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Strengths and Weaknesses of Digital Maturity Models

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Abstract: Assessing digital maturity is a prerequisite for any digital transformation initiative. This assessment allows the business to know its current level of digital maturity and assess its ability to manage change. The evaluation also enables society to identify the main thrusts and objectives of its digital strategy. This article analyses the strengths and weaknesses of 8 digital maturity models to highlight the advantages and disadvantages of these models for measuring the digital maturity of companies and public organizations. This study follows content analysis from 8 papers on digital maturity models. These 8 models are the result of a document reference of 30 models of digital maturity divided into 8 application domains. Within each application area, the most relevant model for measuring digital maturity was chosen after the reference work. In this document, regarding the literature, we have identified 12 strengths that a maturity model should fulfill and we have formulated them into 12 questions that, once answered, will constitute strengths or weaknesses of the model. The results show that the Digital Internet Maturity Model (DIMM) has the most advantages over the others for measuring digital maturity in any application area, followed by the Bank Internet Maturity Model (BIMM) which has several advantages for the banking sector with some significant disadvantages. Next, we have the digital maturity balance model and tool for public organizations for organizations providing public services. The hospital information system maturity model for the health sector takes into account several aspects of the digital transformation of the health sector, but with some handicaps related to its implementation. It was noted that all models reviewed have several strengths and weaknesses, including structural and strategic weaknesses. This article firstly highlights the strengths and weaknesses of 8 digital maturity models that are among the most relevant for measuring digital maturity in their respective domains and secondly, it reinforces the literature on digital maturity models.

Keywords: Digital Transformation, Digital Maturity, Model, Dimension, Strengths, Weaknesses

Introduction

Technological innovations, their acceleration, and mass adoption have changed the uses and behaviours of everyday life for consumers (Henriette, 2018). The market is constantly evolving not only by industries changing their business model to turn their services digital but also by the volatility of the latter by the so-called disruptive newcomers. The public sector has concerns as well. Public establishments and enterprises are critical players in the economy of a state (Benkirane *et al*., 2021). To that end, the State is constantly seeking to improve its performance and the quality of services offered to citizens. However, given the market turmoil and new arrivals scandal, the state is also required to keep pace with change (Benkirane *et al*., 2021). New socalled disrupters are entirely digital and are capable of undermining any other player in the market. The stakes are huge and in response, public/private companies are implementing major digital transformation projects (Henriette, 2018). So, digital transformation has become a necessity not to be uberized, it is no longer a luxury in itself, nor a question of choice. Private/public organisations need this change to survive in complex, competitive market conditions. According to (Carrijo *et al*., 2021), digital transformation is a multi-step evolutionary process,

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consisting of small transformations that sequentially lead the company to be able to meet the demands of a changing digital world. However, a unified and comprehensive definition of digital transformation is lacking in the literature. Based on a matrix focused on the concept, (Morakanyane *et al*., 2017) define it as: An evolutionary process that leverages digital capabilities and technologies to enable business models, business processes, and customer experiences to create value'. Digital transformation is a vast and complex undertaking that requires a fundamental change in the current business model and the creation of new models (Remane *et al*., 2017). As a result, companies in various sectors (Westerman *et al*., 2014) must first evaluate their current business model against emerging opportunities and potentially adapt it to current digital trends (Gannon, 2013). To account for this business model evaluation phenomenon, recent literature has introduced the concept of digital maturity (Remane *et al*., 2017). According to Chanias and Hess (2016), digital maturity is "the state of the company's digital transformation". The evaluation of digital maturity is therefore the measure of this condition.

In their work, Zaoui and Souissi (2020) have presented the evaluation of digital maturity as a prerequisite for any digital transformation project. This assessment consists of the knowledge of the company's level of digital maturity, to evaluate its capacity to manage change and to identify the main axes to be activated for its digital transformation strategy. The digital maturity assessment provides a complete, and clear picture of the organization’s current digital situation. To carry out this assessment, the company should use a digital maturity model (Alsufyani and Gill, 2021). However, several digital maturity models exist (Poeppelbuss *et al*., 2011). Some are specific to an application domain: Health (Carvalho *et al*., 2019; 2017; Duncan *et al*., 2022), education (Begicevic Redjep *et al*., 2021; Ifenthaler and Egloffstein, 2020), industry (large company) (Almamalik, 2020; Wagire *et al*., 2021; Almasbekkyzy *et al*., 2021), SME (Blatz *et al*., 2018; Amaral and Peças, 2021; Kljajić Borštnar and Pucihar, 2021), there are models for banks (Goumeh and Barforoush, 2021) and public administration (Chohan *et al*., 2020; Nerima and Ralyté, 2021; Kafel *et al*., 2021; Alshawi and Alalwany, 2009) Some generic models can be used to measure any business regardless of its sector (Deloitte, 2018; Shahiduzzaman *et al*., 2017; Gill and VanBoskirk, 2016). However, these models are not based on the same dimensions, even if they are in the same field of application or the same sector of activity, which constitutes a handicap in the choice of a model to assess the digital maturity of the company.

