes of digital transformation maturity of small agile organizations?

The **hypothesis** is that the utilization of a digital transformation maturity assessment model that addresses agility components will positively contribute to identify areas of improvements in the transformation journey of small agile organizations.

The hypothesis suggests that utilizing a comprehensive model for diagnosing digital transformation maturity can bring positive impacts on various aspects of the digital transformation journey of small agile organizations, fostering success and positioning them for long-term growth and sustainability in the context of the VUCA world.

B) Research Methods

In this research project, the Design Science Research Methodology (DSRM) is used. The DSRM is an approach used in the field of information systems and computer science to develop and evaluate innovative solutions to complex problems. It focuses on creating and evaluating artifacts or technological interventions to address specific issues or improve existing systems. This methodology has been stated as a promising methodology for standardizing the contribution to the theory of digital transformation maturity models (Thordsen & Bick, 2023),

and it has been previously used for this purpose (Guerrero et al., 2023) (Kammerlohr et al., 2023) (Turkyilmaz et al., 2023)(Haryanti et al., 2023). Table 2 presents an overview of the specific methods and techniques used during the DSRM stages. The next section will explain the research process.

Table 2 Research questions, methodology, research design, and research techniques for the studies

Research Questions	Methodology	Research Design	Research Techniques
RQ1	Qualitative research	Literature Review	Content analysis Descriptive (narrative) synthesis
RQ 2	Qualitative research	Literature review Survey	Content analysis Descriptive (narrative) synthesis
RQ 3	Qualitative research	Case Studies	Cross-Case Analysis Descriptive (narrative) synthesis

C) Research Plan

The process to address the objective of this research follows the different stages of the DSRM, shown in Fig 1.

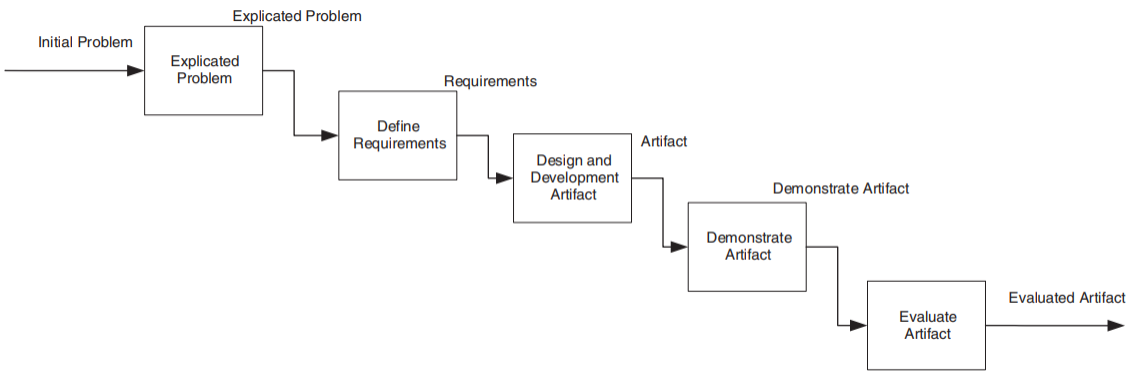

Figure 1 Research process (vom Brocke et al., 2020)(vom Brocke et al., 2020)

The process includes 5 stages. All stages on the DSRM are interconnected as inputs and outputs. The stages are iterative and not necessarily sequential. In the first stage, the root of the problem is identified and analysed. The solutions are then outlined as artifacts for solving

the identified problem. In the next stage, the artifacts are designed and developed. Next, the artifacts that have been built will be demonstrated. This activity is called a ‘proof of concept’, which explains the use of artifacts to users intending to prove the feasibility of artifacts.

3.6 Additional Considerations

Detailed documentation and guidelines that explain the maturity model, its underlying principles, and the assessment process should be provided.

