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DIGITAL READINESS MODELS: A SYSTEMATIC LITERATURE REVIEW

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Abstract: A model that helps organizations to self-assess their digital readiness can be a valuable organizational development tool. This paper systematically reviews such models in the context of Fourth Industrial Revolution. A Systematic Literature Review (SLR) methodology is employed to review 57 papers from peer-reviewed academic journals and industry reports, published from 2007 to 2019. Through this technique, 22 digital readiness models with 119 model dimensions have been explored. The SLR results revealed five major concepts on digitalization: Information Technology (IT), Operational Technology (OT), Unified Theory of Acceptance and Use of Technology (UTAUT), Technological, Organizational and Environmental Framework (TOE), and Industrial Internet of Things (IIOT). Furthermore, four Critical Success Factors (CSFs) have been proposed through thematic analysis that can help managers and companies achieve digital readiness: (a) Digital Agents and Skills, (b) Digital Tools and Applications, (c) Digital Systems and Infrastructure, and (d) Digital Eco-system and Culture. Digital readiness is a trending topic, and in that perspective, this paper provides a review of four factors that can provide a research agenda for future research on digital readiness.

Keywords: Keywords: Digital Readiness, Digitalization, Fourth Industrial Revolution, Industry 4.0, Industrial Revolution 4.0.

I. INTRODUCTION

The digital revolution is reshaping the world, and is promising to unlock new boundaries for human life. For countries, in the form of digital economy, it is leading to redefinition of economic growth, with the inclusion of digital products and services [18], [25]. For companies, in the form of digital transformation, it is improving their productivity and competitiveness to an unprecedented level [2], [17]. To start with, digitalization in the context of this paper is the increased use of computer technology in managing businesses [46]. In order to take leverage of digitalization, companies need a digital readiness model, particularly to follow the path of digital transformation and to self- evaluate themselves continuously [56]. In other words, digital readiness model is a technology roadmap that can guide the managers to take advantage of the key digital technologies. Attaining this digital readiness is both huge and urgent interest and need of businesses now [45]. The identification of these digital readiness models is also significantly needed as it will enable companies to measure precedents and antecedents in the digital transformation process. It will enable policy-makers and decision-takers to decide when and how to intervene, and will determine how to measure the success of digitalization. If not well addressed, this will create a Digital Divide, where the companies with inadequate focus on digitalization will be wiped out from the market [8], [26].

In terms of people development, digital skills will lead the Future of Work (FOW), which includes up skilling and re-skilling of the workforce [25]. The concept of digital intelligence is also gaining momentum with the advancements in digital readiness models [20]. Intelligence is defined as the ability to successfully interact with environment [14]. This asserts that digital intelligence resulting from human interaction with a digital environment is profoundly needed at workplace [56]. Likewise, there are four stages of digital development in terms of people development [42]: (i) Digital leaders: They are the fastest in introducing and using new technology. They can be divided further into Primary and Secondary digital leaders. (ii) Digital strivers: They have a roadmap for digital development but still must strive to reach there. They can be divided further into Primary and Secondary digital strivers. (iii) Digital laggards: They lag, even though they make a reasonable effort to follow Digital leaders and Digital strivers. (iv) Digital leapfroggers: They struggle with low employment and low income. This study is a witness that digitalization can lead to great success for managers, which can than lead to organizational success. In this context, it is important to first understand the following four key terms, as shown in Table 1.

To successfully master the digital transformation, researchers and consultancy firms have developed a variety of digital readiness models in the recent years. This paper aims to conduct a Systematic Literature Review (SLR) to explore the breadth and depths of existing digital readiness models, and to propose Critical Success Factors (CSFs) on digital readiness by focusing on the following three research questions:

Research Question 1: What are the existing digital readiness models (academia/ industry)?

Research Question 2: What are the dimensions used in these digital readiness models?

Research Question 3: What are the Critical Success Factors (CSFs) for assessing digital readiness of organizations?

