INCUMBENT'S DIGITAL TRANSFORMATION: A MULTI-DISCIPLINARY AND PARADOXICAL PERSPECTIVE

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Research-in-Progress

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Abstract

Digital transformation (DT) is a major challenge for incumbent organisations with an astonishing failure rate. We review digital transformation in established, old, large, and incumbent organisations adopting a Structured and Computational Literature Review (SLR and CLR). We employ a machine learning algorithm (LDA) to inspect the topics discussed in 103 peer-reviewed studies published between 2010 and 2022 in the fields of Information Management, Innovation Management, Operation Management, Strategic Management and General Management. We extract and discuss the top-five key topics emerging from the studies to understand the state-of-the-art literature on DT in established firms. Then, we advance paradox thinking as a lens to study DT in incumbent settings. We contribute to the DT discourse by providing a multidisciplinary review of the current trends on the topic of DT of incumbent firms; moreover, we contribute by advancing paradox thinking as a novel lens to study DT in incumbent organisations, further proposing research questions and avenues; finally, we propose managerial insights in line with paradox thinking to create momentum and thrive as DT champions.

Keywords: Digital transformation, Incumbents, Multidisciplinary, Systematic Literature Review, Computational Literature Review, Text Mining

1   Introduction

Digital transformation (DT) is a complex, interdisciplinary, and multifaceted phenomenon impacting individuals, organizations, ecosystems, and societies (Hanelt *et al.*, 2021). Scholarly, the literature on DT is emerging and fragmented, albeit recently consolidated by review articles delineating the phenomenon (Vial, 2019; Gong and Ribiere, 2021). From an industry perspective, DT is at the forefront of organizations' agendas across industries and accelerated as a result of Covid-19 (McKinsey, 2020), nonetheless having a high failure rate (Boutetière, Montagner and Reich, 2018; Benhnam *et al.*, 2019).

Digital transformation is distinct from other seemingly similar phenomena due to the greater magnitude, scale and depth of the involved change (Baptista *et al.*, 2020). DT differs from IT-enabled organizational change (Wessel *et al.*, 2021), digitizing (a technical process) and digitalization (a sociotechnical process) – although thrives with their coexistence (Baiyere *et al.*, 2018; Vial, 2019). DT is not a one-time project that enhances performances, but a continuous and emergent change process that qualitatively modifies the deep structure (Gersick, 1991) of the organization- e.g., routines, beliefs, assumptions, habits, myths, identity- and brings the "malleability" of the organizational design (Baiyere, Salmela and Tapanainen, 2020; Hanelt *et al.*, 2021). DT leverages digital innovations (Hinings, Gegenhuber and Greenwood, 2018), however, the latter are not enough for a digital transformation, as changes in people, strategy, culture and work practices are paramount for successful DT journeys (Kane, 2019; Vial, 2019). Current research is attributing prominence and distinctiveness to DT, while editorials and calls for papers argue that the phenomenon is not "old wine in a new bottle" but requires novel theory (Markus and Rowe, 2020) and the revisitation of existing theories (Kohtamäki *et al.*, 2022); moreover, editorials suggest to be sensitive to the organisational context, as it differentiates DT trajectories (M. Lynne Markus and

Rowe, 2021). Moreover, trends highlight the rise in business agility, the introduction of new technologies and new digital platforms to sustain big data and new decentralized governance models (Chawla and Goyal, 2022). Such trends in DT follow a recent wave of infrastructural changes in organizations that have become more strategic and customer-oriented (Pihir, Tomičić-Pupek and Furjan, 2018).

Incumbent organizations face DT as one of the main challenges nowadays (Nadkarni and Prügl, 2020), reporting failure rates of up to 70% (Forth *et al.*, 2020), such as the case of General Electric (Lanzolla, Pesce and Tucci, 2021). Path dependency, core rigidities and inertia threaten incumbent organisations (Lucas and Goh, 2009; Eggers and Francis Park, 2017) and the failure of established firms has negative consequences on the wider society. Hence, scholars need to generate knowledge on DT in incumbents to investigate the mechanisms building momentum to create DT champions rather than laggards.

