

Digital Transformation in the Public Sector: Bibliometric and Systematic Review Analysis



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ABSTRACT:

Purpose: This article aims to analyze the evolution of digital transformation in the public sector as well as the trends, limits, and obstacles of this process.

Method: Our bibliometric and systematic literature analysis on digital transformation in the public sector is based on scientific articles published between 2017-2021 in different selected contexts. This analysis is based on the inclusion and exclusion criteria defined by adopting the PRISMA method. Out of 3083 extracted articles, 88 were processed through a bibliometric analysis, followed by a systematic analysis to answer the research questions.

Finding: The analyzed articles highlighted the growing interest of researchers in digital transformation in the public sector, particularly after the advent of the COVID-19 pandemic. This integration of digital, based on endogenous and exogenous factors, would allow public organizations to improve their capacities at all levels.

Theoretical and managerial implications: This work reviews the research papers on digital transformation in the public sector. In addition, this paper summarizes the good practices identified in organizations on a global scale to promote benchmarking.

Limitations: The exclusion of several articles from other areas of research (Law, sociology, economics, politics, etc.).

KEYWORDS: Digital transformation, public sector, PRISMA, bibliometric analysis. systematic analysis.

INTRODUCTION

Digital transformation is revealed as a new way of modernizing management science in the private and public sectors. Its evolution was born in the 1990s (Suray et al. 2020) by several economic theorists.

This phenomenon never ceases to interest the international scientific community, to align with political and socio-economic changes. It aims to face internal and external pressures, referring to the current New Public Management, where electronic administration constitutes a part of its basic policies and assumptions (Satry & Belkadi (2020)). Moreover, digital technology is considered "a real lever for change and development and as a catalyst for structuring and high-impact transformations" (CSMD. (2021)).

Several definitions of digital transformation have been proposed. Collin et al. (2015) defined it as "a series of events and processes which individuals, business organizations, societies and nations practice globally for technology adoption, resulting from digitalization.". Nevertheless, livari, S. and Ventä-Olkkonen (2020) assimilated it as "a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies.". Martin. (2008), cited by (Reis et al. 2018), retains the following definition: "Is now commonly interpreted as such usage of Information and Communication Technology, when not trivial automation is performed, but fundamentally new capabilities are created in business, public government, and in people's and society life.".

We retain this last definition in the sense of Martin 2008 of digital transformation because he argues that the use of information and communication technologies is not limited to the automation, but contributes to the modernization and growth of various capacities in private businesses and state administrations, as well as in the lives of individuals.

Through this bibliometric and systematic review, this article aims to explore and analyze the state of the art on digital transformation in the public sector by answering some formulated research questions. Accordingly, the structure of this paper

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consists of three sections. The first one describes the adopted work methodology. The second demonstrates the results of the bibliometric analysis, while the last discusses the systematic review results.

1. Materials and Methods

To meet the objectives of this research, we opted for bibliometric and systematic analysis of the literature. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) is a research protocol adopted to allow our meta-analysis to be transparently documented (Nambiem et al. 2021). A careful research process follows it to contribute to a reliable analysis of the data, on the one hand, and by answering the research questions and objectives on the other hand.

In the present article, a bibliometric analysis is adopted in the first place to quantify and analyze the extent of digital transformation in the public sector through statistical methods using several software programme : Power BI, Zoho analytics and VOSviewer. Then, the study is completed with a rigorous and in-depth analysis of all the articles obtained after the application of the exclusion criteria through a systematic analysis. This latter aims to study, analyze and understand the digital transformation in the public sector by answering the questions set by this article.

1. Research questions

Our study contributes to answering the following research questions:

- 1- What are the areas and functions digitized in the public sector?
- 2- What theories are used to frame digital transformation in the public sector?
- 3- What are the public sector's digital transformation tools and actors?
- 4- What are the integration factors of digital in the public sector?
- 5- What are the trends and perspectives of digital transformation?
- 6- What are the limits of digital transformation in public organizations?

2. Selection criteria

In this article, four search engines are studied: Scopus with a total of 1979 articles, Web of Sciences with 805 selected articles, Sciences Directes with 443 articles, and finally, Google Scholar with a total of 576 articles using the Boolean operators OR and AND.

