Examining the Competencies of the Chief Digital Officer

Completed Research

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Abstract

Digitalization drives innovations in products, services, customer experience and business models in many industries. Organizations are recruiting professionals for a Chief Digital Officer (CDO) role, which is responsible of generating new digital business and acting as the digitalization change agent. We conduct a review of scientific articles about digitalization and the CDO role, and apply the lenses of a competence framework to examine the competencies of the CDO. Specifically, we analyze the personal, professional, business and technical competencies of the Chief Digital Officer. Based on the insights from our empirical study, we outline the most important competencies for the CDO role.

Keywords

Digitalization, Chief Digital Officer, CDO, Competency

Introduction

Digitalization has become a driving force of change in many industries. The term essentially refers to transforming products, services and business models by the means of employing digitized information and digital technologies (Fichman, Santos, & Jindal 2014; Westerman, Calméjane, Bonnet, Ferraris & McAfee 2011). In the industry context, such technological change facilitates to companies' extensions of existing business or entering adjacent markets, but only to those firms striving to innovate and investing in development of their products, services and business operations. Harnessing the potential of digital technologies is therefore one of the priorities for growth-oriented companies. In the public sector, digital technologies are similarly utilized to make governmental and municipal services available online.

The technology-related tasks of managing the acquisition and development of information technology (IT) within the organization are normally assigned to a chief information officer (CIO). However, the tasks for sensing and seizing strategic and business opportunities related to digitalization and taking on the transformational use of information technology, may not necessarily fit to the role of the CIO, but may be overwhelming for the role. In these cases, a Chief Digital Officer (CDO) may be appointed to take the responsibility.

The role of the Chief Digital Officer is a rather new in the firms and public organizations (Horlacher and Hess 2016), and despite the obvious need to understand the role of the leader of digitalization in the information systems research, this discussion doesn't appear in the literature until very recently. Matt, Hess and Benlian (2015) argue for the need for research defining of the role, responsibilities and tasks of a CDO, as well as the need for the role of CDO in a company. We agree on the importance of these aspects and additionally call for further investigation of the kind of knowledge and skills the appointed person should possess. Examination of the competencies of the CDO does not yet appear in the extant literature.

Consequently, the purpose of this paper is to examine and determine what competencies are essential for the Chief Digital Officer role. We approach this objective by conducting a literature review and performing empirical research of the topic. Our aim is to analyze the identified competencies by matching them to the framework of competencies required from IT professionals presented by Havelka and Merhout (2009). The research question for this study is: What competencies are needed in the tasks of Chief Digital

Officer? Moreover, to obtain better understanding of the subject under study, we also address the concept of digitalization and how it will affect businesses as well as the role and duties of the Chief Digital Officer in the organizations.

In our thinking, the work and the required skills of the CDO role are concrete manifestations of digitalization concept. This study therefore contributes by adding to the topical digitalization research. Besides increasing the understanding about the CDO role in research, we provide practical insights that could be applied in the organizations considering establishing a CDO role, recruiting new officers to occupy that position or evolving the CIO role into the modern CDO role. For individuals to take on such role the present study highlights the knowledge and skills needed in the CDO role.

Literature Review

Digitalization and digital transformation of the firm

In the extant literature digitalization can designate different aspects of the overall phenomenon. *Digitizing* is used to describe both the conversion of analogue information to digital form (Yoo et al. 2010) and the development and automation of business processes with digital technologies (Henriette et al. 2015). *Digital convergence* in turn refers to availability and consumption of the digitized information, media and related services via multiple different digital channels (Fichman et al., 2014). Moreover, *digital transformation* is used to describe capabilities to converting an existing physical or analogue product or service into its digital counterpart, which provides substantially better value over a tangible product or analogue service (Carlos da Silva Freitas et al. 2016; Fichman et al. 2014; Haffke et al. 2016; Henriette et al. 2015; Tilson et al. 2010; Yoo 2010).