In this study, we did an in-depth analysis to determine the strengths and weaknesses of 8 digital maturity models. These models are the most relevant for measuring the digital maturity of public and private organisations in the comparison of 30 models carried out by Barry *et al*. (2022). This comparison was based on the dimensional component of these 30 models divided into 8 business lines concerning the dimensions of the onto digital model (Zaoui and Souissi, 2018). onto digital has 9 dimensions and 18 sub-dimensions to take into account in every digital transformation project.

Related Works

The digital maturity model is now emerging as the most effective weapon to help managers digitally transform their companies (Minh and Thanh, 2022). However, the plurality of models presents a challenge for managers to choose the appropriate model for their projects (Alsufyani and Gill, 2021; Barry *et al*., 2022). In their work, Alsufyani and Gill (2021) made a comparison of 30 maturity models taken from 36 articles to help managers in choosing the appropriate model for their digital transformation projects. This comparison is summarised by the lack of ability of most models to capture a holistic picture of the digital maturity of the company. As for Thordsen *et al*. (2020), their comparison of 17 digital maturity models revealed that most of the models identified do not comply with the assessment criteria they have established to support companies in their digitalization efforts. For his part, Cognet (2020) considers that the maturity models have broadly the same pattern but different contents and do not generally assess the same aspects. Based on this observation, (Cognet, 2020) compared 13 models to propose a global list of maturity indicators "Key Performance Indicators (KPI)" that should be taken into account by the digital maturity models. Most digital maturity models are developed to support multinationals and only a limited number are suitable for SMEs (Mittal *et al*., 2018). Based on a study of 15 models, (Mittal *et al*., 2018) propose a roadmap and provides crucial information for developing a model that accurately reflects the realities of SMEs.

In their work, Barry *et al*. (2022) dealt with the comparison of digital maturity models according to their dimensions. This comparison through the methodology of content analysis deals with 30 models according to their dimensions about the dimensions of an onto digital ontological model (Zaoui and Souissi, 2018) from the literature that proposes 18 sub-dimensions divided into 9 dimensions that must be taken into consideration in any digital transformation project. Figure 1 shows the distribution of these 30 models according to their fields of application.

This comparison made it possible to rank the 30 models in descending order of coverage of the dimensions of the ontological model (Barry *et al*., 2022). Figure 2 shows the result of the comparison.

For each field of application, the most relevant model was identified, i.e., the model closest to the ontological model, i.e., a total of 8 models to be dealt with in this study. These models can be found in Table 1.

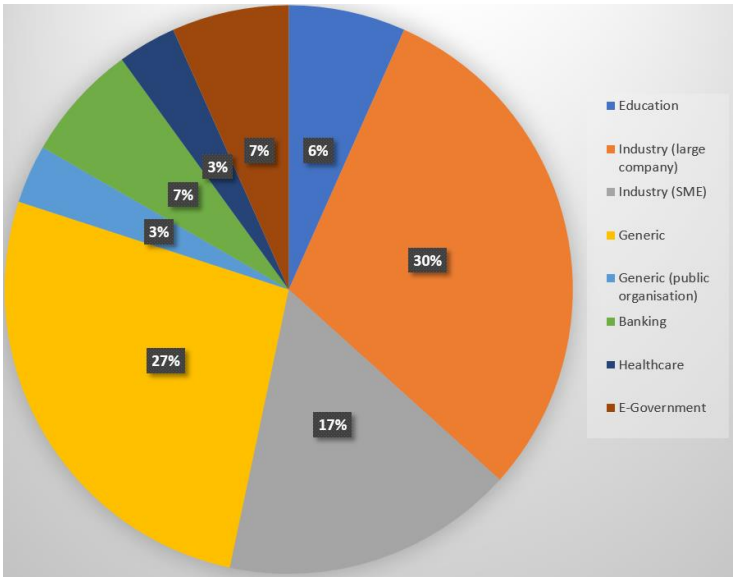

Fig. 1: The distribution of the articles studied according to their field of application

