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The Shape of Digital Transformation: A Systematic Literature Review

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THE SHAPE OF DIGITAL TRANSFORMATION: A SYSTEMATIC LITERATURE REVIEW

Complete Research

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Abstract

Digital market has never been so unstable due to more and more demanding users and new disruptive competitors. CEOs from most of industries investigate digitalization opportunities. Through a Systematic Literature Review, we found that digital transformation is more than just a technological shift. According to this study, these transformations have had an impact on the business models, the operational processes and the end-users experience. Considering the richness of this topic, we had proposed a research agenda of digital transformation in a managerial perspective.

Keywords: Digital transformation, Business models, Operational processes, User experience.

1 Introduction

In the past few years, industries are facing technological shifts. Market volatility has resulted in a need for a better response to demand. In a perspective of enabling business agility and changing the way people work to optimize business performance, companies have undertaken digital transformation. Some of the most important innovations are essentially based on internet and cloud technologies; also called digital technologies.

Digital transformation, also known as digitalization, refers to a business model driven by "the changes associated with the application of digital technology in all aspects of human society" (Stolterman and Fors, 2004, p. 689). It is usually implemented through digitization, i.e. the "ability to turn existing products or services into digital variants, and thus offer advantages over tangible product" (Gassmann et al., 2014).

As part of our research, we found that most of existing papers regarding digitalization dealt with technological innovations (e.g. mobile technologies, analytics solutions, etc.), while this subject actually covers a wider potential of scope. We believe that digital transformation should also be studied from a different angle. Indeed, both observations and existing studies from professional papers (MIT - Cap Gemini, 2013; IBM Institute for Business Value, 2012) expose that digital transformation affects every aspect of an organization. The four aspects we will be focusing on are digital capabilities, business models, operational processes and user (internal and external IT consumer) experience.

In this paper, we intend to provide a research agenda on digital transformation with new perspectives, based on systematic literature review method. We will discuss the following questions:

- What are the digital capabilities impacted by the digital transformation?
- How digitalization transforms business models, operational processes and user experience?

The remainder of this paper is organized as follows. Section 2 describes the research methodology. Section 3 presents the results. Finally, section 4 discusses the key findings and provides future research directions.

2 Methodology

The aim of this study is to explore the shape of digital transformation drawing on a literature review. For it, we used a systematic literature review, following Kitchenham (2007) and Okoli and Schabram (2010) protocol. It is a rigorous approach to select, analyze and assess papers. Applied in a given domain, it allows identifying trends and gaps in research.

The systematic literature review follows these following 6 steps:

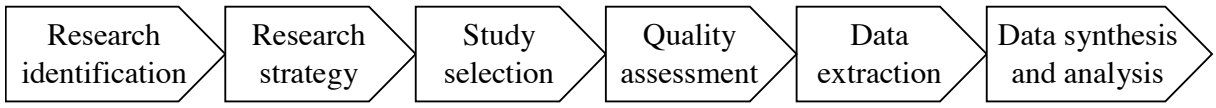

Figure 1. Systematic literature review method.

2.1 Research identification

The idea here is to examine and evaluate research on digital transformation. For that, we investigated the above research questions.

2.2 Research strategy

Our search strategy consists first in deriving major terms related to the research questions, and then identifying alternative spelling and synonyms for these terms by leading a pilot test. We used the Boo-

lean operators (OR; AND) for connecting the founded terms. This resulted in the following used strings for automated search:

("digital transformation" OR "digitalization") AND ("user experience" OR "operational process" OR "business model").

The search of articles was conducted regardless of time limitation of publications by using Scopus database. This bibliographic database holds more than 21,000 peer-reviewed journals, over 1,200 "open access" journals, more than 600 trade publications, 350 book series. The search of articles has begun on May 16th, 2015.

2.3 Study selection

In this step, we defined selection criteria to determine which studies are included or excluded. Studies that met the following criteria were included:

- The paper should be written in English
- The paper should be published in a scientific journal
- The paper approaches digital transformation

The articles which they weren't accessible stated as excluded, as well as, master and doctoral theses, proceedings or conference articles, working papers and textbooks. This choice of journal articles falls in line with Ngai and Wat (2002, p.416), who believe that "academics and practitioners a like use journals most often for acquiring information and disseminating new findings and represent the highest level of research".

The final list of considered publications included 202 articles. Both authors carried out the selected study process independently. Each reviewer performed the screening of the results based on title and abstract for each publication that was considered according to the inclusion and exclusion criteria. Then, a comparison of screening results is realized, in case of difference, verification is jointly made to reach a consensus. At the end of this process, 153 articles were excluded and 49 articles were kept for the quality assessment step.