In this research we adopt the following formula : (digital AND transformation OR digitalization) AND (public AND sector OR public AND administration OR organization) AND (LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2021) , 2019) OR LIMIT-TO (PUBYEAR , 2018) OR LIMIT-TO (PUBYEAR , 2017)) AND (LIMIT-TO (SUBJAREA , "BUSI") OR LIMIT-TO (SUBJAREA , "DECI")) AND (LIMIT- TO (OA , "all")) AND (LIMIT-TO (DOCTYPE , "ar")) , in order to homogenize our search on the different engines consulted.

3. Inclusion and exclusion criteria

On the one hand, the inclusion criteria are: 1-Articles published between 2017-2021; 2- Articles published in newspapers and reviews dealing with subjects in management sciences and management of public organizations, 3- Articles published in English as the universal language used in the publication in indexed reviews. On the other hand, the exclusion criteria are; 1- Duplicate articles cited in our databases, 2-Articles not mentioning the terms digital transformation, digital, digitization, or technology in one of the following databases; titles, keywords, summaries 3- Articles dealing with an economic or political issue, 4- Articles operating in the private sector.

4. Collecte des données Collection of data

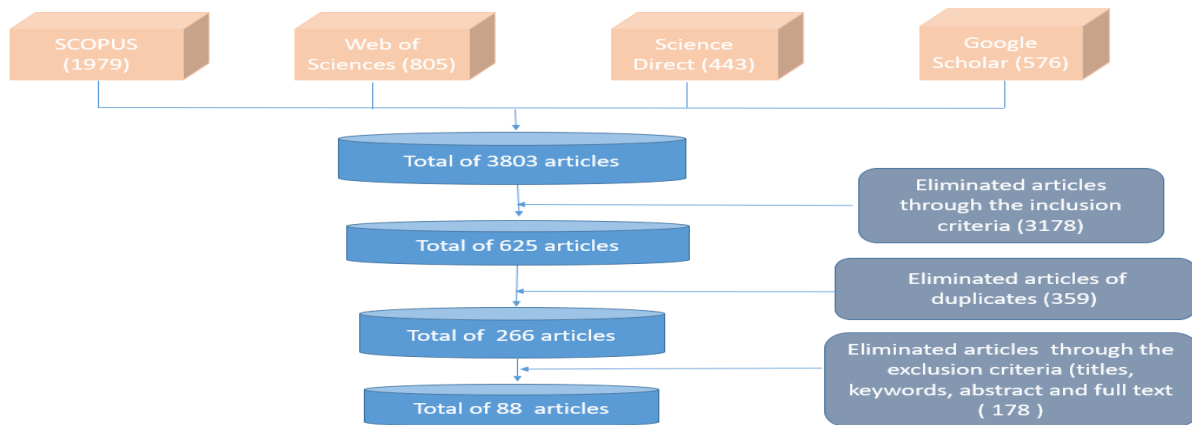
To guarantee the richness of the data, we made sure to consult a wide range of databases (Scopus, Web of Science, ScienceDirect, and Google scholar), applying the inclusion and exclusion criteria (diagram 1).

2. Data analysis

Our database was imported into search engines using Zotero and Mendely bibliographic reference management software. Then, the selected database was submitted, after the implication of the exclusion criteria, to a meta-analysis through a bibliometric analysis considered as a statistical tool (Assar. (2013)). This analysis allowed synthesizing and quantifying the achievements accomplished by contribution to our subject by trying to meet our research objectives, cited above; by using some data analysis solution like; Power data analysis solutions BI, Zoho analytics and VOSviewer. Then, a systematic analysis was carried out through an in-depth analysis of our database.

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Diagram N°: 1 Database selected by adopting the inclusion and exclusion criteria



