

Development of a Web-Based MSME Digital Transformation Readiness Evaluation System Using a Design Science Research Approach

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Abstract

Micro, Small, and Medium Enterprises (MSMEs) are still encountering challenges in gauging their overall preparedness for digital transformation. The goal of this study is to create an online platform that evaluates the digital readiness of MSMEs, offering a clear and organized assessment of their preparedness. The research approach employed is Design Science Research (DSR), which includes phases such as identifying the problem, defining the solution's goals, designing and creating the system, demonstrating its use, evaluating its effectiveness, and communicating and documenting the process. The outcome is an assessment tool that uses a survey to evaluate digital readiness across four key areas: technology, personnel, business workflows, and organizational strategy and culture. The results of the study reveal that the tool can effectively be applied by MSMEs and helps to discern variations in readiness across each area. It is anticipated that this system will assist MSMEs in establishing priorities and strategies for a more precise and sustainable approach to digital transformation.

Keywords: Design Science Research; digital readiness; digital transformation; evaluation system; MSMEs

1. Introduction

Micro, Small, and Medium Enterprises (MSMEs) play a vital role in Indonesia's economy. They contribute significantly to job creation, income generation, and the Gross Domestic Product (GDP) [1][2][3]. MSMEs are essential for economic activity and have shown resilience in times of hardship. This strength makes them a pillar of national economic stability [4][5]. Therefore, enhancing MSMEs capabilities and competitiveness is central to sustainable economic development plans.

Digital technology and changes in the global business landscape have forced companies to change how they operate. Digital processes improve efficiency, streamline activities, and expand market reach through targeted digital tools [6][7][8]. For micro, small, and medium enterprises, digital transformation is now essential to stay viable and competitive in a fast-changing environment [3].

However, many research findings reveal that MSMEs still grapple with significant obstacles, such as restricted human resources, inadequate digital knowledge and abilities, limited application of technology in operations, and a lack of clear and sustainable digital plans [8][9][10][11][12][13][14]. These situations underscore a considerable disparity between the requirements for digital transformation and the existing abilities of MSMEs to carry out such changes successfully.

This situation is made more difficult because many MSME owners are not aware of how ready they are for digital change. Not knowing about their digital strengths in important areas like technology, employees, business operations, and company strategy makes it hard for MSMEs to find out what to work on and increases the risk of making poor decisions [6][9][15]. As a result, MSMEs often start digital transformation efforts that are unfinished, unorganized, and do not help their business perform well.

On the flip side, there is a lack of organized, easy-to-use, and readily accessible resources for assessing the digital transformation preparedness of MSMEs. Evaluations of digital readiness are frequently performed in a manual, biased, or incomplete way, and they seldom form part of a holistic evaluation framework [7][10][12][13][14][16]. Thus, there is a need for an online system to assess digital transformation readiness, which would offer MSMEs a clear and structured understanding of their digital readiness levels, laying the groundwork for informed choices and more focused and lasting digital transformation strategies [5][13][17].

2. Method

The method utilized in this research is Design Science Research (DSR), chosen for its effectiveness in creating artifact-driven solutions that tackle actual problem situations. Design Science Research (DSR) is a research framework aimed at creating artifacts through a process of repeated phases [18]. This method not only seeks to generate innovative artifacts but also adds to the body of knowledge through the research activities involved.

The execution of Design Science Research is carried out through an organized sequence of phases, which comprise identifying the problem, designing a solution, implementing it, demonstrating or testing it, evaluating the results, and refining the created artifact [19]. Each phase in the Design Science Research methodology systematically aids in developing and assessing effective and efficient solutions [20]. The phases of the Design Science Research (DSR) approach utilized in this investigation are depicted in Figure 1.