2.4 Quality assessment

In this step, the quality criteria are defined to evaluate the rigor and credibility of the selected articles. The evaluation requires the complete review of the paper. Based on the works of Nguyen-Duc et al. (2015), Hauge et al. (2010), and Dyba and Dingsoyr (2008), we defined the following quality stated criteria as questions:

- Is there an adequate description of the context in which the research was carried out?
- Is there a clear statement of research aims?
- Does the paper describe an explicit research question?
- Is the research design appropriate to address the research aims?
- Is the literature review adequate?
- Is the collected data in a way of addressed research issue?
- Is the data analysis sufficiently rigorous?
- Is there a clear statement of findings?
- Is the study valuable for research or practice?
- Does the paper discuss limitations or validity?

Each question has four possible options: (0) issue is not mentioned at all, (1) little mentioned, (2) adequately addressed and (3) completely addressed (Nguyen-Duc et al., 2015). Hence, we used a four points Likert scale for collecting answers. Articles with an average quality score lower than 1, were removed. At the end of this process 13 articles were qualified to be analyzed for the data extraction step.

2.5 Data extraction

In this step, we extracted data from the qualified articles.

2.6 Data synthesis and analysis

At the end, some results came out of the extracted data. The data synthesis includes a descriptive analysis to provide a background about the included articles and an analysis of their findings in order to underline the future directions of research.

Figure 2 presents the literature search, selection and assessment process.

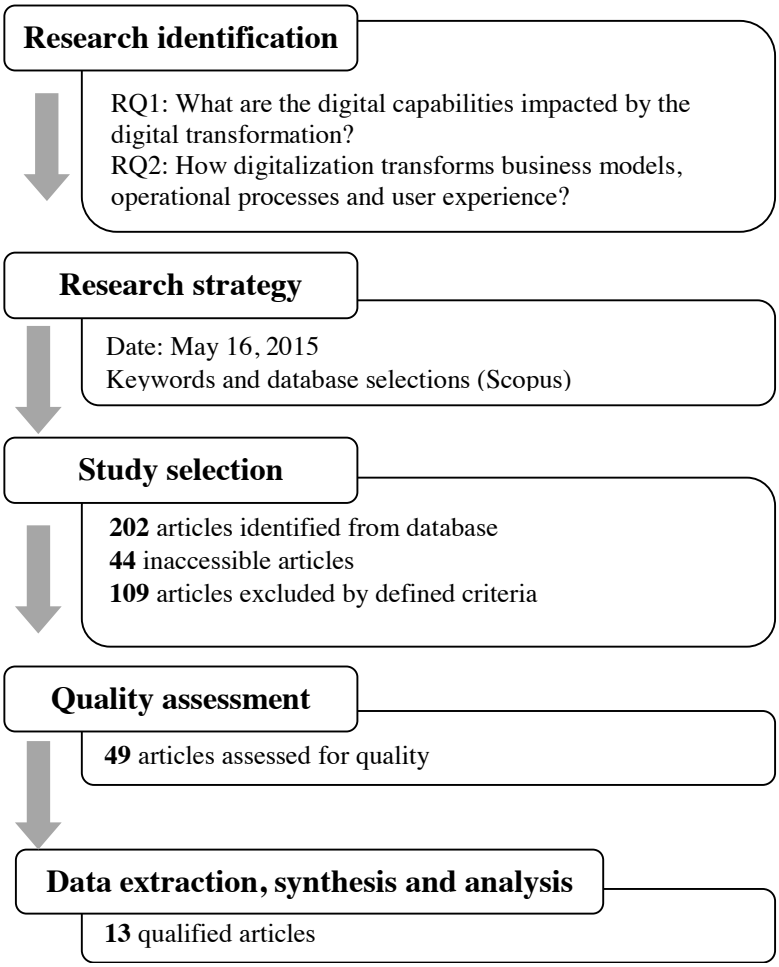

Figure 2. Systematic literature review process.

3 Results and Analysis

This section presents an overview of 13 selected articles and a classification by digital capabilities, business model, operational process, and user experience.

3.1 Distribution of articles by year of publication

Table 1 presents the distribution of articles by the year of publication. The first article was published in 2006. From 2011 to 2012, the amount of articles doubled each year to finally stabilize to 3 articles per year in 2013 and 2014. As the subject is contemporary and at leading-edge, publications are steady over time.

