
Decision-Making Methods for Selecting the best Strategy for Industry 4.0

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Abstract:

Emerging Industry 4.0 creates a critical challenge when an organization decides to reform and adapt to developing technologies. The decision-maker must be aware of the elements prior to implementing Industry 4.0 strategies and technologies. Following the research approach, this article presents the decision-making framework for SMEs in Industry 4.0 implementation decisions. This research begins with Industry 4.0 aspects and readiness maturity levels that identify SME capability. This model is a hybrid multi-criteria method: the fuzzy DEMATEL was used to evaluate the direction of the aspect, and then the fuzzy Best-Worst method analyzed the weighting of aspects. After that, the prioritization of strategies was ranked. The result concluded the priority of SMEs to select the suitable strategy toward Industry 4.0. Moreover, human skills are the core organizational aspects that embrace adaptation. Finally, the research not only highlights the best strategies selection but also presents the human skills that support organizational implementation.

Keywords: decision-making; decision process; decision framework; human skills; Industry 4.0, technology; maturity model; strategies, readiness

1 Introduction

The fourth industrial revolution has led to an important technology for manufacturing sectors. In particular, during this period, technology leaps and bounds due to the problem of the pandemic has meant organizations have had to adjust to working. During the past year, companies have introduced technology to play a role in working more and faster than before (Pluralsight, 2020). People all over the world have to adapt to the use of technology, which is considered to accelerate the application of technology in the organization and work-life (Vargo et al., 2021).

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Industry 4.0 is the newest advanced technology enabling manufacturers to streamline production and processes, innovate faster, lower costs, and deliver higher quality (Moeuf et al., 2018). Whenever a company decides to transform and adapt to the emerging technologies, the decision-maker has to understand the factors that involve the commencement of the technologies and strategies for improvement. Due to the emerging Industry 4.0 strategy and technology, this raises a significant decision, especially for small and medium-size enterprise who strive to remain competitive in national and global markets. The ambiguity and complexity of Industry 4.0 adoption are still issues facing enterprises (Ghobakhloo and Iranmanesh, 2021).

In addition, important human skills involve the adjustment of technology skills. Modern organizations will reduce the use of paper to zero use in the future, as part of digital technology. In addition, organizations store big data on the online database. Personnel in the digital age must adapt knowledge, abilities, and skills in using modern technology and equipment that are updated periodically (Santiteerakul et al., 2019). It includes using software to process data and respond quickly. Thus, working in the digital age is always the most efficient. That drive to continuous systems improvement results in innovative products and process that solve problems and remove barriers. The organization integrates digitalization into in-depth work processes, reducing traditional organizational obstacles while also changing the working style. The organization moves in a direction consistent with the situation of globalization. There is a connection, flexibility, convenience, unlimited time and place, and quick response to needs.

Human resource evidence of the organization and capability to learn and change drives the motivation of organizational culture by accepting innovation and digital change (Schwab, 2017; Oberer and Erkollar, 2018) In fact, human skills and resources are the core aspects of the organization (Rampasso et al., 2020). Proactive adaptation embraces the requirement of human skills, so that lack of the correct skills leads an organization to poor performance.

In general, multi-criteria decision-making techniques are suitable to assist the decision-maker in choosing the best solution. There is various research regarding the different criteria and alternatives. In this sense, this study aims to propose a decision-making framework that includes the critical phases of deciding by a small business. A decision-making method is developed in the research approach to deal with the Industry 4.0 best strategy implementation. This research also highlights the human skills to

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support the organization and work tasks that are complex and difficult for Industry 4.0 implementation (Ghobakhloo and Iranmanesh, 2021).

This model approach is a hybrid multi-criteria method. First, the organization will need to evaluate its actual readiness and target before promoting Industry 4.0 in business. The aspect of the Industry 4.0 component is determined for the readiness measurement. Afterward, the fuzzy decision-making trial and evaluation laboratory (DEMATEL) is used to evaluate the direction of the Industry 4.0 aspect (main attributes/ aspects). Then the fuzzy Best-Worst method is used to analyze the weighting of aspects attributes. Vlse Visekriterijumska Optimizacija I Kompromisno Resenje (VIKOR) techniques are used to analyze the best Industry 4.0 strategy selection. In addition, the result highlights both the strategies selection and presents the human skills that support their implementation.

The research structures as follows, beginning with the research background is the literature review in Industry 4.0 and decision-making methods. It was carried out to understand the Industry 4.0 decision framework and the field of human resources. Next, the methodology is adopted to reach the research objective and the decision framework. Finally, the application of the model is presented followed by the implication, conclusion, and limitation.

2 Background

In this section s literature in existing work in the technology adoption, and the Industry 4.0 assessment and related is discussed.

2.1 Industry 4.0 and decision-making model

First, this research reviews the model and framework to implement Industry 4.0 in an organization, for example, the development model for assessing Industry 4.0 maturity (Schumacher et al., 2016)., the framework of service management in Industry 4.0. (Rennung et al., 2016) and a model for business to implement Industry 4.0 (Tvenge and Martinsen, 2018). All the research entails the conceptual model that concerns the requirement for implementation Industry 4.0.

Sriram and Vinodh (2020) used the complex proportionality assessment (COPRAS) methodology a multiple-criteria decision-making methodology, to analyze the readiness factors for Industry 4.0 in SMEs. For this reason, the output ordered the priority of the factors and suggests the challenges to SMEs in Industry 4.0 adoption.

Kaya et al. (2020) created the roadmap development for Industry 4.0 and developed the alternative and criteria about the Industry 4.0 strategies and