



Research on the evaluation of enterprise digital transformation maturity based on comprehensive evaluation model

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Abstract. The comprehensive promotion of China's intelligent strategy has provided a huge development opportunity for the digital transformation of enterprises. However, due to the influence of factors such as market environment, industry characteristics and digital foundation, there are large differences in the degree of digital transformation of enterprises. Therefore, the establishment of a digital maturity evaluation model can provide guidance and assistance for the practice of digital transformation of enterprises. Combining the key areas of digital transformation, this research selects four dimensions of enterprise strategy and organization, infrastructure, digital application, efficiency and benefit, and sets up 14 second-level indicators (categories) and 36 third-level indicators (domains). The digital transformation maturity evaluation model is constructed and explored. At the same time, based on the analytic hierarchy process, the weights of each index are assigned, and through enterprise application diagnosis, the current maturity level is determined, and the weak links in the digital transformation process are identified, in order to improve the level of digital development and realize the sustainable development of digital transformation.

Keywords: digital transformation; maturity; evaluation model

1 INTRODUCTION

With the rapid development of information technology and the wave of digital transformation of enterprises, more and more enterprises have begun to pay attention to the strategic significance of digital transformation to enterprises. However, the success of enterprise digital transformation does not only depend on the introduction and application of technology, but also requires comprehensive organizational changes and management innovations. Therefore, evaluating the maturity of enterprise digital transformation and understanding the status quo and development trend of enterprise digital

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transformation has become a research hotspot in the fields of management and information technology[1]. As a commonly used evaluation method, the comprehensive evaluation model is of great significance in evaluating the maturity of digital transformation of enterprises. It establishes a complete evaluation system by comprehensively considering multiple aspects of enterprise digital transformation, and provides comprehensive analysis and evaluation for enterprise digital transformation. This paper aims to discuss the evaluation method and research status of the digital transformation maturity of enterprises based on the comprehensive evaluation model. First, this article will introduce the background and significance of enterprise digital transformation, and analyze the influencing factors and evaluation indicators of enterprise digital transformation. Secondly, this article will introduce the basic concepts and characteristics of the comprehensive evaluation model, and discuss its application in evaluating the maturity of digital transformation of enterprises. Finally, this paper will summarize the current research status of evaluating the maturity of digital transformation of enterprises based on the comprehensive evaluation model, and look forward to the future research direction. The significance of this study is that, through in-depth discussions on the evaluation methods and research status of the digital transformation maturity of enterprises, it can provide certain reference and guidance for the management and practice of digital transformation of enterprises. At the same time, the research in this paper can also provide some enlightenment for the academic and management circles, and promote the research and application of the digital transformation maturity evaluation method based on the comprehensive evaluation model.

2 RELATED WORK

The comprehensive evaluation model is a commonly used evaluation method, which obtains a comprehensive index or evaluation result through comprehensive evaluation of multiple indicators or factors. The scope of application of the comprehensive evaluation model is very wide, including but not limited to enterprise management, environmental assessment, risk assessment and other fields. In the evaluation of enterprise digital transformation, the comprehensive evaluation model is also very practical. Because the digital transformation of an enterprise is a comprehensive process involving many aspects and factors, it needs to take into account the strategic goals of the enterprise, organizational changes, information technology applications, and management innovations. Therefore, by establishing a comprehensive evaluation model that includes multiple evaluation indicators, it is possible to more comprehensively and objectively evaluate the maturity and status quo of an enterprise's digital transformation.

