Original Research Paper

Digital Maturity Assessment – A Case Study

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Abstract: The digital transformation is in progress; this exercise is very agile in the sense that it requires the adoption of one of the key precepts of agility and that supposes to include the digital transformation in an iterative and incremental logic. This can only be achieved if there is evaluation and adjustment accordingly. This is the focus of this study, the assessment of digital maturity, whose objective may vary depending on the stage at which this exercise is carried out, before, during, or after digital transformation. Nevertheless, it allows us to orient and sharpen our digital action and adapt it to the reality of the company. To do this, many digital maturity assessment models have been developed, which are reference frameworks based on assessment axes and indicators. In this study, we ask the question if these models can achieve the expected objectives, which are to (re) orient the company's digital strategy, knowing that they are developed according to a given vision of the digital transformation. We adopted an empirical approach to answer this question; after positioning digital maturity in the value chain of digital transformation, we conducted a field experiment focusing on a key axis of digital transformation, namely human resources. This case study to assess the digital maturity of an industrial company allowed us to make revealing recommendations on the opportunities and limitations of digital maturity models.

Keywords: Digital Transformation, Digital Maturity, Assessment Models, DIMM, Case Study

Introduction

In a context of digital transformation, new business models are emerging (Berman, 2012) and giving rise to a long digital transformation, with which several concepts have appeared, including digital maturity.

The Digital maturity represents a reliable image of the digital journey of a company; it is a systematic impact of the digital transformation that it is appropriate to measure in order to situate itself:

Upstream: To define the initial context on the basis of which the digital strategy will be designed
On the way: To identify the adjustments to be made to the deployment process of the digital strategy
At the end of the digital transformation exercise: To evaluate the achievement of the digital strategy's objectives

Thus, the objective of the digital maturity assessment varies according to the stage at which it is conducted, as well as the dimensions that make up this representative indicator of the transformative process, since it depends essentially on the axes of digital transformation. We explain this multidimensional vision of digital transformation in the paper (Zaoui and Souissi, 2018).

The digital maturity assessment exercise is necessary and relies on models that constitute a reference framework based on evaluation axes and indicators to assign a level of maturity to the evaluated organization.

Since the digital transformation burst, several digital maturity models have been developed, and companies are increasingly demanding them (Teichert, 2019). In this study, we ask the question of their applicability. Do they allow us to identify dysfunctions or obstacles based on which recommendations can be made to achieve a successful digital transformation? Are they digital diagnostic tools?

To better understand these models and answer the above questions, we propose to conduct a case study with a large company in order to evaluate its digital maturity with a generic model, applicable to any type of structure, the Digital Internet Maturity Model (DIMM) (Fayon and Tartar, 2022).

The objective is to capture the opportunities and limitations of the digital maturity models by applying them. Due to the broad scope of this evaluation, we only report on the evaluation of the People dimension in this study. Firstly, because it is a key component at the core of the digital strategy of the company being evaluated, and secondly because it is a crosscutting axis that integrates several key elements of the digital transformation (Digital Culture).

Theorical Background

Digital Transformation Roadmap

The digital transformation roadmap has been the subject of previous work (Zaoui and Souissi, 2020a), where we have highlighted the key components of digital transformation. These are 3 families of stages that have been built from the phases identified in the literature, namely.

The evaluation of digital transformation. This is mainly linked to the existing digital state of a specific company. The evaluation should be multi-dimensional, as several studies have advocated (Zaoui and Souissi, 2018; 2020b; Zaoui *et al.*, 2019). It is indeed very significant to go through this evaluation during the different stages of digital transformation to reflect on the digital maturity of the company and question how efficient the adopted processes were. This should help sensitive the different stakeholders on the need for an engaged and agile approach to the process of digital transformation.

