

Who's who in the zoo? Clarifying the difference between the chief digital officer and chief information officer

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Background: The new chief digital officer (CDO) role within top management is shrouded with confusion and ambiguity.

Objectives: The purpose of this study is to identify the differences between the traditional chief information officer (CIO) and more modern CDO role.

Method: Being grounded within the paradigm of interpretivism, this study follows a qualitative research approach and adopts a narrative research strategy. This study explores the opinions of top management relating to both CIO and CDO roles through conducting in-depth interviews with open-ended questions. Insights into the data are gained through an analytical process of thematic content analysis.

Results: This study shows that distinctions are emerging between the roles and responsibilities of the CDO and CIO roles within companies. Even though both roles are strategic, the CDO is responsible for digital strategy, while the CIO is responsible for the information technology (IT) strategy.

Conclusion: This study illustrates that IT is becoming central to a company's business model and this focus change requires specific skills and competencies within the company. Furthermore, the study shows that differences exist between the CIO and CDO roles within a company.

Contribution: This study highlights key differences between the roles and responsibilities of the CDO and CIO. This study also identifies key contingency and institutional factors that influence a firm to introduce a CDO and clarifies the concept of digital transformation.

Keywords: chief digital officer; chief information officer; roles and responsibilities; digital transformation; digital strategy; IT strategy.

Introduction

Information technology (IT) is disrupting companies at an unprecedented rate and is also leading to the radical transformations of companies (Matt, Hess & Benlian 2015; Zysman & Kenney 2018). This transformation revolves around the company's strategies, products and structures, with Matt et al. (2015) describing this transformation as the digital transformation of companies. According to Tumbas, Berente and Vom Brocke (2017), this digital transformation is primarily driven by the chief digital officer (CDO).

Disruptions caused by IT are not new phenomenon, with the chief information officer (CIO) traditionally being responsible for IT management (Coltman et al. 2015; Riedl et al. 2017). Riedl et al. (2017) argue that there is a considerable overlap between the areas of digital transformation and IT management, with Tumbas et al. (2017) pointing out that the role of the CDO is surrounded by ambiguity and confusion. Companies characterised by strategic uncertainty and role ambiguity are associated with an increase in miscalculated decision making and undesirable results (Akiyama, Hanaki & Ishikawa 2017; Tuffrey-Wijne et al. 2016).

Even with the role of the CDO being shrouded with confusion, research conducted by Logan et al. (2017) found that large and midsize companies are increasingly adopting the role of the CDO. According to Logan et al. (2017), more than 57% of their respondents had already introduced a CDO within top management. The adoption rate of the CDO role suggests that digital transformation and IT management must differ to a large extent from one another (Sing & Hess 2017; Tumbas, Berente & Vom Brocke 2018).

The introduction of the CDO, however, does not come without contempt as the CIO is traditionally associated with the management of the IT capability within the company (Dahlberg, Hokkanen & Newman 2016; Dery, Sebastian & Van der Meulen 2017; Horlacher & Hess 2016).

The article commences with a literature review detailing the domain of digital transformation and highlighting the roles and responsibilities of the CIO and CDO. It proceeds with an overview of the methodological framework, followed by an in-depth account of the data analysis and findings of the study. The article concludes with limitations and recommendations.

Literature review

According to Mazzei and Noble (2017), large, diverse and complex datasets, also known as big data, are fundamentally altering the corporate strategy of companies. Mazzei and Noble (2017) are of the view that companies are no longer deciding which data to capture based on the company's vision, but rather that the long-term vision of the company and overall direction are driven by big data. This is a fundamental mind shift as traditional IT management is concerned primarily with aligning itself to the strategy and is not central to shaping it (Coltman et al. 2015; Reynolds & Yetton 2015).

Furthermore, an abundance in computing power that enables large-scale data analysis is leading to massive changes in the business and competitive environment (Zysman & Kenney 2018). Porter and Heppelmann (2015) explain that a combination of connected products powered by cloud computing, big data and analytics is changing the competitive landscape through allowing companies to uniquely position new product offerings in the market. Information technology is also readily available to competitors within the company's competitive and market environment and is no longer seen as a unique, rare or valuable resource (Zysman & Kenney 2018).

According to Reynolds and Yetton (2015), when IT was first introduced, it allowed companies to be more operational, efficient and effective. Traditional IT management deals with the automation and standardisation of business processes (Tallon et al. 2016). However, Porter (1996, 2008) argues that the main goal of the business-level strategy is to achieve a sustainable competitive advantage over rivals (Al-Taie, Lane & Cater-Steel 2014). Operational efficiency and effectiveness only lead to a temporary advantage over the competition and thus cannot be considered a key aspect in business-level strategies (Al-Taie et al. 2014).

As the widespread adoption and availability of IT are enabling competitors to compete at the same level of operational efficiency and effectiveness, it seems Porter's (1996) argument that a competitive advantage can only be achieved through uniqueness, and not through operational efficiency, is still valid (Zysman & Kenney 2018). Companies should be focusing on re-engineering their business models

through the exploitation of new opportunities that IT is presenting, while simultaneously creating a unique position for the company in the marketplace (Carley & Babb 2015; Porter & Heppelmann 2015).