Compared to "digital natives", pre-digital, big and old incumbent enterprises have to go digital by changing organizational structures, business models and routines while overcoming inertia (Haskamp *et al.*, 2021). In the DT process, established firms confront themselves in transforming an organisational form imbued with inertia and generating paradoxes: as Besson and Rowe aptly put it "To understand the issues of OT [Organizational Transformation], one must keep in mind the central *paradox* of organizing. Organizing means routinizing. Yet this action of routinization creates inertia by entrenching the organization and causing patterns to become rigid. In this perspective, transforming implies overcoming organizational inertia to realign the organization with its environment" (Besson and Rowe, 2012, p. 105 emphasis added). A paradox is defined as a "persistent contradiction between interdependent elements" (Schad *et al.*, 2016, p. 10) and DT journeys in incumbents are pregnant with enduring paradoxes (Danuso, Giones and Ribeiro da Silva, 2022), such as "between the organizational intent of engaging in DT (and creating specific structures to support this change) and the inherent transformative properties of digital technologies that transcend existing structures and boundaries" (Dąbrowska *et al.*, 2022) or the paradoxical tensions in technology renewal between legacy and digital systems (Wimelius *et al.*, 2021), or the "old" and "new" tension (Gregory *et al.*, 2019).

DT has already been investigated in the setting of incumbent firms (Steiber *et al.*, 2020; Volberda *et al.*, 2021; Danuso, Giones and Ribeiro da Silva, 2022; Jöhnk *et al.*, 2022). However, the literature lacks a systematic review of DT in this organisational context, which fundamentally characterizes the DT trajectory (M. Lynne Markus and Rowe, 2021). Existing DT reviews are bounded to specific disciplines (Vial, 2019) or not focused on a defined organisational context (Nadkarni and Prügl, 2020; Gong and Ribiere, 2021; Hanelt *et al.*, 2021). Moreover, as incumbents DT is pregnant with intrinsic tensions between the transformative processes fuelled by digital innovations and the status quo, paradoxes have been mentioned in several DT studies (Drechsler *et al.*, 2020; Wimelius *et al.*, 2021) but only as a label and not as a theoretical body to draw upon (Schad *et al.*, 2016). Indeed, existing studies investigated DT employing disparate perspectives, such as organisational change (Hanelt *et al.*, 2021), institutional (Hinings, Gegenhuber and Greenwood, 2018), or identity (Wessel *et al.*, 2021). However, no review adopted a paradox lens (Schad *et al.*, 2016) to inspect the literature. Hence, we ask the following research question: *What paradoxes does Digital Transformation entail in incumbent organisations?*

We tackle this research question by inspecting the literature on the DT of incumbent from 2010 to 2022, performing a multidisciplinary review combining a Systematic Literature Review and a Computational Literature Review. We adopt the Latent Dirichlet Allocation algorithm (Rabetino *et al.*, 2021) due to its advantages in terms of scalability and ease of replicability (Eickhoff and Neuss, 2017; Hannigan *et al.*, 2019) and extract the top-five hidden themes understanding what the literature investigated.

Our theoretical contribution consists of developing a multidisciplinary understanding of the state-of-the-art trends on the DT of incumbent firms employing an automated, bias-free, and replicable content analysis methodology. After inspecting and interpreting the topical composition of the literature, we introduce the paradox perspective (Schad *et al.*, 2016) to propose research questions and directions for future studies. Last, we offer insights in line with paradoxical thinking that managers dealing with the incumbent's DT can adopt to build momentum and become DT champions.

2   Methodology

We combine a Systematic (SLR) and a Computational Literature review (CLR) adopting the Latent Dirichlet Allocation (LDA) algorithm - consistently with (Rabetino et al., 2021)- on a multidisciplinary coverage of the DT of incumbents' organisations. The LDA has been extensively leveraged in social science research (Hannigan *et al.*, 2019) and in the Information Systems (IS) field (for a review Eickhoff and Neuss, 2017) to perform literature reviews on security research (Dhillon, Smith and Dissanayaka, 2021), to consolidate research on dynamic capabilities (Talafidaryani, 2021), and data-driven project management (Miller, 2021), among others. Our review gives justice to the multidisciplinary of DT by spanning the fields of IS, Innovation Management (IM), Operation Management (OM), Strategic Management (SM), and General Management (GM) (Appio *et al.*, 2021).