Table 1: Definitions of Key Terms

Terms	Definitions	Selected References
Digitalization	Digitalization is the increased use of Information and Communication Technology (ICT)	[18], [46]
Digital Readiness	The state of organization being prepared for Digitalization	[47], [57]
Information Technology (IT)	The use of hardware and software to transmit and/or retrieve information, as an application of basic IT to achieve functional goals	[44]
Operational Technology (OT)	The use of hardware and software to monitor and/or alter physical systems, as an application of industrial IT to achieve business goals	[15]

The rest of this paper is organized as follows: Section 2 presents the systematic literature review methodology and the fundamental review principles. Section 3 illustrates and discusses the obtained results from both the general data analysis of included papers (providing a general overview of the topic) and the specific data analysis corresponding to each research sub-question (providing specific insights related to what is being researched). Based on these results, Section 4 presents an articulated discussion on the key insights from this review. Finally, Section 5 concludes this paper with the contributions, and Section 6 describes the avenues of future research.

II. REVIEW METHODOLOGY

As this paper aims at specific results through three independent research questions, systematic literature review is more appropriate than the broad traditional literature reviews. Thereon, to achieve the objectives of adding to the extant knowledge on assessing the digital readiness of organizations, Systematic Literature Review (SLR) methodology of Tranfield was deployed [54]. The technique of SLR methodology by Tranfield is particularly helpful as it meticulously summarizes the available research in response to a research question [54]. Furthermore, the inclusion and exclusion criteria, with two attempts on the reduction of articles as per this technique leads to a targeted list of articles. In this paper, this review technique has helped considerably in exploring the various readiness models available, and then narrowing down the choices to merely digital readiness models and digital readiness dimensions. Overall, the steps of systematic methodology adapted for this review article are shown in Appendix A. By definition, a systematic review is an examination of a clearly formulated question that uses systematic and explicit methods to identify, select and critically appraise relevant research and to collect and analyse data from studies that are included in the review. Statistical methods may or may not be used to analyse and summarize the results of the included studies [22].

This literature review has been designed in a structured and rigorous manner. It is replicable, hence can be updated in the future with the state-of-art findings on digital readiness. The scanning of existing literature on the topics related to Digital Readiness and Digital Revolution was done, which led to a total of 257 articles, with timeline spanning from 1964 to mid 2019. The objectives set for this systematic

review were to identify the various digital readiness models, and explore the model dimensions used therein. There were seven search keywords used, which led to 15 publishers or databases. The systematic review considers both inclusion and exclusion criteria. The inclusion criteria was based on search keywords used and the respective search boundaries. Similarly, there were two exclusion criteria considered: Non-English articles and Magazine articles. Since majority of the literature exists in English, this review is based on it. Secondly, magazine articles are considered to be less formal with missing academic rigor, hence excluded from this review.

These 257 articles were then classified in two main categories: Digital Revolution and Digital Readiness Models. The first category refers to the history and trajectory of digital revolution, including Fourth Industrial Revolution. The second category relates to the Digitalization in terms of 'readiness' studies and models only. From this review of 257 articles, there were 60 articles (23 %) on digital revolution and 197 articles (77 %) on digital readiness models. It is important to note that majority of the studies from the literature review conducted, consider the concept of 'Maturity' and 'Readiness' to be the same. Hence, this understanding of interchangeability of these two set of words is also followed in this systematic review. There were two elimination rounds conducted which led to the targeted 57 articles which constitute this review's results and discussion. These 57 articles range from 2007 to 2019. The first elimination round was based on reading the full text instead of the title and abstract of the article. This led to elimination of 62 articles. The second elimination round was extensive, and was based on finding the conceptual, theoretical and empirical studies on digital readiness models only. This eliminated 138 articles, based on the research objectives of the systematic review. The findings or results obtained follow in the next section.