Defining the strategic orientation of the digital transformation of the company and setting strategic goals. Some of the suggested categories were very generic while others were very specific. This called for bringing some categories together and splitting others. In this vein, defining strategic orientations of digital transformation and declining these in specific objectives for this transformation are two phases but they really are part of defining the strategy for this transformation. The latter includes goal setting, internal and external diagnosis, and objectives to action plan. In the meantime, two main variables should be considered: the company size and its activity. It is worth underlining that this phase is of utmost importance to the successful completion of the rest of the process.

Implementing digital transformation. It is needless to mention that implementing digital transformation on the ground requires significant prior preparation and guidance. But implementation remains the most concrete phase of this whole transformational project. Change will be felt and visible to different stakeholders. How fast this change will be concretized depends on how motivated and committed stakeholders are to the collective cause that is digitalization.

Being a transformative process, it is recommended to inscribe digital transformation in an agile logic by designing iterative roadmaps. In what follows, we have chosen to develop the block of steps dealing with the assessment of digital transformation, which allows us to identify the level of digital maturity of the company, considered today as a corporate key characteristic.

Focus on Digital Maturity

To carry out our reflection on digital transformation, we have chosen to develop each phase of the digital roadmap, starting with the digital maturity assessment that is the subject of this study.

In an increasingly digitalized environment, gaining digital maturity is synonymous for companies to gain competitiveness. In the paper (Chanias and Hess, 2016), the concept of digital maturity is defined as "the status of a company's digital transformation» and provides information on "what a company has already achieved concerning transformation efforts". These efforts include the operational changes that have been implemented as well as the skills that have been acquired to master the transformation process.

Digital maturity is therefore an index/indicator that allows us to situate the company on a digital scale and thus determine which step to take in terms of its digital transformation.

The challenge of measuring digital maturity lies in the fact that it conditions the transformative process, and its difficulty in assessing a complex and multidimensional notion that is digital transformation (Zaoui and Souissi, 2020ab). This is a question that has been addressed by a large number of researchers: How to assess digital maturity? In response, a variety of digital maturity models have been proposed in the literature (Mettler, 2010), addressing this question from different perspectives, and confirming the multiple understandings of digital transformation.

Digital Maturity Models

A maturity model is a normative framework whose different levels are conceptualized as evolutionary stages, representing a typical development path. The application of maturity models to organizations enables the assessment of the current level of a set of capabilities, the derivation of improvement actions, and the prioritization of these actions accordingly (Poeppelbuss *et al.*, 2011; Remane *et al.*, 2017).

In the case of digital maturity, the related models make it possible to evaluate the digital level of the company to guide its digital transformation journey (Soares *et al.*, 2021).

To date, many models have been developed to assess digital maturity (Thordsen *et al.*, 2020). Indeed, the axes evaluated to assess digital maturity depend essentially on the initial vision of digital transformation, on which there is still no consensus (Gong and Ribiere, 2021), which explains the evolution of the DMM offer and calls for questioning their validity.

We approach this question from a 'test and learn' perspective, which consists in testing a hypothesis and then learning from its experimentation. It is an agile and user-oriented method, which assumes the continuous improvement of the offer or the expected outcome, which in our case is the evaluation of digital maturity (Rigby *et al.*, 2018). We are experimenting with a DMM in the context of a large production industry that has placed its users at the heart of its digital transformation.

Referring to literature reviews on DMMs (Williams *et al.*, 2019; Thordsen *et al.*, 2020), we have identified those that have considered the 'Staff' component in the assessment of a company's digital maturity, from which we have identified the DMM DIMM, which is described and applied in the following sections.

Materials and Methods

DIMM Description

The Digital Internet Maturity Model (DIMM) is a model proposed and described by David Fayon and Michaël Tartar (Fayon and Tartar, 2014). The DIMM model is based on six levers to measure digital maturity characterized by the dimensions shown in Fig. 1. Performance indicators, each associated with the five levels of maturity specified in Fig. 1, identify these dimensions.

