Governance Model for Digital Transformation

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ABSTRACT
Digital transformation is the key to survive in an era where digital disruption is imposing demands on organizations and information technology, by seeking to take advantage of the digital technologies to increase profitability, efficiency, and effectiveness. The existing frameworks to implement a digital transformation are too generic, presented essentially as a set of good practices and advices, instead of a systematic approach that structures and separates orthogonal concerns. This dissertation proposes a solution for this problem, in which a framework (to describe digital transformation state) is clearly separated from the methodology (to choose and describe digital transformation actions), providing a systematic approach to digital transformations and a means to evaluate the outcome of that transformation. The framework and methodology have been implemented in a simulation tool and evaluated by comparing their expressive power with that of existing approaches, as well as by performing a study of their applicability to a real organization.

Author Keywords
Digital Transformation, Governance, Framework, Methodology, Digital Capabilities, Simulation.

ACM Classification Keywords
I.6.7. Simulation and Modeling: Simulation Support Systems; K.6.1. Management of Computing and Information Systems: Project and People Management.

INTRODUCTION

Until not long ago, the emphasis of any organization was on having a well-designed enterprise architecture. Then digital technologies, such as cloud computing and mobility, started to become ubiquitous and disruptive.

Now a classical, well-designed enterprise architecture is almost a liability, rather than an asset, due to the inertia regarding change that it entails. This is a time in which a startup can outrun an established organization in a short period, if its business model is innovative enough.

Consider the model in Figure 1, in which an organization has to deal with its value chain (customers and suppliers), the market (its competitors) and its internal resources (human and material). If these four channels of interaction are considered barriers that the organization needs to continually overcome, to conduct its business, then the main goal is to reduce the effort cost of channel interaction, as well as the channel's inertia regarding changes.

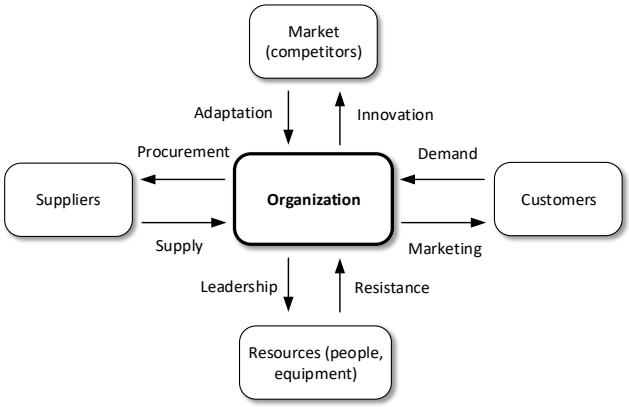


Figure 1. A simple model of the interaction of an organization with its environment.

For an existing company, this does not mean improving the web site, moving the business to the cloud, making business processes more automated, or adding some digital features to existing products or services. This is just a digital makeup, or digital optimization. A true digital transformation (DT) means reinventing the business model and providing a significant improved value as perceived by customers, while significantly reducing the organizational inertia by taking a light approach on the supplier and resource channels.

Unfortunately, digital transformation is a very recent field and available literature is scarce, undetailed, unorganized, inconsistent and mostly describing specific applications or case studies.

Current approaches to digital transformation are more a list of guidelines and advices (do's and don'ts) than a truly systematic approach to the problem. Each consulting company has its own approach, with experience grown out of its previous projects. There are no widely accepted good-practices yet and one danger is that a consultant on a digital transformation of some organization tries to reuse the solutions adopted in a previous digital transformation instead of the adequate ones for this case.

The lack of a systematic approach is currently one of the most relevant problems in the digital transformation domain. The main goal of this paper is precisely to contribute to the systematization and to the body of knowledge of the digital transformation domain, by a proposing a systematic and reproducible approach that includes both a framework and a methodology.

RELATED WORK

There is no universal definition of digital transformation that applies to all cases, since the domain is recent and each transformation is performed by different actors, driven by different motivations and has different solutions and outcomes.

The MIT Sloan Management Review [1] defines digital transformation as the use of new digital technologies (social media, mobile, analytics or embedded devices) to enable major business improvements (such as enhancing customer experience, streamlining operations or creating new business models).

The digital transformation of an organization is not just implementing new technologies but transforming the organizations to be able to take advantage of the possibilities that new technologies provide.

Predictions by IDC [2] indicate that, by 2020, as much as 50% of the G2000 companies will see "*the majority of their business depend on their ability to create digitally-enhanced products, services, and experiences*". In order to adapt to this changing world and the pressure from their competitors, organizations need to start thinking about undergoing a Digital Transformation.

According to George Westerman, principal research scientist with the MIT Sloan Initiative on the Digital Economy and author of the book "Leading Digital" [3], the drivers for digital transformation tend to be market disruption from newcomers or innovation from rivals seizing the opportunity to win new customers. In this book, organizations that use digital technologies to obtain significantly higher levels of profit, productivity, and performance are designated *Digital Masters*.

These outperform their peers, becoming on average 26% more profitable, generating 9% more revenue, and achieving more efficiency. This requires essentially leadership and digital capabilities [3].

Capgemini uses an approach that recognizes three key areas in its Digital Transformation Framework [4]:

- Customer experience;
- Operational processes;
- Business models.

Each of these areas encompasses several digital capabilities and aspects to deal with during a Digital Transformation.

Cognizant also has a Digital Transformation Framework [5], which revolves around a few relevant concerns, detailed into several aspects, but here the business model does not seem to be a top-level concern. Apart from the customer, this framework focus on the organization itself and on the products it produces. This framework seems to deal more with digital optimization than with Digital Transformation.