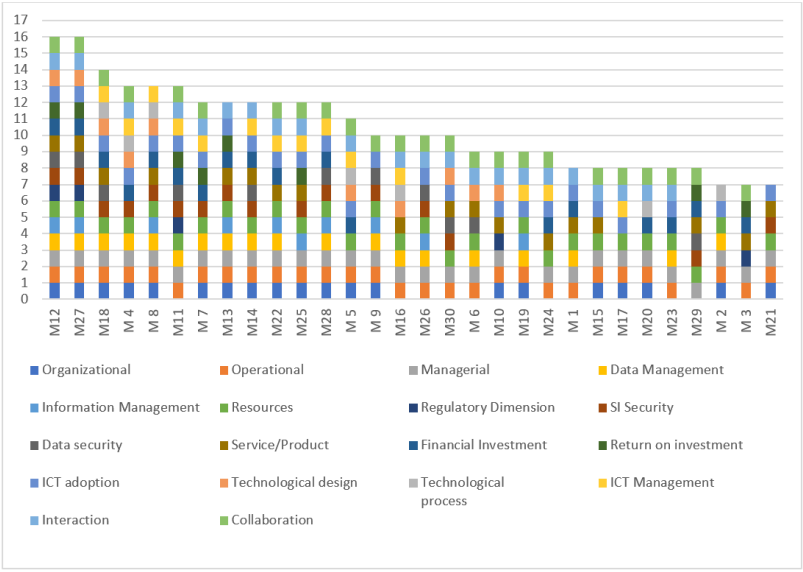

Fig. 2: Number of sub-dimensions per model (Barry *et al*., 2022)

Table 1: Digital maturity models addressed in this study

Model	Model name	Reference	Domain	Number of dimensions, and sub-dimensions
M12	DIMM-digital internet maturity model	Fayon and Tartar (2019)	Generic	6 levers, and 20 sub-levers
M27	BIMM-bank internet maturity model	Fayon (2018)	Bank	6 levers
M18	Maturity model for assessing the implementation of industry 4.0	Wagire *et al*. (2021)	Industry (large companies)	This model includes 38 maturity measures grouped into 7 dimensions
M8	Framework for assessing manufacturing SMEs industry 4.0 maturity	Amaral and Peças (2021)	Industry (SMEs)	6 dimensions, and 26 subdimensions
M28	Digital maturity balance model, and tool for public organisations	Nerima and Ralyté (2021)	Generic (Public organisation)	5 dimensions
M26	HISMM-Hospital Information System maturity model	Carvalho *et al*. (2019)	Health	6 dimensions
M30	E-government maturity model	Chohan *et al*. (2020)	E-government	5 dimensions
M1	Maturity Model for Educational Organisations (MMEO)	Ifenthaler and Egloffstein (2020)	Education	6 dimensions

Summary of the 8 Digital Maturity Models

Digital Internet Maturity Model (DIMM) (Fayon and Tartar, 2019): It is a generic model that can be applied to any organization regardless of its sector of activity. It has six levers and 20 sub-levers for measuring digital maturity and a digital platform. We also met with several other relevant generic models, including consulting firms (Deloitte, 2018; Shahiduzzaman *et al*., 2017). Other sources include university research (Ivančić *et al*., 2019; Berghaus and Back, 2016; Gimpel *et al.*, 2018). However, the DIMM model was notable in our comparative study with 89% coverage of the ontological model dimensions (Barry *et al*., 2022).

Bank Internet Maturity Model (BIMM) (Fayon, 2018): It's a model for banking companies. It uses 6 levers and 20 sub levers to measure digital maturity. It is the most comprehensive banking model according to the comparative study done by Barry *et al*. (2022) with a coverage rate of 89% of the dimensions of the ontological model.

Maturity Model for Assessing the Implementation of Industry 4.0 (MMAII) (Wagire *et al*., 2021): Industry 4.0 or connected industry is the fourth industrial revolution (Wagner *et al*., 2017). It is initially introduced in Germany (Salkin *et al*., 2018) and involves the use of emerging technologies in production processes (Ustundag *et al*., 2018). To measure the digital maturity of Industry 4.0 for the category "large company", the MMAII proves to be the most relevant in the study done by Barry *et al*. (2022) with a coverage rate of 77.77% of the dimensions of the ontological model.