Selected Database

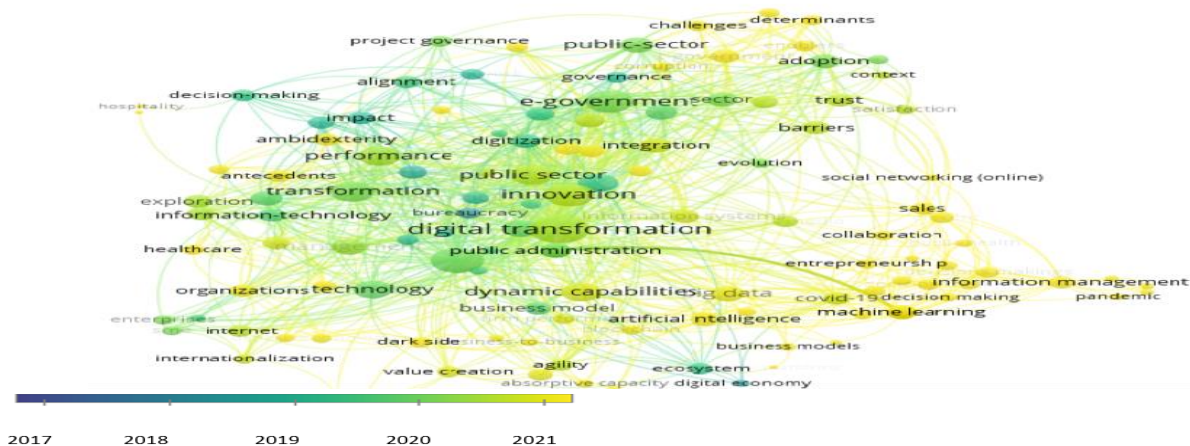
4. Discussions of the bibliometric analysis results

The first results of the keyword search in the aforementioned databases yielded 3083 articles by introducing the Boolean operators OR and AND (Nambiema et al. 2021). After introducing the inclusion criteria, the number of articles selected is reduced to 625 publications subject to other rigorous exclusion criteria mentioned above and come out with a final number of 88 articles.

4.1. Keyword analysis

The results of our keyword research gave rise to a richer database by mobilizing several keywords according to the diagram below generated by the VOSviewer software.

Diagram 2: Visualization of keywords by year



Source: VOSviewer

The analysis of the different keywords by the VOSviewer software shows a variation of the used keywords versus years. However, they all converge toward digital transformation with different nominations. In fact, the most used keywords in 2017 were bureaucracy and digital economy. Then, the authors spoke more in 2018 about e-government, digital governance, digital, digitization, and impact. Afterward, the keywords ecosystem, innovation, transformation, capability, adoption, decision making, public sector, ambidexterity, and healthcare become the most used keywords in 2020, then machine learning, big data, artificial intelligence (AI) pandemic, COVID-19 became the most used keywords in 2021.

This keyword analysis shows a remarkable evolution of the different keywords related to the phenomenon of digital transformation over time, starting with a bureaucratic strategy towards e-government and innovative ecosystems. More sophisticated digital tools and techniques such as big data, AI and machine learning replaced the traditional use of digital towards the year 2021.

Through the Power BI software (see the diagram below). The keywords most used are digital, transformation, public, management, government, technology, innovation, administration, etc. This bibliometric analysis gives an overview of the different terms used in our research.

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Diagram N°: 3 Visualization of the most used keywords in our database

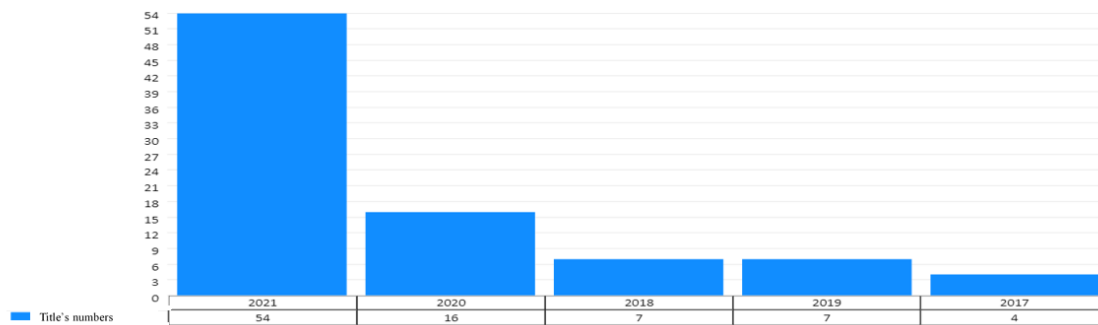


Source: Power BI

4.2. Breakdown of articles by year:

The bibliometric analysis of the articles retained through the aforementioned software gave rise to the following results:

Graph N°1: The database selected by year of publication



Source: Power BI

The period of our study spans between 2017 and 2021, the graph above shows that the majority of publications were made in 2021 with 54 articles among 88 articles compared to only four articles in 2017, which shows the interest given to digital transformation in the public sector lately. This can be explained by the outbreak of the COVID-19 pandemic and the interest in this process in public management.