3.7 Dissemination & Standardisation

To disseminate and standardize the output of this research project, the following actions are proposed:

- Documentation and Guidelines: The documentation of this project should be accessible, well-structured, and accompanied by practical examples and case studies.
- Validation and Refinement: Engaging with experts and practitioners participating in the alliance to validate the model. Gather feedback and insights to refine and improve the proposal.
- Dissemination Channels: Publication in journals and presenting at conferences and/or seminars.
- Training and Workshops: Conduct training sessions and workshops to educate organizations on how to apply the model.
- Continuous Improvement: Guiding how to improve the model based on emerging trends, technologies, and organizational experiences. Encouraging feedback from users and stakeholders to ensure the proposal remains relevant and adaptable.

3.8 Quality Assurance - Evaluation

- Review and release of results via the Internal Evaluation Board (IEB).
- Provide guidelines for updates to the agile DTMM to ensure it remains relevant and reflects evolving trends, technologies, and practices in digital transformation.

4. References

Akdil, K. Y., Ustundag, A., & Cevikcan, E. (2018). Maturity and Readiness Model for Industry 4.0 Strategy. In *Springer Series in Advanced Manufacturing* (pp. 61–94). Springer Nature. https://doi.org/10.1007/978-3-319-57870-5_4

Aras, A., & Büyüközkan, G. (2023). Digital Transformation Journey Guidance: A Holistic Digital Maturity Model Based on a Systematic Literature Review. *Systems*, *11*(4). https://doi.org/10.3390/systems11040213

Barry, A. S., Assoul, S., & Souissi, N. (2022). Benchmarking of digital maturity models according to the dimension component. *2022 2nd International Conference on Innovative Research in Applied Science, Engineering and Technology, IRASET 2022*. https://doi.org/10.1109/IRASET52964.2022.9737781

Benazzouz, T., & Auhmani, khalid. (2023). Digital maturity assessment model for pharmaceutical supply chain: a patient and hospital-centred development. *International Journal of Healthcare Management*. https://doi.org/10.1080/20479700.2023.2177584

Benotmane, M., Elhari, K., & Kabbaj, A. (2023). A review & analysis of current IoT maturity & readiness models and novel proposal. *Scientific African*, *21*. https://doi.org/10.1016/j.sciaf.2023.e01748

Berghaus, S., & Back, A. (2016). *Stages in Digital Business Transformation: Results of an Empirical Maturity Study*. http://aisel.aisnet.org/mcis2016http://aisel.aisnet.org/mcis2016/22

Bianchi, M., Marzi, G., & Guerini, M. (2020). Agile, Stage-Gate and their combination: Exploring how they relate to performance in software development. *Journal of Business Research*, *110*, 538–553. https://doi.org/10.1016/j.jbusres.2018.05.003

Cartaxo, B., Pinto, G., & Soares, S. (2020). Rapid Reviews in Software Engineering. *Contemporary Empirical Methods in Software Engineering*, 357–384. http://arxiv.org/abs/2003.10006

de Moura, R. L., Carneiro, T. C. J., & Dias, T. L. (2023). VUCA environment on project success: The effect of project management methods. *Brazilian Business Review*, *20*(3), 236–259. https://doi.org/10.15728/bbr.2023.20.3.1.en

Deloitte. (2018). *Digital Maturity Model Achieving digital maturity to drive growth*.

Demir, S., Gunduz, M. A., Kayikci, Y., & Paksoy, T. (2023). Readiness and Maturity of Smart and Sustainable Supply Chains: A Model Proposal. *EMJ - Engineering Management Journal*, *35*(2), 181–206. https://doi.org/10.1080/10429247.2022.2050129

Dong, H., Dacre, N., Baxter, D., & Ceylan, S. (2024). What is Agile Project Management? Developing a New Definition Following a Systematic Literature Review. *Project Management Journal*. https://doi.org/10.1177/87569728241254095

Ganzarain, J., & Errasti, N. (2016). Three stage maturity model in SME's towards industry 4.0. *Journal of Industrial Engineering and Management*, *9*(5), 1119–1128. https://doi.org/10.3926/jiem.2073

Gonçalves, M. L. A., Penha, R., Silva, L. F., Martens, C. D. P., & Silva, V. F. (2023). The relationship between project management and digital transformation: Systematic literature review. *Revista de Administracao Mackenzie*, *24*(4). https://doi.org/10.1590/1678-6971/eRAMR230075.en