DIMM has 117 indicators that determine where the organization is in its digital maturity and each indicator is rated from 0 to 5 (0: Failed; 1: Initiated; 2: Managed; 3: Defined; 4: Quantitatively managed; 5: Optimized). The five levels are based on the Capability Maturity Model Integration (CMMI) and level 0 is possible in case the requirements of level 1 are not met as described in Fig. 2.

It should be noted that the digital maturity assessment we are conducting is based on DIMM since it treats the "people" dimension in the same way as the other levers (strategy, organization, offer, etc.) and since the company being assessed places the user at the heart of its digital transformation strategy. The company considered the evaluation of this component to be of great importance insofar as it will enable it to assess its digital transformation strategy if indeed it succeeds in achieving the expected objectives. In what follows, we only report on the evaluation of the digital maturity of the staff according to the 5 levels of maturity and considering 17 indicators of staff performance covering three dimensions: Training, collective intelligence, and expertise through the attribution of a score from 0 to 5, as mentioned in Table 1.

Through the above dimensions, DIMM assesses the digital maturity of the workforce based on the company's support of its employees in terms of adoption and effective use of digital tools, agility, and collaboration to ensure their operational efficiency and adoption of a digital mindset or digital culture.

Training

The training dimension refers to the mastery of digital tools by staff, as well as the development of staff knowledge and skills in line with their short- and long-term needs, training. The assessment of the training dimension in the Digital Internet Maturity Model is based on four performance indicators:

PT1: The digital mastery of employees
PT2: Number of hours devoted to digital training per employee
PT3: Digital training catalog
PT4: Training and evaluation of staff ethics

Collective Intelligence

Collective intelligence is the pooling of skills, knowledge, creativity, thinking, and problem-solving abilities... In the service of a common goal. Its evaluation consists of the study of the development of the spirit of collaboration and initiative in the company and which is favored in the digital context by the digital tools. According to DIMM, the following seven indicators measure collective intelligence:

PI1: Degree of vigilance of an employee in the acquisition of digital skills
PI2: Collaborative intelligence of employees, sharing on projects and social network of the company
PI3: Knowledge sharing to ensure service continuity with digital
PI4: Ability to use digital tools in the context of the employee's missions
PI5: Degree of contribution over a given period of time by internal collaborator
PI6: Degree of contribution over a given period of time by external collaborator
PI7: Deployment of new collaboration tools and their usage rate

Expertise

The expertise dimension covers several aspects, namely the well-being of employees, the development of their potential in a digital work environment, the retention of human resources, innovation, and change management. DIMM evaluates the expertise dimension according to the following six indicators:

