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A Systematic Literature Review of Digital Maturity Model Research

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Abstract

Existing literature suggests that higher levels digitalization could promote the organizational development, and research has focused attention on digital maturity from multiple disciplines. The objective of this paper is to find the common research themes and conclusions in digital maturity research. This paper summarizes the concept of digital maturity, then combines the evaluation of digital maturity in multiple fields. Finally, it also discusses the current research shortage of digital maturity and prospects for the future research direction. This study helps to systematically comb the knowledge context of digital maturity, and helps to promote further research of digital maturity.

Keywords: Digital Maturity; Digital Evaluation; Maturity Models

1 INTRODUCTION

Since the 21st century, digitalization had become one of the most discussed topics in this era. Whether enterprises, hospitals, educational institutions and other fields, the digital environment in which the organization lives are more changeable, making it more important to adapt to the digital environment than ever. Therefore, all fields are inclined to bring unique value to users by reforming information resources and digital technology, so as to realize digital transformation and achieve results. Therefore, it can also be considered that digital transformation is the most important civilization trend in today's society. It is completely changing all industries, not only the strategic background of the organization, but also its competitive mode, business channels and working mode. When the implementation of digital transformation state is optimal, digital maturity is reached. It seemed due to the ongoing epidemic and different national blockade economic consequences, adapting to the gradually digital market environment and realizing digital maturity has become the top priority of organizations, but "2018 Chinese enterprise digital transformation index report" pointed out that although China has become the world second largest digital economy, but in practice only 25% of enterprises digital transformation and upgrading, only 7% of Chinese enterprises digital maturity, more enterprises still lack digital transformation consciousness and means.

In recent years, scholars domestic and overseas had paid more attention to digital maturity, and related research had emerged. Digital maturity has become a hot research vocabulary in the digital field, and scholars from many fields pay attention to and research it. Therefore, this paper will comprehensively review and systematically combine the relevant literature, review the evaluation system of digital maturity, and then prospect future research on digital maturity, in order to bring some enlightenment to the research in the field of digital maturity.

2 DIGITAL MATURITY CONCEPT

In 1984, the scholars, from Institute of Software Engineering at Carnegie Mellon University, proposed the concept of capability maturity, which was gradually applied to other areas such as management and medical care. Numerous literature suggests that many scholars from different disciplines begin to focus on the topic of digital maturity.

In the medical sector, digital maturity was the extent to which its medical IT achieved high - quality healthcare by supporting improved service delivery and patient experience (Martin, et al., 2019).[1] Flott et al. (2016) believed that digital maturity refers to the degree to which digital technology was used as a means to provide high - quality

medical services, which was an emerging concept in the developed medical system[2]. Similarly, Khanbhai, et al.(2019) believed that the digital maturity of the hospital usually changed with the development of time and place, so in this respect, the digital maturity represented the ability to respond to the environment in an appropriate way[3], and it was also the result of constantly adapting to the continuously changing digital pattern. In government governance, digital maturity is considered to be used to measure the state and capacity of government digital governance.

But on the whole, from the point of view of the enterprise research is still mainstream, because different researchers are based on their own subjective understanding and academic background to give different definition of digital maturity, so the concept of digital maturity is still not unified, but the content is generally consistent, basically reflects the organization in digital technology, business and strategic goals of digital progress.

Digital maturity is not currently uniformly defined. Because different maturity models and their basic definition of digital maturity are different in content and method. This paper prefers to think that digital maturity is the achievement of organizational digital transformation. Technology is a condition for organizations to achieve highly digital maturity, but research has found that organizations in various fields will no longer rely on the technology itself, but rather more of the ability to implement these technologies through rethinking strategies, culture and talent. The research shows that the four aspects of customer experience, technology, operation process and organizational culture are the dimensions that most scholars believe to evaluate the digital maturity, and some scholars have introduced organizational strategy, partnership, innovation, and etc., to more comprehensively calculate the digital maturity of the organization.

3 DIGITAL MATURITY EVALUATION

After the concept of digital maturity was gradually known and applied, the research of digital maturity evaluation system has been developed at home and abroad. Effectively evaluating digital maturity can help the organization to clarify the current degree of digital development and further promote the process of digital maturity. However, because digital maturity is multi - dimensional and constantly developing, which makes it difficult to measure or assess itself, digital maturity needs to be specifically evaluated through different dimensions of the maturity model, which can be regarded as a tool to evaluate the progress and maturity level of digital maturity of the organization. Reviewing the relevant literature in the past five years, we found that scholars mostly evaluate the digital maturity of the organizational and technical perspectives.