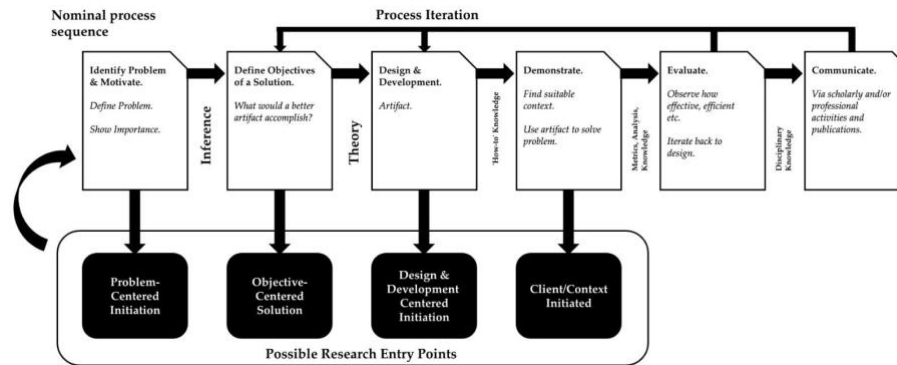


Fig. 1: Metode DSR (Peppers et al., 2007)

The stages of the Design Science Research (DSR) approach applied in this study are explained as follows:

- a. **Problem Identification and Motivation**
This stage aims to identify the problems faced by MSMEs in relation to their readiness to undertake digital transformation through a literature review and direct observation of MSME conditions. The findings from this stage indicate that MSMEs have a low level of understanding regarding their digital readiness, highlighting the need for a more structured evaluation system as a potential solution.
- b. **Define the Objectives for a Solution**
This stage defines the objectives of the proposed solution, namely the development of a web-based digital transformation readiness evaluation system for MSMEs. The system is designed to assess readiness across multiple dimensions, including technology, human resources, business processes, as well as organizational strategy and culture.
- c. **Design and Development**
At this point, the system is designed, and a web-based prototype is developed. This process includes system architecture design, user interface design, and the development of a questionnaire instrument that serves as the basis for processing digital readiness assessment data.
- d. **Demonstration**
The demonstration stage is conducted by applying the developed system to MSME users. During this stage, users complete the questionnaire through the system to demonstrate that the artifact can be used in accordance with the objectives of the study.
- e. **Evaluation**
The evaluation stage aims to measure the effectiveness of the artifact by analyzing questionnaire results using descriptive quantitative analysis. This stage also assesses the extent to which the system meets the predefined solution objectives.
- f. **Communication Documentation**
The communication stage involves the preparation of reports and scientific publications as a means of disseminating the research results and knowledge contributions to the academic community and practitioners.

3. Results

The Results and Discussion part offers an examination of the research outcomes to address the research questions and provide solutions. If in-depth clarification is necessary regarding the topics covered, this section can be divided into smaller subsections as described below.

3.1. Problem Identification and Motivation

At the stage of recognizing problems, this research emphasizes the need to comprehend the state of digital transformation readiness among MSMEs. From the findings of the literature review and the analysis of MSME situations, it became clear that most MSME operators lack a solid understanding of their digital transformation readiness status. Assessments of digital readiness are predominantly carried out in a personal and disorganized way, which restricts their capability to present a thorough picture of MSME preparedness in essential areas like technology, human capital, business operations, and both organizational strategy and culture.

The lack of a systematic assessment tool complicates efforts for MSMEs to establish suitable development priorities and pathways for their digital transformation. This scenario can result in poor decision-making and disjointed digital transformation actions. Consequently, there is a need for an approach that assists MSMEs in measuring their digital transformation readiness in an objective and quantifiable way. The recognition of these challenges acts as the basis and inspiration for creating a research tool in the form of a digital transformation readiness evaluation system accessible online for MSMEs, aimed at offering a well-organized insight into their digital readiness status.