These definitions of digitalization reflect incremental and transformational changes and their impact on societal, organizational and individual levels. Digitalization of the individual has become visible through, for instance, consumerism of IT (Köffer et al. 2014) and through the use of numerous digital services and platforms people use on a daily basis. On the societal level, digitalization changes professions and the way people work (Brynjolfsson & McAfee 2012), and social media has changed participation in public debates and politics. For firms and public organizations, digital technologies allow for improvements in productivity and, as an example, business analytics tools assist managers in day-to-day decision-making (Fitzgerald et al. 2013). Digitalization has also emerged as fast-paced, external changes in the firms' operating environment, which build pressure to make more drastic changes within the organization (Bharadwaj et al. 2013). In organizational context, digitalization may thus lead to a digital transformation.

Focusing next on the digitalization of the firm, i.e. digital transformation, it is seen as a disruptive and incremental change process that begins with the adoption and utilization of technology, ultimately leading to a changes in organization aimed at finding new ways to create value for business and its customers (Henriette et al. 2015). The digital transformation further results the socio-technical changes in processes, products and services as well as technology-induced changes in firms' value propositions, revenue logics and overall business models (Haffke et al. 2016; Henriette et al. 2015; Horlacher et al. 2016; Nwankpa and Building 2016). Companies seek to exploit new technologies to enable rapid development, for example, to improve customer experience, streamline processes, or create new business models (Fitzgerald et al. 2013; Henriette et al. 2015). This will help companies improve their business, improve their reach and gain a strategic competitive edge in their industry (Fitzgerald et al. 2013; Nwankpa and Building 2016; Westerman et al. 2011).

According to Nwankpa and Building (2016), digital transformation has a positive impact on organizational efficiency and innovation for both firms and public organizations. In addition, innovative approaches to the utilization of new technologies have a significant impact on the competitiveness of companies (Earley 2014). Digitalization and the widespread utilization of technology in the organization's activities almost invariably include new innovations. These innovations can be divided into digital process innovations, product innovations, and business model innovations (Fichman et al. 2014; Horlacher 2016).

To conclude, the concept of digitalization covers the exploitation of digital technologies and digitized information to induce innovative and beneficial changes. In organizational context, the exploitation of digital technologies brings into the focus new organizational capabilities as the basis for improving the customer experience, achieving process efficiencies and innovating business models. This is to say, in

addition to capabilities for building and maintaining technological infrastructure and IT organization, companies and public organizations must now develop new capabilities of innovating products, processes and business models and use the technologies to transform organizations. A new role is then needed in the organizations to initiate, guide and coordinate such development.

Prior studies about the Chief Digital Officer role

A Chief Digital Officer (CDO) is a new C-level role, increasing its popularity in organizations, which are planning on undergoing digital transformation (Horlacher and Hess 2016). The CDO fulfills the role of a change agent in digital transformation and of a manager responsible for utilizing technology to develop new products, services and customer relationships (Haffke et al. 2016). In other words, the CDO needs to make sense of the impact of digitalization on the organization, to develop and communicate digital strategy through the organization and to lead to the change it requires (Haffke et al. 2016). According to Horlacher and Hess (2016), the CDO is in charge of the "proactive digitalization" within the company.

Managing technology infrastructures, providing reliable technology services and creating an IT strategy are traditionally the tasks of the Chief Information Officer (CIO). Also the tasks related to managing the digital transformation sometimes fall under the responsibility of the CIO (Zhan & Mu 2016). Whether a separate CDO role is needed depends on the extent of external and internal pressures on digitalization, the mode of organizing to the changes within the company, the role and workload of the CIO and on the extent of change needed in the main functions of the organization (Haffke et al. 2016; Zhan & Mu 2016). In case of a separate the CDO role is established, the CDO is likely to act as a contact between business and IT departments, and to organize change across the organization (Dumeresque, 2014; Horlacher, 2016).