The re-engineering of a business model is however not an easy feat. According to Johnson, Christensen & Kagermann (2008), a business model centres around the customer and consists of four elements:

- a product or service value proposition;
- the resources required to deliver the value proposition;
- the systems and processes involved in producing the product or service and
- how the firm intends to make a profit from providing the product or service to the customer.

Information technology can affect any of these four elements and companies need to determine how IT can be exploited to provide value to the customer (Carley & Babb 2015; Porter & Heppelmann 2015; Yahaya & Ebrahim 2016).

Changes to companies' business models come with uncertainty (Porter & Heppelmann 2015). Uncertainty surrounding the value and use of 'new' IT requires companies to experiment and be more agile to be successful. Changes to the company's product and service offerings ultimately affect the customer, and as such, the inclusion of the customer in the experimentation process becomes key (Porter & Heppelmann 2015). Digital transformation can thus be considered a change process: changing how a company competes in the marketplace through the creation of unique products and services using cloud, big data, mobile and social technologies (Alizadeh 2015; Porter & Heppelmann 2015; Sing & Hess 2017).

In contrast, IT management focuses on the automation and standardisation of systems and processes within the company that lead to a higher quality product and not new products being produced (Dahlberg et al. 2016; Horlacher & Hess 2016). Information technology management forms a key part of the daily operations of the company, being considered a utility provider that enables other functions of the company to operate effectively (Martinez-Simarro, Devece & Llopis-Albert 2015; Taylor & Vithayathil 2018).

According to Sing and Hess (2017), a clear distinction is starting to emerge between the primary role a CIO must perform and the new requirement that focuses on business-related change driven by IT. The CIO's primary focus is the operational and functional strategies of the company, whereas the CDO focuses more on business-level strategies (Matt et al. 2015; Taylor & Vithayathil 2018).

The design of specific positions within a company, such as the CIO and CDO, depends on parameters that deal with job specialisation, behaviour formalisation and training (Lunenburg 2012; Sinha et al. 2017), as explained here in detail:

- The job specialisation parameter influences positions within a company when specific tasks to be performed become very specialised, requiring the company to restructure (Sinha et al. 2017). The CIO's role in the company is that of a strategic IT specialist, whereas the CDO's primary role is that of a digital transformation and change specialist (Sing & Hess 2017). Sing and Hess (2017) maintain that digital transformation is at the core of the CDO's role and cannot be a further extension of the CIO's role.
- According to Sinha et al. (2017), **behaviour formalisation** within companies deals with the degree of predictability and controllability that products and services are delivered by the company. Advances in IT are requiring companies to be more agile and to experiment with technology, thus decreasing the degree of predictability and controllability (Porter & Heppelmann 2015; Sebastian et al. 2017). However, this decrease is in conflict with the role of a utility provider that the CIO fulfils, which requires IT operations to run without problems 24 h a day (Weill & Woerner 2013). The CDO is viewed as a change agent that focuses on changing the company's business models, requiring agility and experimentation while working in an environment that is not predictable (Matt et al. 2015; Sing & Hess 2017; Tumbas et al. 2017).
- **Training** parameters influence certain structures when specific tasks to be performed are very complex and require specific training and skill sets to be completed. An overarching belief was that the CIO does not possess the required business skills that can focus on the company's digital transformation journey and as such a new position emerged (Arnitz, Hütter & Riedl 2017; Dahlberg et al. 2016; Fitzgerald 2015).

The difference between the CIO and CDO is however not only captured within the design of these positions, but also their roles and responsibilities act as a differentiator (Al-Taie et al. 2014; Rytberg & Geschwind 2017). The following section details the roles and responsibilities of CIO and CDO within the company.

Chief information officer

The CIO can be considered the pinnacle of IT leadership within a company and is located within the strategic apex of the company (Wunderlich & Beck 2017). According to Ionescu (2017), the roles and responsibilities of the CIO evolved from a technologically driven role, focusing on information and communication technology, towards a new role that requires a strong business background focusing on tactical and strategic issues of companies. Dahlberg et al. (2016) assert that changes in the business strategy and market environment are the driving force behind the evolving role of the CIO. Roles such as strategist, relationship builder, resource allocator, educator, spokesperson, utility provider and innovator seem to be a recurring trend in various literature (Al-Taie et al. 2014; Dahlberg et al. 2016; De Tuya et al. 2020):