3.2. Define the Objectives for a Solution

The objective-setting stage is conducted based on the results of problem identification from the previous stage. The primary objective of the solution developed in this study is to create a web-based digital transformation readiness evaluation system for MSMEs that is capable of providing an objective, structured, and easily understandable overview of MSME actors' readiness levels. The system is designed to assess digital transformation readiness across several key dimensions, including technology, human resources, business processes, as well as organizational strategy and culture. Through the implementation of this evaluation system, it is expected that MSMEs will be able to understand their current digital readiness position, enabling them to establish appropriate priorities and more targeted directions for digital transformation development.

3.3. Design and Development

At the stage of design and development, the study concentrates on designing and building a web-based evaluation system to assess the readiness of MSMEs for digital transformation. The initial phase of the design involves outlining the system's structure and a functional model that demonstrates the system's entire workflow. After this, the user interface is crafted to make sure that the system is user-friendly, particularly for MSME participants who have different levels of digital skills.

Overall, the system created includes two types of users: administrators and MSME contributors. Administrators have the capability to oversee the evaluation questionnaires for digital transformation readiness, arrange the questions and assessment criteria, establish scoring guidelines, and handle the data related to MSMEs. The features of the administrator interface are depicted in Figures 2 to 7.

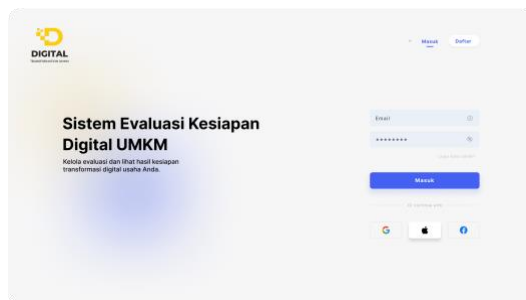


Fig. 2: Login Interface

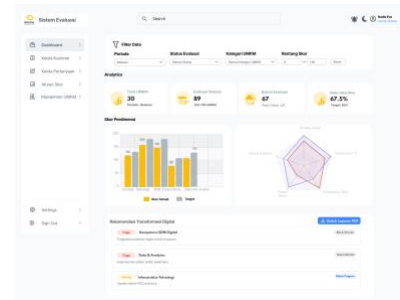


Fig. 3: Administrator Dashboard

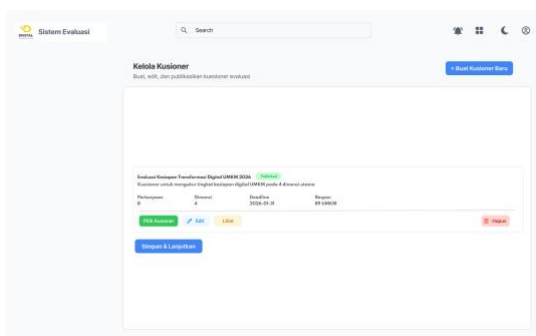


Fig. 4: Questionnaire Management Interface

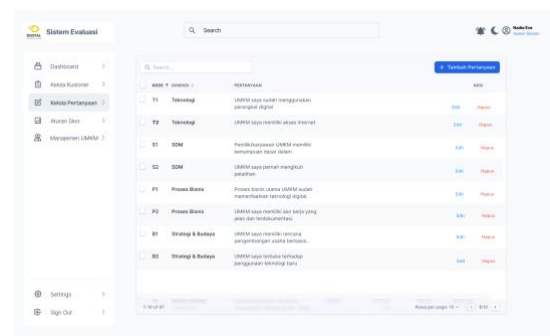


Fig. 5: Question Management Interface

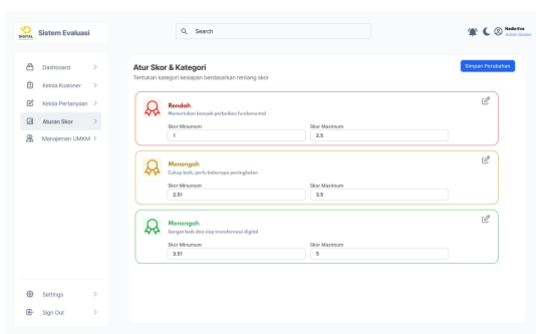


Fig. 6: Scoring Rules Configuration Interface

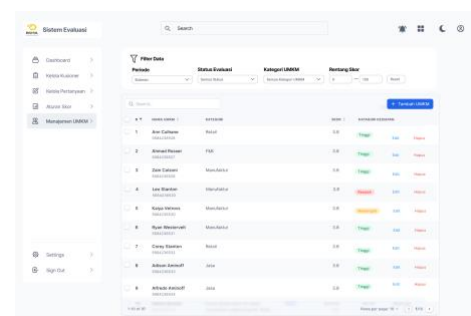


Fig. 7: MSME Management Interface

At the same time, small and medium-sized enterprise users serve as participants who fill out the digital readiness survey via the web-based platform on their business circumstances. The interface and functionalities available to these MSME users are illustrated in Figures 8 to 14.