The CDO is a business manager role, responsible for change management and innovation, but the type of change agent has been found different across organization. The type depends on the extent of digital transformation and the degree of maturity of the company. As the company's digital transformation progresses, the tasks and responsibilities of the CDO are also likely to change (Haffke et al. 2016). Haffke et al. (2016) found that there are five different types of CDO roles:

- *Digital innovator* is innovating on strategies and customer experience,
- *Digital coordinator* is managing the planned transformation and controlling change initiatives,
- *Digital advocate* communicates the change between departments to facilitate co-operation,
- *Digital evangelist* is promoting the need and benefits of the transformation,
- *Digital entrepreneur* seeks opportunities for changes and envisions fitting exploitation strategy.

The CDO acts as a business leader in change management, innovator and creator of strategy. The tasks of the CDO consists mainly of digital transformation activities such as planning, communicating and controlling the change programs and projects (Dumeresque 2014; Haffke et al. 2016; Horlacher and Hess 2016; Zhan and Mu 2016) as well as promoting the change and educating the management and employees about the change (Haffke et al. 2016). Transformational activities also include development and acquisition of new capabilities and facilitation of collaboration between department in executing the changes (Haffke et al. 2016; Singh and Hess 2017).

Further CDO tasks consist of demand-side tasks close to the customer interface. The CDO is required to sense the opportunities and threats related to new technologies (Dumeresque 2014; Haffke et al. 2016) and exploit the opportunities by envisioning, guiding and directing the development of new products, services, overall customer experience and business models (Dumeresque 2014; Ghawe and Brohman 2016; Horlacher and Hess 2016; Singh and Hess 2017; Zhan and Mu 2016). This means, the CDO is also responsible of generating new revenues for the firm.

Overall, our literature review results in defining the CDO as a complementary role to the established CIO role in organizations. Whereas the CIO maintains the existing IT infrastructure, the CDO is responsible for generating new products, services and revenues from exploiting digital technologies. Whereas the CIO aligns the IT infrastructure and services with the firm's strategy, the CDO is sensing for and creating new digital strategies and performs change management tasks to execute the strategy. However, our review of the prior studies did not reveal examination of the competencies of the CDO.

Research in IT competencies

According to Woodruffe (1993), the term competence is used as an umbrella concept to cover virtually everything that can directly affect the efficiency of work. According to Lane and Koronios (2007), competences are general descriptions of the advanced knowledge, skills and abilities needed to perform a certain task. Havelka and Merhout (2009)describe competencies as the knowledge, skills and abilities of the individual. Competences can therefore be a collection of information, skills and abilities needed to perform effectively in different tasks.

Working as IT professional demand general skills as well as skills specific to the IT domain. The domain is constantly changing together with technological changes and consequently the skills required in the domain are continually changing. As a result, a number of competency frameworks with competency categories and distinct competencies have been introduced earlier by Lee, Trauth and Farwell (1995) and Bassellier, Reich and Benbasat (2001) and more recently by Bailey and Mitchell (2007) and Havelka and Merhout (2009). We chose the most recent framework by Havelka and Merhout (2009), because it is deemed as most suitable for analyzing competencies of both technical-oriented and business-oriented roles in IT, regardless of the task and phase of the career. Their framework consisting of four distinct categories and 28 distinct competencies:

- *Personal competencies* are individual traits helping individuals to succeed in their work; including passion for one's work, experience, positive attitude, reliable and honest character and flexibility.
- *Professional competences* are expected of professional in all domains; including ability to organize one's work, analytical skills, leadership skills, ability to work in teams, communication and interpersonal skills and problem-solving skills.
- *Business competencies* are knowledge about the business concepts, about the business processes and how to execute them and about the firm's business domain (incl. business models in the domain).
- *Technical competencies* are knowledge about concepts used and practices applied in the IT domain and the management of information systems; including IT project management development methods, application, architectures, IT infrastructures, programming, IT security, business intelligence and network technologies.