The maturity evaluation of enterprise digital transformation needs to take into account multiple factors and indicators. At present, the influencing factors and evaluation indicators mainly concerned by academia and industry include several aspects, such as strategic goals: the digital transformation of enterprises needs to be planned and implemented according to the strategic goals of enterprises. Therefore, when evaluating the maturity of an enterprise's digital transformation, it is necessary to consider whether the

enterprise's digital transformation is consistent with its strategic goals[2]. Organizational change: The digital transformation of an enterprise requires the reconstruction and transformation of the organizational structure and business processes of the enterprise. Therefore, when evaluating the maturity of an enterprise's digital transformation, it is necessary to take into account the degree and effect of the enterprise's organizational change. Information technology application: The digital transformation of enterprises requires the use of information technology to automate and digitize business processes. Therefore, when evaluating the maturity of an enterprise's digital transformation, it is necessary to take into account the application degree and effect of information technology. Management innovation: The digital transformation of enterprises requires the innovation of enterprise management methods and management models. Therefore, when evaluating the maturity of an enterprise's digital transformation, it is necessary to take into account the degree and effect of enterprise management innovation[3]. Risk management: There are many risks and challenges in the process of enterprise digital transformation, such as data security risks and personnel loss risks. Therefore, when evaluating the maturity of an enterprise's digital transformation, it is necessary to take into account the ability and effect of enterprise risk management.

3 EVALUATION MODEL CONSTRUCTION

3.1 Selection principles of evaluation indicators

In order to establish a more standardized index system that fits the digital transformation of enterprises, this study follows the following principles when selecting indicators: First, the scientific principle, the selected indicators should be able to objectively reflect the connotation and characteristics of digital transformation, and accurately reflect the development stage of digital transformation, the collection of indicators should be accurate and controllable, using a combination of qualitative and quantitative methods to effectively support the evaluation, analysis, diagnosis and improvement of digital transformation level and capabilities, efficiency and benefits; secondly, the principle of effectiveness, the indicator system should be representative, It can reflect the status quo and transformation trend of enterprise digitalization from the perspective of strategic level, development basis, application scenarios and innovative development, so as to evaluate the level and ability of enterprise digital transformation; finally, the principle of operability, the evaluation index should be easy to select, and can be related to the actual situation of the enterprise. Combined, it is convenient for collection and analysis, and it highlights the evaluation of digital transformation in key links such as strategy, infrastructure, management, and service, and has wide applicability.

3.2 Evaluation model index selection and interpretation

On the basis of analyzing and referring to the evaluation model of integration of industrialization and industrialization and digitalization, combined with the current status of digital transformation of enterprises, this research constructs four dimensions of strategy and organization, infrastructure, digital application, efficiency and benefit as the

core. The purpose is to comprehensively and systematically evaluate the level and effect of digital transformation of enterprises, provide guidance and support for enterprises, and promote the smooth implementation of digital transformation.

3.3 Maturity Evaluation of Enterprise Digital Transformation

In order to evaluate the digital transformation maturity of enterprises, we constructed a maturity evaluation model, including 4 core dimensions, 14 second-level indicators and 36 third-level indicators. Through procedures such as constructing a judgment matrix by using the AHP, evaluating expert opinions, calculating weights, and conducting consistency checks[4], we determined the weight of each indicator for comprehensive evaluation and grading. This evaluation model can not only help enterprises understand the maturity of their digital transformation, but also provide targeted improvement suggestions and development directions for enterprises, helping to improve the level and competitiveness of enterprises' digital transformation.

3.3.1 Formation of the Judgment Matrix

a_{ij} in matrix A represents the comparison result of index i relative to index j , and the judgment matrix is as follows:

$$A = (a_{ij})_{n \times n} = \begin{pmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{pmatrix} \quad (1)$$

3.3.2 Calculation of index weights

The square root method is used to geometrically average the indexes of each row of matrix A to obtain the square root vector \overline{W}_i , which is then normalized to calculate the weights and eigenvectors W_i of each evaluation index for the maturity of the digital transformation of the enterprise[5].

$$W_i = \frac{\overline{W}_i}{\sum_{i=1}^n \overline{W}_i}, i = 1, 2, \dots, n \quad (2)$$

3.3.3 Consistency check

Since the subjective judgment of evaluation experts in the judgment matrix will produce certain deviations, it is necessary to check the consistency. Firstly, formula (3) is used to calculate the consistency index of the judgment matrix:

$$CI = \frac{\lambda_{max} - n}{n - 1} \quad (3)$$

Where λ_{max} is the largest eigenvalue of matrix A. Then use the formula (4) to calculate the random consistency ratio CR of the judgment matrix:

$$CR = \frac{CI}{RI} \quad (4)$$

When the calculation result of the consistency index is $CR < 0.1$, it can be considered that the construction of the judgment matrix has a satisfactory consistency, otherwise, experts need to re-judge the score. RI is the standard value of the average random consistency index[6].