2.1   Systematic Literature Review (SLR)

We perform a systematic literature review (Tranfield, Denyer and Smart, 2003). The article sample is assembled using a "backward" and "forward" search (Webster and Watson, 2002). The "backward" starts from existing reviews to identify articles discussing the digital transformation in incumbents. We expand the corpora through a Scopus database search, bounding the search to journals ranked by the Combined Journal Guide of the British Association of Business Schools (ABS) level 3 and above. We adopted keywords that have proven successful for other DT reviews (Vial, 2019; Hanelt *et al.*, 2021; Verhoef *et al.*, 2021); additionally, we captured articles in the organizational context of incumbent organisations. The query searched in the title, abstract and keywords of articles published after 2010, written in English, as other reviews did. The query is reported in Table 1.

Key terms	Term 1	Term 2	Term 3
	"digital transformation" AND	incumbent* AND	organi?ation
Synonyms	"digital innovation" OR	"large" OR	
	"digitali?ation" OR	"old" OR	
	"digitali?e" OR	"big" OR	
	"transformation" OR	"established" OR	
	"transform" OR	"traditional"	
	"technology" OR		
	"disrupt"		

Table 1.   Research query.

The query resulted in 492 items on 28/07/2022; the total number of items is 498. Pre-specified inclusion/exclusion criteria guided the documents' screening, reported in Table 2.

No	Exclusion Criteria	Inclusion Criteria
1	The article does not provide a thoughtful description of the context in which the research was conducted.	The article must provide an overview of the empirical study context. Included articles are empirically grounded in incumbents' organizations.
2	Articles not relevant to the phenomenon of digital transformation.	We included articles having as a primary focus the digital transformation or digital-induced transformation of organisations.

Table 2.   Exclusion and inclusion criteria.

A total of 398 articles titles and abstracts were screened by three researchers adopting the ABC logic (Hiebl, 2021). The final corpus is composed of 103 research articles. Table 3 reports the review process.

Stage	Database Query	Backward Search
Identification	Records identified from: • Journals IS (n = 220) • Journals OM (n = 119) • Journals GM (n = 78) • Journals IM (n = 61) • Journals SM (n = 14)	Records identified from: Other reviews (n = 6)
Screening	Records screened (n = 492)	Assessed for eligibility (n = 6)
	Records excluded (n = 395)	
	Records excluded: • No context provided/incumbent (n = 286) • Not configurable as DT (n =59) • Other reasons (n =56)	
Analysis	Studies included in review (n = 103)	

Table 3.   Review Process.

2.2   Computational Literature Review (CLR)

We use a computational literature review (CLR) methodology that employs the Latent Dirichlet Allocation (LDA) topic modelling algorithm to retrieve hidden themes from the text corpora composed of academic articles (Antons *et al.*, 2021). Topic modelling allows analysing corpora to discover and extract macro-patterns and latent themes challenging to see from a close-up perspective and it is the most adopted machine learning algorithm in social science (Hannigan *et al.*, 2019). The LDA does not understand texts as humans but maps the statistical structure of written language (Ru, 2022); however, its output often matches a human understanding of the text (Blei and McAuliffe, 2009).

The LDA is an unsupervised, bottom-up approach to topic modelling for unstructured data. The LDA detects patterns without a-priori restriction on words or categories but clusters words according to the word co-occurrence in a set of documents (Blei, Ng and Jordan, 2012; Silipo and Tursi, 2018). LDA isolates the main hidden topics in the corpora assuming that each document is generated by multiple topics; each topic is described by "topic descriptors" which are the most representatives words appearing in the topic (Silipo and Tursi, 2018) which can belong to multiple topics (Blei, Ng and Jordan, 2012).