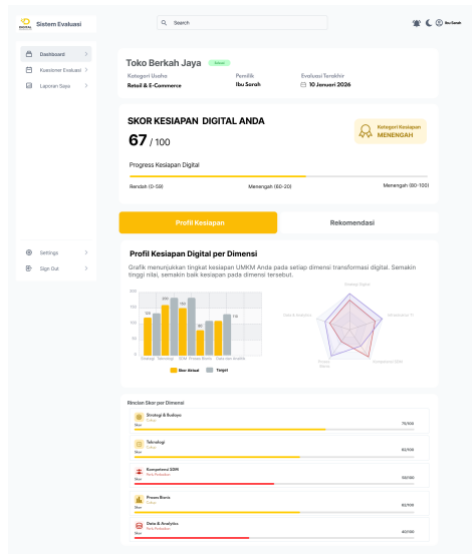


Fig. 8: Digital Readiness Profile Dashboard

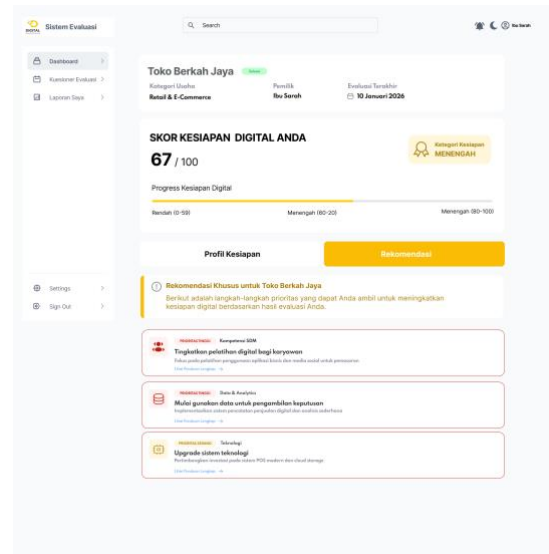


Fig. 9: Digital Readiness Recommendation Dashboard

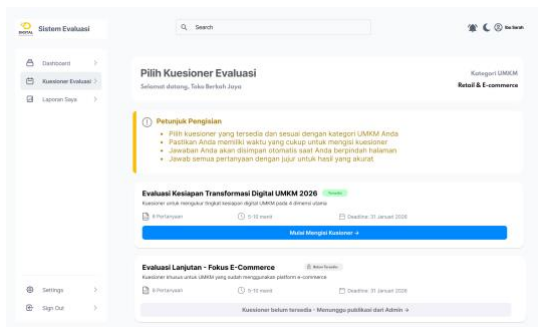


Fig. 10: Digital Transformation Readiness Questionnaire

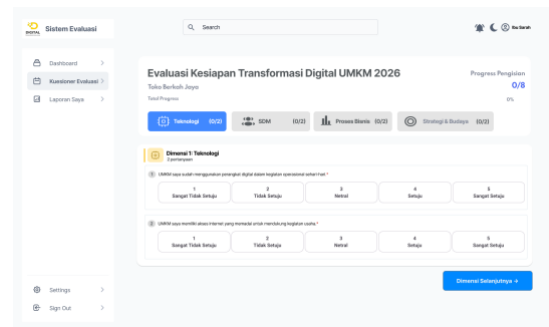


Fig. 11: Technology Dimension Questionnaire

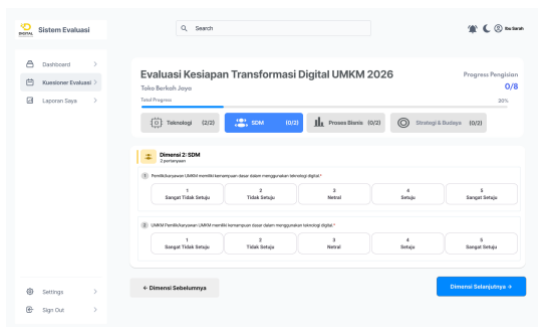


Fig. 12: Human Resources Dimension Questionnaire

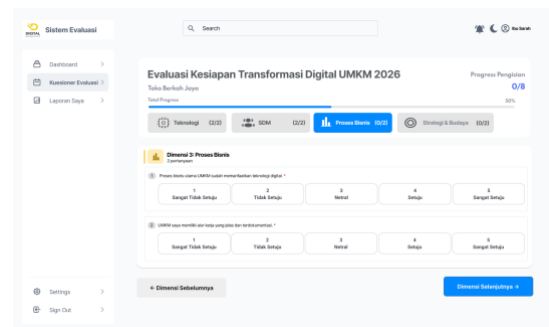


Fig. 13: Business Process Dimension Questionnaire

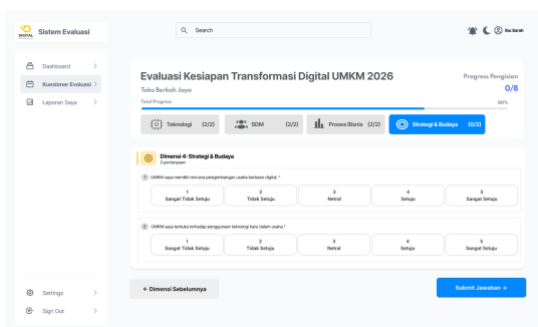


Fig. 14: Strategy and Culture Dimension Questionnaire

3.4. Demonstration

The purpose of the demonstration phase is to illustrate how the web-based for assessing the readiness of MSMEs for digital transformation can be utilized by users as intended before moving on to evaluate its effectiveness in the next phase. During this phase, MSME users are requested to fill out a digital transformation readiness questionnaire that is supplied by the system. The questionnaire is organized according to established assessment criteria, allowing users to easily grasp each element of digital transformation readiness being assessed. Data gathering during this phase is conducted via a questionnaire. This instrument is crafted using a five-point Likert scale, offering response choices from 1, which signifies strong disagreement, to 5, which indicates strong agreement. This scale is implemented to gauge how much respondents agree with each statement that represents the digital transformation readiness status of MSMEs. The five-point Likert scale was chosen for its clarity, ease of comprehension for participants, and its common application in evaluating user perceptions.

Table 1: Likert Scale Assessment (Sugiyono, 2013)

Response Option	Score
Strongly Agree (SA)	5
Agree (A)	4
Neutral (N)	3
Disagree (D)	2
Strongly Disagree (SD)	1

The questionnaire implemented in the system includes four key aspects of readiness for digital transformation: technology, human resources, business process, and organizational strategy, along with culture. The set of inquiries utilized during the demonstration phase of the system can be found in Table 2.