1. **Relationship builder:** According to Liu et al. (2014), companies can be viewed as social systems in which actors compete for limited resources to assist in achieving their goals. For actors to pursue their own goals successfully, they need to rely on other individuals when it becomes too difficult to achieve their own goals with available resources and power granted by the company. It is for this reason that interpersonal competencies are crucial for individuals operating within companies (Liu et al. 2014). A CIO needs to build relationships both across the company and outside the company with key IT service providers (Al-Taie et al. 2014). They need to develop contacts with important stakeholders in the external environment as well as develop personal relationships with people external to the IT department that provide or receive services. Furthermore, the CIO needs to be aware of the political climate that might influence the work to be carried out (Dahlberg et al. 2016; Milovich 2015).
2. **Resource allocator:** The general focus shifts from operational towards strategic means, and resource allocation forms a key part of an effective CIO's role. At its core, the role of resource allocator deals with financial budgeting and assigning human resources to key IT projects of the company (Wunderlich & Beck 2017). The role of resource allocator closely relates to the resource-based view in strategy that emphasises the way in which companies utilise their resources to improve their performance and to gain a competitive advantage (Arrfelt et al. 2015; Huang et al. 2015). Research conducted by Arrfelt et al. (2015), for instance, found a strong relationship between sound resource allocation and superior company performance. A company's resources can be classified as either tangible or intangible, with physical assets such as finances, property and servers being classified as tangible and knowledge, information, product reputation, human capital and company culture being classified as intangible (Kull, Mena & Korschun 2016; Pearson, Pitfield & Ryley 2015). For companies to succeed in the digital age, environmental analysis is a crucial step that identifies both opportunities and threats (Fonseca & Domingues 2017), with the CIO needing to be aware of environmental changes that might influence the resources of a company (Chatzoglou et al. 2018; Kozlenkova, Samaha & Palmatier 2014). This includes being aware of changing markets and how current IT trends might influence resources, such as IT acquisition costs, operational expenditure, employee behaviour and internal knowledge (Dahlberg et al. 2016; Milovich 2015).
3. **Educator:** The role of the CIO can be viewed as an IT missionary who provides insight and understanding about key information technologies to relevant stakeholders such as the top management team of the company. The main aim of the CIO as educator is to raise top management savviness, awareness and appreciation of IT. Being educated by the CIO on IT assists the top management team in making appropriate judgements about the business value of IT and wise IT investment decisions (Milovich 2015; Schirf & Serapiglia 2017).

4. **Spokesperson:** The CIO needs to be a representative of the IT department in meetings and serve as an IT expert of the company. The CIO must be able to communicate effectively with both internal and external stakeholders about the true value and strategic direction of IT within the company (Milovich 2015).
5. **Utility provider:** The company requires the CIO to be an organisational steward for high-quality data and operationally reliable systems. The role of the CIO can be viewed as a builder of sustainable solid, dependable and responsive IT infrastructure services. In addition, the CIO must provide leadership in areas that focus on the digital integration of processes, information and decision support that spans the entire company. The services and utilities provided by the IT function of a company can be considered a key aspect that allows other functions to operate effectively (Al-Taie et al. 2014; Milovich 2015).
6. **Innovator:** The CIO needs to decide on specific IT initiatives to invest in. The introduction of innovative IT is also expected to be performed in controllable manner. Innovative effort from the CIO will focus primarily on automation within the company using IT (Milovich 2015).

In contrast to the CIO, the primary scope of the CDO is the digital transformation of the company to create a company that is customer centric and digitally empowered (Sing & Hess 2017). However, the infancy of the position within companies means that the roles and responsibilities of the CDO are quite fragmented (Horlacher & Hess 2016; Sing & Hess 2017). The following section interrogates the roles and responsibilities of the CDO in more detail.

Chief digital officer

The primary roles emerging for the CDO are change agent, relationship builder, integrator, innovator and educator (Matt et al. 2015; Tumbas et al. 2017):

1. **Change agent:** The core focus of the CDO should be on strategic changes to the company's business models, processes, products and services utilising IT. Uncertainty in the value and use of certain information technologies means that CDOs need to experiment and work on an agile iterative approach (Matt et al. 2015; Tumbas et al. 2017). This differs from the CIO's responsibility to ensure that the operations of the company are not affected by innovation (Weill & Woerner 2013).
2. **Relationship builder:** According to Tumbas et al. (2017), the CDO has a responsibility to build relationships with the company's customers to gain a clear picture of how digital technologies are impacting them. Research conducted by Sing and Hess (2017) also found that CDOs are responsible for creating a seamless customer experience for all customers across all points of engagement. This is in line with Porter and Heppelmann (2015), who are of the opinion that a company's transformation because of IT requires the company to build and maintain good relationships with its customers. This differs from the CIO's relationship building role, which revolves