Year	Number of articles (%)	References
2006	1 (8%)	(Zhu et al., 2006)
2011	2 (15%)	(Kohli et al., 2011); (Rogers et al., 2011)
2012	4 (30%)	(Berman, 2012); (Gastaldi et al., 2012); (Liu, 2012); (Pînzaru et al., 2012)
2013	3 (23%)	(Barland, 2013); (Belk, 2013); (Medina et al., 2013)
2014	3 (23%)	(Pardo et al., 2014); (Øiestad et al., 2014); (Rothmann et al., 2014)
TOTAL	13 (100%)	

Table 1. Distribution of articles by year of publication.

3.2 Distribution of articles by journal

Figure 3 represents the distribution of articles by journal subject area. We can notice that digitalization covers a lot of areas such as social sciences, information system and management.

5 articles are published in a high ranked journal:

- MIS Quarterly Executive (Kohli et al., 2011)
- European Journal of Information Systems (Zhu et al., 2006)
- Technological Forecasting & Social Change (Øiestad et al., 2014), (Rothmann et al., 2014)
- Journal of Consumer Research (Belk, 2013)

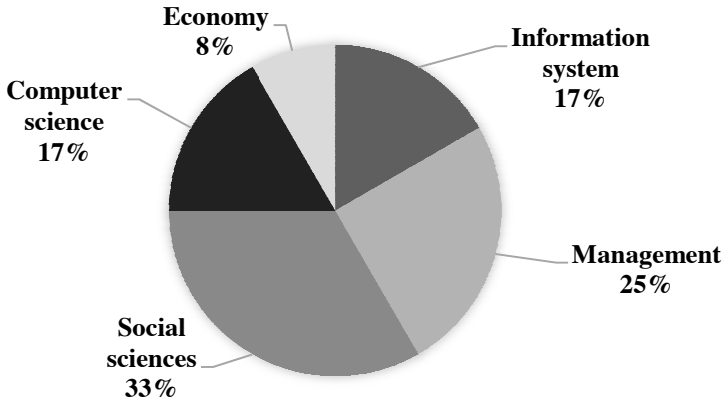

Figure 3. Articles distribution by journal subject area.

3.3 Distribution of articles by methodology

The distribution of articles by research methodology (Palvia et al., 2006) is shown in Table 2. Most of the articles (6 – 60%) use "case study" methodology due to the contemporaneity of the subject and because most of the articles have for main subject digital business models (of which case study is an appropriate method). 20 % of articles adopt a frameworks and conceptual model development (2 articles). The rest of articles use quantitative and qualitative research (with 1 article each).

We also noticed that most of the time, research methodology was poorly developed and research limits were not expressed. Moreover, we couldn't find any rigorous literature review dealing with the concept of digitalization.

Methodology	Number of articles (%)	References
Case study	6 (60%)	(Liu, 2012); (Rothmann et al., 2014); (Barland, 2013); (Øiestad et al., 2014); (Kohli et al., 2011); (Gastaldi et al., 2012)
Frameworks and conceptual model	2 (20%)	(Zhu et al. 2006); (Pînzaru et al., 2012)
Quantitative research	1 (10%)	(Pardo et al., 2014)
Qualitative research	1 (10%)	(Medina et al., 2013)
TOTAL	10 (100%)	

Table 2. Distribution of articles by methodology.

3.4 Distribution of articles by application area

Table 3 presents the studies which were applied on industries. A large part of articles deals with non-material industries. We can suppose that researchers have more hindsight on both internet-based and digitization business models which are the pioneers of digital era thus bring more perspectives for a case study.

Industry	Number of articles (%)	References
Book / publishing	3 (30%)	(Liu, 2012); (Øiestad et al., 2014); (Rothmann et al., 2014)
Media	3 (30%)	(Barland, 2013); (Medina et al., 2013); (Pardo et al., 2014)
Music	2 (20%)	(Pînzar et al., 2012); (Rogers et al., 2011)
Healthcare	1 (10%)	(Gastaldi et al., 2012)
Oil/Gas	1 (10%)	(Kohli et al., 2011)
TOTAL	10 (100%)	

Table 3. Distribution of articles by application area.

3.5 Classification of articles by digital capabilities

A firm's IT capabilities represent "the application of physical or intangible IT resources such as technology, knowledge, practices, relationships, management skills, business process understanding and human resources to further organizational goals" (Sandberg et al., 2014). We made the assumption that a digital capability is a kind of IT capability. In digital context, the main difficulty is to identify the boundaries of digital capabilities. None of the author tried to neither identify these boundaries nor define what a digital capability is.