PE1: Ability to attract and retain talent
PE2: High-level resources
PE3: Ability to anticipate new professions
PE4: Motivation and reward are modulated according to the support for change
PE5: Quality of life at work with digital technology;
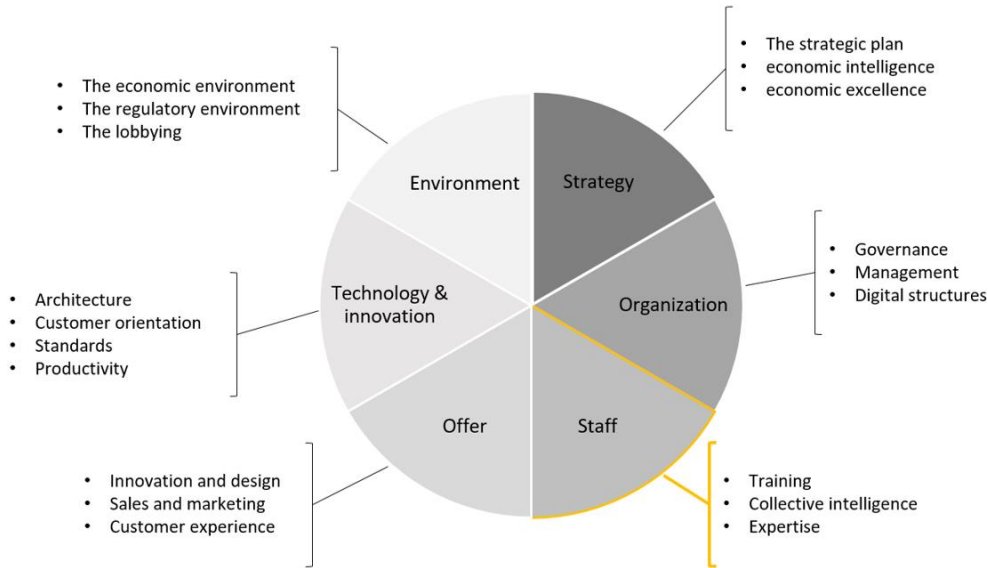PE6: Relationships with innovation players (schools and universities and the percentage of students in the workforce)
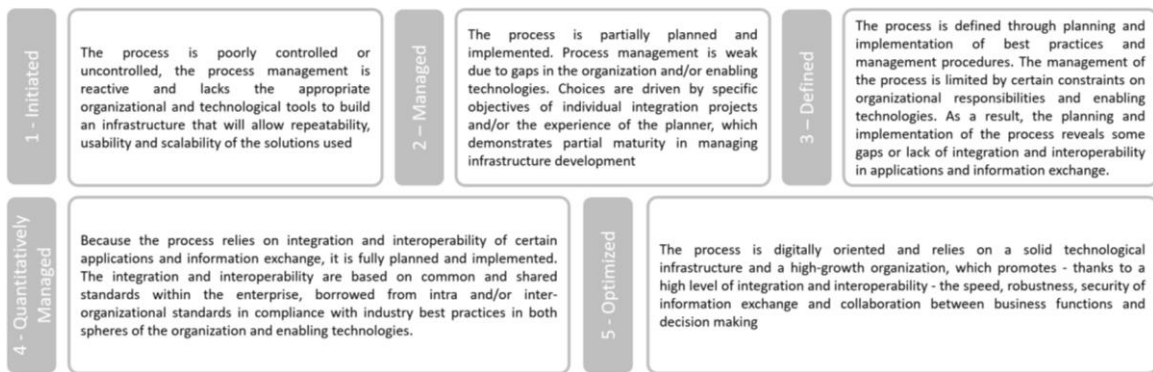
Fig. 1: DIMM dimensions

Fig. 2: Digital maturity levels

Table 1: Key performance indicators

Dimension	Coefficient	Indicators
Training	2	PT1: The digital mastery of employees
	2	PT2: Number of hours devoted to digital training per employee
	3	PT3: Digital training catalog
	1	PT4: Training and evaluation of staff ethics
Collective intelligence	2	PI1: Degree of vigilance of an employee in the acquisition of digital skills
	2	PI2: Collaborative intelligence of employees, sharing on projects and social network of the company
	2	PI3: Knowledge sharing to ensure service continuity with digital
	2	PI4: Ability to use digital tools in the context of the employee's missions
	2	PI5: Degree of contribution over a given period of time by internal collaborator
	1	PI6: Degree of contribution over a given period of time by external collaborator
	2	PI7: Deployment of new collaboration tools and their usage rate
Expertise	2	PE1: Ability to attract and retain talent
	2	PE2: High-level resources
	2	PE3: Ability to anticipate new professions
	3	PE4: Motivation and reward are modulated according to the support for change
	2	PE5: Quality of life at work with digital technology
	2	PE6 Relationships with innovation players (schools and universities and the percentage of students in the workforce)

The table below summarizes the key performance indicators of the three dimensions that we have selected for the evaluation of the People axis, as well as their coefficients defined by DIMM. These coefficients are used to calculate the final score for each dimension after all its indicators have been evaluated according to the requirements grid proposed by DIMM.