Framework for Assessing Manufacturing SMEs Industry 4.0 maturity (Amaral and Peças, 2021): This is also an Industry 4.0 model but for the "SME" category. This model uses 6 dimensions and 26 subdimensions to measure digital maturity. It is the most relevant model for SMEs with a coverage rate of 72.22% (Barry *et al*., 2022).

Digital Maturity Balance Model and Tool for Public Organisations (DMBMTPO) (Nerima and Ralyté, 2021) e-government is a concept that translates into the implementation of digital solutions in public administration. In some states, utilities have developed quickly thanks to digital technologies (Kafel *et al*., 2021). The latter contributes greatly to society's increased use of new technologies (Kafel *et al*., 2021). For this public sector, the model DMBMTPO is more appropriate for measuring digital maturity (Barry *et al*., 2022). The model proposed by Kafel *et al*. (2021) is also sufficiently rich to be utilized. The DMBMTPO is based on 5 dimensions with a coverage ratio of 66.67%.

Hospital Information System Maturity Model (HISMM) (Carvalho, *et al*., 2019): Digital health is a key solution for determining population health and disease prevention (Canfell *et al*., 2021). In Australia, the digital health transformation has resulted in the centralization of patient medical records through the use of an Electronic Medical Record (EMR) platform by 65% of public hospitals (Canfell *et al*., 2021). The benefits of digital health range from centralization and availability of data, decision support, precision medicine, preventive medicine, and innovation. In the field of health, digital maturity models are rare. However, among those existing and discussed in (Barry *et al*., 2022), the HISMM (Carvalho *et al*., 2019) proves to be more relevant for the measurement of digital maturity with 6 dimensions and a coverage rate of 55.55% of the dimensions of the ontological model.

E-government maturity model (Chohan *et al*., 2020): A model of E-government. We describe it as a political public administration whose functions, organization and strategy can change after every government. This was developed on Pakistani territory. It is a synthesis of several E-government digital maturity models and is based on 5 digitization steps. It covers 55.55% of the dimensions suggested in the ontological model (Barry *et al*., 2022).

Maturity Model for Educational Organisations (MMEO) (Ifenthaler and Egloffstein, 2020): The speed of modern development means that universities must change their paradigm and respond to the new demands of the labour market (Mamaeva *et al*., 2020). The fourth industrial revolution consists of laying off certain groups of employees and replacing them with new workers (Mamaeva *et al*., 2020). Universities need to change in response to this digital revolution. In this study, (Barry *et al*., 2022) present the MMOE as the most relevant to measure the digital maturity of higher education institutions. It focuses on six dimensions and covers 44.44% of the dimensions of the ontological model.

Methods and Approach

The methodology used in this study for the selection, industry categorization, comparison and analysis of the strengths and weaknesses of MMDTs is that content analysis. Content analytics is a set of communication analytics techniques (Gaspi and Magalhães Júnior, 2021). It is a technique of investigation which, based on an objective, systematic and quantitative description of the content of a document, targets its interpretation (Berelson, 1952). The method involves making logical and justified inferences, and describing the obvious contents of a document using systematic, and objective procedures (Carrijo *et al*., 2021). It is organized in three phases (Carrijo *et al*., 2021): 1 reanalysis (step 1.1 Floating reading; 1.2 Formulation of objectives; 1.3 Selection of

documents; 1.4 Definition of categories for comparison, and analysis), 2 exploration of the material (step 2.1 categorization; 2.2 Comparison of articles), and 3 processing of the results, and interpretation (Gaspi and Magalhães Júnior, 2021).

In this study, we used the methodology of content analysis as follows: In the first phase, it was a question of reading, preparing a questionnaire that allowed the analysis of the 8 models, and formulating the objectives (strengths or weaknesses). During the second phase, we compared each of the eight models with our questionnaire, and the outcome was the strengths, and weaknesses of each model. The third step was to quantify, compare, and interpret the results. Note that the forces describe the internal state of the analyzed entity. It means listing the advantages of the model analyzed, its reputation, its location, its field, its function, its resources, and its quality aspects to deepen the positive impression. In terms of weaknesses, this question focuses on the visible weakness of the model analysed. As an example, the limits. Questions vary depending on what needs to be covered. For example, for forces, questions such as "What is it that sets you apart in your market?" can be asked, and for issues of weakness such as "What expertise are you missing?" The analysis, comparison, and determination of the strengths, and weaknesses of digital maturity models will help business leaders, decision makers, entrepreneurs, managers, specialists, and researchers firstly, to understand the similarities, and differences between the models to adapt or adopt the appropriate model for their digital transformation or research projects, secondly, to know the advantages, and disadvantages of using a given model. To achieve the set objective, concerning the literature (Grover and Damle, 2020; Cognet, 2020), we have identified, and proposed a set of strengths that a model should fulfil, and we have formulated them into questions which, when answered, will allow the identification of the strengths, and weaknesses of the model. Table 2 shows the questions, the possible answers to each question, and the direction of whether this is a strength or a weakness.