The Boston Consulting Group's Digitization Strategy Framework [6] intends to provide organizations with tools to capture new digitization opportunities.

The framework is used more as a diagnosis method than as a planning framework, which means that they help organizations to set the basis for strategy development by understanding global trends, customer needs, and competitors' activities, and by evaluating current capabilities and gaps. After the initial diagnostic, organizations can resort to a set of building blocks to develop a successful digitization strategy.

One of the most interesting approaches to digital transformation is presented by IBM, with their digital transformation Framework [7], which focus on two distinct axes:

- Reshaping the customer value proposition, the *what* of the transformation, discretized into three stages: Enhance, Extend and Redefine;
- Transforming the operating model, the *how* of the transformation, discretized into three stages: Create, Leverage and Integrate.

Unlike the Capgemini Digital Transformation Framework, the digital transformation of the business model itself does not seem to be recognized as a top-level concern.

The highlight of the IBM approach is the fact that it separates the state of the transformation (a coordinate in the two-axis plane) from the method of navigating that plan, leading to three different paths to the transformation goal, as depicted in Figure 2.

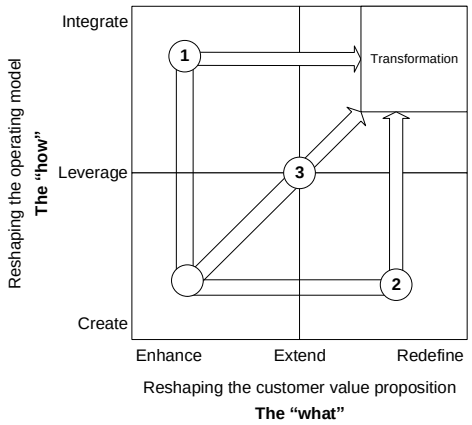


Figure 2. Different digital transformation alternatives in the IBM framework.

Path 1 invests on operations first and customer afterwards, path 2 proceeds the other way around and path 3 develops the two axes at the same time. Each path corresponds to an alternative method to perform a Digital Transformation, which can thus be tailored to the type of organization and/or industry.

THE PROBLEM AND HOW TO SOLVE IT

Any digital transformation is inherently a turbulent process, for which it is not easy to define good-practices, not only because digital transformation is a recent field but also because there is no unique recipe that all fits all industries and organizations. Each transformation is a unique case, which must be tailored to the specific needs, resources, and culture of the organization.

At best, what can be done is to identify basic patterns and techniques that seem general enough, so that they can be applied to any organization. Still, most likely not all organizations will need these patterns and some will need to apply other patterns, not covered by this dissertation.

What is clear is that a digital transformation needs to be well planned and prepared. This is illustrated by an IDC prediction for 2020 that states that the performance of enterprises will be measured by "*a demanding new set of benchmarks in leadership, customer engagement, digitization of new and traditional offerings, operational efficiency and workforce agility*" [2]. However, IDC expects that "*at least one-third of every industry's top 20 companies will fail to reach these new benchmark levels*" [2].

Therefore, before starting transforming, each organization must be able to understand *why* (drivers and goals), *what* (relevant concerns) and *how* (activities to carry out) to perform the Digital Transformation.

This information will allow the organization to develop a map of their desired transformation, with an identified destination. The need of a map is particular important because digital transformation is not a light endeavor, which organizations can pursue blindly and unprepared.

The fundamental question, then, is how to build that map in a systematic way, supported by structured mechanisms that cover the various aspects involved, and how to navigate that map in a concrete, measurable way, so that progress can be evaluated and seen to converge as fast and as efficiently as possible. Building a parallel with the physical world, who starts a journey without a GPS device with a clear map and a planned route?

After analyzing the existing frameworks, briefly described in the previous section, it becomes apparent that what they call framework is, in fact, a methodology. Guidelines, advices, do's and don'ts, and good practices are elements that as a whole define a methodology on how to perform a Digital Transformation. However, there is no clear way to assess in which state the transformation is at a given time, nor to check whether it is converging to the intended goals.

In the example of a physical journey, a set of guidelines and advices such as "avoid congested routes", "highways are safer", and so on, seem logical and in any case needed, but do not really give a clear insight on how the journey should be organized, nor whether the destination is near or still far away.

The IBM Digital Transformation Framework provides a limited improvement to this scenario, by separating the map from the route. The map (states in which the transformation of the organization can be) is composed of a matrix along two main axes (concerns), which can be navigated by different routes (Figure 2).

Therefore, this paper adopts the following terminology, in the context of Digital Transformation:

- **Framework** – A structured classification of digital transformation stages and set of indicators that characterize them. This perspective is consistent with the concept of framework proposed by Zachman [8];
- **Methodology** – Governance and strategic management, with a set of policies, and strategic guidelines;
- **Method** – The actions that implement the path composed of successive transitions between digital transformation stages, from the initial system, AS-IS, to the intended outcome, TO-BE.

The framework describes the state of digital transformation stages, by defining the structural set of aspects to consider. The methodology compares what has already been achieved with what is intended, applies policies and guidelines, and decides what to do next, which overall defines the method that implements a particular digital transformation process. Governing bodies do not have to constantly intervene, since many actions may be required to implement some decision. Different governance choices will lead to different methods.

