Digital leaders and the transformation of the IT function

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Abstract. With digital transformation attracting increasing attention, our study is motivated by a need to understand the impact on the transformation of the Information Technology (IT) function in pre-digital organisations. In particular, we present in this paper a qualitative study that aims to examine how digital transformation influences the IT organisational structure and leadership in pre-digital organisations. The empirical study is based on a series of semi-structured interviews with digital leaders across a range of organisations and sectors in the UK and Scandinavia. We find four different categories of both IT organisational structure and leadership following digital transformation initiatives: managing digital as projects within the IT function; managing the IT and digital functions separately with separate leaders; managing IT and digital within one function with dual leadership; and managing the IT and digital functions together with a single leader. The study has both theoretical and

practical implications for the management of digital transformation and the IT function.

1 Introduction

With the emergence of digital technologies, digital transformation (DT), defined as a process that creates organisational disruption (Vial 2019), has been receiving overwhelming attention from both academics and practitioners alike (Hess et al. 2016). Studies have placed DT high up on the business agenda, with a recent report predicting that the Global Digital Transformation Market is likely to exceed more than US$462 billion by 2024 (MRE Report, July 2019). Advances in smart and interconnected systems, including data analytics, as well as the popularity of artificial intelligence, the Internet of Things (IoTs), digital platforms and social media (e.g. Chanias et al. 2018; McAfee and Brynjolfsson 2017) have all been contributing to an increasing understanding of the possibilities for digitalisation, especially for so-called pre-digital organisations. Digital start-ups (also known as born-digitals) are born with and because of digital technologies, but traditional pre-digital organisations (i.e. those that existed prior to the internet revolution) must seek ways of incorporating DT into their operations and strategies while overcoming structural and cultural constraints (Ross et al. 2019).

As a way of managing the transition of pre-digital organisations to DT, a shared mindset linking information systems (IS) and business leaders has been vital (Hansen et al. 2011). For this, new leadership roles have emerged on the business scene, with the aim of guiding and managing DT-related initiatives. We refer to individuals in these roles as 'digital leaders'. For example, the role of Chief Digital Officer (CDO) has been acknowledged and is quickly becoming part of the executive management team of many organisations (Grossman and Rich 2012). Other similar roles include Head of Digital, Director of DT and Head of Digital Strategy (Engesmo and Panteli 2019). Such roles carry the responsibility for introducing digital technologies and managing DT programmes that have the potential to transform organisational operations and business models. In an extensive review of the literature on DT, Vial (2019) observes that successful DT cases show evidence of leadership with a digital mindset, as well as multidisciplinary and multifunctional competence networks that transcend traditional organisational structures. It follows that DT encompasses an institutional change that takes place over time, affecting different structural and leadership aspects (Becker et al. 2018; Drechsler 2020; Haffke et al. 2017a; Hinings et al. 2018).

Given the important role played by organisational structure and leadership in DT programmes, these will be studied in the context of the IT function. Digital technology, which is often managed by IT departments, are a core component of DT programmes. What is less understood is how the increasing organisational emphasis on DT affects IT functions (Gerster 2017; Haffke et al. 2017a) and IT leadership (Drechsler 2020). Following these, the main research question of our study is:

How does digital transformation influence the IT organisational structure and

leadership in traditional, pre-digital organisations?

In the remainder of this paper, we review the literature on DT, exploring the opportunities and challenges it provides for pre-digital organisations. We then discuss IT organisational structure in pre-digital organisations, and how it evolves alongside increasing pressure for DT. Furthermore, we discuss the role of the Chief Information Officer (CIO), who has traditionally been expected to lead IT-enabled change in organisations, and introduce the emerging role of digital leaders such as CDOs. Following this, we introduce the research design of the study, its findings and its contributions to research.

2 Conceptual Foundations

2.1 Digital Transformation: Concept, Opportunities and Challenges

Researchers have linked DT to the use and application of digital technology. For example, Gruman (2016) define DT as 'the application of digital technologies to fundamentally impact all aspects of business'. A more explicit definition was given by Warner and Wäger (2019), who referred to DT as the use of new digital technologies (e.g. mobile, artificial intelligence, cloud, blockchain, IoTs) to enable major business improvements which augment customer experience, streamline operations or create new business models. Similarly, Hinings et al. (2018) define DT as the 'combined effects of several digital innovations bringing about novel actors (and actor constellations), structures, practices, values, and beliefs that change, threaten, replace or complement existing rules of the game within organizations and fields'. In this paper, we adopt the definition of Vial (2019) who reviewed DT studies and then presented DT as 'a process where digital technologies create disruptions triggering strategic responses from organizations that seek to alter their value creation paths while managing the structural changes and organizational barriers that affect the positive and negative outcomes of this process' (p.118).