Greineder, M., Blohm, I., & Leicht, N. (2020). CONCEPTUALIZING THE AGILE WORK ORGANIZATION: A SYSTEMATIC LITERATURE REVIEW, FRAMEWORK AND RESEARCH AGENDA. *33rd Bled EConference: Enabling Technology for a Sustainable Society, BLED 2020 - Proceedings*, 263–276. https://doi.org/10.18690/978-961-286-362-3.18

Guerrero, R., Lattemann, C., & Gebbing, P. (2023). Helping Personal Service Firms to Cope with Digital Transformation: Evaluation of a Digitalization Maturity Model. *Pacific Asia Journal of the Association for Information Systems*, *15*(2), 1–31. https://doi.org/10.17705/1pais.15201

Haryanti, T., Rakhmawati, N. A., & Subriadi, A. P. (2023). The Extended Digital Maturity Model. *Big Data and Cognitive Computing*, *7*(1). https://doi.org/10.3390/bdcc7010017

Hellweg, F., Janhofer, D., & Hellingrath, B. (2023). Towards a Maturity Model for Digital Supply Chains. *Logistics Research*, *16*(1). https://doi.org/10.23773/2023_5

Hongxiong, Y., & Xiaowen, X. (2022). Research on Computer Evaluation Index System of Digital Maturity of Automotive Supply Chain. *2022 IEEE International Conference on Electrical Engineering, Big Data and Algorithms, EEBDA 2022*, 442–446. https://doi.org/10.1109/EEBDA53927.2022.9744996

Horvat, D., Stahlecker, T., Zenker, A., Lerch, C., & Mladineo, M. (2018). A conceptual approach to analysing manufacturing companies' profiles concerning Industry 4.0 in emerging economies. *Procedia Manufacturing*, *17*, 419–426. https://doi.org/10.1016/j.promfg.2018.10.065

Ibrahimi, G., & Benchekroun, B. (2023). The Contribution of Agility to an Organization's Digital Transformation. *TEM Journal*, *12*(4), 2361–2369. https://doi.org/10.18421/TEM124-48

Industry 4.0 Readiness Online Self-Check for Businesses. (n.d.). Retrieved December 4, 2023, from https://www.industrie40-readiness.de/ ?lang=en

Jiang, J. J. (2023). From Information Technology Projects to Digital Transformation Programs: Research Pathways. In *Project Management Journal* (Vol. 54, Issue 4, pp. 327–333). SAGE Publications Inc. https://doi.org/10.1177/87569728231170261

Ka, X., Ying, T., & Tang, J. (2023). A Conceptual Model for Developing Digital Maturity in Hospitality Micro and Small Enterprises. *Journal of Theoretical and Applied Electronic Commerce Research*, *18*(3), 1511–1528. https://doi.org/10.3390/jtaer18030076

Kammerlohr, V., Paradice, D., & Uckelmann, D. (2023). A maturity model for the effective digital transformation of laboratories. *Journal of Manufacturing Technology Management*, *34*(4), 621–643. https://doi.org/10.1108/JMTM-01-2022-0050

Kılıç, H. S., Kalender, Z. T., Korkmaz, C., & Kaya, B. (2023). INTEGRATED METHODOLOGY FOR THE ASSESSMENT OF INDUSTRY 4.0 MATURITY LEVEL. *International Journal of the Analytic Hierarchy Process*, *15*(2). https://doi.org/10.13033/ijahp.v15i2.1096

Klötzer, C., & Pflaum, A. (n.d.). *Toward the Development of a Maturity Model for Digitalization within the Manufacturing Industry's Supply Chain*. http://hdl.handle.net/10125/41669

Larson, E. W., & C.F. Gray. (2010). *Project management: the managerial process*.