We find that these competency categories provide fitting baseline for the examination of the competencies of the CDO role. The tasks of the CDO identified already in the prior studies suggest that, for instance, experience in working with digital business and technologies is needed, interpersonal skills are needed to guide the change, knowledge about business development is needed to generate new sources of revenues and understanding about the potential of technologies is needed to formulate successful digital strategies. Based on our literature review about digitalization and the CDO role, we assume that the CDO would also need competencies in *visionary thinking* and *strategic thinking* in crafting the digital strategies, *perseverance* to tackling the change resistance, *customer-orientation* in analyzing the demand for new digital products and services and in *sensing new technologies* to spot the impact of the emerging technologies early on.

We conclude our literature review on digitalization, the CDO role and IT competencies by suggesting a research gap in the digitalization research: There are descriptions of the CDO role and its tasks, but the examination of competencies is missing. The literature review results suggest that the CDO role requires a new combination of competencies, which have not appeared in the prior role or job descriptions and, thus, have not been considered in the prior competency frameworks in information systems research.

Methodology and Data Analysis

The present study addresses the identified lack of studies on what competencies are needed in the tasks of a Chief Digital Officer. We chose to conduct an exploratory qualitative study to obtain a rich dataset, which would allow for inductive analysis and better understanding of the novel role and its requirements. Thus, in our study we follow Myers and Newman (2007) and Bhattacherjee (2012) on qualitative studies. In particular, we recognized that the research method for this study would need to be suitable for obtaining information on very personal matter. When asking a person about the competencies, we are asking about what they know about their profession, what they should know and what skills they have been able to obtain. Based on this consideration, we followed Bhattacherjee (2012) and Schultze and

Avital (2011) and chose to conduct a set of in-depth, personal interviews. Interviews are more personalized data collection methods compared to surveys in which interviewee can provide first-hand information and narrative about her experiences (Schultze and Avital 2011) and in which interviewer may ask clarifying questions to guide and focus the interview (Bhattacherjee 2012).

The empirical part of the present study started by drafting an interview protocol. We aimed at semi-structured interviews, which would concentrate on the four competency categories of the Havelka and Merhout (2009) framework, but also leave room for narratives about the daily work. Our protocol accordingly included guiding question about the role and tasks of the interviewee in the organization and more detailed questions about the interviewee competencies according to the competency framework. Specifically, we asked what personal, professional, business and technical competencies the interviewee should have to carry out her daily work and why so. To aid the respondent in understanding the competence categories, we provided the definitions of the categories as per Havelka and Merhout article. After identifying the required competencies, the interviewees were also asked to prioritize them. For practical reasons, we aimed at one-hour interviews.

The data collection was carried out by two interviewers from April to June 2017. The interview invitation was sent to 28 persons acting in the CDO role in the Nordic Countries. Ten of the invited persons participated the study. Each face-to-face interview followed the interview protocol and lasted 60–90 minutes. All the interviews were recorded and transcribed verbatim. The interviewees and the details of the organizations they work for are summarized in the Table 1 below. The primary role of each CDO was identified by comparing their responses against the characterization of CDO types by Haffke et al. (2016).

#	Primary role	Branch of industry	Turnover (Million Eur)	Employees
1	Innovator	ICT	20-50	100-300
2	Evangelist	Public sector	-	300-500
3	Coordinator	Finance and Insurance	200-500	1000-1500
4	Coordinator	Retail	1000-1500	1500-2000
5	Evangelist	ICT	500-1000	1500-2000
6	Coordinator	Manufacturing	2000-3000	10000-15000
7	Advocate	Manufacturing	2000-3000	10000-15000
8	Evangelist	Manufacturing	3000-5000	10000-15000
9	Coordinator	Retail	5000-10000	15000-25000
10	Coordinator	Storage and transportation	2000-3000	2000-5000

Table 1. Summaries of interviewees and details of their organizations

The phases of the analysis of the interviews were: transcribing of interviews, reading, classification, finding links, differences or new findings, and reporting results. Analysis was carried out by using of QDA Miner Lite program. With this program, the classification of the research material was performed by utilizing the user-defined encodings. The program compiled the sentences contained in an encoding into its own text file. This action was performed in iterations to improve the accuracy of the classification.