III. RESULTS AND FINDINGS

The systematic literature review of targeted 57 articles on digital readiness models led to five main study concepts as review findings: Information Technology (IT), Technological, Organizational and Environmental Framework (TOE), Operational Technology (OT), Industrial Internet of Things (IIOT) and Unified Theory of Acceptance and Use of Technology (UTAUT). Overall, these five concepts are further reiterated in this section.

3.1 Information Technology (IT)

Information Technology (IT) is the use of hardware and software to transmit and/or retrieve information, and to achieve functional goals [44]. Since the word Fourth Industrial Revolution (IR 4.0) has been coined, convergence of technologies has been the focus area. This convergence is both horizontal integration across the value chain and vertical integration within a company. Hence, the combination of Operational Technology (OT) with Information Technology (IT) is a trending topic. OT will be discussed in the next sub-section. Information Technology (IT) in academic literature has been controversially discussed. German language distinguishes the terms 'Technologie' and 'Technik', whereas English literature counts them under one as 'technology' [5]. The term 'technology' is based on the Greek term 'technikos' which means craftsmanship and skilful procedures.

There are three aspects in defining 'Technologie [33]: (i) Knowledge of scientific-technical relations, (ii) Proficiency and skills to solve technical problems, (iii) Resources needed to transfer knowledge into practice. In other words, 'Technik' is an applied element of a 'Technologie'. It is materialization of 'Technologie' in products or procedures that solves technical problems. Also, a 'Technologie' can be implemented in one or more 'Technik'. The author suggests two aspects in defining 'Technik': (i) material result of a problem-solving process and (ii) Realized products and services. The most common definition of Technology is by American National Academy of Engineering, which defines Technology as means by which human life is improved. There are multiple theoretical models on the life cycle of technologies such as Gartner's Hype Cycle Model and Ansoff's technology live cycle model [37]. Also, there are three different technology types: pacemaker technologies, key technologies, and basic technologies [52]. Pacemaker technologies are at infancy stage of development. They will grow to be potential key technologies in tomorrow. Next, key technologies facilitate market growth, as they have been introduced and registered as innovations. They carry strategic differentiation against competitor in a sector. Third, basic technologies are tested and proved for multiple sectors. They hardly have any competitive advantage left. In summary, IT plays a key role in digital readiness of organizations, which eventually leads to Fourth Industrial Revolution Readiness.

3.2 Technological, Organizational and Environmental Framework (TOE)

Technological, Organizational and Environmental (TOE) framework was developed by Tornatzky and Fleischer in 1990. Overall it focuses on the adoption of innovations, from need identification to deployment [53]. There are three contexts as per this framework: (a) Technological, (b) Organizational and (c) Environmental. Technological context focuses on how technological practices can add meaning to an organization. The organizational context consists of scope, firm size, managerial structure, human resource and decision making. The environmental context considers multiple stakeholders such as competitors, suppliers, customers, and government. This framework can be visually illustrated in Figure 1.

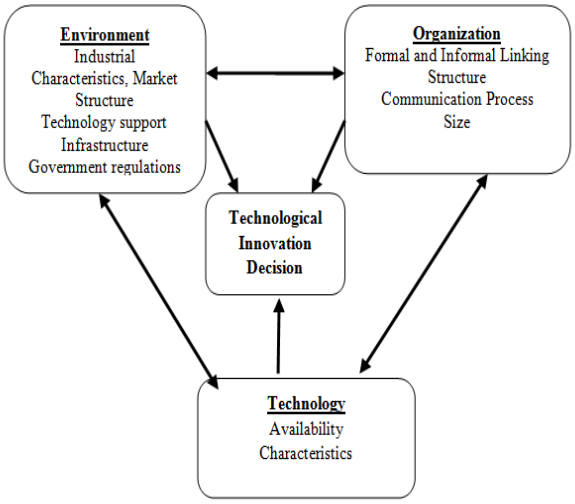

Figure 1: TOE Framework [53]