Mohammadi, S., Heidari, A., & Navkhsi, J. (2023). Proposing a Framework for the Digital Transformation Maturity of Electronic Sports Businesses in Developing Countries. *Sustainability (Switzerland)*, *15*(16). https://doi.org/10.3390/su151612354

Nebati, E. E., Ayvaz, B., & Kusakci, A. O. (2023). Digital transformation in the defense industry: A maturity model combining SF-AHP and SF-TODIM approaches. *Applied Soft Computing*, *132*. https://doi.org/10.1016/j.asoc.2022.109896

Ng, P. L., Maqsood, T., Khalfan, M., & Rahmani, F. (2023). *AgiBuild: A Proposed Framework for Agile Building Adaptation Project Management Based on Literature Review*. https://doi.org/10.20944/preprints202305.0638.v1

P. Senna, P., Barros, A. C., Bonnin Roca, J., & Azevedo, A. (2023). Development of a digital maturity model for Industry 4.0 based on the technology-organization-environment framework. *Computers and Industrial Engineering*, *185*. https://doi.org/10.1016/j.cie.2023.109645

Perera, S., Jin, X., Das, P., Gunasekara, K., & Samaratunga, M. (2023). A strategic framework for digital maturity of design and construction through a systematic review and application. *Journal of Industrial Information Integration*, *31*. https://doi.org/10.1016/j.jii.2022.100413

Romero, D., Wuest, T., & Mittal, S. (n.d.). *Towards a Smart Manufacturing Maturity Model for SMEs (SM3E) Towards a Smart Manufacturing Maturity Model for SMEs (SM 3 E)*. https://www.researchgate.net/publication/327230099

Rossmann, A., & Reutlingen, H. (2018). *Digital Maturity: Conceptualization and Measurement Model*. https://assets.kpmg.com/content/dam/kpmg/pdf/2016/04/ch-digital-readiness-assessment-en.pdf.

Salume, P. K., Barbosa, M. W., Pinto, M. R., & Sousa, P. R. (2021). Key dimensions of digital maturity: A study with retail sector companies in Brazil. *Revista de Administracao Mackenzie*, *22*(6). https://doi.org/10.1590/1678-6971/ERAMD210071

Schlömer, I. F. (2022). Agility as a Driver of Digital Transformation - a Literature Review. *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, *13454 LNCS*, 238–253. https://doi.org/10.1007/978-3-031-15342-6_19

Schuh, G., Anderl, R., Dumitrescu, R., & Krüger, A. (2020). *Industrie 4.0 Maturity Index Managing the Digital Transformation of Companies*.

Shahiduzzaman, M., Kowalkiewicz, M., Barrett, R., & Mcnaughton, M. (2017). *Digital business towards a value-centric maturity model - part A. PWC report chair in digital economy*.

Sjödin, D. R., Parida, V., Leksell, M., & Petrovic, A. (2018). Smart Factory Implementation and Process Innovation: A Preliminary Maturity Model for Leveraging Digitalization in ManufacturingMoving to smart factories presents specific challenges that can be addressed through a structured approach focused on people, processes, and technologies. *Research Technology Management*, *61*(5), 22–31. https://doi.org/10.1080/08956308.2018.1471277

Sukrat, S., & Leeraphong, A. (2023). A digital business transformation maturity model for micro enterprises in developing countries. *Global Business and Organizational Excellence*. https://doi.org/10.1002/joe.22230

Thordsen, T., & Bick, M. (2023). A decade of digital maturity models: much ado about nothing? *Information Systems and E-Business Management*. https://doi.org/10.1007/s10257-023-00656-w

Turkyilmaz, A., Dikhanbayeva, D., Lukhmanov, Y., & El-Thalji, I. (2023). *Managing Digital Transformation: Maturity Model Development*.

Valdez-De-Leon, O. (2016). A Digital Maturity Model for Telecommunications Service Providers. In *Technology Innovation Management Review* (Vol. 6, Issue 8). www.timreview.ca

van Solingen, R. (2019). The Why, How and What of Agile Transformations. In *The Future of Software Quality Assurance* (pp. 217–228). Springer International Publishing. https://doi.org/10.1007/978-3-030-29509-7_17

vom Brocke, J., Hevner, A., & Maedche, A. (2020). *Introduction to Design Science Research* (pp. 1–13). https://doi.org/10.1007/978-3-030-46781-4_1

Wendler, R., & Stahlke, T. (2014). *WHAT CONSTITUTES AN AGILE ORGANIZATION?-DESCRIPTIVE RESULTS OF AN EMPIRICAL INVESTIGATION*. http://nbn-resolving.de/urn:nbn:de:bsz:14-qucosa-130916