- around relationship building with key stakeholders that can influence and are affected by the company's institutionalised IT (Al-Taie et al. 2014; Milovich 2015).
3. **Integrator:** IT is disrupting companies on an unprecedented scale. The CDO is required to integrate disruptive IT throughout the entire company to ensure its exploitation (Matt et al. 2015; Tumbas et al. 2017). The competitive and unpredictable nature of the market environment means that companies need to gain more timeous insight from internal and external sources (Mazzei & Noble 2017). The explosion in big data allows companies to focus on using data science to assist with digital transformation, but it is the responsibility of the CDO to integrate these new data sources into the company to gain access to new insight (Song & Zhu 2017). The insight the company requires, however, is still unknown and the CDO needs to be comfortable to experiment in an iterative manner with various data sources (Tumbas et al. 2017).
 4. **Innovator:** Advances in IT are fundamentally altering the business and internal environment of companies. Information technology is producing new opportunities as well as threats, with companies being forced to innovate to stay competitive (Porter & Heppelmann 2015). Chief digital officers are tasked with creating new business models, products and services, with IT at the core (Hess et al. 2016; Horlacher & Hess 2016; Matt et al. 2015). Mikalef, Van de Wetering and Krogstie (2018) explain that the CDO must find innovative ways to utilise newly acquired data in the process of digital transformation of companies. Tumbas et al. (2017) point out that the CDO does not need to be a technical expert, but does need to understand how data can benefit the company and be the driver behind efforts in data analysis to gain valuable insight. In contrast, the innovative efforts of the CIO revolve around using IT to improve operational efficiency and effectiveness and not the transformation of the company's business models, products and services (Milovich 2015).
 5. **Educator:** According to Schirf and Serapiglia (2017), there is a skills gap between IT education and the actual use of IT within industry. They encourage companies to react quickly to changes in IT trends and hypes. Like the CIO, the CDO must educate the company on the value and use of specific IT to members throughout the company. Being involved in the transformation of business models and the creation of new products and services, the CDO must also educate the customer in their value (Becker, Schmid & Botzkowski 2018; Sing & Hess 2017; Taylor & Vithayathil 2018; Tumbas et al. 2017). The primary difference between the educator role of the CIO and CDO relates to the CDO's accountability in educating the customer on the change resulting from digital transformation.

According to Carillo (2017) as well as Horlacher and Hess (2016), the roles and responsibilities of the CDO and CIO are blurred to a large extent, causing confusion in companies. To clarify roles and responsibilities, responsibility assignment matrices, also known as linear responsibility charts, are used

by companies (Cabanillas, Resinas & Ruiz-Cortés 2018; Golini, Kalchschmidt & Landoni 2015; Kloppenborg 2015; Zhou et al. 2015). The most common form of responsibility assignment matrix is a RACI (Responsible, Accountable, Consultant and Informed) chart, widely used by project managers (Cabanillas et al. 2018; Golini et al. 2015; Kloppenborg 2015; Zhou et al. 2015). Responsible, Accountable, Consultant and Informed matrices have been widely used to evaluate and compare a variety of roles and responsibilities (Hyvari 2016). Table 1 provides an overview of the key roles and responsibilities of CDOs and CIOs using a RACI chart.

The literature points to the role of the CDO being ambiguous and misconstrued within companies (Tumbas et al. 2017). In addition, the introduction of the CDO casts uncertainty on the CIO role within companies (Dahlberg et al. 2016; Dery et al. 2017; Horlacher & Hess 2016). Based on the inconsistencies and confusion surrounding the roles and responsibilities of the CIO and CDO, the following research questions are posed:

- RQ1: What is the strategic rationale behind introducing a CDO within the company?
- RQ2: What are the roles and responsibilities of the CIO and CDO within the company?

TABLE 1: Chief digital officer and chief information officer Responsible, Accountable, Consultant and Informed roles and responsibilities.

Roles and responsibilities	CDO	CIO
Relationship builder		
Build relationships with suppliers	-	R
Build relationships with internal departments	A	A
Build relationships with customers	R	-
Resource allocator		
Allocate resources to key areas of IT-related projects	-	R
Perform environmental analysis of IT and the impact on the company	I	I
Educator		
Educate the value of IT to top management	R	R
Educate the value of IT to the customer	A	-
Educate the value of IT throughout the company	A	A
Spokesperson		
Communicate the value of IT to stakeholders	R	R
Communicate the IT strategic direction of the company to stakeholders	-	R
Utility provider		
Build dependable, stable and sustainable IT infrastructure	-	A
Ensure IT infrastructure and services operating 24/7	-	A
Drive digital integration and automation of systems and processes	-	A
Integrator		
Integrate internal big data sources for exploitation	A	-
Integrate external big data sources for exploitation	A	-
Integrate internal relational data from systems and processes	-	A
Innovator		
Innovate system and process automation utilising IT	-	A
Create new business models, products and services utilising IT	R	-
Change agent		
Change business models, products and services	R	-
Change internal perceptions surrounding IT	A	A
Change customer perceptions relating to IT	A	-

Source: See full reference list, Al-Taie, M., Lane, M. & Cater-Steel, A., 2014, 'The relationship between organisational strategic IT vision and CIO roles: One size does not fit all', *Australasian Journal of Information Systems* 18(2), 59–89. <https://doi.org/10.3127/ajis.v18i2.827>, for more information

CDO, chief digital officer; CIO, chief information officer; IT, information technology; R, responsible; A, accountable; I, informed.