Results

Role and Tasks of Chief Digital Officer

According to the interviewees, the CDO is above all a change agent. The CDO is responsible for implementing the digitalization strategy, coordinating and controlling digitalization projects across the organization and maintaining cooperation in the organization during the change. The CDO operates between the business and IT department and is the business owner for digitalization projects in the organization's management team. The interviewees also mentioned the management of innovations as part of the CDO *role but* did not experience it as the most important task. Half of the interviewees felt that the role of the CDO was to support and renew the existing business. On the other hand, the other half saw that it is the CDO's function to also develop a new business while simultaneously supporting the existing products, services and business. The interviewees described the role as follows:

"I'm in charge of the overall picture. And that our company renews itself, in a way that it's intended in 5 to 10 years, in a way that we're competitive." - Interviewee 9 on implementing the digitalization strategy.

"The work of the CDO will end no later than five years. It is the role of change agent… My job is to make sure that they have an understanding of … how this relates to customer experience and business strategy." - Interviewee 5 on coordinating and controlling projects.

"Last spring there was such an emphasis, to increase the company's digital literacy and understanding." - Interviewee 3 on communicating the change.

"It must be creative. The working environment must be creative. You also have to give time to creativity. It's the way we start formulate new service. " - Interviewee 1 on innovation management.

"In practice, I put 100% to support and renew and enable existing business" - Interviewee 3 on supporting existing business.

"We are creating new business that support old by transforming the processes and the organization's work habits." - Interviewee 9 on developing new business.

Coding the interview data revealed several CDO tasks. Most commonly referred to was change management (mentioned 9 times), the development of customer experience (7), business model development (7), and increasing the understanding about digitalization in the organization (7). Other tasks include coordination of digitalization initiatives (6), maintaining collaboration (6), obtaining information about new technologies (6), developing new capabilities (6), facilitation of development activities (5), managing service development (4) and managing technology supply (3).

Competencies of Chief Digital Officer

Based on the interview data several individual characteristics were identified important in the role of CDO. The necessary *personal competencies* of the CDO role reported by the interviewees include: passion (8 observations), adaptability (5), experience (4), visionary thinking (4), perseverance (4), inspirational skills (3), attitude (3), empathy (1) and conscientiousness (1). Many of the interviewees emphasized the importance of personal competences in the tasks of the CDO over other competencies. When we asked for the most important competence, five of the respondents named one of the competency in this category. The interviewees explained these competencies as follows:

"The reason that I'm in this role is that I have a senseless passion to learn more about technology." - Interviewee 5 on passion.

"The two most important features are curiosity and continuous learning". -Interviewee 9 on passion.

"If you have the adaptability and the desire to learn new things and adapt to changing situations, you can manage everything." -Interviewee 2 on adaptability.

"One must also try to create a vision of what things are really the essence of what we should aspire and how to go for them." -Interviewee 7 on visionary thinking.

"Good temper. It is more like a feature. This requires perseverance, you need repetition. The same things over and over again. " -Interviewee 2 on perseverance.

"Individual and professional skills, because everything else you can learn. They will benefit and speed up learning other skills." -Interviewee 1 on importance of personal competencies.

Based on the interview data several professional competencies were identified as needed in the role of CDO. The necessary *professional competencies* of the CDO role reported by the interviewees include: analytical skills (8 observations), interpersonal skills (8 observations), strategic thinking (7 observations), leadership skills (7 observations), customer orientation (6 observations), organizing skills (6 observations), team orientation (6 observations), change management skills (5 observations), problem solving (4 observations), and facilitation skills (4 observations). When we asked for the most important competence, three of the respondents named one of the competency in this category. The interviewees explained these competencies as follows:

"Well, it is a very important to make sense of the complexities… and building the overall picture is very important." -Interviewee 4 on analytical skills.

"You need to have the skill to ask the right questions." –Interviewee 10 on analytical skills.