However, they mentioned different capabilities presented on table 4. Among digital capabilities, we can identify technological assets which purposes are to optimize and transform business activities such as analytics and mobility.

Digitalization can be implemented through the transformation of physical asset to digital asset (digitization). For example, the book industry has lived a digital shift with the dematerialization from physical books to e-books (Liu, 2012). Internet and social network enable the access of a new field of potential customers and strengthen ties with existing customers (Berman, 2012)

Digital transformation also has an organizational impact on human resources. Job roles evolve in line with the transformation of activities. Decision makers must have to take into account the evolution of knowledge and skills (Kohli et al., 2011; Liu, 2012).

Digital capability	Number of articles (%)	References
Digitization / dematerialization	5 (18%)	(Liu, 2012); (Rothmann et al. 2014); (Øiestad et al., 2014); (Belk, 2013); (Gastaldi et al., 2012)
Internet technologies	10 (37%)	(Liu, 2012); (Rothmann et al., 2014); (Kohli et al., 2011); (Berman, 2012); (Øiestad et al., 2014); (Zhu et al., 2006); (Pardo et al., 2014); (Rogers et al., 2011); (Pînzaru et al., 2012); (Medina et al., 2013)
Analytics	3 (10%)	(Kohli et al., 2011); (Berman, 2012); (Gastaldi et al., 2012)
Mobility	5 (18%)	(Berman, 2012); (Liu, 2012); (Pardo et al. 2014); (Pînzaru et al., 2012); (Medina et al., 2013)
Social Network	2 (7%)	(Berman, 2012); (Rogers et al., 2011)
Knowledge and skills	3 (10%)	(Kohli et al., 2011); (Liu, 2012); (Belk, 2013)
TOTAL	28 (100%)	

Table 4. Distribution of articles by digital capability.

3.6 Classification of articles by business model

In this paper's context, a business model is "a description of a company's intention to create and capture value by linking new technological environments to business strategies" (Liu, 2012). We found that digitalization can be considered either as a business model or as a reshaping of existing business model, taking into account digital capabilities (Rothmann et al., 2014).

Along with the technological shift, convergence of social media and mobile technologies is changing the way of conducting business. Opportunities from new capabilities (for example, dematerialization) are a door opener to an extended market and result to an adjustment of business focus. We also noticed that digitalization is often presented as an inescapable evolution as market imperatives present a high risk of not doing the technological shift, especially for publishing and music companies.

Table 5 presents the distribution of articles by impact on business model. We identified 3 impacts on business models: Extend market (4 articles -36%), focusing on customer value propositions (3 articles – 28%) and reshaping existing business model due to market imperatives (4 articles – 36%).

Business model	Number of articles (%)	References
Extend market	4 (36%)	(Liu, 2012); (Øiestad et al., 2014); (Pînzaru et al., 2012); (Medina et al., 2013)
Focusing on customer value propositions	3 (28%)	(Berman, 2012); (Rogers et al., 2011); (Pînzaru et al., 2012)
Reshaping existing business model due to market imperatives	4 (36%)	(Rothmann et al., 2014); (Kohli et al., 2011); (Rogers et al., 2011); (Medina et al., 2013)
TOTAL	11 (100%)	

Table 5. Distribution of articles by impact of digitalization on business model.

3.7 Classification of articles by user experience

Table 6 presents the distribution of articles by impact of digitalization on user experience. The majority of articles based on user maturity (6 articles – 46%), followed by interaction (3 articles – 15%) and collaboration (2 articles – 18%).

Our review showed that the user is in the heart of digital transformations. Customers are more demanding and expect companies to listen, understand and be flexible about the evolution of their needs. In companies, users, by using new technologies in private context, expect to use the same technologies at work. Especially for new generations, also known as "digital natives" (Pardo et al., 2014), which are born surrounded by technologies.

Collaboration tools expansion and commoditization of social networks changed the way of working by tightening interactions between users and their ecosystem.

User experience	Number of articles (%)	References
Digital natives & user maturity	6 (54%)	(Rothmann et al. 2014); (Berman, 2012); (Øiestad et al., 2014); (Pardo et al., 2014); (Rogers et al., 2011); (Pînzaru et al., 2012)
Interaction	3 (28%)	(Berman, 2012); (Belk, 2013); (Pînzaru et al., 2012)
Collaboration	2 (18%)	(Berman, 2012); (Belk, 2013)
TOTAL	11 (100%)	

Table 6. Distribution of articles by impact of digitalization on user experience.