Despite these different definitions, there is general agreement in the literature about the opportunities that DT provides to transform business models, operational processes, and user experience (Baber et al. 2019; Henriette et al. 2016). According to Cascio and Montealegre (2016), its implications include: "transforming the very foundations of global business and the organizations that drive it […] not just helping people to do things better and faster, but … enabling profound changes in the ways that work is done in organizations" (p. 350). Hence, there is a strategic need for DT initiatives to gain the wider approval of stakeholders and to become institutionalised (Hinings et al. 2018). As such, DT should be guided by a digital strategy, as well as by an organisational culture that encourages innovation and collaboration (Kane et al. 2015). The need for a cultural fit has been emphasised by Tabrizi et al. (2019), when they posit that DT is not just about introducing new digital technologies. Leadership has also been found to be a key factor in the successfully transformation of an organisation into a digital organisation (Kontić and Vidicki 2018), while structural organisational changes also need to take place (Matt et al. 2015).

In the next section, we will review the IT organisational structure and the potential changes it faces as a result of DT.

2.2 IT Organisational structure

DT puts pressure on the IT function, presenting conflicting goals for achieving innovation and agility through IT, on the one hand, and the need for reliability and stability on the other (Haffke et al. 2017b). Initially developed by practitioners, Gartner´s concept of bimodal IT and McKinsey´s approach of two-speed IT suggested a way of resolving these conflicting goals and achieving a balance between the traditional delivery of IT and a more agile and business-orientated mode (Gartner 2014; Bossert et al. 2014). As Bossert et al. (2014) point out, pre-digital companies have to deal with their legacy systems in their effort to become digital enterprises, and alongside customer-centric front-end solutions, need to manage a two-speed architecture. As part of this, a new organisational and governance model needs to be built and developed. Gartner (2014), on the other hand, focuses on the ways in which bimodal IT should be structurally implemented, first in projects and then in the enterprise as a whole. The concept of bimodal IT is summarised by examining the contrasting characteristics of the two modes (see Table 1), where Mode 1 concerns traditional IT, which aims for stability, security and reliability through waterfall approaches, whereas Mode 2 involves agile or digital IT, aiming for agility, speed and innovation through iterative development and fast delivery (Horlach et al. 2016).

Traditional IT (Mode 1, industrial/core IT)		Digital IT (Mode 2, agile IT)
Stability	**Goal**	Agility & speed
IT-centric	**Culture**	Business-centric

Remote from customer	**Customer proximity**	Close to customer
Performance and security improvement	**Trigger**	Short-term market trends
Performance of services	**Value**	Business moments, customer branding
Security & reliability	**Focus of services**	Innovation
Waterfall development	**Approach**	Iterative, agile development
System of records	**Applications**	System of engagement
Slow	**Speed of service delivery**	Fast

Table 1 Characteristics of Traditional and Digital IT (from Horlach et al. 2016, p. 1421).

Horlach et al (2016) found that there were many publications about bimodal IT or two-speed IT written for practitioners, but only one academic paper about the ways in which IT departments deal with heavyweight and lightweight IT (i.e. Bygstad 2015). While explaining and contrasting these two types of IT, Bygstad examines the potential of their relationship. As he suggests, the governance of lightweight IT by an IT department is an unsolved problem, and its relationship to heavyweight IT also needs to be considered when dealing with this problem. In another study, Haffke et al. (2017a) extended Bygstad´s work by focusing on organisational structures while studying different archetypes of IT design to implement bimodal IT. Horlach et al. (2016) examined the organisation of bimodal IT, whether project-based, with a separate digital unit outside the IT department, or with IT as a service broker, partnering with external vendors and third-party providers. Haffke et al. (2017b) found three archetypes of bimodal IT design: project-by-project and a split between the two modes either within or outside the IT function.

Since then, more research has been carried out on bimodal IT. Jönhk et al. (2017) focused on developing design options for agile IT when implementing bimodal IT, while Badr (2018) studied practices that improve organisational ambidexterity and enable bimodal IT. These practices include leading internal and external practices , where examples of internal practices include IT participation in business decisions and strategic discussions, and elevating the value of IT (Badr 2018). Finally, Horlach et al. (2017) studied the ways in which bimodal IT may be implemented in order to increase agility of IT delivery, while paying particular attention to the role of outsourcing.

The agility of the IT function consists of the ability to sense and respond to opportunities in emerging business needs, changes in the markets and emerging digital opportunities (Leonhardt et al. 2017). Ultimately, due to different design options being implemented to enable bimodal IT, the IT organisational structure is also expected to change, with the role of the CIO being supplemented more and more often with other digital leaders, such as CDOs and Digital Strategists. We will explore the differences between these roles in the following section.