3.1 Firm Level Evaluations

A minority of scholars evaluate the digital maturity of organizations, focusing on the organizational level of strategy, operation and manpower, and did not incorporate the technical perspective into the evaluation system. Hie(2019) believed that digital maturity can be evaluated in terms of customer experience, operation and business model[4]. Customer experience is mainly to simplify customer process and use digital customer self - service to improve its experience performance; while operation belongs to the strongest dimension, involving the new function, operation transparency, automation and data - driven decision - making; business model includes digital packaging, digital enterprise integration and decision - making redistribution. North et al.(2020) developed a framework for enterprises that evaluates digital maturity that with operational and business models as basic assessment elements, while incorporating strategy and employee elements into the assessment[5]. Operation within this framework refers to the implementation of digital mechanism and continuous updating; business model considered investment factors and new areas to determine the current business model; and strategy was digital management process and thinking; in such a digital - oriented framework, employee dimension was not simply refers to the ability to digitize but was powered and encouraged to try digital planning. Petani et al.(2018) used the expert re-ranking of the existing evaluation dimensions of digital maturity to obtain the five most important dimensions (culture; customer experience; ecosystem; operation; business model innovation)[6]. Organizational culture was an important factor in digital maturity, which was the digital value centered on digital strategy that can create a digital enterprise environment for employees; ecosystem was the development and maintenance of partners and a key element of digital business; Business model innovation can be regarded as an open organizational governance, and as an open cross - functional

field. Similarly, Brkić et al.(2020) argued that organizations ' highly digital maturity was achieved only in digital change and must be evaluated from the five dimensions of customer experience, staff, culture, innovation and leadership[7]. The first three elements were consistent with most of the scholars. Notably, innovation was the foundation of the digital business and means focusing on more flexible and agile ways;leadership means the ability to practice the strategy of digital organizations and lead employees to work for digital goals. In the medical field, Johnston(2017) believed that the digital maturity of the UK national service system could be evaluated through connectivity, digital architecture and digital strategy[8]. Interchange referred to the ability to share information within the medical service system; digital architecture was the organizational structure that medical staff and patients can participate in service and effectively manage patient information; digital strategy was to coordinate medical service organizations and better implement digital technology. Khanbhai et al.(2019)believed that resources, utilization, and sustainability were also the key elements of digital sustainability assessment on the basis of interoperability[3]. Resources was effective information available in the healthcare system; utilization was patient engagement and responsiveness; sustainability was activities that continuously improve digital quality and cost effectiveness.

More scholars still consider both technical and organizational perspectives to measure digital maturity. Gill and VanBoskirk(2016) had established a digital maturity 4.0 models that measured the digital maturity of an enterprise from four dimensions: culture, technology, organization, and data insight[9]. It was also pointed out that enterprises must pay attention to three key issues in the process of digital integration: formulating the digital strategy, the governance of cross-functional digital activities, and the excellent operation of the digital implementation process. The following year, Blagoeva(2017) evaluated the digital maturity of the banking industry in the Republic of Macedonia mainly from the five pillars of leadership, organizational culture, ability, innovation, and technology[10]. The organizational culture of the Bank of Macedonia was a customer-focused and more focused risk appetite and employee acceptance than other organizations. After reviewing multiple literature, competence was obtained for the first time, which is defined as the ability to acquire resources, training skills, staff skills and support procedures needed to achieve digital maturity. In terms of overall digital maturity, the pillar of innovation refered to the innovation potential of exploring digital channels to provide new services, and in the view of Blagoeva, technology was the basic technology platform that supports the other four pillars and the highest level among others.Similarly, Vuksanović Herceg et al.(2020) also used a Deloitte digital maturity model with five core dimensions (customer experience, strategy, technology, operation, and organizational culture) to assess the digital maturity of the organization[11].Valdez-de-Leon(2016) had developed a seven-dimensional model of digital maturity through case studies in multiple industries and talked with subject experts[12]. Its digital maturity was mainly evaluated on seven dimensions: organization, technology, operation, strategy, customer, partnership (ecosystem) and innovation. Organizations emphasize changed in internal communication, culture, and knowledge management; while technology meant functions that support digital business; operations focus not only on their operational processes focused more on providing supporting services. In line with its ideas, Isae et al.(2018) also conducted the digital maturity evaluation of the company from seven aspects: strategy, organization, customer, partnership (ecosystem), operation, technology and innovation[13], but the technical dimension emphasized by Isae was more focused on the integration of automation technology to reduce the likelihood of enterprise mistakes. Ramantoko et al. (2018) had built a set of capability models to evaluate digital maturity through empirical research methods for traditional Indonesian business communities, including nine dimensions: organization, sales channels, information systems, knowledge development, marketing, client relations, internal communication, partnerships (ecosystem) and digital income[14]. Organizations was to implement online systems, And have websites, forums and other digital channels; Sales channel was a way to use the online sales of digital process; Technically speaking, The information system can be understood as a set of interconnected components that collect and process information; Knowledge development involved the development ability to share and apply new knowledge between individuals, departments, or organizations; Marketing was an activity to increase the number of potential customers by using digital media; Customer relations was the management process of using the media to communicate, communicate and give back to customers; Internal communication was a technical communication media between staff and management, It was also the core element of employee development; Partnership involved stakeholders around digital exchange in the enterprise ecosystem; Digital income was the revenue generated through online activities.