4.3. Breakdown by the search engine:

The following dashboard shows the distribution of the articles by search engine and year of publication:

Table N°1: Breakdown of articles by year of publication

	Year ↓	google scholar	science direct	scopus	web of sciences	journal Count
1	2017 to 2018	4				4
2	2018 to 2019	4		3		7
3	2019 to 2020	3		4		7
4	2020 to 2021	5	1	10		16
5	2021 to 2022	35		16	3	54
Décompte général		51	1	33	3	88

Source: Zoho Analytics

The processed articles were selected from four databases according to the table above. 51 articles were published in the Google scholar database followed by Scopus with 33 articles and 3 articles in Web of Science and finally 1 article was selected in Science Direct.

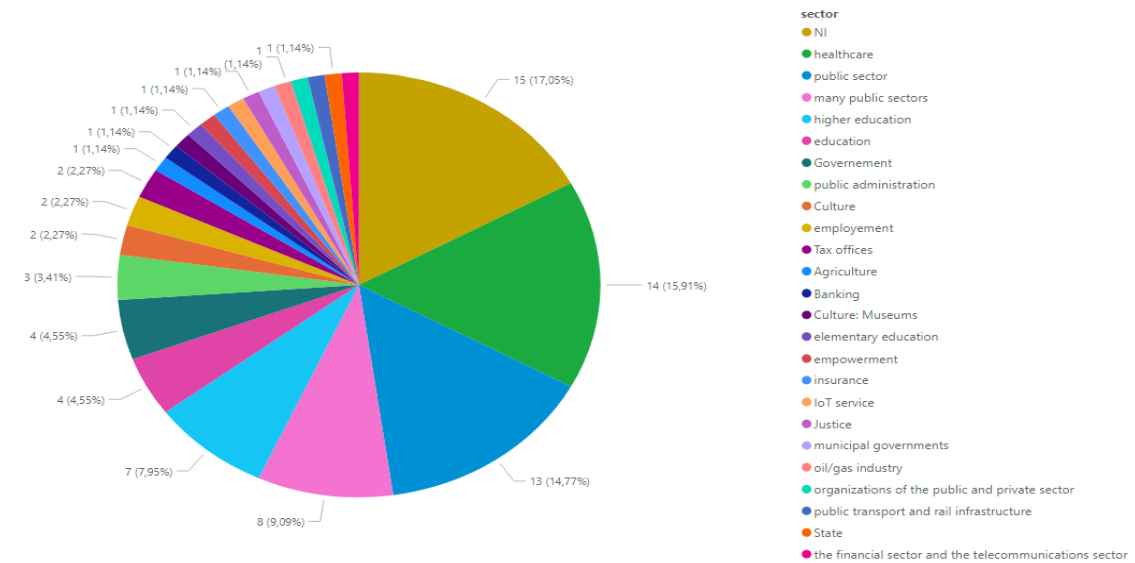
This shows that the search engines Google Scholar and Scopus are specialized in several fields of research, in particular, of managerial and social sciences against Web of science and Sciences Direct which are developed in articles in pure and technical sciences.

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4.4. Analysis by sector of study:

This digital transformation process has emerged in all sectors as shown in the following graph:

Graph No. 2: Breakdown of articles by sector of activity



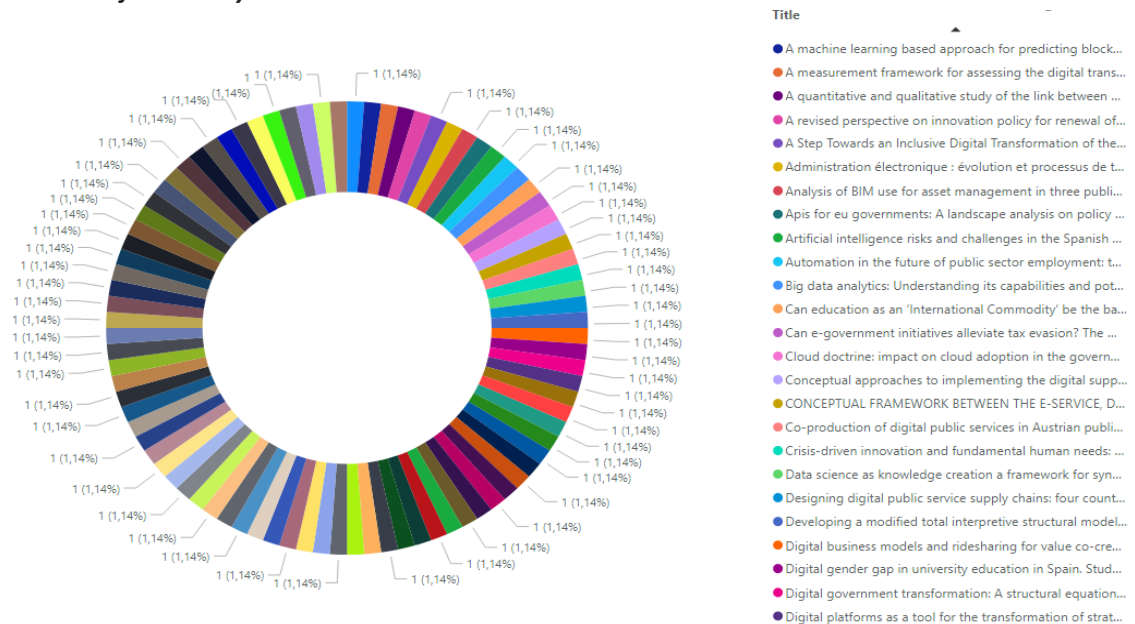
Source: Power BI

Through the selected articles, our analysis via the Power BI software shows that the most dominant sector is the health sector with 15.91% followed by higher education with 7.97% then the education sector with 4.55%, and other sectors, in particular, the taxes sector with 2.27%, public employment, justice, etc.

4.5. Analysis according to the authors:

Our analysis shows that the distribution of articles by authors is almost equal, which shows the novelty of this process, which has drawn the attention of several authors who have contributed to the study of this phenomenon in several public sectors (Graph 3).

Graph N° 3: Breakdown of articles by author



Source: Power BI

4.6. Analysis by country of study:

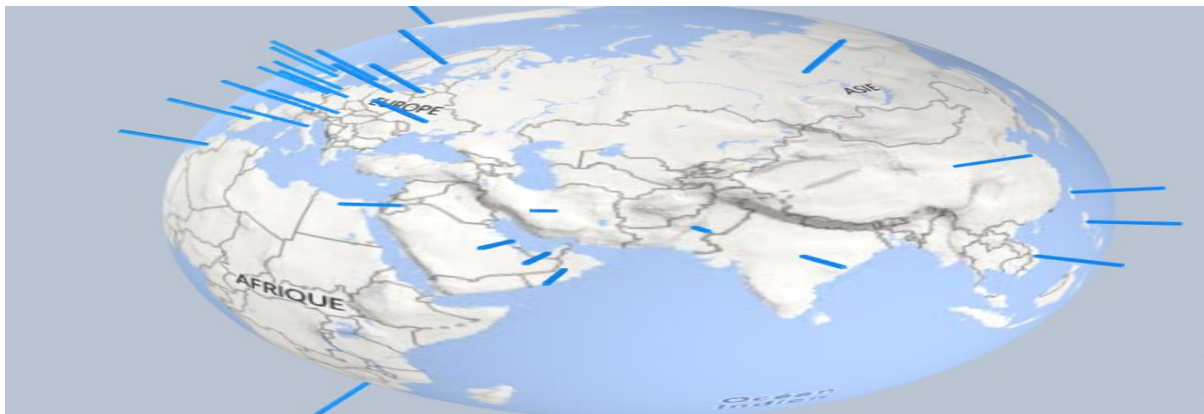
Through our study, several countries are interested in digital transformation in the public sector. Italy is ranked first with eight scientific productions followed by Spain with seven productions then Germany with four publications...etc.