2.3 CIOs and Digital Leaders

The job description and responsibilities of the CIO have often been discussed in the IS literature, in relation to the need to achieve IT-business alignment (Hütter and Riedl 2017; Sambamurthy et al. 2003). Several studies have thus examined the evolving role of the CIO, showing that its strategic responsibilities have become more important (e.g. Chun and Money 2009). Previous literature has argued that, as IS matures, CIOs will gain more managerial responsibilities, some of which will be strategic (Grover et al. 1993; Hunter 2010; Peppard 2010). Despite this, recent evidence has shown that CIOs do not perform strategic leadership roles, with Gonzales et al. (2019) arguing that this is often due to the stereotype that the IT leader is solely a technology-oriented role, which undermines their business credibility and authority. As Weill and Woerner (2013) have pointed out, this is also related to the challenge of free up time for CIOs, enabling them to spend less time on operations and more time on working with non-IT colleagues, e.g. participating in strategic discussions.

Research on CDOs shows that this role is evolving. Singh and Hess (2017) find three different roles undertaken by CDOs: entrepreneur, digital evangelist and coordinator. Tahvanainen and Luoma (2018) show that CDOs possess a combination of competencies, including technical, business, professional and personal. They also argue that a CDO is recommended when internal and external complexity and pressure for DT are all at a high level. Haffke et al. (2016) show that CIOs and CDOs complement and influence each other, and, in particular, that the former will change, reducing its strategic responsibility. As the CDO shares responsibility for DT initiatives with the business, it is stressed that close CIO-CDO alignment in terms of governance is important in order to ensure business and IT alignment. Following from this, previous literature has posited that more research is needed into the ways in which DT is affecting digital leadership as an evolving phenomenon (Haffke et al. 2016; Tumbas et al. 2018).

Research into the relationship between digital leaders and the IT organisational structure also remains limited. Horlacher and Hess (2016) argue that governance structures are affected by the employment of CDOs, and that CDOs need to be positioned and have sufficient influence in these structures in order to pursue efforts for DT. They call for more research into companies which have progress and experience with both DT and digital leaders. A similar call has been made by Singh et al. (2019). In this study, we aim to cover some of this research gap.

3 Research Approach and Methods

Our study is based on the qualitative interpretative approach that aims to understand phenomena through the meanings assigned to them (Klein and Myers 1999). The approach adopted follows our recognition that the phenomenon of DT is understood and experienced in different ways. Based on

this, we invited digital leaders based in different pre-digital organisations to participate in the study. Where appropriate, we asked CIOs from the same organisation to take part. The data collection took place between May and September 2019 and was based on 14 semi-structured interviews in 12 different organisations, in the UK and Scandinavia, ranging across sectors such as education, utilities, consultancy, finance and fitness (see Table 2). For confidentiality reasons, the names of the companies and participants interviewed remain confidential. Across all the organisations, the participants were key informants on the topic of DT; they were people with direct responsibility for DT in their respective organisations and had roles such as CDO, Heads of Digital, CIO and Chief Technology Officer (CTs). The majority of the interviewees were male, reflecting the fact that IT is a male-dominated profession (Gillard et al. 2008).

Interviewee	Gender	Organisation	Industry	Size
CIO	F	O1	Food and beverage	National, Large
CDO	M	O1	Food and beverage (same company as above)	National, Large
CIO	M	O2	Health and fitness	Global, Large
CDO	M	O2	Health and fitness (same company as above)	Global, Large
CDO	M	O3	Energy group	National, Large
CIO	M	O3	Energy group (same company as above)	National, Large
CIO	M	O4	Energy SBU	National, Medium
Operations Manager	M	O5	Production	National, Medium
CEO	M	O6	Recruitment	National, Small
CDIO	F	O7	Education	National, Large
Digital Manager	M	O8	Research consultancy	Global, Small
Head of Digital	F	O9	Financial	National, Large
Head of Digital	F	O10	Utility	National, Large
CIO	M	O11	Heritage	National, Medium
CTO	M	O12	Energy	Global, Large

Table 2. List of interviewees

The interviews were semi-structured, and were guided by a list of pre-designed topics, to produce consistency in the dataset. Examples of pre-designed topics which appeared in the interview protocol include: the participants' main responsibilities; their current and previous projects/activities involving DT in the organisation; the current and previous IT organisational structure; personnel and other managerial roles in the IT function; their relationship with senior management; and their strategic influence. Where the case involved both a CIO and CDO (or a different digital leader), we also sought to explore with additional questions the relationship between the two, and the influence that they exert or are expected to exert on each other. The interviews lasted between 35 and 70 minutes and were subsequently transcribed.