The aim is that by answering the two research questions, deeper insights are created into the differences between the roles of the CIO and CDO within a company.

Research methods and design

This study adopts a qualitative methodology and creates understandings behind the subjective meanings and interpretations of the participants. Moreover, this study is designed to explore the differences between the CDO and CIO roles. A narrative research strategy is followed and is interested in developing deep insights into the participants' experiences and interpretations. The study was only interested in the participants' views at a specific point in time, thus, a cross-sectional approach was followed.

A qualitative face-to-face interview approach is appropriate because this research is exploratory and expected to bridge the gap between the theories and practice and will allow for more information. The qualitative research technique is preferred because this research is more concerned with flexible answers as this allows the ability to investigate the empirical areas that might be omitted before conducting the interviews and to also adjust the interview guide in line with the abductive research approach.

The population of this study are senior managers of South African companies that: (i) introduced the role of the CDO, (ii) have been affected by the role of CDO or (iii) CDOs themselves. As a result of the limited access to the target population, this study used non-probability purposive sampling where one's own judgement was used in choosing participants. Participants for this study were identified through personal networks as well as through LinkedIn.

In total, 13 participants who formed part of the top management of companies were interviewed (Table 2). Not all companies interviewed had a dedicated CIO, as some only employed a chief technology officer (CTO) who focused on the IT strategy of the company.

TABLE 2: Demographic details of participants.

ID	Role	Tenure	Total executive experience	Group
P001	Chief information officer	2 years	12 years	CIO
P002	Chief digital officer	2 years	11 years	CDO
P003	Chief digital officer	3 years	6 years	CDO
P004	Chief digital officer	2 years	4 years	CDO
P005	Executive head of digital	1 year	2 years	CDO
P006	Chief executive officer	1 year	4 years	Head
P007	Chief information officer	2 years	6 years	CIO
P008	Chief digital officer	3 months	3 months	CDO
P009	Chief digital officer	2 years	4 years	CDO
P010	Chief information officer	6 months	6 months	CIO
P011	Chief digital officer and chief technical officer	5 months	20 years	CDO
P012	Managing director	20 years	30 years	Head
P013	Chief information officer	19 years	19 years	CIO

CDO, chief digital officer; CIO, chief information officer.

In two instances (P004 and P011), the participants who held the title of CDO also headed the IT function of their respective companies, with participant P011 holding dual titles of both CDO and CTO. Participants P006 and P012 were top management individuals with titles of chief executive officer (CEO) and managing director. One participant (P005) held the title of executive head of digital but with similar roles and responsibilities to those of a CDO.

Ethical considerations

Ethical clearance to conduct the study was received from the University of Johannesburg Research Ethics Committee (2019SCiiS01).

Results

The introduction of the CDO can be thought of as strategic in nature: The company either needs strategic direction or requires strategic insight into how technologies impact both the internal and external environments of the company. Participants P005 and P011 believed that the strategic direction played a major part in the introduction of the CDO in their company: 'One is that you need a strategic direction' (P005) and 'it's more from a strategic direction that we have the title of chief digital officer' (P011).

Chief digital officers also provide insight into how technology could be applied within the company. Participant P004 stated that during the interview process when he initially met Company X's CEO, COO and CFO, their discussion centred around insights into IT and how the company should exploit IT going forward.

It seems that one of the reasons for the position of CDO is that the CIO does not have the necessary skills and competence required to fulfil the strategic nature of digital transformation. Participant P009 explained that CIOs are competent in technology strategy including managing the successful implementation of technology, harmonising design and technology deployment, and managing lifetime costs, but lack competency surrounding corporate strategy.

Roles and responsibilities of the chief digital officer

Five different roles and responsibilities were identified from the analysed data, namely that of strategist, sales and marketing, capability management, innovator and change agent.

Strategist

Similar to the views of Al-Taie et al. (2014) on executive roles, participants felt that the CDO role is strategic in nature. One of the main tasks of the CDO is the design and formulation of the digital strategy for the company. According to participant P006, the initial task of the CDO is to design a digital strategy for the company: 'I've seen a CDO getting appointed and his or her first job is to develop a digital strategy' (P006).

Participant P002 commented that in addition to developing a digital strategy, the CDO is expected to provide strategic insight into how technology will impact the company. This includes insight into business development, optimisation and marketing through a technological lens.

It is important to notice that the participants did not think that the CDO is responsible for the execution of IT, but rather focuses on providing strategic uses of IT within the company. Participant P002 stated that as CDO, they represent technology in strategic conversations and in the steering of the business, but the execution of the strategy is the accountability of the CTO, leading the IT function.

Sales and marketing

Based on the analysis of the data, the CDO is expected to perform both sales and marketing role within the company. The most prominent themes emerging from the sales and marketing function are revenue generation, customer experience and customer focus.

The CDO is expected to increase and generate revenue for the company, and this is achieved by using technology in innovative ways to acquire new business. Participant P008 believed that his role was split between the existing business and ensuring retention of customers, as well as new business.