Visualization through Power BI shows that Europe is ranked in the first round followed by Asia, then the United States, and finally Africa. This interest given to this phenomenon in European countries is explained by the context of the covid 19 pandemic which

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has accelerated the pace of digital transformation in the public sector, particularly in education and health. The classification of scientific articles relating to digital transformation in Asian countries and the United States is explained by the emergence of these countries towards more sophisticated processes such as artificial intelligence, the cloud computer, and the Internet of Things (IoT). As far as African countries are concerned, the emergence of this phenomenon is developing, especially during the period of a health crisis that corresponds to our study period.

Graph No. 4: Breakdown by country of study



Source: Power BI

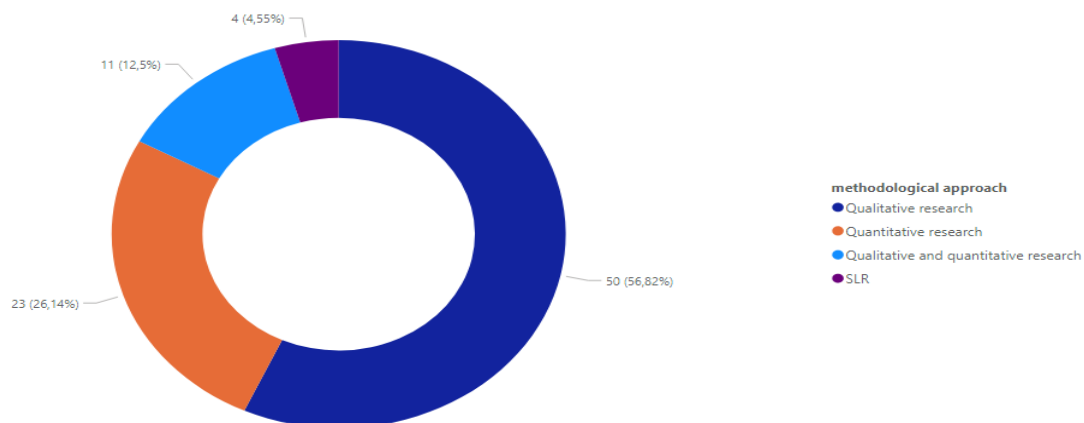
These articles are published in several journals dealing with managerial issues related to technological innovation in public administrations and organizations.

The majority of publications were published in the journal “Technological Forecasting and Social Change”, followed by the journal “Technology in Society” and then “Administrative Sciences”, and many others specialized in the management of organizations and public administrations.

4.7. Analysis by the adopted methodological approach:

The most dominant working methodology is the qualitative methodology with 56.82%. This trend can be explained by the specificity and the nature of the studied problem that is under development. Indeed, the study of digital transformation in public administration is very recent, which requires exploratory studies to understand the extent of this phenomenon in the public sector. Then, quantitative methodology occupies the second round with 26.14% of publications, followed by the mixed approach with a percentage of 12.5%, and finally, the methodology (systematic literature review) occupies the last round with only 4.55% of scientific publications.

Graph No. 5: Working methodology



Source: Power BI

The authors used several methodological tools; for both qualitative and quantitative studies. The qualitativists have opted for exploratory approaches, given the topicality and the nature of the issues that require in-depth analysis. However, quantitativists tend to mobilize structural equations to explain the phenomena of digital transformation. The adoption of its quantitative tools is

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justified by the maturity of scientific research in specific sectors, particularly that of the digitization of higher education and health. In addition, the predictive factors of the adoption of digital transformation are latent in nature. (eg attitudes, intention, perception, etc.) Which drives the authors to apply these methods of analysis.

This first bibliometric analysis is completed with a deeper systematic analysis by analyzing the content of each article. In this perspective, all the articles are studied in depth in order to answer the research questions presented as the objective of this systematic research.

5. Discussion of the results of the systematic review

The in-depth analysis of our database allowed us to assimilate the phenomenon of digital transformation in the public sector by answering our research questions.

5.1. The mobilized theories

Through our systematic analysis, the most used theories are; the theories treating the behavior of the individuals, their perceptions, and their attitudes towards the use of a new process, namely: The theory of the diffusion of innovations (DIT) (Rogers. 1995), Reasonable Action Theory (TRA) (Ajzen et Fishbein. 1975), Theory of Planned Behavior (TPB) (Ajzen 1991), Decomposed Theory of Planned Behavior, (Taylor et Todd 1995). In addition, other theories and models related to the technological process and information systems are mobilized, namely, Technology Acceptance Model (TAM) (Davis, Bagozzi, et Warshaw 1989), Technology Acceptance Model 2 (TAM2) Venkatesh and Davis (2000), and Technology Acceptance Model 3 (TAM3) (Venkatesh et Bala 2008), UTAUT, UTAUT2.