The TOE framework has been tested under different disciplines for theoretical strength, empirical support in investigating readiness, adoption and deployment of innovations. It has been used with IS innovations [34], for ICT [51], and for Small and Medium Enterprises (SMEs) [3]. Furthermore, TOE framework has been employed to study e-businesses and examining the adoption of systems and technologies such as Customer Relationship Management (CRM); Enterprise Resource Planning (ERP); Electronic Data Interchange (EDI) [18], [34]. The unique perspective of this study is that it links TOE with Digital Readiness to examine e-maintenance readiness, or organizational readiness to new innovations. From a managerial perspective, this study gives managers a frame of reference to analyse firm's situation before taking technology initiatives. In conclusion, organizations aiming to be digitally ready should focus on all three contexts (Technological, Organizational and Environmental) as per TOE framework.

3.3 Operational Technology (OT)

Operational Technology is defined as the use of hardware and software to monitor and/or alter physical systems, and to achieve business goals [15]. IT has been a keyword since the last revolution. However, OT has recently gained prominence. Taking advantage of Operational Technology (OT), companies are already shifting from 'if' to 'how' on using IOT (Internet of Things), IT, and OT. On technology, the shift is from technology to business outcome. On cyber security, the shift is from caution to action. On processes, the shift is from optimizing to engaging. Organizations will very soon be self-learning, capable to lead cognitively making extensive use of different sorts of technologies available for both corporate departments and business units in an organization [24]. This will lead to convergence of OT and IT, which can be shown in Figure 2.

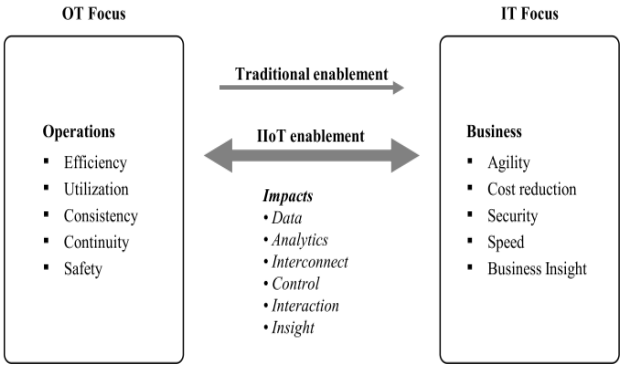

Figure 2: IT/OT Convergence [24]

Sibel [48] have authored a paper on the different operational technologies. The two prime ones as per author are Simulations and Augmented Reality. Simulations have multiple scenarios through which cost effective solutions can be drafted. Augmented Reality adds to process efficiency [39]. Likewise, Kamble [29] elaborated the various other operational technologies. The interconnection between software, sensors, processors, and various other communication technologies on a single platform are now possible [4]. On part of efficiency, machines in the smart factory will be required to do variable tasks without reprogramming [59]. The author Xu [60] studied Cyber-Physical Systems in more detail. On the other hand, Fatorachian [13] conducted empirical research on Smart Manufacturing. Back in the past, the word Focused Factories and Flexible Factories were used, these now have been replaced with Smart Factory or Factory of the Future [49]. These factories are not only resilient but sustainable in terms of environmental changes. Fourth Industrial Revolution (IR 4.0) can result in novel business models and new ways of creating value in manufacturing. Internet of Services (IOS) is using internet for value creation through materialization of Product-as-a-Service (PAAS). IOS helps manufacturers of consumer products who want to directly establish link with customers [1]. Internet of People (IOP) refers to a complex socio-technical system where the humans and their personal devices are actors and not end users. Internet of Data (IOD) can be regarded as the extension of the IOT in the digital world [12]. IOD involves data tracing, data identification, data vitalization and business intelligence. Overall, these concepts come under Web of Things (WOT). Service concept in the context of digital readiness mostly refers to the concepts of Manufacturing as a Service (MAAS).