Before submitting the corpora to the algorithm, it is paramount to pre-process the document to remove unnecessary words and noise to increase the consistency and quality of the dataset (Hickman, Thapa and Tay, 2020). To systematically remove certain elements, such as the bibliography, the name of authors and the journal's name that would interfere with the LDA algorithm we developed a Python script to massively convert the academic articles from a PDF (i.e., portable document format) to a TXT (i.e., text file) format and adopted the open-source software KNIME Analytics to pre-process the corpora and execute the LDA algorithm. The Python code and KNIME workflows are freely accessible on GitHub's repository for future use and inspection (https://github.com/Tiziano1234/LDA_CLR_MCIS.git).

The following pre-processing steps consistent with the literature (Antons *et al.*, 2021) were performed: a) Converted cases to lower case;   b) Removed emoticons, asterisks, wingding, punctuation signs, and numbers; c) Removed short words (minimum length to three characters) and stop-words (removal of ubiquitous words such as articles, pronouns and auxiliary verbs); d) Filter Markup Tags to remove links and similar tags; e) Tagged and filtered out: person, organisations, date and time, tables, and graphs using the Natural Language Processing NE technique; f) Lemmatized: as words have different forms, lemmatizing is necessary to maintain only the root of the words (e.g. "emissions" to "emission") to remove inflectional endings and derivations, such as plurals and verb tenses (Silipo and Tursi 2018).

The pre-processing enhances topics' interpretability and reduces the computational complexity of the LDA. After pre-processing, we count more than one hundred thousand unique words in the corpora.

3 Findings

Table 4 reports the topic descriptors. We extract the top-five key topics most preponderant in the corpora and the top-ten terms, ordered as indicating the preponderance of the term in the topic. Topic modelling is not a supervised or labelling algorithm, meaning that researchers do not have to pre-specify any constrain. Hence, we inspect the high-probability words to advance a topic label in a way to intuitively and parsimoniously describe each key topic, following the approach of (Huang *et al.*, 2018). We now describe the five topics.

Topic's Top 10 Words	Topic Label	Research Questions
Topic #1: *Hospital, healthcare, patient, health, doctor, care, activity, practice, desk, sale*	Digital transformation of healthcare	- What tensions do healthcare organisations face during DT? - How can healthcare organisations manage tensions in times of DT? - How do healthcare organisations manage the coexistence of digital and traditional logic?
Topic #2: *digital, system, practice, renewal, service, process, transformation, change, innovation, platform*	Digital transformation's processes of renewal and change	- What are the mechanisms enacted in the DT process of incumbents? - What processes do incumbent organisations employ to cope with DT-generated paradoxes? - How do paradoxes generated in DT journeys unfold over time?
Topic #3: *project, system, industry, technology, manufacture, process, management, framework, decision, development*	Digital transformation's project management in industrial settings	- What are the tensions industrial players face in their DT journeys? - How does the emergent and generative process of DT coexist with traditional (e.g., deterministic, control-seeking) project management logics? - How to manage tensions among functional managers during DTs?
Topic #4: *business, technology, change, firm, value, performance, service, analytic, capability, customer*	DT's impacts on business value, performances, consumers, and capabilities	- Is DT an opportunity or a threat for incumbent organisations? - How established organisations manage multiple and concurrent transformation initiatives (e.g., digital/legacy)? - How can established firms manage both legacy (old) and digital technologies in their DT journeys?
Topic #5: *business, innovation, application, unit, strategic, model, system, capability, product, renewal*	DT's strategic consequences on product applications	-How can incumbents strategically manage hybrid ecosystems (digital and physical)? -How to manage tensions between organisational units (e.g., digital units/traditional units) during DT? - How do traditional change initiatives and DT coexist in incumbents?

Table 4.   Topic descriptors, research avenues and exemplar research questions.

3.1 The digital transformation of the healthcare industry

The first and most prominent topic indicates healthcare as an industrial setting that figures in the DT academic discourse. Indeed, the final sample of articles in the review is composed of several papers discussing and reviewing DT in healthcare organizational settings (Agarwal *et al.*, 2010; Kraus *et al.*, 2021). This trend grew especially after COVID-19 hit (Tortorella *et al.*, 2022), as the pandemic encouraged a focus on the DT of healthcare organizations (e.g., telemedicine, case predictions, patient monitoring, etc.). The topic is consistent with a focus on established organisations as the healthcare sector is resistant to change due to the power and authority of professionals, as well due to the presence of regulations fostering the status quo in the industry (Volpentesta, Miozza and Satwekar, 2021).