We add the theories that deal with organizational change namely; structuring theory (David Autissier et Waheux 2000), sociotechnical change theory, organizational change management theory (D. Autissier et Moutot .2016), and New Public Management (Wang, Kung, et Byrd 2018).

5.2. Tools and actors of digital transformation

Through an exhaustive analysis of the selected articles by adopting the PRISMA method, several tools have been mobilized to support and encourage the adoption and use of digital transformation in public organizations in different sectors. In the education sector, online learning technologies, namely MOOCs, E-learning (Liu, Wang, and Koehler 2019; Yang, Du and Shi, 2020; EL FEROUALI et al. 2021) have facilitated the transition from face-to-face teaching to distance learning and e-learning through virtual classes. In practice, ICTs combined with external factors (Covid-19 crisis) have caused lecturers to migrate to mixed or distance courses through videoconferencing and online learning systems. Indeed, teaching has gone from being a complement to a requirement (Gallego Sánchez et al. 2021).

In the health sector, hospital structures have benefited from Big Data Analytics (Wang, Kung, et Byrd 2018) to develop their capacities for analyzing models of care, unstructured data, assistance with decisions, and ability to predict and traceability. In the long term, these capacities will help these structures formulate more effective analytical strategies based on the data). Digital hospital transformation also promotes a Value-Based Healthcare (VBHC) approach that fosters the development of new capabilities linking micro-levels (individual levels) and macro-levels (hospital levels) through constructive dialogue at the meso-level (departmental and interdepartmental level (Kokshagina 2021).

Other more sophisticated tools are used in the public sector, we cite Machine Learning (Kamble et al. 2021), big data (Tijsvan et Fleur van Veenstra 2018), the internet of things, and artificial intelligence (Trung, Tran Ngoc Huy, et Le 2021) and (Abdeldayem et Aldulaimi 2020), the integrated online payment system (Lai 2017), Algorithmic decision-making systems (ADM) (Al-Okaily et al. 2020a).

Regarding the actors involved in these digital transformation projects, they are mainly those of the business processes of organizations. In the education sector, three types of actors have been cited: students, teachers, and civil servants (EL FEROUALI et al. 2021) ;(Gallego Sánchez et al. 2021) ;(Bawack et Kala Kamdjoug 2020); (Kamble et al. 2021). In the health sector, clinicians, nurses, and hospital administrators (Kokshagina 2021), Patients (Kraus et al, 2021), doctors, nurses, and pharmacists (Zaman, Shahwan, et O'Connor 2021).

5.3. Factors of digital integration in the public sector

The articles studied show that a set of factors promote the acceptance, implementation, and use of technologies. The literature classifies these determinants according to four groups of variables; exogenous variables, endogenous variables, mediating variables, and outcome variables.)

Among the endogenous variables; Perceived usefulness, perceived ease of use, intention to use, appreciation-satisfaction-subjective norms-perceived value perçue (Shen, Wang, et Yang 2020) (Ponzoa et al. 2021), perceived control behavior (Lai 2017), other authors classify expected performance, expected effort, ease of use as endogenous variables (Al-Okaily et al. 2020b).

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The exogenous variables are numerous; we cite: habit, experience, knowledge, facilitating condition, use of technology revolving on the teacher and on the student, pressure from competitors, preparation of partners (Kemble et al. 2021), awareness, security, and privacy (Al-Okaily et al. 2020b). We add Communication and relationship, minimization of costs and time (Gallego Sánchez et al. 2021). In addition, the variables influencing the evaluation of ICT on health are Ecosystem enhancements, changes in the user base or unforeseen or unprepared system adaptations, collaboration, training, resources and capabilities, information flow, technology awareness, and technological infrastructure on the effective management of cybersecurity (Mettler et Pinto 2018). Indeed, the determinants of digital transformation are not interpreted or treated in the same way, this is justified by the multitude of models of acceptance and use of technology mobilized by the authors in the study of the problem of digital transformation. Some authors use endogenous variables classified as exogenous variables by other researchers. Other authors add or remove intermediate variables justifying that the models of acceptance and use of digital transformation are justified in specific contexts. This is confirmed by the qualitative exploratory methodology which is the most dominant in the research protocol studied in our bibliometric analysis estimated in 62% of all the articles treated. However, the obtained results cannot, in any case, be generalized without going through a contextualization analysis.