The digital transformation process is thus designed as an iteration loop, in which each iteration can flow along the following steps (definitions build the framework, decisions build the methodology and actions build the method):

- Define strategic goals;
- Identify indicators to assess goal achievement;
- From the indicators, derive the set of digital capabilities needed to achieve the intended indicator values;
- From the set of digital capabilities, derive the set initiatives that implement them;
- Take into account initiative dependencies and resource needs, as well as resources available;
- Execute initiatives, taking into account policies (that may dictate the order of execution of initiatives) and risks that may prevent intended goals from being achieved;
- As initiatives finish, way until they produce effect on the indicators (the effect of the availability of a digital capability is not immediate);
- Check whether the intended indicator values have been achieved. Decide whether to iterate or to move forward.

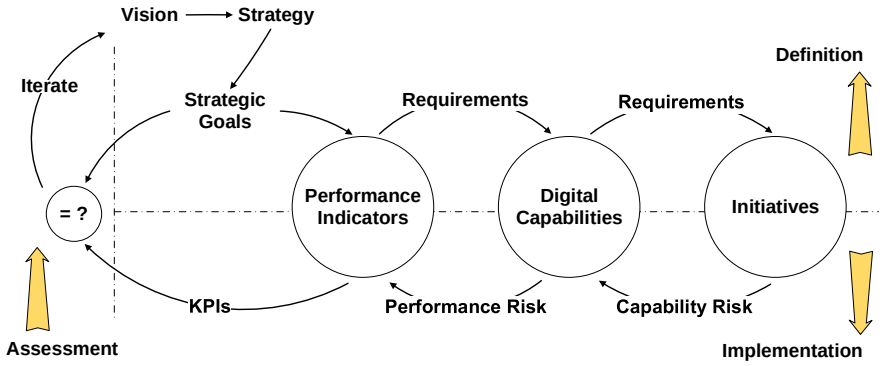


Figure 3. The generic mechanism underlying the digital transformation approach.

GOVERNANCE MODEL PROPOSED

From Strategy to Action

Figure 3 illustrates this loop. Three main phases can be identified in each iteration:

- **Definition**: The organization's governing bodies develop a vision of what it intends to reach through the transformation, draw a strategy, and elaborate a strategy mapping to the goals needed to attain the vision. This in turns leads to the definition of which performance indicators can be used to assess the results, of which capabilities are required to support them, and of which initiatives are needed to implement these capabilities;
- **Implementation**: In this phase, initiatives are executed, but nothing is guaranteed. There is the risk that some initiatives do not implement digital capabilities correctly and that some digital capabilities, although correctly implemented, do not reach the intended results.
- **Assessment**: KPIs need to be measured and compared with the intended values, stemming from the strategic goals. If needed, the whole process needs to be iterated. This need may arise due to risks taking their tool or even due to evolution of the strategic goals, which may have occurred in the meantime.

This three-phase iteration loop is a good match for the distinction between framework, methodology, and method, as discussed in the previous section:

- The definition phase sets the framework with all the information that describes the state (a snapshot) of the transformation, namely set of indicators (and current values), set of capabilities (and availability status), set of initiatives (and execution status), and risks;
- The implementation phase corresponds to one step of the method (which encompasses the sequencing, or orchestration, of all the steps taken along the transformation);
- The assessment phase is an instantiation of the methodology, in which governance has a higher stake. Results are compared with goals in the light of external factors such as technological advances, customer expectations and business models of competitors. Potentially, corrective changes can be made all the way up to the vision. This corresponds to a methodology because these changes can also affect policies and other strategic decisions, thereby changing the method from then onwards.

The initial inspiration for Figure 3 came from the Balanced Scorecard (BSC) [9], since it includes the underlying notion of linking strategy to goals and use the measurement of performance indicators to assess whether these goals are being met.

However, BSC as it stands is not entirely adequate for Digital Transformation, since:

- Its metrics are general-purpose and do not contemplate explicitly the aspects most relevant to Digital Transformation;
- There is no indication of how these indicators can be improved, namely which initiatives should be taken and how they contribute to improve the indicators;
- Although BSC can include risk management by measuring Key Risk Indicators (KRIs), again there is no indication of which risks should be assessed in a Digital Transformation, nor of their relation with digital capabilities and initiatives.

Nevertheless, it constituted a good starting point for the approach taken by this paper.

The framework

The framework must be a template, open-ended, adaptable and extensible, rather than a prescriptive recipe that must be followed in all cases from start to finish. Any organization must be able to tailor and extend the framework to suit its particular needs. It is based on the following concepts:

- **Areas of concern** (axes), describing orthogonal types of issues to consider in a digital transformation and can be divided into categories of more detailed aspects;
- **Performance indicators**, to assess the success of the strategic goals defined for the Digital Transformation, aligned with the axes and categories;

- **Digital capabilities**, which express the skills that the organization must master to achieve the digital transformation goals and must be aligned with the axes and categories. Capability improve indicators;
- **Initiatives**, needed to implement and/or acquire digital capabilities. Their execution requires time and resources, both human and material, which are necessarily limited;
- **Risks**. The execution of initiatives may not endow the organization with the envisaged capabilities. Even if a given capability is acquired, its effect in the improvement of the indicators may not be as high as expected.

The basic framework includes 6 areas of concern, 33 categories of aspects, 33 performance indicators (one for each category, for simplicity), 49 digital capabilities, and 78 initiatives. Due to space limitations, only the areas of concern and categories of aspects are shown, in Table 1.

Area of concern	Category
Customers	Streamline the sale's process Digital Interactions CRM strategy Needs of the Digital consumer Online presence Predictive marketing tools Digital Marketing Digital Interface with the clients Differentiate with digital community Customer service Touch point integration Cross-channel coherence Self-service Socially-informed knowledge Customer-analytics capabilities Predictive Usage
Processes	ERP solution Process performance Operational transparency Data-driven decision-making
Human resources	Networked workforce Virtualization of the workplace Community knowledge sharing Dynamic partner ecosystems Agile approaches
Suppliers	Digitally-enabled supply chain Digital supply chain enablers
Business model	Digitally-modified business New digital business Business globalization
Finance	Digitally-integrated budgeting Digital-related investments Revenue from digital assets

Table 1. Areas of concern and categories of the framework.