Participant P005 added that the role further includes the identification of new revenue streams for the company through the creation of complementary or new products and services.

Closely linked with the sales and revenue generation function is the concept of the customer experience. When CDOs introduce technology into the product offering of the company, the customer becomes a central figure. The CDO needs to understand and cater for the needs of the customer: 'My primary point of departure is, what do customers want' (P003).

This process of identifying and understanding the needs of the customer can be considered a form of market analysis (Harmeling et al. 2017). Participant P003 indicated that the CDO is responsible for conducting ongoing market and consumer analyses, and responding through the creation of new products and services.

Participant P004 stated that the CDO is not only responsible for conducting market analyses, but rather the whole marketing function of the company, in this instance including traditional marketing.

In contrast to the given views expressed, participants P009 and P011 strongly felt that the CDO must not be a marketing expert. They viewed the CDO's role as all-encompassing and focusing on various areas of the company to ultimately become the future CEO of the organisation.

Capability management

Information technology is fundamentally changing companies and this requires a new set of skills, competencies and capabilities (Cahen, Lahiri & Borini 2016; Teece 2018). Participant P001 said that CDOs are creating separate capabilities within a company: 'But you can see that with some chief digital officers ... they set up separate capabilities' (P001).

Changing business models and introducing newer technology within the company require a new set of internal capabilities. Participant P005 stated that part of the roles and responsibilities includes building a new capability: 'The second thing is building internal capability as it pertains to digital resources' (P005).

The building of new capabilities is part of a process to de-institutionalise existing structures, culture and technology within the company. Participant P003 felt that this process can liberate the business from legacy systems and decisions.

Innovator

Similar to the ideas of Mikalef et al. (2018), participants considered the CDO as an innovator within the company that utilises technology to produce new opportunities for the company. Participant P006 believed that part of the role of the CDO is to design and build business propositions that are new and disruptive, for example, partnering with technology giants, exploiting opportunities within adjacent industries or partnering with smaller startups.

The innovative opportunities the CDO focuses on can lead to operational efficiency and effectiveness or new products and services within the company. Participant P011 added that innovation projects spearheaded by the CDO in their company ended up being product launches.

Change agent

The CDO is considered a change agent within the company. As such, the CDO is required to accelerate change and manage the change process within the company. Participant P001 felt that the introduction of the CDO is to accelerate change: 'We introduced a chief digital officer ... to accelerate change' (P001).

While participant P007 shared a similar sentiment, he also believed the introduction of the role of a CDO in businesses may be ascribed to the slow pace of transformation within companies.

Constant change is a new capability requirement for any company (Arora et al. 2020; Teece 2018). A mutual feeling shared among participants was that even though the initial role of the CDO is to kickstart change, it is also to ensure constant change. Participant P009, for example, felt that companies today need to transition on a constant basis, which requires maintained change.

Roles and responsibilities of the chief information officer

Primary themes emerging from the data relating to the roles and responsibilities of the CIO are strategic, governance, decision maker, technology specialist and operations.

Strategic

Participants agreed with Wunderlich and Beck (2017) and Ionescu (2017) that the CIO leads the strategic IT capability of the company and is responsible for the company's overall IT strategy. According to the participants, the IT strategy tends to deal with the management and deployment of IT. The focus areas within the IT strategy are usually IT infrastructure, data governance, cyber security and compliance. According to participant P009, the CIO's strategic capability is very technology focused, centering around establishing an appropriate design framework, harmonising design and technology deployment, ensuring successful implementation and deployment of technology, and managing lifetime costs.

Large parts of the IT strategy are centred on infrastructure and IT must act as an enabler as well as supporting function within the company. Participant P013 believed that senior IT executives tend to focus their effort on infrastructure strategy such as the improvement of data centres, virtualisation of physical servers and improvement of the network layer.

Governance

As a result of macroenvironmental forces such as government regulation, parts of the IT strategy and responsibility of the CIO rest on data governance, compliance and cyber security. Participant P003 concurs, stating that CIOs concern centres around maintaining access control, upholding system performance and ensuring security.

The responsibility of the IT infrastructure within the company rests with the CIO, who needs to ensure the security of the data residing on the infrastructure. Participant P010 sees the CIO as being accountable for managing and maintaining data, applications that feed from that data, as well as systems and any integration of systems.

Decision maker

Being responsible for the IT infrastructure within the company, the CIO is seen as a technological decision maker. Participant P003 thought that one of the differences between the CDO and CIO is that the CDO does not make technology decisions, which are left to the CIO.

Furthermore, participant P013 explained that the technology decisions the CIO is responsible for rest on decisions about the implementation and use of IT within the company.

Technology specialist

Many participants ($n = 7$) felt that as a technology decision maker within the company, the CIO must be a technology specialist. As an example, participant P004 viewed the CIO as

someone who caretakes both the infrastructure and software within the company, whereas the CDO's sphere of accountability is more business oriented.