Strengths, and Weaknesses of the Models

Tables 3-10 present the results of our analysis of the 8 digital maturity models concerning the 12 questions presented in Table 2. Each of Table 3 through 10 consists of the following: The first column contains the 12 questions; the second column contains the strengths, and the third column contains the weaknesses. For each question, the answer is put under the column of strengths or weaknesses according to the position of the analyzed model on this question.

Table 2: Response, and description of the analysis questions

	Response, and description	
Questions	Strengths	Weaknesses
Q1: Is the model generic?	Yes, this s a generic model	No, this s not a generic model
Q2: How many dimensions does it have?	9 - nbD <5 (where nbD is the number of dimensions in the model analysis, and 9 is the number of dimensions of the ontological model)	9 - nbD > = 5
Q3: Is the model documentation available?	Yes, accessible, and clear documentation is available	No, no documentation is available
Q4: Is it implemented as digital software?	Yes, the software that implements the model exists	No, no software is implemented for this model
Q5: Has the model already been applied or even industrialised for digital maturity assessment?	Yes, the model has been tested and validated in a company	No, the model was not tested in a company
Q6: Are the dimensions broken down into sub_dimensions? (The level of granularity, high or low?)	The model dimensions are subdivided into sub_dimensions => high level of granularity	The dimensions are not subdivided => low level of granularity
Q7: Do all dimensions have the same weight (coefficient) or are their weights different depending on their importance in the digital transformation?	No, the dimensions do not have the same weight	Yes, all dimensions have the same weighting
Q8: How is the level of maturity achieved by the organisation calculated?	The level of maturity is calculated first by dimension, and then the level of maturity of the organisation as a whole is calculated according to the weights of the dimensions	The maturity level is directly calculated without taking into account the weight of the dimensions or the maturity 6 level of the dimensions
Q9: Are the measurement items in the form of a closed questionnaire or are they grouped into KPIs?	The measurement elements are grouped into KPIs in which the question relating to each element is asked	The measurement elements are in the form of a questionnaire
Q10: Do the maturity elements have the same weight (coefficient) or different weights depending on their importance?	No, the measurement elements (KPIs) do not have the same weighting	Yes, the measurement elements (KPIs) have the same weighting
Q11: Is the model scalable? (Is it maintained to adapt to the changing?)	Yes, the model is monitored by a team that updates it to track changes in the environment	No, the project that created the model is not being followed, and the model may be outdated in time
Q12: Is the model measurement tool accessible?	Yes, the model is open access or a test version is available	No, no tool to use or test the model was found in open access

M12 Model

Table 3: Strengths, and weaknesses of the digital internet maturity model (M12)

Questions	Strengths	Weaknesses
Q1	Yes, this is a generic model	
Q2	It has 6 levers ?9-6 = 3 <5	
Q3		No, no documentation is available
Q4	Yes, the software that implements the model exists	
Q5	Yes, the model has been tested, and validated in a company	
Q6	The model dimensions are subdivided into sub-dimensions => high level of granularity	
Q7	No, the dimensions do not have the same weight	
Q8	The level of maturity is calculated first by dimension, and then the level of maturity of the organisations as a whole is calculated according to the weights of the dimensions	
Q9	The measurement elements are grouped into KPIs in which the question relating to each element is asked	
Q10	No, the measurement elements (KPIs) do not have the same weighting	
Q11	Yes, the model is monitored by a team that updates it to trac changes in the environment	
Q12		No, no tool to use or test the model was found in open access

M27 Model

Table 4: Strengths, and weaknesses of the bank internet maturity model (M27)

Questions	Strengths	Weaknesses
Q1		No, this is not a generic model, used only for banks
Q2	It has 6 levers ?9-6 = 3 <5	
Q3	Yes, accessible, and clear documentation is available	
Q4	Yes, the software that implements the model exists	
Q5	Yes, the model has been tested, and validated in a company	
Q6	The model dimensions are subdivided into sub-dimensions = > high level of granularity	
Q7	No, the dimensions do not have the same weight	
Q8	The level of maturity is calculated first by dimension, and then the level of maturity of the organisations as a whole is calculated according to the weights of the dimensions	
Q9	The measurement elements are grouped into KPIs in which the question relating to each element is asked	
Q10	No, the measurement elements (KPIs) do not have the same weighting	
Q11		No, the project that created the model is not being followed, and the model may be outdated in time
Q12	Yes, the model is open access or a test version is available	