5.4. Trends and perspectives of digital transformation in the public sector

The results of the research show that digital transformation has upset and changed the functioning of public organizations, particularly the education and health sectors. This subject experienced a significant revival of interest after 2020, following the advent of the COVID-19 crisis, which accelerated it. Today, digital transformation has become a question of the public authorities' will and priorities. Some public sectors have undergone profound change with the integration of digital technology, particularly in education and health.

With regard to the teaching sector, higher levels of relational coordination have been developed in the university thanks to information systems. These lead to higher levels of quality education (Gallego Sánchez et al. 2021). In addition, information technologies and artificial intelligence have radically affected teaching and student assessment methods (Trung, Tran Ngoc Huy, et Le 2021).

It should also be noted that the quality of education is not only linked to the digital process (Laorach et Tuamsuk 2022). For instance, the human factor, the collaboration between the various stakeholders, and relational coordination have a role in accelerating the digital transformation (Gallego Sánchez et al. 2021). In addition, the role of emotional intelligence must not be neglected as a key skill in supporting the digital intelligence of public organizations (Abuzyarova et al. 2019), this once again justifies the role of the human factor in the implementation of the digital strategy in all types of organizations.

Indeed, the use of information systems in the public sector guarantees an improvement in the performance and efficiency of the government (König et Wenzelburger. 2021).

In the health field, the research work analyzed has underlined the importance of big data and artificial intelligence in developing the supply of care and guaranteeing greater accessibility. Beyond integrating digital in the support functions (management of appointments, traceability of acts, interoperability between systems), the digital health project aims to integrate digital in the care of patients, particularly in teleconsultation, telemonitoring, and robotic surgery.

5.5. Limits of digital transformation

Several critics of digital transformation have been highlighted through this research work which are environmental, organizational, individual, technical, social, and financial. We cite the low level of digital infrastructure, insufficient digital support actions, the reluctance towards the implementation of digital by civil servants who see it as a means of control or the inability to follow technological developments, and the lack of qualified personnel (EL FEROUALI et al. 2021). At this level, some authors highlighted the concept of digital maturity (Digital Internet Maturity) based on six levers: strategy, organization, personnel, offer, technology/innovation, and environment (Mettler et Pinto 2018).

Distrust of confidentiality and data security is classified among the limits that block and complicate the implementation of the digital strategy in its adoption. Finally, other factors are classified social such as; culture, income, and education level (Zaied, Tri Kuntoro, et Nur 2019); (Edelmann, Steiner, et Misuraca 2023).

We add as a financial limit a lack of resources and an insufficient budget range for the implementation of this digital strategy (EL FEROUALI et al. 2021).

We also cite the institutional and regulatory pressure which make the application of the digital strategy very complicated and requires the implementation of procedures and the support of users (Kamble et al. 2021).

CONCLUSION

The objective of this article is to systematically review the literature on digital transformation in the public sector and more specifically in the fields of management sciences and human sciences.

Applying the PRISMA approach, a sample of 88 documents was reviewed. The overview of this sample shows that the majority of studies are of a descriptive or exploratory nature, which justifies the novelty of this strategy in public organizations, especially with the outbreak of the COVID-19 pandemic which has accelerated the process of digital transformation in the public sector, in all areas and specifically in the education and health sector. Indeed, the digital transformation strategy is no longer a matter of choice on the part of governments and therefore public organizations, but it becomes an obligation to follow the evolution demanded around the world.

In addition, the processes of digital transformation and the dematerialization of procedures provide organizational value to public organizations (Aayale et Seffar 2021). This allows them to achieve organizational objectives such as the provision of quality service, support for change, openness, transparency, organizational learning, and cost reduction (Edelmann et Mergel 2021).

Several detractors hinder the implementation of digital transformation in the public organization in different ways, which requires taking action to alleviate its limits in order to support the change required by this strategy.

In addition, the research perspectives outlined in the previous point make it possible to improve the avenues for future research by the scientific committee.

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