Being a technology specialist, the core responsibility of the CIO is to drive IT transformation. Information technology transformation refers to the introduction of new IT into the company that supports and enables the company to achieve its strategic goals. Participant P006 thought that companies tend to expect the CIO to drive technology adoption.

Operations

As a result of the integrated and diffused nature of IT throughout the company, a CIO has a very important role in operations. Chief information officers provide both an enabling and a supporting function to the company. Simply put by participant P013, the CIO ensures that the company keeps functioning on a day-to-day basis ensuring all systems function and are protected.

The CIO needs to enable the company to achieve its strategic goals. This means providing IT to the entire company that allows it to achieve its strategic objectives. Participant P003 believes that the CIO considers how systems enable the business and ensures success will be achieved. Participant P001 agreed, stating that they focus on enabling the organisation to effectively deliver its operational commitment through technology.

The CIO also uses IT to improve the overall operational efficiency and effectiveness of the company. This is achieved through internal process automation. Participant P010 identified internal process automation as a key strategic focus and introduced robotic process automation. Participant P003 agrees stating that their CIO's primary focus is optimising internal processes, whereas they are concerned with addressing ever-changing consumer needs.

As a supporting function, the CIO supports the company, its IT infrastructure and internal functions. Participant P006 explained that the CIO attends to the company's requirements by architecting IT solutions that support the entire company.

Participant P007 believed that the CIO controls IT within the company and shared similar thoughts with participant P006 that the CIO needs to architect solutions using IT that supports the entire company. Participant P001 also shared some concerns regarding the CIO supporting existing IT infrastructure, which in some cases is extremely old.

Differences between the chief digital officer and chief information officer roles

Seven of the participants felt that there was a real difference between the CDO and CIO roles. Participant P003 maintained that the difference between the roles was to such a degree that they cannot be compared.

Participant P006 shared that the primary function of the CIO is to support the company and tend to the existing operations, whereas the CDO's core responsibility is to redesign and alter the company to ensure sustained competitiveness into the future.

Participant P005 added that the CIO provides IT services to the company, whereas the CDO needs to use the services provided by the CIO to generate revenue.

In contrast to other viewpoints, participant P004 felt that the role of the CIO is in decline, with the CDO in the prime position to take over most responsibilities of the CIO. His feelings stemmed from general cloud adoption coupled with the revenue generation function of the CDO.

Cloud adoption removes the IT infrastructure and support responsibilities from the CIO. Furthermore, because of the longstanding internal perspective of the CIO, they might find it difficult to adapt to introduce an external perspective to their strategies. Participant P009 believed that there is a competence issue that CIOs have when it comes to corporate strategy.

Three participants, however, disagreed that the CIO and CDO are distinct, with one participant holding both CTO and CDO titles. It is interesting to notice that the difference in opinion stems from the traditional IT leaders of the company. Participant P010 was of the opinion that the CIO and CDO can be the same individual.

TABLE 3: Chief digital officer and chief information officer roles and responsibilities.

Roles and responsibilities	CDO	CIO
Strategist	Strategic insight	IT strategy
	Digital strategy formulation	-
	Digital strategy	-
Sales and marketing	Revenue generation	-
	Sales	-
	Customer experience	-
	Customer focus	-
	Marketing	-
Capability management	Capability management	-
Innovator	Innovation	-
Change agent	Change	-
	Business transformation	-
	Digital transformation	-
	Organisational structure	-
Governance	-	Data governance
Decision maker	-	Technology decision making
	-	Technology specialist
Operations	-	Enabler
	-	Introduce technology
	-	IT infrastructure
	-	Operational efficiency and effectiveness
	-	Operations
	-	Software
	-	Supporting function
-	Technology execution	

CDO, chief digital officer; CIO, chief information officer.

TABLE 4: Identified differences between the roles and responsibilities of the chief digital officer and chief information officer: Responsible, accountable, consultant and informed.

Roles and responsibilities	CDO	CIO	Own data
Spokesperson			
Communicate the IT strategic direction of the company to stakeholders	A†	R	IT strategy, digital strategy
Integrator			
Integrate internal big data sources for exploitation	C†	A†	Digital strategy, IT infrastructure, supporting function, enabler, technology specialist
Integrate external big data sources for exploitation	C†	A†	Digital strategy, IT infrastructure, supporting function, enabler, technology specialist
Ensure data governance procedures in place‡	-	R	Data governance
Change agent			
Drive revenue generation through change introduced‡	A	-	Revenue generation, sales, customer experience
Manage internal capability requirement resultant from IT driven change‡	A	-	Capability management
Change organisational structure related to the change‡	R	-	Organisational structure, business transformation, change
Strategist‡			
Build IT strategy‡	-	R	IT strategy
Build digital strategy‡	R	I	Digital strategy, digital strategy formulation
Provide strategic insight of IT to the company‡	R	I	Strategic insight

CDO, chief digital officer; CIO, chief information officer; IT, information technology; R, responsible; A, accountable; C, consultant; I, informed.

†, A change identified in existing literature.