"Interpersonal skills are the kind you use to influence people." - Interviewee 9 on interpersonal skills.

"If you think of the soft skills, communication skills are very important. Both written and oral communication is related to the presentation skills,… but I need to add that when you are with your clients, written communication is very important. " -Interviewee 1 on interpersonal skills.

"And the ability to take the client's viewpoint and to figure out what's important to the customer,.. and how to make it easier for a customer to work everyday." -Interviewee 6 on customer orientation.

"I am very much involved in various customer events and customer meetings." -Interviewee 1 on customer orientation.

"But if you can make people change their actions and change to the direction we see as a business of the future, it will have a big impact. That is why it is really important for people to get people to change their work and activities. " -Interviewee 8 on change management skills.

Not surprisingly, interviews show that *business competencies* are highly important in the role of CDO. Nearly all interviewees highlighted the need of knowledge in business concepts (9 observations) and processes (9) and the need of possessing domain and organizational knowledge (9). Four of the interviewees stressed the competence to employ and exploit company data in decision making and in generating new business for the firm. The interviewees explained the business competencies as follows:

"Data is so important driver for the change and for business transformation,… and you need to be analytical to know what the data tells you." -Interviewee 9 on the role of data.

"The CDO needs to understand the aspects of business in a profound way. So where's the money coming in, how we do products, how we serve the customer, and how we market to them." - Interviewee 5 on business concepts and domain knowledge.

"You need to know about the business models, customer relationships, processes of the company." - Interviewee 6 on processes and organizational knowledge.

"I would say that the cross-disciplinary understanding of how the organization works is really important." -Interviewee 4 on organizational knowledge.

"When the vendors sell you a piece of software, you need to understand whether there's a business case for us." -Interviewee 10 on organizational knowledge.

Based on the interview data several technical competencies were identified as needed in the role of CDO. However, the interviewees clearly stated that technical competencies are not among the most important skills for the CDO role. Generic level technological know-how is sufficient in this C-level role and technical deep knowledge is found elsewhere in the organization. The important *technical competencies* of the CDO role reported by the interviewees include: general knowledge about technology (9 observations), architectures (6 observations), development methods (5 observations) and about project management (4 observations). In addition to, CDO tasks may require knowledge in business systems (3 observations), applications and software (1 observations), software production (1 observations), data management (2 observations), infrastructure (2 observations), programming (1 observations), information security (1 observations), business insight management (1 observations) and information networks (1 observations).

"You have to understand what technology enables for you, not necessarily that you have a deep knowledge of programming." - Interviewee 1 on general knowledge about technology.

"Understanding the potential of technology is a key part for me and my team …" -Interviewee 3 on general knowledge about technology.

"Knowledge about new technologies. To be able to talk with the vendors. " -Interviewee 9 on general knowledge about technology.

"… to understand the different pieces of the puzzle. Knowing what role the system plays in whole,… that is more important than to know the system through and through. That level of architectural understanding. "- Interviewee 6 on architectures.

Discussion

Following our analysis, we aim at synthesizing our findings and answering the main research question: What competencies are needed in the tasks of the Chief Digital Officer? Most importantly, we identified competencies in all four competency categories and interviewees mentioned at least once all the competencies in the chosen competency framework. We can conclude that the CDO shall need a board combination of generic personal and professional competencies as well as specific business and technical competencies. The identified CDO competencies for each category in Havelka and Merhout (2009) framework are summarized in Table 2 below. The table 2 also highlights the observations that are consistent with prior studies of CDO role, new observations made in this study and the CDO competencies prioritized by the interviewees (bolded). In particular, the interviewees emphasized passion for learning, analytical and interpersonal skills, customer-orientation, understanding about business models and understanding about the impact of new technologies.