M18 Model

Table 5: Strengths, and weaknesses of the maturity model for assessing the implementation of industry 4.0 (M18)

Questions	Strengths	Weaknesses
Q1		No, this is not a generic model, used only for banks
Q2	It has 7 dimensions? 9-7=2 <5	
Q3	Yes, accessible, and clear documentation is available	
Q4		No, no software is implemented for this model
Q5	Yes, the model has been tested, and validated in a company	
Q6		The dimensions are not subdivided = > low level of granularity
Q7	No, the dimensions do not have the same weight	
Q8	The level of maturity is calculated first by dimension, and then the level of maturity of the organisations as a whole is calculated according to the weights of the dimensions	
Q9		The measurement elements are in the form of a closed questionnaire
Q10	No, the measurement elements (KPIs) do not have the same weighting	
Q11	Yes, the model is monitored by a team that updates it to track changes in the environment	
Q12		No, no tool to use or test the model was found in open-access

M8 Model

Table 6: Strengths, and weaknesses of the framework for assessing manufacturing SMEs industry 4.0 Maturity (M8)

Questions	Strengths	Weaknesses
Q1		No, this is not a generic model. Used only for SMEs
Q2	It has 6 dimensions ➔9-6 = 3 <5	
Q3	Yes, accessible, and clear documentation is available	
Q4		No, no software is implemented for this model
Q5	Yes, the model has been tested, and validated in a company	
Q6	The model dimensions are subdivided into sub_dimensions = > high level of granularity	
Q7		Yes, all dimensions have the same weighting
Q8	The level of maturity is calculated first by dimension, and then the level of maturity of the organisations as a whole is calculated	
Q9		The measurement elements are in the form of a closed questionnaire
Q10		Yes, the measurement elements (KPIs) have the same weighting
Q11	Yes, the model is monitored by a team that updates it to track changes in the environment	
Q12		No, no tool to use or test the model was found in open-access

M28 Model

Table 7: Strengths, and weaknesses of the digital maturity balance model, and tool for public organisations (M28)

Questions	Strengths	Weaknesses
Q1		No, this is not a generic model. Used only for public sector organizations
Q2	It has 5 dimensions ➔9-5 = 4 <5	
Q3	Yes, accessible, and clear documentation is available	
Q4		No, no software is implemented for this model
Q5	Yes, the model has been tested, and validated in a company	
Q6		The dimensions are not subdivided = > low level of granularity
Q7	No, the dimensions do not have the same weight	
Q8	The level of maturity is calculated first by dimension, and then the level of maturity of the organization as a whole is calculated	
Q9	The measurement elements are grouped into KPIs in which the question relating to each element is asked	
Q10		Yes, the measurement 9 elements (KPIs) have the same weighting
Q11	Yes, the model is monitored by a team that updates it to track changes in the environment	
Q12	Yes, the model is open access or a test version is available	

M26 Model

Table 8: Strengths, and weaknesses of the hospital information system maturity model (M26)

Questions	Strengths	Weaknesses
Q1		No, this is not a generic model. Used in the health sector
Q2	It has 6 dimensions ➔9-6 = 3 <5	
Q3	Yes, accessible, and clear documentation is available	
Q4		No, no software is implemented for this model
Q5	Yes, the model has been tested, and validated in a company	
Q6		The dimensions are not subdivided = > low level of granularity
Q7	No, the dimensions do not have the same weight	
Q8	The model has 6 phases of maturity in which each of the dimensions can be found independently of the others	
Q9	The elements of measurement are defined based on which the questions should be asked	
Q10		Yes, the measurement elements (KPIs) have the same weighting
Q11	Yes, the model is monitored by a team that updates it to track changes in the environment	
Q12	Yes, the model is open access or a test version is available	

M30 Model

Table 9: Strengths, and weaknesses of the E-government maturity model (M30)

Questions	Strengths	Weaknesses
Q1		No, this is not a generic model. It' an E-government_specific model
Q2	It has 5 steps ➔9-5=4 <5	
Q3	Yes, accessible, and clear documentation is available	
Q4		No, no software is implemented for this model
Q5	Yes, the model has been tested, and validated in a company	
Q6		The dimensions are not subdivided = > low level of granularity
Q7		Yes, all dimensions have the same weighting
Q8	The level of maturity is by dimension, each dimension is like a stage to be crossed, the condition of which is to reach the maturity of these	
Q9	KPIs are proposed as a measurement element 10	
Q10		Yes, the measurement elements (KPIs) have the same weighting
Q11	Yes, the model is monitored by a team that updates it to track changes in the environment	
Q12	Yes, the model is open access or a test version is available	