Case Study

Selected Indicators

The company in which the DIMM model was tested is a large industry with several sites. This is the particularity of the digital transformation of this company, which presents considerable challenges because, in addition to the complexity of the digital transformation of the industrial sector, it must embark on its digital transition with a considerable number of employees, without whom the transformative process will fail.

For this reason, the digital transformation strategy of this company has been fundamentally focused on the staff dimension, and its evaluation must essentially involve the evaluation of the digital maturity of the staff, which will be carried out in the following using the DIMM model. The objective of this experimentation is to verify the applicability of this model and to qualify the results if they correctly assess the digital reality of the company and if they allow identifying its digital perspectives.

We have selected from the previous indicators those that can be measured in the context of this company, these are:

Results

Among the selected dimensions we find as many qualitative dimensions that we collected through questionnaires submitted to employees as quantitative ones that were provided to us by our digital transformation contacts. Based on the consolidated answers obtained, the indicators were qualified as stated in the Table 3, 4 and 5.

The evaluation of each of the above dimensions is done in the following tables, by assigning a score from 0 to 5 for each indicator using a grid of requirements to be met proposed by DIMM. Each score corresponds to a level of maturity which is explained in Table 2 of chapter 2: (0: Failed; 1: Initiated; 2: Managed; 3: Defined; 4: Quantitatively managed; 5: Optimized). Note: A score of 0 is assigned if the requirements of level 1 are not met.

The training dimension is therefore positioned at a definite level thanks to the importance that the company gives to the training of its employees through the establishment of a training institute that offers various programs, activities, and projects to develop the digital skills of employees. However, the training offer still needs to be developed, especially in terms of planning, to reach more employees and meet their learning needs.

Discussion

Whether in terms of training, collective intelligence, or expertise, the company has undertaken solid actions for its workforce, which is considered the main pillar of its digital transformation. The results shown in Fig. 3 demonstrate considerable progress in terms of the company's digital change management, which are outlined in the above-mentioned dimensions, and which channel most of the operations are carried out to enable the company to adapt to digital change by having it adopted by its collaborators.

To complete the digital diagnosis through the assessment exercise, the results were supported by interviews with the key stakeholders of the company's digital transformation, i.e., those who designed the digital transformation strategy, those who deploy it, and those who monitor its deployment. These actors, who are working to lower the resistance to digital change and deploy it, helped us to assess and explain the figures obtained, which they consider to be average or moderate for a company that places the employee at the heart of its digital strategy (Kandler *et al.*, 2021). They also made recommendations that could help the company achieve its digital strategy objectives.

These recommendations represent the continuum of change management actions, being the main axis of the company's digital strategy. They cover the improvement of the adoption of digital tools and the development of the individual and collective performance of employees. The stakeholders have declined these recommendations regarding the following operational objectives:

- Develop communication on digital tools
- Develop the training offer by aligning it with employee needs
- Develop a collaborative culture and team synergy

These operational objectives will be developed into a portfolio of projects that will lead to an action plan to implement the recommendations.
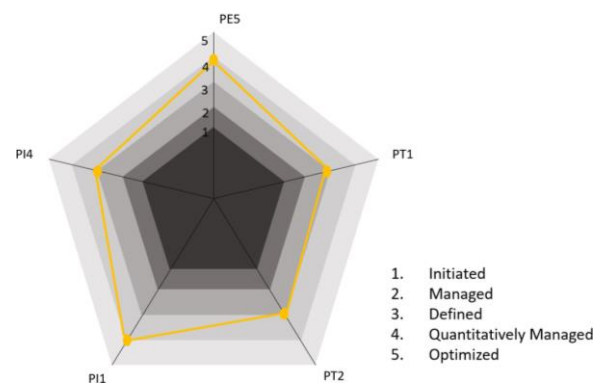
Fig. 3: Case study evaluation results