3.4 Overview

Aiming at the status quo of enterprise digital transformation, the digital maturity evaluation model can be used for self-diagnosis and improvement. Evaluation experts can score the three-level indicators according to the digital maturity from low to high, and perform weighted summation according to the weight of each indicator to obtain the final score, so as to evaluate the digitalization of the enterprise against the grades set by the maturity evaluation model Transformation maturity[7]. To this end, this study refers to the intelligence capability maturity model released by the China Electronics Standardization Institute, etc., and divides the maturity of digital transformation of enterprises into five levels. Planning level (level 1), specification level (level 2), integration level (level 3), optimization level (level 4) and leading level (level 5). At the planning level (Level 1), companies begin to prepare for digital transformation and are able to process core business activities. At the specification level (level 2), enterprises carry out digital transformation and standardization of core equipment and business activities to achieve data sharing of a single business activity. At the integration level (level three), enterprises realize the data sharing of digital equipment, information systems, etc., and carry out comprehensive integration among cross-business activities. At the optimization level (Level 4), the enterprise has realized data mining and digital transformation of personnel, resources, etc., and can accurately predict and optimize core business activities. At the leading level (Level 5), the digital maturity of the enterprise is already at the leading level in the industry, realizing the innovation and coordination of all business activities and deriving new digital models and business models. The evaluation experts can assign scores from 0 to 5 for each level of indicators according to the digital maturity from low to high, and calculate the final score by weighting and summing the scores of each indicator combined with the weight, so as to self-diagnose the maturity of the overall digital transformation of the enterprise[8]. Therefore, enterprises can conduct self-diagnosis of digital transformation based on the digital maturity evaluation model, and take corresponding measures to improve the level of digital transformation.

Table 1. Evaluation reference for the maturity level of enterprise digital transformation

Grade	Score
Leading Level (Level 5)	[4.5, 5.0]
Optimization Level (Level 4)	[3.5, 4.5]
Integration Level (Level 3)	[2.5, 3.5]
Specification Level (Level 2)	[1.5, 2.5]
Planning Level (Level 1)	[0.5, 1.5]

4 CONCLUSION

The status quo of enterprise digital transformation needs to be analyzed from four dimensions: strategy and organization, infrastructure, digital application, efficiency and benefit, and these factors should be summarized into considerable and measurable factors to build a digital transformation maturity evaluation model. By using this model, enterprises can self-diagnose the problems existing in digital transformation, optimize the scope of resource allocation, and improve the development level of digital transformation to achieve long-term sustainable development. This model can guide enterprises to shift the allocation of resources from traditional elements to data elements, thereby improving the efficiency and effectiveness of digital transformation. The key factors of digital transformation need to be systematically assessed and managed to drive the development of enterprise digital transformation.

5 DISCUSSION

In order to promote the digital transformation of enterprises, we can start from the following aspects: formulate digital transformation strategies and plans, and comprehensively design digital transformation as a system engineering. Optimize resource allocation and establish a comprehensive talent protection system. Increase investment in software and system construction, attach importance to the construction of smart connection systems, and continuously improve the service functions of the digital information platform. Broaden financing channels, strive for government special fund support for digital transformation, and use information technology to transparentize corporate financing information and strive for long-term investment. Through improvement in these dimensions, enterprises can accelerate digital transformation and achieve sustainable development. At the same time, they also need to focus on improving digital transformation capabilities and levels to adapt to market competition and changing needs.

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