Peter [43] studied Artificial Intelligence (AI) in connection. The question is that what are the hurdles in adoption of AI. The answers collated by author include business leadership, digital natives, mental blockage, lack of knowledge or benefits of AI. Technology is a key enabler for Knowledge Management (KM) [40], particularly in the automotive sector. Kohlegger [32] defined a maturity model as an instrument to rate companies' capabilities based on certain

elements, and selection of appropriate actions to achieve higher levels of maturity. However, the leading challenge companies face today is that they are diffident to assimilate business models and measure business value [9]. AI can provide significant service and product innovation for companies hence its value should not be discounted. Likewise, Jones [27] evaluates different perspectives on Big Data. The study by Jay Lee [36] is well known for 6 Cs of data analytics: (i) Connection (sensor and networks), (ii) Cloud (computing and data on demand), (iii) Cyber (model & memory), (iv) Content/context (meaning and correlation), (v) Community (sharing & collaboration), (vi) Customization (personalization and value). Smart Manufacturing is also known as Intelligent Manufacturing [61]. It is a broad concept of manufacturing making best use of advanced technologies. The idea is that whole product life cycle can be facilitated using various smart sensors and devices. With the usage of IOT, it involves human-to-human, human-to-machine, and machine-to-machine connections. In brief, technologies and its extensive use in business operations is important to achieve organizational efficiency in the era of digital readiness.

3.4 Industrial Internet of Things (IIOT)

Industrial Internet of Things (IIOT) is primarily about converting traditional factory to Factory of the Future [31]. There is no universally accepted definition of IIOT [55]. According to Bauer [6], IIOT is intelligent, horizontal, and vertical connection of people and machines. It is also known as IOT plus CPS [28]. IIOT's reference with Digital Revolution is relatively new as compared to IOT [41]. In moving between revolutions, the objectives have been resource efficiency, cost reductions, quality, productivity, flexibility and accelerated time-to-market. Kagermann [28] is of the view that job design and improved work-life balance are outcomes behind revolutions. In simple words, IIOT is digitization by and through: i) integrating all corporate functions, ii) across all products and services, iii) across the entire value chain, iv) with novel digital technologies and v) with modified and new business models.

Erol [11] conceived a three-stage process for IIOT implementation. First stage, Envision, refers to alignment of IIOT ideas with company objectives. Second stage, Enable, refers to translating long term IIOT vision into a business model. Third stage, Enact, refers to transformation of strategies into projects. Likewise, Birkel [7] recommended a five-stage innovation model for IIOT era. In the first stage, a value proposition of CPS is to be established. In the second stage, IIOT dynamics need to be established. In the third stage, business model framework needs to be developed. In the fourth stage, firm resources are optimized by considering the theory of constraints. In the fifth stage, an action program for the management is to be chalked out. Also, to note that IIOT is not mandatory for each company. Sommer [50] indicates that German companies implement IIOT based on company size and global implementation intention. The most important attribute of digital readiness has been the advent of Industrial Internet of Things (IIOT) [30]. IIOT is digitization of industrial manufacturing. To maintain flexibility and agility, businesses must adopt the recent trends of ICT [21]. IIOT is seen as a new manufacturing paradigm, and the core element required for the implementation of the IIOT are Cyber-Physical Systems (CPS) that acts as a fusion between mechanical and electrical. The factory of the future is more complex but more productive. Improved work-life balance and optimized decision making, are the opportunities that can be leveraged faster through IIOT. In summary, digital readiness is about convergence of technologies which can be better achieved with the extensive application of Industrial Internet of Things (IIOT).

3.5 Unified Theory of Acceptance and Use of Technology (UTAUT)

The Unified Theory of Acceptance and Use of Technology (UTAUT) is about user intentions to use an information system and his/her subsequent usage behaviour. The theory has been tested for gender, age, experience, and voluntariness of use as Moderators. This theory is a combination of eight important models: Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Motivational Model, Theory of Planned Behaviour (TPB), a combined Theory of Planned Behaviour/ Technology Acceptance Model, Model of Personal Computer Use, Diffusion of Innovations Theory (DOI), and Social Cognitive Theory. UTAUT was conceptualized by Venkatesh and Zhang [58]. UTAUT takes inference from Technology Acceptance Model (TAM) and TAM2 as it combines various constructs into a single psychometric construct. To empirically test UTAUT, Venkatesh and Zhang [58] also compared U.S. with China. The study then confirmed that social influence is important for all, without any inference to gender, age and voluntariness. There is high motivation for technology adoption research (Gartner 2007). Research on psychological and sociological factors has already taken centre stage with reference to behavioural intention towards using technology. UTAUT model may perform differently in different cultures [35]. This model can be illustrated through Figure 3.