The data analysis was guided by the main research question, which aimed to examine the influence of DT on the IT organisational structure and leadership. Firstly, during the analysis we identified the following themes and used them to code the interviews: organisational experience with DT; the current and previous IT organisational structure; and the current and previous leadership responsibilities of the different digital leaders. During our reading and re-reading of the transcriptions, we were also open to new themes as they emerged from the data. An example of an emerging theme is the nebulous nature of the DT process and the influence that this had on internal organisational relationships, such as those between digital leaders and the executive management team. Secondly, we identified four distinct categories of IT organisational structure and leadership: IT function with digital as projects; separate IT and digital functions; integrated IT and digital functions with dual leadership; and integrated IT; and digital function with single leadership. Finally, we sought to identify how the interviewees understood the relationship between the emerging DT process and the various distinct categories of IT organisational structure and leadership. To do this, we identified recurrent themes in the emerging DT process within each of the four categories. These steps in the data analysis process are also shown in Figure 1 below. We will present the findings of our analysis in the following section.

Figure 1. The data analysis process

4 Findings

4.1 Digital Transformation: A process in the making

From the data analysis, we found that DT was experienced as an evolving process, rather than a one-off project, the latter being typically described as a unique, goal-specific and temporary activity (Turner and Muller 2003). The quotations below illustrate this view:

> «We don't see it as a project any more but as a team; specific projects and components have a certain lifespan. We talk about digital transformation horizons, but the digital community is part of a continuum and is evolving». (Head of Digital, Financial, O9)

> "…so, as I always say it's [DT] not a destination. But it is a focus, if you like, it won't be done in just three years. It's just that we know that we have some big things that we must address…" (CDIO, Education, O7)

Another participant explained this evolving process with reference to continual technological advancements: "It never stops transforming. We talk about snapchats, Augmented Reality. It is still a buzzword." (Head of Digital, Utility, O10)

DT was also described as a creative process (Digital Manager, Consultancy, O8) and as an experimental one (CDO, Health and fitness):

> "…Not a programme, but a continual effort. We do a little work to establish business cases before doing rather smaller incremental parts: proof-of-concepts, test it, see if it gets any attention, and then escalate. It is an agile approach. We test, learn, get feedback." (CDO, Health and fitness, O2).

However, DT as a process still encompasses both agile projects and more traditional ones, which have been planned and implemented using DT or have been undertaken as preparation for DT.

The findings also indicate that DT is a business and strategic phenomenon which provides opportunities for different business functions and units to be more digital-orientated, as well as affecting the strategic activities of the entire organisation:

> "So you have to be really close to the business units, and to have enough insight into the technology side that you can translate it into something that provides business value for them" (CDO, Energy group, O3).

DT as a strategic topic occurs on occasion, recurrently or regularly and naturally in discussions in the executive management team. This is sometimes also reflected in the business strategy, where digital transformation or digitalisation can be a dedicated or integrated theme.

"The decisions that the executive team are making increasingly have a technology component. […] And, through the advisory role I play, I can say ´We can do this like that or like that, but my recommendation is to go in this direction because of one reason or another´" (CDO, Food and beverage, O1).

"Digitalisation is one of several strategic themes in the business strategy. […] It provides us with an obligation to be aggressive so that we can make real progress in digitalisation" (CDO, Energy group, O3).

4.2 Digital Transformation and its influence on IT organisational structure and leadership

Following our research question, we have identified different ways in which the IT organisational structure is influenced by DT, which we present in this section as four different categories. Within these categories, we present findings related to leadership responsibilities. Collectively the different categories show the transformation of the IT organisational structure and leadership, although this is different in both degree and nature. In Table 3 we provide an overview of the four different categories of IT organisational structure and leadership, with themes from the emerging DT process within each of these categories, as well as case evidence from the organisations in the study. It was not possible to place the interview with the CIO in the recruitment company (O6) within any of the categories, as he was referring to experiences from various organisations he had previously worked for, while his current work was the recruitment of IT executives.

IT organisational structure	IT (and Digital) Leadership	Emergent themes linked to DT process	Case Evidence
Managing digital as projects within IT function	CIO*:* • IT operations • IT Security • Vendor management • System architecture • Project management • Managing DT projects • Participation in strategic discussions	DT occurs as a topic in discussions of possible opportunities in different business functions and units, and as a strategic topic in the executive management team Stand-alone projects involving DT is initiated and carried out	O4, O5
Managing IT and digital functions separately	CIO: • IT operations • IT security • Vendor management	DT occurs as a recurrent topic in discussions of possible opportunities	O1, O8, O9, O12