Digital maturity, expressing how digital an organization currently is, as a result of its Digital Transformation, should assess the values of the performance indicators and which digital capabilities are implemented. The better these are, the more digitally mature an organization is.

Conventional, process-based maturity models are scalar at the process level, with a single value that measures the maturity of each process.

In this framework, the basic concepts whose maturity can be measured are the performance indicators (quantitative maturity) and digital capabilities (qualitative maturity). These are intertwined in a graph of dependencies, since each capability can improve several indicators, and each indicator can be receive improving contributions from several capabilities. In addition, both can pertain to different aspects, categories and axes.

This means that the maturity model of this framework is inherently vectorial in nature, not scalar. The current maturity of an organization is a vector, considering the value of variable that the framework contemplates (the value of each performance indicator, the implementation degree of each capability, and so on). Governing bodies may check the degree of evolution of the digital transformation by observing partial or global maturity indicators, most likely in graphical form.

The methodology

The main components of the methodology and methods are the following:

- **Initiatives**, the basic blocks of action that are able to implement or acquire digital capabilities. Several constraints (dependencies on other initiatives, timeframe and available resources) influence the orchestration of the execution of the various initiatives;
- **Risks**, which take into account that not all foreseen outcomes will appear as smoothly as planned;
- **Policies**, which indicate the preferred options on many aspects, including the order of implementation of the various aspects of the Digital Transformation
- **Simulation**, an invaluable technique to decide which the most favorable out of a set of possible scenarios.

The order of execution of the initiatives matter, since quick wins are always welcome. This obeys policies such as:

- Performance-first. The initiatives that maximize the overall performance are executed first;
- Capabilities-first. This policy considers that the best approach is to give priority to the initiatives that contribute the most to implement digital capabilities, since these are a requirement to make the organization more digitally mature;
- Risk minimization-first. The two previous policies do not assume failures, but these will inevitably happen, and their potentially negative effect should be minimized. This means executing the least risky initiatives first.

Simulation can also provide insight to support decisions, since the effect of various policies can be assessed in various scenarios.

A CASE STUDY: "MINISTÉRIO DA JUSTIÇA"

Applying the digital transformation approach proposed in this paper to an actual case study requires obtaining the necessary information from the organization, to tailor the framework and the methodology to the organization.

The problem is that it is almost never easy to obtain the required information, and the organization may have already taken some measures to improve its digital maturity before it recognizes the need to perform a true Digital Transformation, an investment that cannot be thrown away.

In these situations, a questionnaire (Table 2) may uncover the required information without explicitly requesting it in technical terms. This is a way to bridge the contexts of consultants and that of the organization's employees.

Q#	Question
1	What is the name of this project and how does it fit in the organization?
2	What is the project scope?
3	What are the main difficulties and problems that you intend to solve with the project?
4	What are the main motivations for the development of the project?
5	What are the areas of impact of the project?
6	What services does the organization offer?
7	How transversal is the project in the organization?
8	Which are the success criteria of the project?
9	Which are the strategic goals of the project?
10	Which are the performance indicators most relevant to the project?
11	Which are the digital capabilities that the organization's strategy has deemed relevant?
12	What is the expected impact of each digital capability in each performance indicator?
13	What is the current state of the project? Non-existing, in planning, in progress, or in conclusion phase?
14	If in progress, what is the state of the project against the initial strategic goals?
15	Which are the initiatives that have already been implemented and which ones are being planned?
16	What is the estimated number of employees allocated to the project?
17	What are the eventual problems and risks that could affect the project success?
18	Which digital capabilities could suffer more resistance by employees and stakeholders?
19	What are the project's temporal constraints?
20	Is there any additional constraint?

Table 2. Questions to obtain information to tailor the framework and methodology.

This questionnaire was used in an interview with the project manager of the "Plataforma Digital da Justiça" project [56], which is being carried out by the "Ministério da Justiça", the Portuguese Department of Justice.

This platform has brought together in one location, for the first time, a plethora of justice-related digital services and constitutes the case study analyzed by this paper. Currently, its phase 1 is finished and phase 2 has not started yet.

The Portuguese government expects to invest up to 477 million euros in the next four years, with expected benefits of 1.3 billion of euros [10].

Although space limitations preclude a more detailed analysis of this case study, the main conclusions were the following:

- All the main areas of concern and more detailed categories of aspects mentioned by the project manager were contemplated in the framework proposed by this paper. A few specific aspects were mentioned for selected services, which shows the advantage of having an extensible framework;
- The same can be said about digital capabilities, although the project manager sees them more as objectives (functionality provided by services) than as tools or necessary steps to achieve the intended values of performance indicators;
- The indicators defined by the project manager were very few and subjective. Clearly, the project is driven by functionality and not by performance improvement, which is not alien to the fact that the organization provides public services and does not operate on a market with competitors. Its main goal regarding digital transformation is to provide more and better services, not increase its market share or profit;
- Risk and project management seem to have been dealt with implicitly in the usual way, not specifically with a digital transformation mindset;
- Services seem to be based on a best-effort approach, although following basic digital transformation tenets such as adopting a customer-centric philosophy, improvement of internal processes, and a business model based on service integration, transparency, and self-service, have been adopted from the beginning.