3.2 Evaluation Systems for Educational and Medical Institutions

Due to the increasing importance of ICT in education, the concept of digital maturity of educational institutions is becoming increasingly important. Without digital technology, any of its three main missions (teaching, research, and contribution to society) are almost impossible, because of this it becomes necessary to assess the digital maturity of educational institutions. Sotiriou et al.(2016) evaluated the innovation programs of 400 schools across Europe using five indicators, including development planning, curriculum, information technology culture, professional development, and information technology infrastructure[15]. Development planning was to develop a long-term plan for balanced school development that can effectively integrate information technology in teaching. Balaban et al. (2018) studied the digital maturity of Croatian primary and secondary schools and developed a framework of five evaluation areas[16]. It included development planning, application of information technology in teaching, cultivation of digital ability, information technology culture, and information technology infrastructure. Cultivating digital capacity was to strengthen the development of students ' digital capabilities, and informal learning encouraged and recognized in the formal education system. In the same year, Jeladze et al. (2018) studied how digital schools remain innovative, and researched the European national 447 schools to establish a digital maturity evaluation framework that conceptualized technology as a medium to change human behavior and enhance knowledge[17]. The framework covered seven dimensions: leadership and governance practice, teaching and learning practice, professional development, evaluation practice, content and curriculum, collaboration and networking, and information technology infrastructure. Durek et al.(2019) had proposed a digital maturity evaluation system for higher education institutions based on scientific research[18]. It covered seven dimensions: development planning, quality assurance, scientific research ability, technology transfer, teaching and learning, information technology culture, and information technology infrastructure. Hummel et al.(2019) studied the digital maturity level of the teaching field of UAS and UAV management through empirical research on organizational structure, information technology, business processes, customer experience, culture, service, strategy, collaboration and employees[19]. It showed management did not realize the importance of digital change, and only with management innovation, teaching and research can continue to develop in the digital future. Ifenthaler et al.(2020) developed a digital maturity evaluation system for educational organizations with six characteristic dimensions (infrastructure, leadership, organization, organizations, employees, culture and educational technology)[20] .

The development of digital information technology is also affecting the field of medical care. Martin et al.(2019) had analyzed the UK NHS system[1] , believing that digital maturity was multifaceted, including not only technology, resources and capabilities, but also the digital literacy of staff and patients, the ability and motivation to use new technologies.It evaluated hospital digital maturity through organizational planning (leadership, governance, strategy, etc.), digital capabilities, and digital infrastructure. Martin et al. (2020) also argued in the following year that despite the widely varying digital maturity of organizations across England, more mature organizations and those with better digital infrastructure were more likely to become quality healthcare providers[21]. In non-profit public institutions, Pă văloaia et al.(2019) studied the digital maturity of Romanian public institutions through empirical analysis, mainly from the indicators of information and communication technology infrastructure, ICT application, human resource education level, and information and communication technology security and policy[22]. The research results showed that its information and communication technology were relatively mature, and the vast majority of employees could use information equipment for digital office at high frequency in their work activities.

3.3 The Characteristics of Evaluation Systems

According to the above analysis, we can summarize various evaluation systems. Through comparative analysis of different evaluation systems in the business field, we found that customer experience and technology have become the two most important dimensions, which may show that compared with the early stage of digital development, organizations strive to develop digital technology, now tend to develop an external environment like technology and customer experience, so understand the needs of customers and customer experience reflects digital maturity and technology. Secondly, organizational culture plays the important role in the digital maturity evaluation, in our literature, organizational culture as a dimension of digital maturity evaluation, second only to customer experience and technology, because organizational culture is more and more regarded as a barrier to digital maturity, so more

organizations will be digital culture attributes into the digital maturity evaluation. The operational and organizational dimensions also occupy an important position, which means that in a complex market environment, complete organizational capabilities and high-level operational capabilities are equally important. In most digital maturity evaluations, the digitization of business model innovation seems to be ignored and mentioned only once, which can be argued that most organizations are more focused on the development and innovation of digital technology than exploring the development of new business models to generate new digital revenue. Organizations may require different evaluation of the digital maturity to realize their vision, but similarly business needs talent, organizational structure, and culture to keep pace with the surrounding digital environment and professionals in the education field. Information technology infrastructure is equal to maintaining steady changes in the teaching environment; the medical field needs professional ability, digital infrastructure and organizational planning to coordinate with the macro medical environment.

4 CONCLUSION

Focusing on the core element of digital maturity, this paper comprehensively analyzes the concept and evaluation.

Although the current digital maturity has achieved relatively fruitful development, it can be found that the existing research is still insufficient from many aspects. First, most of the existing digital maturity research are concentrated in the business field, and other fields such as education, medical care, government, etc., which obviously have not received full attention. Second, almost all included digital maturity models are descriptive in nature, so their scope is limited to assessing the level of evaluating digital maturity without providing guidance or explicit roadmap on how to achieve a higher level of maturity. Third, most of the current stage of digital maturity research are incomplete, most simply from the perspective of digital maturity model evaluation. At the same time, few digital maturity evaluation models can comprehensively integrate various dimensions into the evaluation model. As a complex research problem, the evaluation mechanism and influence results is worth continuing research.

Therefore, in order to promote further development of digital maturity research, this paper believes that it needs to be further improved in the future. First, scholars can expand the research field. Second, scholars can analyze the maturity level at different stages of development. Third, scholars can consider more organizational condition.

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