3.8 Classification of articles by operational process

Undertaking digital transformation can impact the whole company supply chain. Table 7 presents the distribution of articles by operational process impacted by digitalization.

Our review showed two kinds of impact in operational processes:

- Transformation of processes induced by implementation of new technologies: As we explained above, digitalization transforms the way to work, both in term of user experience and business model. For example, implementing analytic tools to make predictive analysis on consumption trends will impact the way of doing marketing, and so, the marketing process (Berman, 2012).
- Digitalization of a chosen process: Companies can decide to undertake the digitalization of a specific process which implies to make investments in order to modernize a full process. For example the digitalization of knowledge management implies to invest on new technologies (such as collaboration or analytic tools), to conduct change on usages and assign specific resources on knowledge management (Kohli et al., 2011).

Operational process	Number of articles (%)	References
Supplier relationship	1 (10%)	(Kohli et al., 2011)
Customer relationship	1 (10%)	(Kohli et al., 2011)
Knowledge management	1 (10%)	(Kohli et al., 2011)
Marketing	1 (10%)	(Berman, 2012)
Delivery	3 (30%)	(Kohli et al., 2011); (Berman, 2012)
Sales / Engagement	1 (10%)	(Berman, 2012)
Knowledge management	2 (20%)	(Kohli et al., 2011); (Gastaldi et al., 2012)
TOTAL	10 (100%)	

Table 7. Distribution of articles by operational process impacted by digitalization.

4 Discussion and future research directions

We have seen that digital transformation is often described as a new business model or as a reshaping of existing business models. It is driven by several factors:

- Companies are vulnerable to these new technologies: the past few years of technological shifts have broken down market barriers for new disruptive competitors (e.g. Netflix, Uber, etc). Industries such as publishing, media or music had to undertake deep transformations, especially by digitizing assets.
- Opportunities to extend the market: we saw that new capabilities (e.g. internet and mobile technologies) are a door opener to an extended market. They require a company to adjust their business model accordingly.

- A high and fluctuant expectation from users: with a deep knowledge on new technologies users wish to use personalized and cutting-edge technologies.

A digital transformation project involves implementing digital capabilities to support business model transformations. It impacts the whole organization, especially operational processes, resources, internal and external users. This is a major change in ones habits and ways of working, which is based on collaboration and intensive interactions.

Table 8 summarizes findings of this study, responding to our following research questions: What are the digital capabilities impacted by the digital transformation? How digitalization transforms business models, operational processes and user experience?

Research questions		Findings
What are the digital capabilities impacted by the digital transformation?		Digitization / dematerialization; Internet technologies; Analytics; Mobility; Social Network; Knowledge and skills
How digitalization transforms business models, operational processes and user experience?	Business models	Extend market; Focus on customer value propositions; Reshaping existing business model due to market imperatives
	Operational processes	Supplier relationship; Customer relationship; Knowledge management; Marketing; Delivery; Sales / Engagement
	User experience	Digital natives & user maturity; Collaboration; Interactions

Table 8. Findings summary.

Nonetheless, our research is limited by several factors such as the chosen keywords. We would have, for example, added afterwards other keywords such as "consumer experience" or "business process". We can add others databases such as "science direct" or "business source complete" in order to enrich our results. Regardless of the prior, this first investigation also highlights some future research directions.

First, we believe that the priority is to settle a rigorous theoretical frame on what digitalization is and what digital capabilities are.

Second, we identified a lack of research regarding the realization of digital transformation projects. The questions that arise are: How to manage a digital transformation? ; How to identify and manage the costs of this transformation?

Third, it would be interesting to make a digitalization maturity assessment tool to identify opportunities and make a benchmark of organizations interested in leading a digital transformation. Then, a guide for digital transformation could help industries initiate a change and frame their project.

Fourth, as we have seen above, digitalization projects have a strong impact on this whole organization. The authors mentioned some of them; however, a research focused on digitalization impacts would also be interesting; especially regarding its impacts on IT. This has an even larger impact on big companies. Indeed, blue-chip companies have a significant and aging infrastructure (system of record), which might have to evolve to adjust to these digital technologies. It also raises issues regarding IT management and governance: who will manage IT infrastructure, how to avoid shadow IT and how IT jobs will evolve?

Finally, our three research questions had resulted in that digitalization impacts business models, operational processes and the user experience. Research on these three areas should be deepened. To lead proposed research, we suggest the use of different approaches (e.g. design science or quantitative approach) and expand application area (blue-chip companies, other industries such as retail or governments).

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