In the current context, in which established methods and best practices do not exist yet, it is no surprise that the project could not have used a systematic approach to digital transformation such as the one proposed by this paper, involving a detailed framework and a methodology. A concrete problem, with the need of a solution as fast as possible, leave almost no margin to invent innovative approaches and to build adequate tools.

Nevertheless, the author of this paper felt that the experience was very enlightening and instructive, since it provided contact with an actual digital transformation project and gave a strong feeling that the proposed framework, methodology, and simulation tool could provide a more structured and systematic way of approaching future digital transformation projects.

EVALUATION

Comparison with Current Approaches

The existing digital transformation approaches were the starting point to elaborate a list of areas of concern and categories of aspects, as well as a list of digital capabilities relevant to Digital Transformations. These lists have been completed with ideas and contributions from many publicly available formal papers, whitepapers and web sites.

Figure 4 compares the coverage by existing approaches of the digital capabilities contemplated by the framework proposed by this paper. The most complete is the Capgemini approach, and even so it misses 29% of the total of digital capabilities.

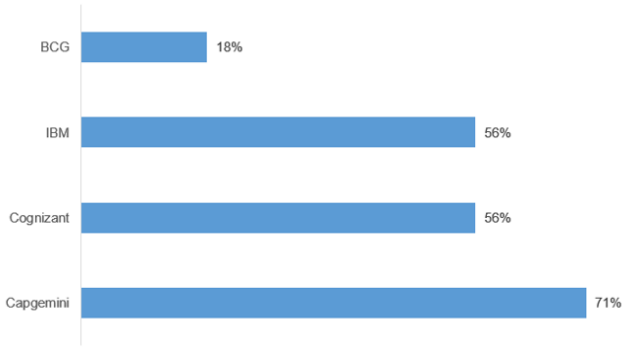


Figure 4. Coverage of digital capabilities by existing approaches.

A comparison can also be made on the principles and basic features that each approach supports, as seen in Table 3.

	This paper	Cap.	BCG	IBM	Cog.
Separation Framework/Method	Yes	No	No	Yes	No
Methodology	Yes	No	No	Yes	No
Detailed stages of DT.	Yes	No	No	Yes	No
Identification of current DT stage	Yes	No	No	Yes	No
Allows different policies	Yes	No	No	No	No
Maturity Model	Yes	No	No	No	No
Explicit support for governance	Yes	No	No	No	No
Has performance indicators	Yes	No	No	No	No
Simulation tool	Yes	No	No	No	No

Table 3. Comparison of coverage of principles and features.

The overall conclusion of this section is that the approach proposed by this paper is more complete and provides better support to the relevant principles of digital transformation than the existing approaches.

A Digital Transformation simulator

Simulation has the advantage of quickly getting results without the effort, time delays and risks of an actual implementation. How meaningful these results are depend on the underlying simulation algorithm and how faithfully the features covered reproduce real-life Digital Transformation, but in any case they favor the organization of information and the graphics they typically produce are helpful to understand how the various factors interact.

This section describes a simple digital transformation simulation tool, based on Microsoft Excel, which implements the various principles and features proposed by this paper and described in previous sections.

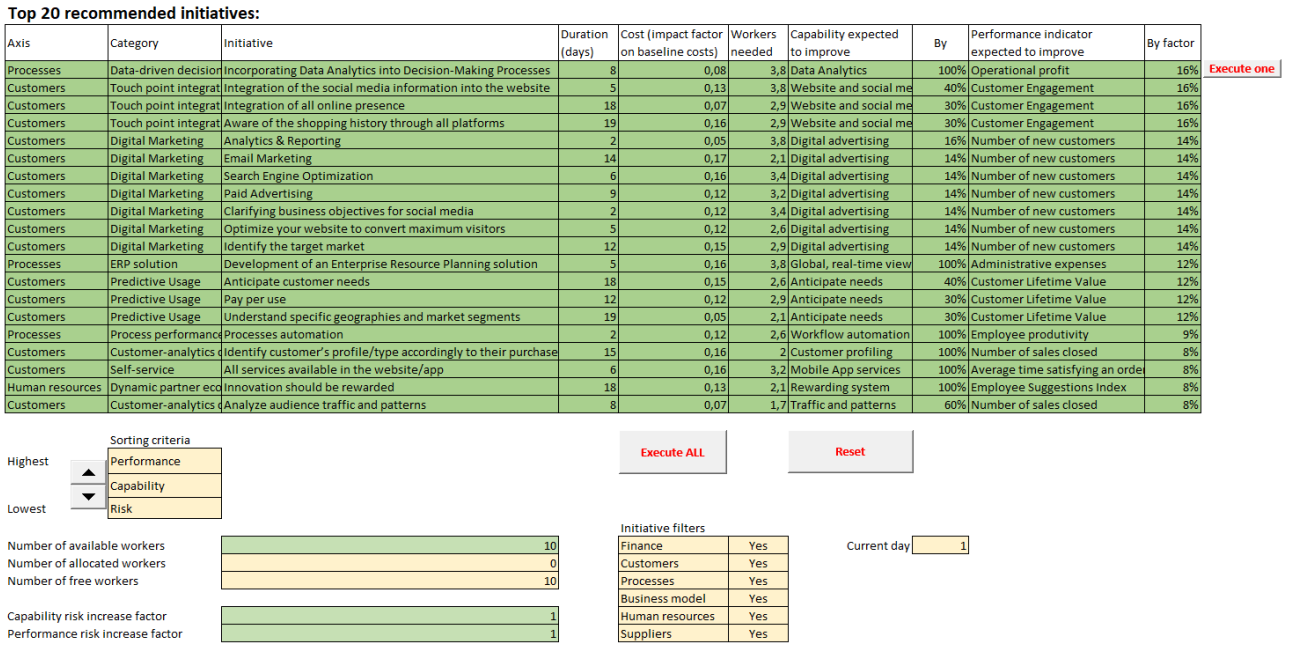
The Excel file has several worksheets, some used to introduce data, others to visualize results, in graphical form. The basic use of this tool can be described by the following sequence:

1. The framework information needs to be provided. This means filling in the areas of concern (axes), categories of aspects, performance indicators, digital capabilities, initiatives, and risks, including detailed information on each of these items;
2. Global data needs to be provided, such as the number of people available to execute the initiatives and the policy regarding initiative execution (performance-first, customer-first, or risk minimization-first);
3. Execute all the initiatives, by pressing a button (which executes Excel macros);
4. Analyze the various graphics produced;
5. If needed, reset the system to its state before the execution and start again from step 2, if a new execution policy is to be tested, or even from step 1, if any definition (such as varying the specified risks) needs to be changed.

To provide an example of what a simulation tool can do with the approach to digital transformation presented in this paper (framework and methodology), the Excel file was setup according to Table 1 and many other details not presented here, which entails the following:

- 33 categories of aspects, 33 performance indicators (one for each category, for simplicity), 49 digital capabilities, and 78 initiatives were defined;
- Weights were defined for the contribution of each initiative to the capabilities that it helps implement and for the contribution of each digital capability to improve the performance indicators that it affects;
- Risks were also defined, with a given probability and impact, for each initiative (failure in implementing a digital capability) and for each digital capability (failure in improving a performance indicator);
- In addition, for each initiative, the number of workers required to execute it, a duration, and a delay (until its result produces effects) were also defined. The tool supports the specification of a cost and of dependencies on up to initiatives, but for simplicity these features were not used in the simulation;

The main worksheet is the Dashboard, shown in Figure 5, seen before starting the simulation.



Top 20 recommended initiatives:

Axis	Category	Initiative	Duration (days)	Cost (impact factor on baseline costs)	Workers needed	Capability expected to improve	By	Performance indicator expected to improve	By factor	
Processes	Data-driven decision	Incorporating Data Analytics into Decision-Making Processes	8	0,08	3,8	Data Analytics	100%	Operational profit	16%	Execute one
Customers	Touch point integrat	Integration of the social media information into the website	5	0,13	3,8	Website and social me	40%	Customer Engagement	16%	
Customers	Touch point integrat	Integration of all online presence	18	0,07	2,9	Website and social me	30%	Customer Engagement	16%	
Customers	Touch point integrat	Aware of the shopping history through all platforms	19	0,16	2,9	Website and social me	30%	Customer Engagement	16%	
Customers	Digital Marketing	Analytics & Reporting	2	0,05	3,8	Digital advertising	16%	Number of new customers	14%	
Customers	Digital Marketing	Email Marketing	14	0,17	2,1	Digital advertising	14%	Number of new customers	14%	
Customers	Digital Marketing	Search Engine Optimization	6	0,16	3,4	Digital advertising	14%	Number of new customers	14%	
Customers	Digital Marketing	Paid Advertising	9	0,12	3,2	Digital advertising	14%	Number of new customers	14%	
Customers	Digital Marketing	Clarifying business objectives for social media	2	0,12	3,4	Digital advertising	14%	Number of new customers	14%	
Customers	Digital Marketing	Optimize your website to convert maximum visitors	5	0,12	2,6	Digital advertising	14%	Number of new customers	14%	
Customers	Digital Marketing	Identify the target market	12	0,15	2,9	Digital advertising	14%	Number of new customers	14%	
Processes	ERP solution	Development of an Enterprise Resource Planning solution	5	0,16	3,8	Global, real-time view	100%	Administrative expenses	12%	
Customers	Predictive Usage	Anticipate customer needs	18	0,15	2,6	Anticipate needs	40%	Customer Lifetime Value	12%	
Customers	Predictive Usage	Pay per use	12	0,12	2,9	Anticipate needs	30%	Customer Lifetime Value	12%	
Customers	Predictive Usage	Understand specific geographies and market segments	19	0,05	2,1	Anticipate needs	30%	Customer Lifetime Value	12%	
Processes	Process performance	Processes automation	2	0,12	2,6	Workflow automation	100%	Employee produtivity	9%	
Customers	Customer-analytics c	Identify customer's profile/type accordingly to their purchase	15	0,16	2	Customer profiling	100%	Number of sales closed	8%	
Customers	Self-service	All services available in the website/app	6	0,16	3,2	Mobile App services	100%	Average time satisfying an orde	8%	
Human resources	Dynamic partner eco	Innovation should be rewarded	18	0,13	2,1	Rewarding system	100%	Employee Suggestions Index	8%	
Customers	Customer-analytics c	Analyze audience traffic and patterns	8	0,07	1,7	Traffic and patterns	60%	Number of sales closed	8%	

Figure 5. The dashboard of the simulator.

This worksheet shows relevant information on the 20 highest priority initiatives, according to the sorting criteria for the execution of initiatives. This expresses the policy adopted, which can execute first the initiatives that have higher performance gains, improve digital capabilities faster or minimize risk. This list of initiatives is presented as a suggestion to support governance decisions.

Initiatives can be filtered by area of concern (customers, processes, business model, and so on), so that only the improvements from that area of concern are analyzed.

The total number of available workers (a global limitation that prevents all initiatives from executing simultaneously) is specified here. An initiative only starts to be executed once there are enough workers available to execute it and if no higher priority initiative is ready for execution.