with separated leaders	• Platform for future innovation CDO: • Strategy • Innovation (together with business) • System architecture • Portfolio management • Customer services	from operational to strategic level DT is an evident part of many initiatives for exploring and adopting different digital solutions in the business	
Managing IT and digital within one function with dual leadership	CIO/Head of operation and security: • IT operations • IT security • Vendor management • Project management • System architecture CDO: • Strategy • DT in the company • Innovation (together with business) • Digital development • IT and digital operations • IT and digital security • Vendor management • System architecture • Project management • Benefit management	DT occurs as a regular and integrated and natural topic in the business functions and units, and in the executive team DT is a part of "running the business" (quote) with different projects and processes continuously in different states in the pipeline	O2, O3
Managing IT and digital function together with a single leader	Chief Digital and Information Officer: • IT/digital operations • IT/digital security • Digital development • Digital strategy	DT becomes an organisational (though not necessarily a strategic) initiative; increasingly IT and other (e.g. marketing) projects have digital technologies embedded in them.	O7, O10, O11

Table 3. DT and categories of IT organisational structure and leadership

Below we will present the findings about IT organisational structure and leadership from these four categories.

4.2.1 Managing digital as projects within the IT function

The first category involves an IT function that has sole responsibility for managing DT and related initiatives. Pre-DT, the CIO who was managing the IT function had an operational focus. With DT occurring as a strategic topic for the executive management team, pressure was created for the CIO to become more strategy-oriented and participate in these discussions, to enable the progression of initialisation, implementation and realisation of the DT

initiatives. With DT featuring as a topic in different business functions and units, it was also necessary for IT to be involved with the business side, in terms both of exploring opportunities and maintaining alignment with IT, and of the system portfolio and architecture. For example, in O5, production had acquired a robot for use in an isolated work process in the factory, but it was not integrated and connected with any of the company´s enterprise systems. Because of this, it was dependent on manual input and control. Hence, there was a need for the IT function to manage this as a project in order to realise its potential in terms of DT.

Similarly, in O4, the company advertised for a new CIO who would be more strategy-oriented. The IT organisational structure and leadership was then changed. The CIO role was now extended through both membership and management of DT projects jointly with the business side, together with participation in strategic discussions alongside the rest of the C-suite.

In those organisations which did not have a separate structure for digital, either in terms of organisational structure or leadership, the management of DT initiatives was now handled by the IT function. However, most of the focus of the IT function remained on IT operations and security, in addition to vendor management, system architecture and project management. In O4, the IT leader indicated that he was required to reduce the complexity of the system landscape; cloud-based solutions were an important part of this.

> "Technical skills here are very good, but the portfolio shows that you just add and add new solutions, and never remove any […]. That means that the portfolio is so large that even if we just start making small changes at one end, we are going to spend 10 years doing it. So we need a game changer, and for us that's the cloud" (CIO, energy SBU, O4).

He was also involved in discussions with senior management about DT opportunities, and as a result became part of strategy development. However, because of limitations of time and resources in the IT function, they focused on handling the technical issues of DT initiatives.

To summarise, even though we label this category 'IT function with digital projects', DT is still a work in progress, and includes a range of specific projects, as well as discussions on the business side and with executive management.

4.2.2 Managing IT and digital functions separately with separated leaders

The second category involves cases where IT is separated from digital, both in terms of organisational structure and leadership. Hence, there are two distinct functions with two leaders. The situation prior to DT involved a strategy-oriented CIO managing the IT function, with responsibility for operations, security and architecture. At this time, projects involving DT were managed by the IT function. However, there were also many initiatives in the business (e.g. customer services) that involved DT but were carried out without involving IT, thus creating various shadow-solutions, such as in O1. With DT being a recurrent topic both in the business functions and units and in the executive management team, this put a strain on the IT function and the CIO

in terms of capacity and focus. The CIO in O1 became a bottleneck for decision-making, because he spent much of his time working strategically. Hence, there was a gap between the CIO and the person responsible for IT operations and security, and also between the business side and the IT function.

To provide greater focus on closer collaboration and alignment between IT and the business side, and to prevent avoiding a strategic CIO from becoming a bottleneck for operations and security, a new organisational structure was implemented, with a CIO and CDO managing the IT function and the digital function respectively. An advantage of this separation was linked to the digital branding of the organisation:

> "The company now has a CDO who was previously a director of mobile digital channels. At the time there was a big debate about whether or not to have a CDO. Some liked the idea, some didn't. Some said: 'CDO is being given a golden ticket to do things differently'. The CDO is part of the formal leadership structure of the organisation. If you ask me, it's a positive thing, but other people found it was threatening their power. It was positive because 'We needed someone to focus on digital'". (Head of Digital, Financial, O9).