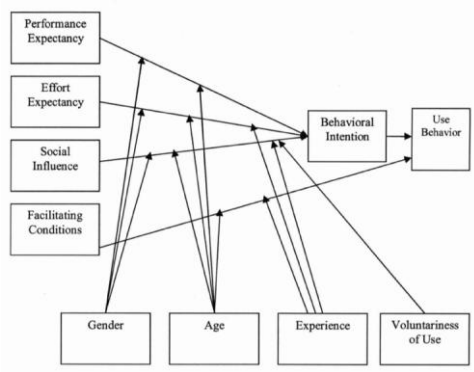

Figure 3: UTAUT Model [58]

This theory has four main components: i) performance expectancy, ii) effort expectancy, iii) social influence, and iv) facilitating conditions. The first three are focused on usage intention and the last one is based on user behaviour. Performance Expectancy is the extent to which people believe that technology will improve their performance and hence rewards. This effect is strongest for younger men. Effort Expectancy is the extent to technology is ease to use. This effect on the contrary is strongest for older women. Social Influence then is defined as the extent to which people perceive that others will use or adopt technology. The last component Facilitating Conditions is the extent to which people believe that organizational and technical infrastructure exists for the due support. This effect is seen strongest for older workers.

Cross-cultural research proves that there are certain belief systems as per the varying cultures that help or hurt technology adoption. Culture has long been considered powerful to influence social behaviours. The most popular conceptualization of culture is Hofstede's taxonomy with 5 magnitudes: uncertainty avoidance, power distance, long-term orientation, individualism/collectivism and masculinity/femininity [23]. Cultural diversity is a key challenge for global leaders and diverse teams in multinational companies. Furthermore, research in management has been studied culture with reference to cooperation, work-related attitudes, and adapting behaviours. So, UTAUT overall extends the research of technology adoption in different cultural contexts. The study has been replicated for different countries as well. This theory is an excellent combination of culture and technology, which refers to cultural differences and similarities both. Overall, UTAUT considers culture important for overall business management research, and specifically for technology research. Based on this theory, multinational organizations should acknowledge the differential impacts across countries with reference to new technology.

IV. DISCUSSION

This review paper was conceived on the basis of three research questions. This section will lead discussion on those questions in the same order.

Research Question 1: What are the existing digital readiness models (academia/ industry)?

The systematic literature review conducted in this paper has led to the identification of 22 digital readiness models. These 22 digital readiness models are listed with detailed parameters in Appendix B. It is interesting to observe two major trends in the development of digital readiness models: a) Year-wise Development b) Academia-Industry Split. As can be witnessed from Figure 4, the trend of developing new digital readiness models is increasing, from four models in 2016 to seven models in 2018.

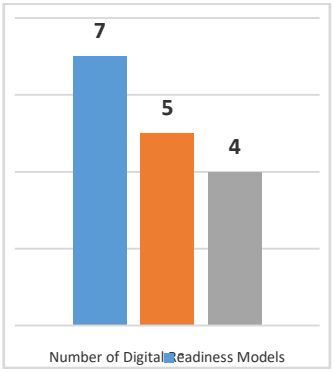

Figure 4: Year-wise development of digital readiness models

Furthermore, a large part of contribution in the development of these models has been from academia, followed by industry. Out of the 22 models reviewed, 13 were developed through academic research and 9 were developed through industry surveys. This split can be seen in Figure 3. In summary, the Appendix B along with Figure 4 and 5, precisely answer the first research question on the breadth and depth of digital readiness models available.