After executing all the activities in batch (by pressing the "Execute All" button), the simulation ends and the "Current day" cell reflects the last day of simulation, which corresponds to the project duration.

Simulation results

Figure 6 shows the evolution of the use of manpower along the duration of the project (execution of all the initiatives), with a limit of 10 people. There are some inefficiencies, resulting from the fact that enough human resources must be free to start a new initiative. The project took 267 days in this example. With less manpower, it would take naturally longer. Note the absence of manpower in the last days. The initiatives finish around day 230, but there are delays until the performance indicators can be read (to allow the outcomes of initiatives to take effect), and therefore only after these the digital transformation can be considered complete.

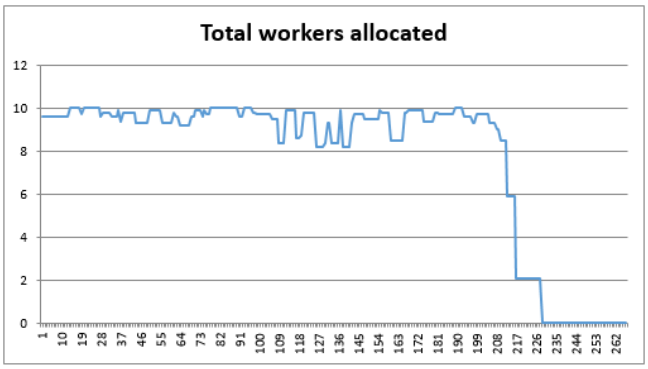


Figure 6. Daily evolution of the allocated workers.

Several simulations were performed, by varying the relative order of relevance of initiative execution policies, as described above. The duration of the project can vary slightly with the order of execution of the initiatives.

Figure 7 shows what happens if the priority (relevance) of risk minimization is the lowest (Figure 7, left), middle (center) or the highest (right).

If risk is not a big concern, then quick-win initiatives get executed first, and those with greatest improving potential tend to also be the riskier. This means that the risk is initially higher, as shown in the left of Figure 7. The problem with this policy is that initiatives fail more in the early stages of the Digital Transformation, which may constitute a demotivating factor.

If, on the contrary, risk minimization is a very important factor, then probably the best is to execute initiatives with lower risk first, so that the digital transformation project gets an easier start. This is why the risk accumulates at the end of the project, in the right part of Figure 7.

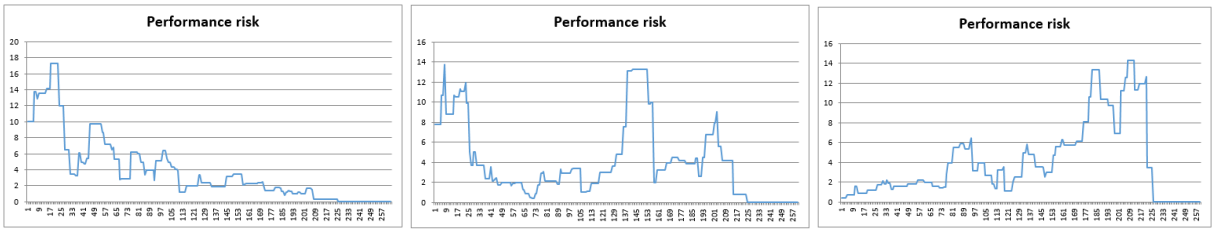


Figure 7. Daily evolution of the performance risk.

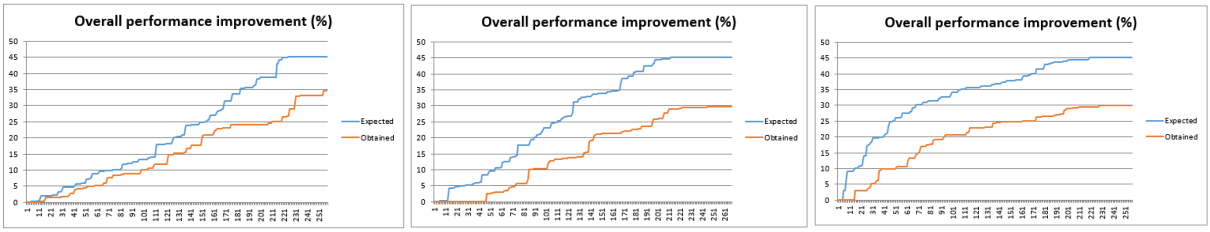


Figure 8. Daily evolution of overall performance.

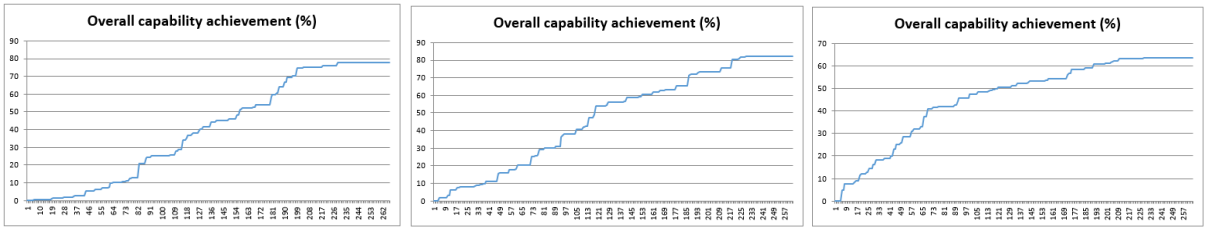


Figure 9. Daily evolution of overall digital capability achievement.

Figure 8 presents a similar perspective, but now concerning an overall performance indicator, by performing a weighted average of all the performance indicators, using the relative weights of categories of aspects within areas of concern and between areas of concern themselves.