Table 2: Selected indicators for the case study

Dimension	DIMM indicator	Definition	Sub-indicator
Training	PT1. The digital mastery of employees	This indicator evaluates the ability to master 5 categories of digital tools (videoconferencing, management and planning, sharing, messaging and administration)	PT1.1: Level of mastery of digital tools PT1.2: Level of proficiency by category
	PT2. Number of hours devoted to digital training per employee	This indicator measures the investment made in training delivered to employees either on-site or through e-learning	PT4.1: Percentage of employees who have taken at least one digital training course PT4.2: Average time spent on digital training for employees to digital
Collective intelligence	PI2. Collaborative intelligence of employees, sharing of projects and social network of the company	This indicator evaluates the use of collaborative tools to ensure cross-functionality and the development of collective intelligence that is useful for creativity and projects	PI2.1: Level of collaboration
	PI4. Ability to use digital tools in the context of the employees missions'	This indicator measures the impact of the use of of digital tools made available to users on their operational efficiency	PI4.1: Number of collaborative incidents PI4.2: Average rate of collaboration incidents
Expertise	PE5. Quality of life at work with digital technology	This indicator measures the quality of life at work, enables all employees to feel good and to be effective in their missions, particularly with the help of digital tools	PE5.1: Digital Experience Score PE5.2: Satisfaction score PE5.3: Productivity score

Table 3: Evaluation grid for the training dimension

Training		Results
PT1. The digital mastery of employees	1: Overall average higher than 10/20 and more than 50% of the employees obtain at least 10/20 2: Overall average higher than 12/20 and more than 60% of the employees obtain at least 10/20 3: Overall average higher than 12/20 and more than 80% of the employees obtain at least 10/20 4: Overall average higher than 14/20 and more than 90% of the employees obtain at least 10/20 5: Overall average higher than 15/20 and more than 100% of the employees get at least 10/20 and more than 80% of the employees get at least 12/20	The respondents to the questionnaire obtained an overall average of 13.06/20 and 86.2% of the respondents average had an of more than 10/20 The indicator "PT1. Digital literacy of staff" is positioned in level 3" defined" concerning DIMM
PT2. Number of hours devoted to digital training per employee	1: At least 2.5 hours of digital training on average per agent + at least 5% of employees have received digital training 2: At least 5 hours of digital training on average per agent + at least 10% of employees have received digital training 3: At least 7.5 hours of digital training on average per agent + at least 12.5% of employees have received digital training 4: At least 40% of employees have received digital training + self-training 5: At least 10 hours of digital training on average per agent + At least 25% of the employees have followed a digital training	An average of 18% of employees have taken at least one digital courses in the last three months, with an average of 7.6 hours per employee The indicator "PT4. Number of hours devoted to digital training per employee" is therefore positioned in level 3: "defined"

Table 4: Evaluation grid for the collective intelligence dimension

Collective Intelligence		Results
PI2: Collaborative the intelligence of employees, sharing on projects and social network of the company	1: Existence of a collaborative network such as a corporate social network 2: Employees exchange, share and interact on the company's social network 3: Collaboration tools allow employees to work together on projects or to consult on technical issues 4: Integration of agile methodologies in the collaboration between teams 5: Full adoption of agile methodologies by the teams, achievement of collaborative management. Annual objectives include collective intelligence indicators	The adoption of agile methodologies by employees allowing the PI2 indicator to be positioned in level 4 "quantitatively managed"
PI4: Ability to use digital tools in the context of the employee's missions	1: More than 70% of problems come from digital collaboration tools 2:]40-70[% of the problems come from digital collaborative tools 3:]20-40[% of the problems come from collaborative digital tools 4:]0-20[% of problems are with digital collaborative tools 5: No obstacle to the use of digital collaborative tools	The average rate of collaboration incidents is 32.93% This means that the PI4 indicator is at the "defined" level