3.2   Digital transformation's processes of renewal and change

The second-most important topic retrieved by the LDA algorithm emphasises the actual and inherent processes of digital transformation. Renewal and transformative processes and mechanisms deeply characterize DT journeys, especially in established organisations that "have to go" digital continuously transforming rigid organisational structures and elements (Warner and Wäger, 2019). A focus on the DT process itself -rather than on DT as the outcome- requires investigations on the "how to" of digital transformation (Li, 2020). Moreover, the topic represents articles discussing DT's implications that go beyond the single organisation toward digital platforms and ecosystems (Cennamo *et al.*, 2020). Process models of DT in established organisations (Sebastian *et al.*, 2017; Svahn, Mathiassen and Lindgren, 2017; Chanias, Myers and Hess, 2019) are also representative of this topic, which highlights the trend of studying DT from a processual point of view, focusing on the how-to, and unveiling the deep mechanisms and unfolding of the phenomenon - rather than on the what or final implications (Cozzolino, Verona and Rothaermel, 2018; M Lynne Markus and Rowe, 2021).

3.3   Digital transformation's project management in industrial settings

The LDA reveals as the third most prominent latent topic in the corpora the one related to DT of industrial organisations, with a focus on project management. Words such as *development* and *framework* underly typical project management approaches recently applied to DT (Baiyere, Salmela and Tapanainen, 2020). Indeed, DT has been extensively treated from a project management view (Chirumalla, 2016). Researchers offered staged models and descriptive accounts of DT journeys, as well as criticized a view of DT as a "project" preferring the latter as a continuous and emergent -and not linear- phenomenon, not manageable with traditional approaches (Bianchi, Marzi and Guerini, 2020; Brock *et al.*, 2020; Abayomi Baiyere *et al.*, 2022). This stand of research also investigated whether project managers, IT professionals or business managers should lead DT initiatives (Jöhnk *et al.*, 2022). The project management view co-occurs with a focus on companies in the manufacturing industry as a setting for executing DT in a controlled manner. We often reviewed papers investigating DT in established manufacturing systems (Rauch, Linder and Dallasega, 2020), industrial and pre-digital industries (Björkdahl, 2020; Sjodin *et al.*, 2021; Danuso, Giones and Ribeiro da Silva, 2022).

3.4   DT's impacts on value, performances, consumers, and capabilities

The fourth topic reveals a set of studies oriented toward an outcome-based view of DT, highlighting investigations focused on the final impact that DT has on services, customers' expectations, and value-creation. Papers focus on a consumer-centric (Shi, Cui and Liu, 2022) and value-oriented view of DT (Saldanha, Mithas and Krishnan, 2017). The topic represents investigations on the outcome of DT – rather than the process of DT- discussing the implications that DT brings to products, customer relationships (Vial, 2019) and value creation paths (Smith, 2021). This view relates to the end objective, outlining what DT brings in terms of transformed value propositions, capabilities (Warner and Wäger, 2019) or business models (Nambisan *et al.*, 2017; Cozzolino, Verona and Rothaermel, 2018), rather than emphasizing a processual onto-epistemology. The focus on performance was predominant in the initial discussions on DT (Vial, 2019) focused on increased operational performance in the organisation, rather than the recent focus on the DT strategic and organisational consequences (Hanelt *et al.*, 2021).

3.5   DT's strategic consequences on product applications

DT tremendously alters product and their applications, leading as consequence organisations to execute organisation-wide change impacting strategy, governance, and structure (Nadkarni and Prügl, 2020). The fifth top topic gives justice to articles discussing the implications of digital value creation from the dematerialization of tangible products (Gregory *et al.*, 2021), applications (v. Wangenheim, Wünderlich and Schumann, 2017; Alaimo and Kallinikos, 2020) or whole industries and markets (Kallinikos and Mariátegui, 2011; Diaz-Rainey, Ibikunle and Mention, 2015) that have been digitally transformed within

a very short period. These changes require building new and complementary capabilities such as digital ambidexterity (Magnusson, Koutsikouri and Päivärinta, 2020), digital competitive (Dąbrowska *et al.*, 2022) and digital business strategies (Bharadwaj *et al.*, 2013) changing competition dynamics (Cennamo *et al.*, 2020) to deal with the blurring industry boundaries and redefined industry logics.