The underlying idea is that using the performance optimization policy at an increasing priority increases overall performance faster, as Figure 8 shows, but the final values will be similar, since these policies only affect the order of execution of the initiatives.

Note that the lower curves, which express the obtained indicators, exhibit lower performance values than expected, shown by the higher curve. This is due to the assumed risks. Some initiatives may fail implementing capabilities, or some capabilities will not produce the intended effects. The fact is that some performance indicators are not as improved as intended, as shown by Figure 10, in which performance indicators 10 and 25 were not improved at all, and several others were only partially improved (some contributions to the improvement worked, others didn't). In fact, in this example only the financial indicators performed as expected, as Figure 11 shows in radar form, by axis.

Figure 9 is similar to Figure 8, but now concerning an overall capability achievement indicator, obtained by performing a weighted average of all the indicators that express how much of a digital capability has already been implemented (from 0 to 100%), using the relative weights of digital capabilities, categories of aspects and areas of concern.

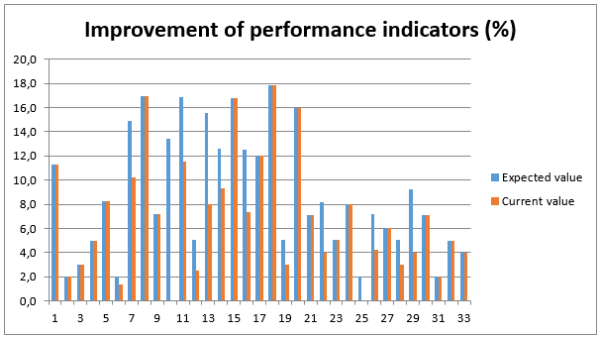


Figure 10. Improvement in performance indicators, expected and obtained.

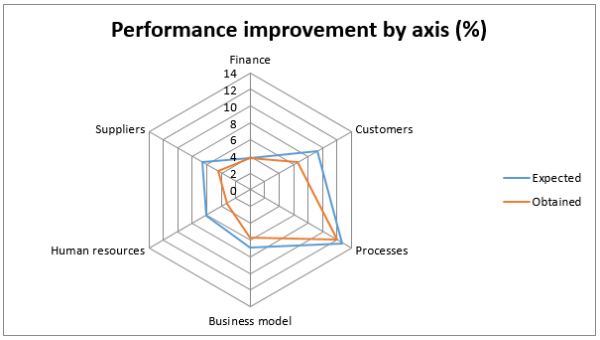


Figure 11. Improvement in performance by axis, expected and obtained.

Again, implementation of digital capabilities progresses faster if this is the topmost priority, but performance and risk may be affected by this.

Risks are precisely the cause of not achieving 100% in all digital capabilities, as shown by Figure 12, in which it is noticeable several capabilities were not implemented with complete success. In fact, in this example only the human resources capabilities were implemented successfully as expected, as Figure 12 shows in radar form, by axis.

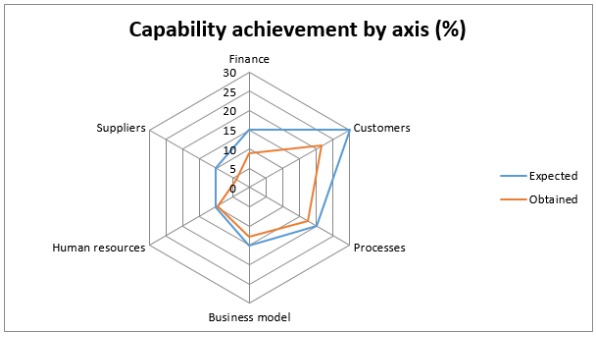


Figure 12. Capability achievement, expected and obtained.

Finally, the simulator is also able to express the expected contribution of each capability to overall performance, as shown in Figure 13, thereby visually identifying the most relevant digital capabilities.

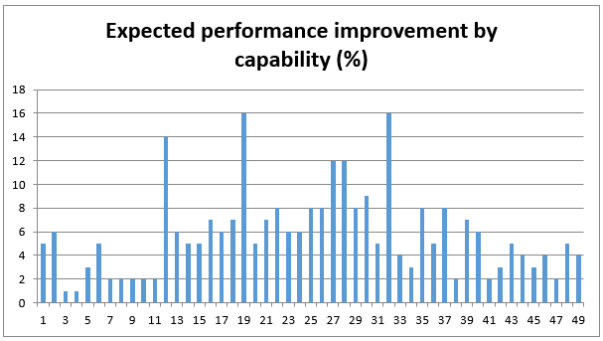


Figure 13. Expected contribution of each digital capability to overall performance.

CONCLUSION

Digital transformation is a complex field. It deals with organizations and their environments, governance and strategic management, not to mention the alignment between business, technology, processes, and people. It is not a matter to take lightly. Young a field as it is, there is a clear lack of common terminology and good practices. Naturally, only time and experience will allow these issues to settle by general acceptance.

Existing approaches seem to constitute more a list of general advices and guidelines than a methodic and systematic list of steps to take and a set of parameters that describe in detail how the transformation is progressing. None of the existing approaches defines in detail which information should be used to describe the current state of the transformation and do not separate state from behavior. One thing is the state of the transformation, with all the information that it implies. Another is the decisional mechanisms of governance, based on that information, and still another is the management of the actions deemed necessary to execute.

The purpose of this paper has been to tackle all these issues, by proposing both a framework and methodology. Governance and management can then produce better and more informed strategy and decisions that support digital transformation actions with a greater probability of success.

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