According to the digital manager of a small consultancy organisation, O8, another advantage is that there is a clear difference between the functions and roles: *"Someone's providing internal IT support. My role is more outward-facing. I'm not putting any strain on internal IT" (Digital manager, O8).* These separate managers with specialised expertise both report to the senior management of the organisation.

In O1, both leaders report to the COO who represents IT and digital in the executive management team. Here, the CIO is responsible for IT operations and security, and for vendor management, including ensuring IT governance. Furthermore, the CIO focuses on enabling more of this to be carried out by the application owners within the business. Every application is cloud-based, and the IT function is small in terms of resources, compared to different business divisions and units. Hence, the CIO perceives her role as being to provide training, structure, policies and specialist resources when needed (e.g. system architecture) so that application owners in the business can carry out IT governance. She sees herself as being responsible for providing a platform for future flexibility towards new technology and projects:

> "I do not think anyone can sit here now and say how the market will look like in five or ten years. We don't know what will happen, but if something does happen, we'll have to react quickly, and then we'll need platforms making this possible, which is why we're working on moving to the cloud, and on having APIs and integration platforms, so that we easily can plug in and out of services. So I have to think differently in terms of this groundwork, but I think it's very hard to say what will be on top of it" (CIO, Food and beverage, O1).

In the same case, the digital function is led by a CDO, although internally this person is known as the "Head of Architecture and Digital Transformation". This refers to seeing innovative possibilities, sometimes based on knowledge about technology, and also on understanding the business. The CDO also acts

as an adviser to the executive management team, and by doing this can influence strategic decisions:

> "The executive management team has to make decisions, and more and more of them involve technology. […] So I can say ´We can do it this way, or we can do it that way. But my recommendation is that we choose this direction because of these reasons.´ So, my opinions about what is a good idea or not will influence this" (CDO, Food and beverage, O1).

4.2.3 Managing IT and digital as one function with dual leadership

In this third category, IT and digital are integrated into one function. Prior to this, the CIO managed the IT function, while DT was a part of business development outside the IT function. In O2, for instance, a new leader was hired outside the IT function to focus on new digital business. This leader later became the CDO. In O3, the appointed CDO was the prior leader for business developments in the customer business area, showing that DT initiatives were taking place outside the IT function. To close the gap with the business side, to provide greater focus on DT and to ensure alignment with IT, changes to organisational structure were implemented, and a CDO was employed. Within the modified function, the degree to which they are merged or exist as separate groups can vary. The CDO is generally the leader, except where an IT leader has the role of CIO or Head of IT Operations and Security reporting to the CDO.

In O2, for example, IT and digital each have their own team/group, despite being part of the same function, with a CIO and CDO as their respective leaders. Here, the CDO is the leader of both, and the CIO reports to the CDO. The CDO reports to the CEO, and is also part of the executive team. In O3, the CDO is also leader of this function, but IT and digital are not dedicated groups, so the separation between them is not very evident. However, he also said that one member of his team is responsible for operations and security.

In one company (health and fitness, O2) the CIO is responsible for the IT operations of the network, communication, servers, clients and applications (including the ERP system). He also has responsibility for security, vendor management, project management and system architecture. In his team, he has resources dedicated to all these areas. In addition, they have a business development resource. The CIO took up his position eighteen months earlier and perceives the most important aspects of his role to be the reduction of system landscape complexity and the implementation of the IT governance structure. All applications are cloud-based. He also works closely with the CDO on the development of digital and on maintaining alignment between digital and IT.

> "…There is a great focus on delivering new functionality digitally, or direct to the customer. And then there is a fight to resolve the technical debt […] because digital is racing forward with new functionality and if we do not resolve this technical debt, everything will be more difficult to govern and also more expensive" (CIO, Health and fitness, O2).

The CDO has worked in this position for three years and is responsible for both IT and digital operations and security. In particular, he is responsible for developing the digital services of the organisation (e.g. mobile apps, websites), as well as managing the implementation of those projects. In addition, he collaborates closely with the different business units, exploring and exploiting digital solutions for innovation purposes (e.g. use of IoT, social media to enhance or create new value for customers) and strategy development with the executive management team. He perceives his role as being the main driver of digital development, to then drive strategy development. Digitalisation and DT are seen by them as "running the business", and he believes his role to be a long-term one. The focus of the organisation is on trying to separate IT and digital by developing a service platform to integrate the two. In another company (energy group, O3), the CDO sees his role as closing the gap between IT and business.

Collectively, these cases indicate that some organisations recognise the different skills and capabilities of CIOs and CDOs, and therefore have opted to keep both roles, so that they work alongside each other within the same function.