M1 Model

Table 10: Strengths, and weaknesses of the maturity model for educational organisations (M1)

Questions	Strengths	Weaknesses
Q1		No, this is not a generic model. It's an education-specific model
Q2	It has 6 dimensions →9 - 6 = 3<5	
Q3	Yes, accessible, and clear documentation is available	
Q4		No, no software is implemented for this model
Q5		No, the model was not tested in a company
Q6		The dimensions are not subdivided = > low level of granularity
Q7		Yes, all dimensions have the same weighting
Q8	The maturity level is calculated per dimension, and then the overall level is calculated	

Results and Discussion

To make it easy to reflect on the analysis of strengths, and weaknesses that we have made, we have made a digital representation of the strengths, and weaknesses of the different models that we have studied. Table 11 presents this digitization of the analysis, which is composed as follows: In the columns, we have the models represented by their symbols (Table 1), and in the rows, we have the issues that fed into our analysis represented by their symbols (Table 2). We have completed the table by replacing the strengths with the number 1, and the weak points with zero (0).

Figure 3 shows that the M12, and M27 models are more robust than the other models with a total of 10 positive responses on 12 questions, a rate of 83.33%. Next come the M28, and M26 models with 8 positive answers on 12 questions, a rate of 66.67%. The M18 industry model, and the M30 government model come in 3rd position with 7 strong points each out of 12, in second, and last place comes respectively the M8 SME model with 6 strong points, and the M1 education model with 5 strong points. Figure 3 summarizes the analysis.

The M12, and M27 models each have 10 of the 12 strengths that we have identified, and each has 2 weaknesses. M12 is a generic model applicable to all organisations but is not free of charge, its documentation, and user guide are only available for purchase. M27 is a particular case of M12 for the banking industry. It is not generic but is used in particular for the banking sector. The strengths, and weaknesses of both models are illustrated in Figs. 4-5.

The shortcomings of the M12 model are strategic due to its commercialization, which makes the model's resources unavailable on an open-access basis. These resources include the complete documentation, and digital platform for the model, which are available upon purchase. As for the M27 model, it has the same number of weaknesses as the M12 model, but at a different level. M27 is a model of the banking sector, and thus not generic, which is its weakness against M12.

Table 11: Quantification of the results of the analysis of the model's strengths, and weaknesses

Models/questions	M12	M27	M18	M8	M28	M26	M30	M1
Q1	1	0	0	0	0	0	0	0
Q2	1	1	1	1	1	1	1	1
Q3	0	1	1	1	1	1	1	1
Q4	1	1	0	0	0	0	0	0
Q5	1	1	1	1	1	1	1	0
Q6	1	1	0	1	0	0	0	0
Q7	1	1	1	0	1	1	0	0
Q8	1	1	1	1	1	1	1	1
Q9	1	1	0	0	1	1	1	1
Q10	1	1	1	0	0	0	0	0
Q11	1	0	1	1	1	1	1	0
Q12	0	1	0	0	1	1	1	1
Total	10	10	7	6	8	8	7	5
Rate (%)	83,33	83,33	58,33	50	66,67	66,67	58,33	41,67