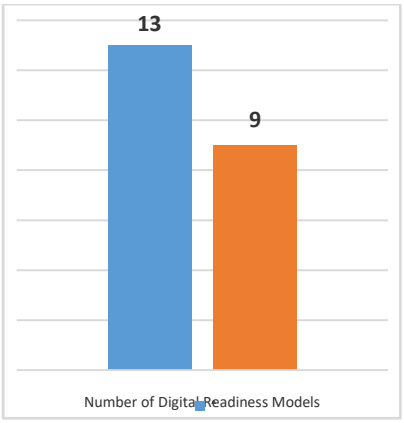

Figure 5: Academia-Industry split of digital readiness models

Research Question 2: What are the dimensions used in these digital readiness models?

Analyzing the 22 digital readiness models, there is a diversity of model dimensions. The heterogeneity of the digital readiness model dimensions is such that a total of 119 dimensions were discovered by systematically reviewing the existing digital readiness models. The maximum number of dimensions used in a model are 10 (e.g. E-Business 4IR Readiness Model) and minimum being 1 (e.g. The IoT Technological Maturity Model). There was a certain repetition of specific dimensions by multiple authors in their readiness models, however this redundancy was marginal. Table 2 lists all the dimensions extracted from the existing digital readiness models. These discrete dimensions were then pooled in terms of similarity, after which four different themes on model dimensions can be proposed: (a)

Digital Systems and Infrastructure, (b) Digital Tools and Applications, (c) Digital Eco-system and Culture, and (d) Digital Agents and Skills. The collective occurrences in the table reflect the number of dimensions that have been pooled together. In short, Appendix B along with Table 2 adequately highlight the dimensions available in existing digital readiness models.

Table 2: Pooling of digital readiness model dimensions

Dimensions from Existing Digital Readiness Models	Collective Occurrences	Proposed Themes
Agile IT structure, Architecture, Automation production technology and robotics, Controls and devices that feed and receive data, Cross-sectional Technology Criteria, Database integration, Degree of automation, Degree of networking, Degree of Standardization, Digital Practices, Digital product development, Digitalization of product portfolio, Digitization and integration of vertical and horizontal value chains, Digitization of product and service offerings, Digitizing horizontal and vertical integration of the value chain, Horizontal Integration, Information, Information, Information infrastructure hardware and software, Information integration, Innovation implementation effectiveness, Innovation valance, Integrated, Integration of internal processes, Internet and communication technology, Interpretation and services, Level of automation, Location of data use, Managed, Management Practices, Monitoring, Monitoring and controlling, Networks that move all of this information, Offline, Process, Processes, Products & Services, Real-time capabilities, Reporting, Security policies, Service-oriented architecture, Smart factory, Smart product, Technical infrastructure, Vertical & horizontal integration, Vertical Integration	46	Digital Systems/ Infrastructure
Adoption of IoT technology, Advanced analytics, Agile IT architecture, Analytics, Application , Cloud computing services, Data and analysis as a key capability , Data and Analytics as core capability, Data driven services, Data storage and compute, Determining the residual tool life, Digital twins, Electronic SCM, Embedded systems, Enterprise sending e-invoices, Enterprises using social media, IT readiness, IT Security, RFID Drivers, RFID Implementation, RFID Knowledge, RFID use, Sensor technology, Software system technology, Technologies, Technology, Time horizon of data analytics, Tool identification, Use of analytical CRM software, Website with sophisticated functionalities	32	Digital Tools/ Applications
Adaption and optimization, Business, Business Model, Business model, customer orientation a digital product, Business strategy, Compliance, security, legal and tax, Cultural readiness, Culture, Culture & execution, Data and data culture, Digital business model and customer access, Digital business models and customer access, Distribution control, Global measures of organizational readiness for digital innovation, Insights, New Business, Operational model, digital environment and management, Organization, Resource readiness, Strategic readiness, Strategy, Strategy & Organization	23	Digital Eco-system/ Culture
Actionable, Actuators, Cognitive readiness, Communication and analysis, Competencies, Complaint handling security law and tax, Cooperation, Digital capabilities, Employees, Employees have remote access to IT system, Governance, Human machine interface, Leadership, HR, openness, firm culture, Organization employees' digital culture, Organization, employees and digital culture, Partnership readiness, People, Portable devices to more than 20% employees	18	Digital Agents/ Skills