4.2.4 Managing the IT and digital functions together with a single leader

The fourth category presents an integrated function with a single leader. We have found cases where organisations had an integrated IT and digital function, with a single leader responsible for both IT and digital. This was observed specifically in cases where the IT function was renamed and rebranded, to signal the organisation's focus on DT. The quotation below shows evidence of this rebranding of the IT function and its integration with digital:

> "We used to have a traditional IT department. Mike was the Chief Technology Officer. His vision was to digitise many of our assets with really basic digitalisation across the region. Very much the non-customer-facing side. The executive board decided to give him the new title of CDO. He also brought in an external consultant as a part of this process. This disrupted the way people thought about digital. The IT department was renamed [company name] Digital with significant changes, a whole new structure, governance and finance" (Head of Digital, Financial, O9).

There was a similar case of rebranding in an educational organisation:

> "I have taken on the university's IT function with the responsibility of building more digital capability. I am responsible for building the digital profession. This is really an IT role in many ways but with a lot of digital focus, if that makes sense. Where do I start? It involves the transformation of our infrastructure, putting data governance in place, using data for business intelligence, AI, data architecture. It involves defining our digital capability framework and service design standards to create new digital products; so we are building a new

technology blueprint informed by digital thinking. They all come under one umbrella programme, the university's DT programme." (CDIO, Education, O7)

A successful implementation was described by the CIO of a heritage organisation (O11):

"You cannot take technology out of digital.… In order to build successful digital capability, you need a senior team with a very strong engineering, data and technology capability; these need to be lasting things – not just one-offs... It was a collaborative process."

Despite the effectiveness of this approach, it was not without its challenges:

"At [heritage organisation] there were a few conservative people and quite a lot of fashionistas, but they couldn't work together. My role was to bring the two groups together and make them understand that they couldn't have everything."

To summarise, the study has shown that DT causes changes in internal organisational structures and leadership for both IT and digital services. Nevertheless, it also became evident that different organisations have utilised IT and digital capabilities in different ways. In the first category, DT takes the form of isolated projects which are managed by the CIO along with his/her other responsibilities; in the second category, DT is recurrently occurring, becoming a regular and natural topic in the third category; and an increasingly embedded part of organisational activities in the fourth category. Thus, the appointment of a CDO or similar digital leader becomes important if the organisation is to cope with the increasing demands of digital exploration and business needs, with DT occurring regularly, as a continuously integrated and natural topic within the business.

5 Discussion

Pre-digital organisations are increasingly trying to work out how to initiate and manage DT. The evidence of this study has shown that DT is an emergent process in all participating organisations, albeit in various ways and with various levels of intensity. Within this context, we have examined the influence of DT on the IT organisational structure and leadership in pre-digital organisations. On the one hand, advocates for DT have argued that it is necessary to transform the organisational structure and leadership, so that these are more digital-orientated (Vial 2019). On the other hand, there have been calls for the IT function to become more agile and customer-orientated (e.g. Horlach et al. 2016), in order to cope with the increasingly digitalised nature of organisations. Following our research question, we discuss our findings below in relation to the extant literature. In this section, we will also discuss the ways in which this study contributes to the literature.

Firstly, our findings have shown that the IT organisational structure is transformed when an organisation engages with DT. In particular, we have identified four different organisational structures for the IT function in organisations that are undergoing DT: managing IT together with digital projects; managing IT and the digital function separately with separate leaders;

managing IT and digital within one function with dual leadership; and managing IT and the digital function together with a single leader. Our study has not shown that these categories represent an evolutionary path which corresponds with the organisation's maturity with DT, nor does it posit that some of these categories are better than others. Instead, and despite their differences, these organisational structures collectively confirm the organisational need to adapt the IT function in order to accommodate the need for digital capability when they embrace DT. In the first category, the IT function is expanded by taking responsibility for specific DT initiatives, with the CIO taking on this additional role. In the second category, where the IT function is differentiated from DT, with the latter being the responsibility of a new function, its role becomes more specialised and narrower, focusing on technology matters rather than digital ones. In the third category, the IT function is structured in such a way that technology and DT projects are managed by different leaders and/or units, to ensure both sufficient focus and alignment. In the fourth category, the IT function is not only restructured through the adoption of DT programmes, but is also rebranded to become the digital driver of the organisation. Our findings are in line with previous research on bimodal IT (e.g. Gartner 2014), and confirm earlier research by showing that there are different methods of transforming the IT function to accommodate digital initiatives (Haffke et al. 2017b). Nevertheless, our findings add to existing research on bimodal IT, by showing that the recruitment of a digital leader (e.g. CDO) actively contributes to the bimodal transformation of the IT function. In our findings, the presence of a digital leader was clearly evident in the last three categories, but was absent from the first, where DT was treated as though it consisted of independent projects.