‡, New data identified.

Participant P013 did not think that there is a difference between the CIO and CDO, but added that it depends on the skills of the individual. These thoughts do at some level agree with those of participant P004, albeit from a different perspective. These ideas suggest that the CIO and CDO can be the same person. The reason that the position of CDO emerged can be attributed to a lack of specific skills of the CIO (Armitz et al. 2017; Dahlberg et al. 2016; Fitzgerald 2015). These skills that the company require are introduced through a CDO.

Comparing the most prominent themes identified between the CDO and CIO roles and responsibilities Table 3 shows that there is very little overlap between the two roles. Associating the CDO with the business or competitive-level strategy is in line with literature (Matt et al. 2015; Sing & Hess 2017; Tumbas et al. 2017).

As illustrated in Table 4, the data collected within this study provide additions as well as changes to the roles identified in literature. Most prominently, the CDO's sales and marketing role points to a strong focus in revenue generation. The CDO is seen as a change agent being tasked with holistic business transformation with companies rationalising the position of CDO through increases in revenue. It should be noticed that the CDO's focus in using technology for revenue generation is different from that of the CIO. The CDO takes calculated risks to future-proof an organisation's competitiveness by generating revenue through technology. The CIO's focus centres around managing risk by ensuring technology stability to support and enable business operations.

Interestingly, only the CIO is being viewed as the technology specialist of the company. The CDO is not accountable for the integration of internal and external data sources that might be beneficial, but rather consults and provides insights into the company's requirements to the CIO. It becomes the responsibility of the CIO, a utility provider, to support and enable the CDO that seeks to transform the company. As the responsibility of data management rests with the CIO, the onus is on the CIO to ensure proper data governance is implemented within the company.

Both the CIO and CDO must be viewed as strategists within the company. While the CDO is responsible for defining the digital strategy, the CIO is responsible for the IT strategy. The primary difference of a digital strategy rests in the focus on change and how IT can be used to fundamentally alter the company, compared to an IT strategy's emphasis in using IT to support and enable the company. Both the CIO and CDO are viewed as spokespersons that must communicate the strategic IT direction to all stakeholders of the company.

Conclusion

The CDO role within top management is shrouded with confusion and ambiguity (Sing & Hess 2017; Tumbas et al. 2017). Matt et al. (2015) and Tumbas et al. (2017) argue that the CDO's primary role revolves around how IT is fundamentally changing the company. Digital transformation is however not a new phenomenon, with the CIO traditionally being responsible for IT management within companies (Coltman et al. 2015; Riedl et al. 2017; Wunderlich & Beck 2017).

Similar to Sing and Hess (2017), this study shows that distinctions are emerging between the roles and responsibilities of the CDO and CIO roles within companies. Even though both roles are strategic, the CDO is responsible for digital strategy, while the CIO is responsible for the IT strategy.

The CDO is seen as an innovator within the company and focuses on using IT in innovative ways to fundamentally transform the company. The digital transformation role further sees the CDO as a change agent within the company. The primary goal for CDO when changing the company is revenue generation and requires the CDO to be closely related to the sales and marketing function of the company.

The CIO's function and team is regarded as being the technology expert of the organisation and is seen as the technology decision maker. The integral part of IT

throughout the operations of the company requires the CIO to perform a supporting function to company and is responsible for IT governance. In addition, IT enables the company to operate efficiently and effectively and sees the CIO as an enabler.

It is recommended that if a company wants to embark on a digital transformation journey, a new role be introduced to drive the transformation, such as the CDO. Digital transformation is an in-depth change process of the company and requires the individual to not only have expertise in change management but also fully understand the various elements of a business model, how IT affects these elements and how IT can be exploited to provide more value to the customer. It would be unwise to require the CIO to drive digital transformation as it would result in conflict between the risk averse supporting and enablement function, and the new business transformation requirements.

The data collected within this study are qualitative and exploratory in nature with a purpose of generating themes and patterns and not to generalise conclusions. Future research should perform quantitative studies around the roles and responsibilities of the CDO and CIO considering operating models for each, reporting roles in the organisation for each, as well as drawing parallels between the respective career trajectories of each of these roles. In addition to this, collected data within this study did show some ambiguity between certain terms such as digital technology and IT, as well as digital strategies and digital business strategies. Future research should interrogate the differences between the terms and provide a more crystallised definition and use of each.

This study contributes to the existing literature by clearly differentiating the roles and responsibilities of the CIO and CDO in today's organisations. In addition, a more detailed understanding of the contingency and institutional factors that influence firms to introduce the role of a CDO is provided. Finally, as a direct outcome of the aforementioned, the study contributes to existing literature by clarifying the concept of digital transformation as it relates to the roles of CDO and CIO.

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Authors' contributions

T.v.N. and C.M. conceived of the presented idea. C.M. developed the theory and performed the data analysis. T.v.N. verified the analytical methods. C.M. supervised the findings of this work. T.v.N. and C.M. discussed the results and contributed to the final manuscript.

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