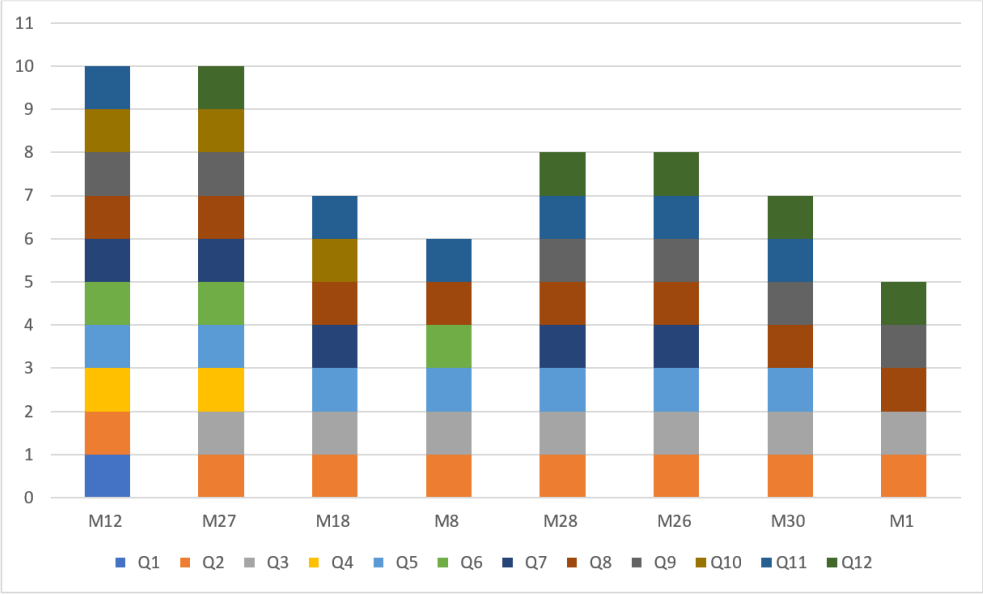

Fig. 3: The number of highlights per model

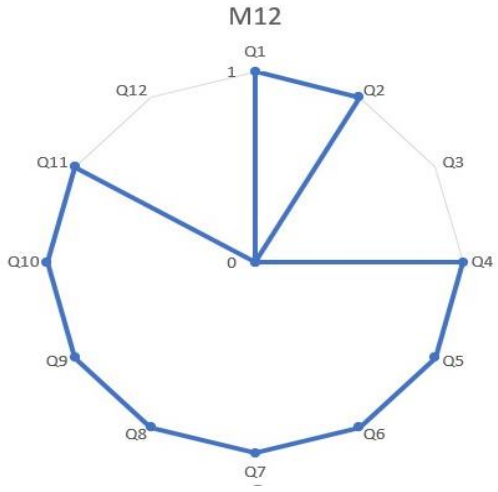

Fig. 4: Strengths, and weaknesses of the M12 model

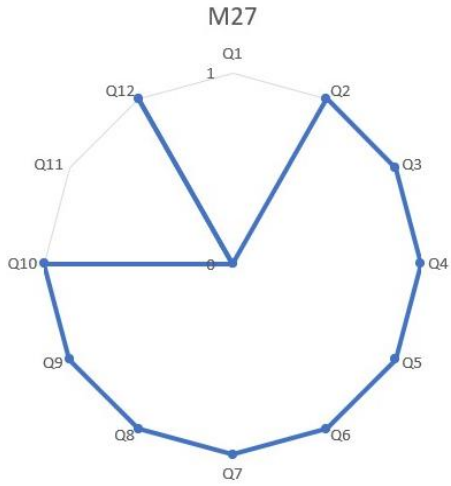

Fig. 5: Strengths, and weaknesses of the M27 model

Given the above, this analysis shows that, of the 12 points that a model must fulfil, around which we have formulated 12 questions, 7 out of 8 digital maturity models reach the 50% mark, i.e., a minimum of 6 strong points., and of those 7, 6 surpass the 50% mark, a minimum of 7 strengths. This result is consistent with work conducted by Barry *et al*. (2022) on the analysis, and comparison of digital maturity models. The M12 model, by its generic nature, and with a coverage of 10 strengths out of the 12 that we consider necessary to fulfil, presents less of a handicap than the others for measuring the digital maturity of public, and private organisations.

Conclusion

This document has been the subject of an in-depth study of 8 digital maturity models. This study consisted of an analysis of the strengths, and weaknesses of each of the models that were found to be the most relevant for the measurement of digital maturity in its field of application in a benchmark from the literature. The results show that the Digital Internet Maturity Model (DIMM), and Bank Internet Maturity Model (BIMM) models have more advantages than the other models for measuring digital maturity. The DIMM model, which is generic, can be used in any field of application, and has a digital platform, has fewer constraints for measuring the digital maturity of companies in general. However, it should be noted that for certain specific domains such as the public sector, the health sector or education, the specific models discussed in this document are more rigorous for measuring digital maturity than the generic model. However, their use presents several disadvantages related to their structures, and lack of digital implementation.

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Author's Contributions

Abdoulaye Sadio Barry: Developed this contribution.

Saliha Assoul and Nissrine Souissi: Participated in the organisation of the work plan, in the revision of the article to give it a meaningful intellectual content and she also gave her approval to the final version of the article to be submitted.

Ethics

This study is original and contains unpublished material. The authors have perused and endorsed the manuscript and no ethical issues involved or conflicts of interest to release.

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