Category	Identified CDO competencies	Comparison
Personal competencies	Prior experience, perseverance, visionary thinking, inspirational skills	Consistent w. prior work
	Passion for learning, flexibility, positive attitude, reliable and honest character.	New observations
Professional competences	Leadership skills, ability to work in teams, strategic thinking, communication and **interpersonal skills** and problem-solving skills, change management skills.	Consistent w. prior work
	Ability to organize one's work, **analytical skills**, facilitation skills, **customer orientation**.	New observation
Business competencies	Knowledge about the business concepts, about the business processes and how to execute them and about the firm's **business domain and business models**.	Consistent w. prior work
Technical competencies	Project management, specialized technical knowledge	Consistent w. prior work
	General knowledge about technologies and their impact, knowledge about architectures, knowledge about development methods.	New observation

Table 2. Identified CDO competencies in the present study

Moreover, the interviews indicate that the personal and professional competencies are more relevant for the CDO role than the business and technical competencies. We believe these were highlighted because of the change agent's role of the CDO. This demanding role requires among other things inspirational skills, perseverance, empathy, interpersonal skills team orientation and, naturally, change management skills.

Finally, the novel observation in our analysis is that the CDO role may need competencies, which do not appear in the chosen competency framework and which are not detected in studies of the CIO role (Lane and Koronios, 2007; Peppard, 2010; Correia and Joia, 2014). In particular, the interviews confirmed our assumptions that, compared to the CIO role, *the CDO will need competencies in visionary and strategic thinking, in customer-orientation and perseverance to deal with change resistance*. We suggest that these competencies are related to the CDO's responsibilities in renewing the organization and generating new business as well as in acting as the change agent.

This study has both practical and research implications. From an organizational point of view, the present study provides new insights about the effects of digitalization in the organization. The results presented in this paper help in assessing the needs for digital transformation and the required competency to execute the change. Also, organizations need to define the role of CDO and its tasks, and the results of the present study can be used to evaluate the CDO's suitability for the position. We found that the CDO is primarily responsible for improving the customer experience, renewing business models, and performing change management tasks to execute the strategy.

Conclusions and Further Studies

This study has analyzed the competencies of a new role in organizations, the Chief Digital Officer, which is responsible of helping the organization to embrace digitalization. This study synthesized the existing literature relevant to understanding digitalization and the role and tasks of the CDO, and examined the competencies of the CDO role empirically by conducting ten in-depth interviews. Our empirical work was based on a competency framework for IT professionals. The study results in identifying a list of relevant competencies for the CDO role, which further highlights essential parts of digitalization phenomenon: It is about the use of digital technologies and digitized information to bring about innovative changes organizations renewing or reinventing the way organizations conduct their business and daily operations.

This study identified CDO as a business developer and a change agent. To undertake the changes, the present investigation of the CDO has shown that the role requires broad range of competencies:

- Understanding of the digital technologies and their impact,
- Visionary, analytical and strategic thinking to craft a digitalization strategy,
- Customer-orientation and business model development to exploit the digital technologies,
- Interpersonal and communication skills and perseverance to manage the changes.

Regarding the scope of the study, the interviewees represent companies operating in Nordic Countries. This geographical limitation may constrain the generalizability outside the Nordic context, although most of the companies have international or global operations. Besides repeating the study in other geographical context, we would like to see further research about how the company's digital maturity influences the role of the CDO and what are the differences in the roles of CDO in companies with a different digital maturity level. We assume that the firms are recruiting to the CDO position both the type of CDO and an individual with competencies that matches the digital maturity level of the organization.

The scope of the study was also limited to comparing the CDO role with the CIO role, as discussed in information systems research. Further studies could compare the CDO role with the change agent role, as discussed in the organizational and innovation literature, and go deeper into analyzing the differences of the leader of digitalization and different change agents. Related to this, it would be interesting to examine whether the organizations see digitalization as one-off project or as continuous development. In the first case, companies would hire a change agent to transform the firm and, in the latter case, companies would recruit a CDO to change the culture of the organization to cope with and exploit the constant changes.

Acknowledgements

The authors would like to thank mr. Kari Kaario for his comments and insights into digitalization.

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