4 Contribution

DT threatens incumbent organisations' survival (Nadkarni and Prügl, 2020) and latest estimates approximate that DT initiatives in incumbents fail up to a rate of 70% (Forth *et al.*, 2020) with wider negative consequences on societies. Incumbents DT metamorphosis is pregnant with inherent paradoxes due to the coexistence of multiple and interdependent realities. However, DT research referred to paradoxes only as a label and not as a whole theoretical body (Lewis and Smith, 2014). Moreover, existing reviews are disciplinary-bounded (Vial, 2019) or neglect the role of the organisational context (Hanelt *et al.*, 2021). Given the managerial and academic relevance of studying DT of incumbent firms, we performed a multidisciplinary, systematic, and automated content analysis on academic articles leading to the discovery of trends in the literature, presented in the finding section.

After reviewing the literature, we advance paradox thinking (Schad *et al.*, 2016) as a novel lens to advance a non-exhaustive list of research for future studies based on the five extracted topics. The competing goals, ambiguities, tensions, contradictions, and oppositions (e.g., legacy vs digital, old vs new, digital vs non-digital units) make DT pregnant with inherent paradoxes (Dąbrowska *et al.*, 2022). Paradox theory advises that mismanaging paradoxes cause chaos, decline and ambivalence, while effective management generates learning, sustainability, legitimacy and long-term performances (Lewis and Smith, 2014). Future studies could analyse how to manage paradox in the delicate environment of healthcare organisations (e.g., hospitals, biopharmaceutical companies, regulatory agencies). Second, researchers could adopt longitudinal perspectives (Langley, 1999) to unpack the unfolding of DT paradoxes in the context of established firms, highlighting the dynamics, movements and flows as core of DT paradoxes over time. Third, research could investigate paradoxes arising between different approaches to managing DT, and how to handle different logics (e.g., an emergent DT and a deterministic project management approach) effectively. Fourth, future studies could unpack how to integrate the "old" and "new" in a complementary way, how to manage multiple and inconsistent competencies simultaneously, and how incumbents align and integrate different strategies (traditional business and digital strategies). Last, researchers could explore how incumbents strategically cope with the paradoxes arising from using structural changes and spatial separations (e.g., separation of digital venture vs incorporation, digital competence centres), how to manage organisations or organisational units that are independent but interconnected with the mainstream business, and how to manage the coexistence of digital and physical products. Additionally, studies could integrate findings of paradox research in other topics (e.g., profit vs sustainability) to verify if similar mechanism of managing paradoxes could be employed in DT initiatives. Moreover, we call for DT studies to be more sensitives to contextual factors (e.g., size, age, industry, institutional environment) as contributing to a more nuanced understanding of DT.

Successful DTs need managerial capabilities (Markus, 2004) to depart from the current organizing logics. Our study pinpoints that paradox thinking can be an effective digital mindset (Eden *et al.*, 2018) to build momentum in DT initiatives and facilitate the renewal process. Managers lagging behind DT can shift from "either-or" solutions -where one pole is preferred over the other (e.g., digital or physical) - to embracing a "both-and-with" thinking balancing between poles (e.g., digital and physical) to successfully fuse the digital and the legacy (Lewis and Smith, 2022; Smith, Lewis and Edmondson, 2022), enact the renewal, and build and maintain momentum for DTs.

To conclude, this work adds to the DT debate as it complements existing literature reviews providing a multidisciplinary review proposing the paradox as a perspective– heretofore neglected by DT studies – to stimulate future research on DT in incumbents. We advise future studies on DT to embrace approaches borrowing from the paradox lens to study how to manage or cope with paradoxes of DT, and to be more sensitive to the organisational context as shapes different DT trajectories.

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