Table 2: Digital Transformation Readiness Questionnaire

Code	Dimension	Question
T1	Technology	My MSME has used digital devices in daily operational activities.
T2	Technology	My MSME has adequate internet access to support business activities.
S1	Human Resources	The owner/employees of the MSME have basic skills in using digital technology.
S2	Human Resources	My MSME has participated in training or learning activities related to digital technology.
P1	Business Process	The main business processes of the MSME have utilized digital technology.
P2	Business Process	My MSME has clear and well-documented workflows.
B1	Strategy & Culture	My MSME has a digital-based business development plan.
B2	Strategy & Culture	My MSME is open to adopting new technologies in business operations.

3.5. Evaluation

The evaluation stage aims to assess the extent to which the developed artifact is able to address the identified research issues. The assessment is conducted by examining the results of questionnaire responses provided by MSME users using a quantitative descriptive analysis approach. The mean score of each indicator is used to represent the level of digital transformation readiness across each assessed dimension.

Table 3: Questionnaire Results

MSME	Questionnaire Code							
	T1	T2	S1	S2	P1	P2	B1	B2
MSME 1	2	2	2	2	3	3	2	2
MSME 2	3	3	2	2	3	3	3	3
MSME 3	4	4	3	3	4	4	3	3
MSME 4	2	2	1	1	2	2	2	2
MSME 5	5	5	4	4	4	4	4	4
MSME 6	3	3	3	3	3	3	3	3
MSME 7	1	1	2	2	2	2	1	1
MSME 8	4	4	4	4	5	5	4	4
MSME 9	3	3	2	2	4	4	3	3
MSME 10	5	5	5	5	5	5	5	5
Total Score	32	32	28	28	35	35	30	30
Mean Score	3,2	3,2	2,8	2,8	3,5	3,5	3	3

Based on the evaluation results presented in Table 3, the business process dimension achieved the highest mean score compared to the other dimensions, indicating that several MSMEs have begun to utilize digital technology in their operational processes. In contrast, the human resources dimension obtained a lower mean score, suggesting that limitations still exist in terms of digital skills and technological experience among MSME owners and employees. The results of this assessment indicate that the developed system can provide an organized overview of the readiness for digital transformation among MSMEs and can serve as a foundation for planning future digital advancements.

3.6. Communication Documentation

At the communication and documentation stage, the results of the artifact's demonstration and evaluation are presented to highlight both the practical and academic contributions of the developed system. This study produces an artifact in the form of a web-based system designed to evaluate the digital transformation readiness of MSMEs, providing a structured and objective overview of their digital readiness conditions. Through the conducted demonstration and evaluation, the developed system can be utilized by MSME actors to assess their digital transformation readiness based on key dimensions, including technology, human resources, business processes, as well as organizational strategy and culture. The evaluation results indicate that the system is capable of revealing variations in readiness levels across these dimensions, thereby helping MSMEs gain a clearer understanding of their current digital readiness positions. From a practical perspective, the system serves as an initial decision-support tool for MSMEs in determining priorities and directions for more focused digital transformation development. Meanwhile, the academic contribution of this study lies in the application of the Design Science Research approach to the development of a digital transformation readiness evaluation system for MSMEs, which may serve as a reference for future studies with similar contexts and research objects. In this way, the resulting artifact not only offers a practical solution but also contributes to the advancement of knowledge in the fields of information systems and digital transformation for MSMEs.

4. Conclusion

This study successfully develops a web-based digital transformation readiness evaluation system for MSMEs using the Design Science Research (DSR) methodology to address the limited understanding of MSMEs regarding their level of digital readiness. By following a structured DSR process, the developed system is able to assess MSMEs' digital transformation readiness in an objective and systematic manner across four main dimensions, namely technology, human resources, business processes, and organizational strategy and culture. The conducted demonstration shows that the system can be effectively utilized by MSME actors as a tool for evaluating their digital transformation readiness. Therefore, the developed evaluation system functions not only as a practical support tool for MSMEs in identifying priorities and directions for digital transformation development, but also provides an academic contribution through the application of the DSR approach in developing a digital transformation readiness evaluation system for MSMEs.

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