Research Question 3: What are the Critical Success Factors (CSFs) for assessing digital readiness of organizations?

The heterogeneity of 119 dimensions used in 22 readiness model by different authors and industry practitioners with little or no similarity raises the need of condensed and simplified model dimensions to assess digital readiness of organizations. Thereby, Thematic Analysis of literature was conducted as part of the systematic literature review to pool model dimensions from existing digital readiness models that are similar in nature or outcome [16]. Four major themes were identified: (a) Digital Agents and Skills, (b) Digital Tools and Applications, (c) Digital Systems and Infrastructure, and (d) Digital Eco-system and Culture. The rationality of using these four themes is two-pronged. First, the dimensions were analyzed in a micro to macro

perspective (i.e. from inside the organization to outside the organization). Hence, the first theme is Digital Agents and Skills and the last theme is Digital Eco-system and Culture. These four themes are not mutually exclusive and can have marginally overlapping areas. Secondly, all these four themes are fundamentally based on the concept of digitalization, hence these four themes add value in terms of strategic planning and operations management for managers and organizations willing to improve their digital readiness. These proposed four themes have been classified as the suggested Critical Success Factors (CSFs) for assessing digital readiness of companies, and are visually illustrated in Figure 6. This answers the third and the final research question of this systematic literature review.

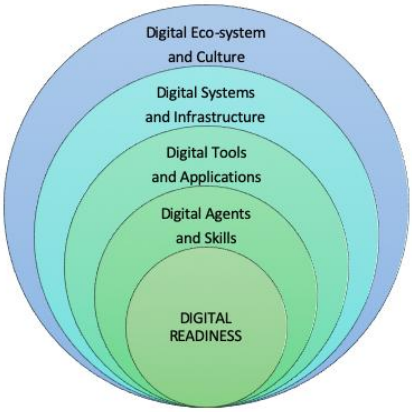

Figure 6: Critical Success Factors for assessing digital readiness of organizations

V. CONCLUSION

Digital Readiness, in the age of Fourth Industrial Revolution (IR 4.0), is a contemporary topic in management studies. This systematic literature review unearths 22 existing digital readiness models which answers the first research question of this study. The review further explores the available 119 model dimensions used by different authors and firms to evaluate the digital readiness, which answers the second research question of this study. Subsequently, based on the systematic review of existing models and model dimensions, this paper proposes four critical success factors that are important for ascertaining the digital readiness of companies: (a) Digital Agents and Skills, (b) Digital Tools and Applications, (c) Digital Systems and Infrastructure, and (d) Digital Eco-system and Culture. This finally answers the third research question of this paper through the SLR methodology. This paper has several contributions from a theoretical point of view. First, the systematic literature review on digital readiness models follows a well-structured and replicable methodology. Second, it provides an original contribution in the form of four critical success factors that can be considered as key ingredients for achieving digital readiness in companies.

VI. FUTURE WORK

There is an increasing level of interest among academicians and industry professionals about digital readiness [11], [19], [38]. The systematic review of existing digital readiness models and dimensions highlighted in this paper are potent enough to set a research agenda for future research. The four critical success factors proposed in this review paper can be empirically tested through quantitative research to further establish the inter-relationships between these factors. Empirical studies followed by semi-structured interviews and case studies can yield new and valuable insights. The study can be then extended to various industry sectors and countries. On the outset, the future studies can also link digital readiness models with fourth industrial revolution readiness models for broader implications and impact.

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