Secondly, the study contributes to the literature on DT leadership by extending research in this area. It shows evidence for the emergence of leaders such as CDOs in the digital era. This reinforces earlier research into the creation of new and specialised leadership roles which can support the DT process (e.g. Hess et al. 2016; Vial 2019). Although some existing literature questions the sustainability of these new roles, our study has found that these roles play a crucial part in their respective organisations, especially at an early stage of the DT process, and in preparing for it. As one of the respondents put it: "CDO is being given a golden ticket to do things differently" (Head of Digital, Financial Sector). In relation to this, our study adds to existing knowledge by showing how digital leaders relate to the IT function and to CIOs. We know that this relationship varies between different organisations. We reveal new arrangements that manage the interdependencies between IT and digital, adding understanding of the relationship between lightweight and heavyweight IT, as suggested by Bygstad (2015), and of the need for alignment between the CIO and CDO (Haffke et al. 2016). In the second category, with separated IT and digital functions, the alignment is ensured through the CDO, who appears to take responsibility for system architecture and portfolio management. In the third category, where IT and digital are integrated but with a CDO as the main leader, this alignment is made tighter by being supported by a hierarchical relationship between digital and IT. Prior research has indicated that unimodal structures with digital and IT are the best methods of handling the need for two-speed IT (Haffke et al. 2017b). In terms of

leadership, our results show that digital leaders of these new structures need to take responsibility for both these modes. In this way, they could find themselves in a similar situation to CIOs in the period before the advent of DT, with challenges of both scope and priority (Chun and Money 2009; Weill and Woerner 2013). An obvious example of this is the leadership role known as the CDIO. However, these organisations have gained digital capabilities which they might not have had before, and so could now be in a better position to deal with such challenges (Osmundsen 2020).

Thirdly, our study contributes to the discourse on the impact of DT and how it shapes organisations. Much of the existing literature concerns the impact of DT on changing business models (e.g. Henriette et al. 2016). We add to this by showing how DT contributes to changing the organisational structures and leadership roles within organisations.

Finally, despite the increasing reference in the academic and practitioner literature on investments in DT, our study shows that such initiatives are not always strategically orientated or clearly defined. This has implications for the role that digital leaders perform in organisations, where they are sometimes seen to perform an operational rather than a strategic role. In relation to this, DT initiatives may not be driven by business strategy; instead, our data has shown, they may trigger digital strategy formulation by attracting attention from senior management, both reactively and incrementally. The findings also suggest that 'digital' is a nebulous word, and show that organisations are still in the process of learning, exploring and unpacking the opportunities of DT for themselves. In doing so, they are rethinking their strategies, structures, digital leadership, skills, digital capabilities and the role of the IT function. Our conclusions about this latter issue are only tentative, however, and more research is needed, to shed more light on the strategic orientation of DT programmes.

6 Conclusions and implications

The study has aimed to provide empirical insight into the ways in which DT is changing the IT function and, in particular, its organisational structure and leadership. Despite an increasing amount of research into DT, this is, to our knowledge, the first study to explicitly examine the relationship between DT and the IT function. As DT becomes an integral part of organisational activities, and also as it is a process rather than just a project, it is important to understand the influence it is exerting on the IT function and related resources. The study has also focused on pre-digital organisations, which tend to face more challenges when they adopt and implement digital initiatives than the so-called born-digital organisations.

Our study has implications for the management and leadership of both DT programmes and IT functions. It has shown that different categories of organisational structure and leadership may develop to support DT, and that no one category is better than any other. The categories are not following an evolutionary path, as different organisations have been found to undertake DT in different ways. Regardless of organisational structure, there is a need for

clarity about the organisation's approach toward digital leadership across different managerial levels. Furthermore, as digital and IT capabilities are interdependent, there is a need for the relevant leaders to work together and develop effective collaborations that can contribute to the success of DT programmes, whichever organisational structure is adopted.

The study is not without limitations. Our findings indicate different organisational structures that could be adopted in different organisations as a result of DT. We have also not carried out an assessment of the effectiveness of each of the different organisational structures. This could be the focus of future research. Moreover, while Vial (2019) has identified several factors that make DT possible, including structure, leadership, culture and employee roles and skills, our study has only focused on the first two of these.

More research is therefore needed to explore these influences. Our study has not produced conclusive results about the reasons why some organisations choose to integrate the IT and digital functions while others choose to separate them. Research is therefore required to provide further insight into the reasons for structuring the IT function in particular ways. Our findings are also based on a limited number of interviews. Although we attempted to get the views of CIOs and digital leaders from the same organisation, this was not always possible. In particular, there is a need for in-depth case-study research in this area, enabling researchers to determine the extent of DT in specific organisations, while also identifying the challenges that organisations face during this process. Future research should also study the relationships between IT leaders and digital leaders over a period of time, to examine their mutual influence.

Acknowledgment

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