Table 5: Evaluation grid for the expertise dimension

Expertise		Results
PE5: Quality of life at work with digital technology	1: The existence of a digital infrastructure necessary for 2: Existence of a support and assistance service for the use of digital tools 3: The existence of productivity and work organization tools 4: Continuous evaluation of the quality of work with digital tools and the staff's feelings 5: Adoption of a digital workplace	The quality of life of the company's staff evaluated at work with digital technology is positioned in level 4 "quantitatively managed" insofar as the digital experience for employees is meticulously monitored and measured continuously with a dedicated tool and dedicated through periodic surveys of users

However, some considerations can be made regarding the concrete conduct of the evaluation exercise, including the following:

- The indicators provided by the DIMM model are shortlisted in order to keep only those that can be measured in the company's environment, given the lack of available data to measure all the indicators. The digital maturity assessment model is thus adapted to the context studied, which may bias the results
- The examination/review of the assessment results of the "personnel" dimension using the DIMM model is based on the standardized maturity levels to propose a reading of the company's digital situation. This allows categorizing but does not explain the digital state of the place, which is why it is challenging to identify the actions to be taken to address the identified shortcomings (Normann Andersen, *et al.*, 2020). That's why some opinions claim that digital maturity is an equivocal interpretation exercise that should be entrusted to digital transformation experts
- The definition of SMART objectives (specific, measurable, achievable, relevant and time-bound) (Bjerke and Renger, 2017), associated KPIs, and rules/tools to measure these KPIs is a necessary prerequisite for a realistic assessment of digital maturity. In this case, the assessment will focus on more metrics and the results obtained will be compared to the set objectives, which will allow to correlate the assessed digital maturity with the context and the initial objectives of the company and establish a pragmatic diagnosis. Moreover, it is precisely at this level that the monitoring of the digital strategy is expected

This is what brings us to our proposition to the stated reserves, the piloting of the digital strategy (Wiraeus and Creelman, 2019) which consists in measuring the achievement of the objectives set in the digital strategy to make the necessary adjustments to succeed in this transformation. Thus, we emphasize that digital strategy management is strongly correlated to digital maturity, in the sense that, achieving strategic and operational objectives through the portfolio of related projects is in itself an improvement in terms of digital maturity that should be measured as part of digital strategy management.

We propose to articulate the management of the digital strategy on the following axes:

- Operational monitoring: Consists of monitoring projects that contribute to the effective implementation of the digital strategy
- Strategic monitoring: Consists in the evaluation of the achievement of strategic objectives through strategic diagnosis and the examination of strategic risks:

The use of DMMs is useful for this exercise, which must be continuous and carried out at key moments in the deployment of a digital strategy. The choice of DMM must take into consideration the dimensions involved in the company's digital strategy, to align them. As for its application, it mainly depends on the prior definition of SMART objectives, the related performance indicators (KPI), and the rules/tools for measuring these KPI

- Strategic intelligence and innovation: Integrate two components:

    Strategic intelligence by seizing external business opportunities and internal recommendations to improve the company's digital journey (Gitelman *et al*., 2021);
    Innovation and development of levers of influence to refine the company's digital strategy

Conclusion

Performing this case study of digital maturity assessment in its staff component allowed us to understand the complexity of the digital maturity concept. A pre-established maturity model facilitates this exercise but is conditioned by a digital transformation logic that may diverge from the digital construction of the company being evaluated, resulting in an approximate appreciation of this maturity.

It is, therefore, appropriate to use a digital maturity assessment model upstream of its digital transformation, on which the company can eventually base its digital strategy by adopting the same digital dimensions, and thus work to develop its digital maturity by deploying its digital strategy. In this scheme, the monitoring of the digital strategy consists in following the evolution of the digital maturity through this same model that the company can use during its entire digital journey.

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Author's Contributions

Fadwa Zaoui: Developed this contribution.
Nissrine Souissi: Proposed the theme of his study, led the conception and development of his contribution, and supervised it from beginning to end until its validation.

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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